

LINC 2010 Conference



University Leadership: Bringing Technology-Enabled Education to Learners of All Ages

Proceedings of the Fifth Conference of Learning International Networks Consortium



May 23 – 26, 2010 MIT, Cambridge, Massachusetts, USA

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Forward

On May 23rd, 2010, 120 educators arrived on the MIT campus from almost 40 different countries to attend the 5th Conference of MIT's Learning International Networks Consortium (LINC). They came together for this four-day meeting to learn from international experts in technology-enabled education and to share their own professional expertise in this exciting and fast-evolving field. The theme of the 2010 LINC Conference was "University Leadership: Bringing Technology-Enabled Education to Learners of All Ages," and many speakers addressed the need for increased university involvement in moving advanced educational technologies into both K-12 and lifelong learning settings.

The conference included 19 plenary speakers and approximately 80 presentations presented in 16 parallel sessions - selected from over 120 submitted papers. Papers covered diverse topics such as the role of education on economic growth in Pakistan, information and communication technologies for lifelong learning in Africa, and mobile learning in Thailand — just to name a few. There was tremendous excitement in the air as keynote speaker, Charles Vest, spoke of the new global phenomenon, "brain integration", and when Michael Horn applied his vision of disruptive technologies to global education. And parallel session attendees were amazed to learn of innovative approaches for delivering education to distant, rural populations in places like India, Mexico, and Afghanistan.

These proceedings represent the visions and hopes of everyone who attended the 5th International Conference of MIT LINC. They are a testimony to the promise and power of collaboration in a world that often appears to be hopelessly divided and broken. The diverse authors of these presentations and papers are all dedicated educators, focused on a future where access to quality education will provide a brighter future on this small planet we share.

Elizabeth Murray Editor Cambridge, MA USA March 2011

A special thanks to Alison Hearn and Eileen Carney who assisted with the editing of these proceedings.



Massachusetts Institute of Technology

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May 22, 2010

Dear Participant:

I am pleased to welcome you to this fifth international meeting of the MIT Learning International Networks Consortium (MIT LINC) on "University Leadership: Bringing Technology-Enabled Education to Learners of All Ages." We are delighted that this conference, being held at MIT, includes participation by professionals from about 40 different countries, who will look at academia's responsibility to acknowledge all age groups — to reach down to high schoolers and up to life-long learners.

MIT Chancellor Phil Clay will present the opening address, and you will hear from leading experts at universities, government organizations, foundations, and private companies from around the world. You will pool the talents and energies of collaborating universities to develop strategies for the challenge of applying e-learning to the delivery of high-quality university education in developing regions of the world.

We are proud of MIT's work in the Open Source and the Open Educational Resources (OER) movements, both of which are major topics of the LINC conference. The MIT OpenCourseWare (OCW) program now posts the content of nearly 2,000 MIT courses on the web. At MIT, pedagogical innovations on the web are providing new and innovative learning environments for students, both on campus and at a distance, including the web-based laboratories, I-Labs, and the new high school interactive videos of the BLOSSOMS (Blended Learning Open Source Science or Math Studies) project.

You bring extraordinary expertise to this conference, and all of us will learn from your experiences, plans, and operating methods. Your involvement with the ever-expanding dimensions of technology-leveraged learning is invaluable to us and will help to shape our outreach policies.

We are indebted to the many volunteers here at MIT and to the companies and foundations that have made this LINC conference possible. Thank you for making it the most interesting and successful yet.

In true MIT spirit, the bar is set high, and we are grateful that your professional, academic, and entrepreneurial exchanges at the conference will move LINC forward as a growing and sustainable organization.

Sincerely,

Auson Hockfuld

Susan Hockfield

SH/rcl



Massachusetts Institute of Technology Engineering Systems Division



LINC 2010 Conference

May 21, 2010

Dear LINC Participant:

Welcome to MIT LINC 2010, our fifth international LINC conference! Whether you have traveled from Jordan, Botswana, Pakistan, the U.K., Mexico, Kenya, Uruguay, Malaysia, or one of many other locations, we very much value your presence at LINC. You, the participants of LINC 2010, represent about 40 countries, presenting 80 papers, together with 17 plenary speakers -- our most ambitious LINC agenda yet!

LINC, *Learning International Networks Consortium*, is an MIT-based all-volunteer effort started about eight years ago. By attending LINC, you have joined our LINC family, representing concerned professionals from many countries – each wanting to leverage technology to improve educational opportunities for under-served communities in their respective regions.

The theme of LINC 2010 is "University Leadership: Bringing Technology-Enabled Education to Learners of All Ages." In the 21st Century, our 'knowledge societies' require lifelong learning. Universities, as traditional citadels of learning, have a responsibility to reach to younger learners in high schools, to help prepare them for university education, and to older lifelong learners – to renew post-graduates with the career skills they need as job markets continually evolve. You will see this theme developed in many of the LINC 2010 presentations.

LINC 2010 would not be possible without the dedicated efforts of our volunteers and the financial support of our sponsors, most notably the Saudi Aramco Corporation with its generous \$50,000 platinum sponsorship. At MIT, we especially thank the efforts of the Engineering Systems Division (ESD), MIT OpenCourseWare (OCW) and the Office of Educational Innovation and Technology (OEIT). Thank you to Saudi Aramco, to MIT and to all LINC sponsors and volunteers!

Please let us know how we can serve you better in your time here. Feel free to stop any one of the LINC volunteers to inquire about any issue or to make suggestions. And we will be soliciting your formal feedback in a short written evaluation questionnaire. We hope you choose to complete it near the end of your stay with us. Again, welcome to LINC 2010!

Sincerely yours,

Kichard (Richard C. Larson

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The MIT LINC 2010 Conference Plenary Speakers



MIT Kresge Auditorium

Charles M. Vest President, U.S. National Academy of Engineers MIT President Emeritus

Open Education for an Open World

It really is a great honor and privilege to be back, and to speak to this extraordinary international gathering. I wanted to just begin by saluting the effort that has been undertaken under the acronym LINC. There are two things that I think are particularly important to note. One is that the "C", as you know, stands for "Consortium." I think that is probably the most important element of that acronym, because it means bringing together people and resources from around the world for a common purpose. But I also want to take this opportunity to point out that this is one of the few things of substance in the world that really has been the idea of a single individual. And Dick Larson is a hero. He conceived LINC. He pushed it through all the brick walls and made something really quite extraordinary. So Dick, I just don't want to miss this opportunity to say that you're one of my heroes and I appreciate what you have done.

I want to begin my talk by giving you four quotations, four great thoughts that have shaped my own view of education and particularly of higher education. You will see, not too surprisingly, that I am going to start off my discussion today with the world I know best, the world of higher education in the form of research universities. You're going to hear just a little bit of engineering and scientific centricity—again no surprise—and then a few comments about what is really, I believe, at the core of LINC and this meeting.

As Dick mentioned, I did my graduate work at the University of Michigan. The University of Michigan's epigraph since the turn of the last century has been this: "An uncommon education for the common man." And today, everybody has to stutter a little bit because of that word, "man." It obviously today is for men and women. But it is this idea that is at the heart of America's— particularly public— research universities, the idea that a first-rate education is due the common person.

The second, those of you from the United States will recognize as being the start of what we know of today as the American research university. In the closing years of the Second World War, the U.S. President at that time, Franklin D. Roosevelt, wrote a letter to a very famous MIT person, Vannevar Bush, who was on leave the MIT in Washington, and was very much in charge of pulling together the scientific, engineering and industrial communities in the United States for the war effort. Roosevelt became convinced that the Allied victory was going to come very soon. He wrote a letter to Vannevar Bush, and in that letter, he said this: "New frontiers of the mind are before us, and if they are pioneered with the same vision, boldness and drive with which we have waged this war, we can create a fuller and more fruitful employment and a fuller and more fruitful life." What Roosevelt was saying was that science and technology had contributed immensely to the war effort. How could we now use those same forces and harness them to make a better nation, a better world, in peacetime? He asked Bush to put a group together, think this through, and come up with his recommendations. When Bush submitted his report to then President Harry Truman because, even though it was only nine months later, President Roosevelt had died. Bush wrote to Truman and said, "If ability, and not the circumstances of family fortune, determines who shall receive higher education, then we shall be assured of constantly improving quality at every level of scientific activity." This quote is pulled from the famous report "Science the Endless Frontier," that mapped out the vision that in the United States our universities should be the core of our research enterprise, as well as our enterprise of higher learning. But the key phrase here, again, relates back to this uncommon education for a common purpose, because Bush said it should not be circumstance or family fortune— that is, wealth— that determines who gets a good education.

Finally, to bring us a little closer to today, I turn for my fourth quote to another wonderful colleague, Sir Tim Berners-Lee, another hero. Tim is a person who really had a singular idea and vision, and that, of course, was the World Wide Web. In accepting the Japan prize in 2002, Tim said this: "May we now use every ability we have to communicate to build a society in which mutual respect, understanding, and peace occur at all scales, between people, and between nations." These words summarize very much— when coupled with the previous quotes about education per se— where we are today, and what programs like LINC not only aspire to, but help to achieve.

The world is changing in many ways, and I just want to throw out three or four metrics about ways in which it is changing, particularly for those of us involved in science, engineering, research, and development. The point of this slide, this map of the world, is simply to say that even back in 2002— the most recent good data that I have for this— we had already reached a point where about one-third of the world's R&D investments, by both governments and industry, are in North America, about a third in Europe, and about a third in Asia. Such a map, a decade or two previously, would have looked very different, with a huge swath in North America, a moderate swath in Europe, and a tiny swath across Asia and indeed the rest of the world.

The message here is that the financial input that drives science and engineering is beginning to be smeared amazingly uniformly around the world, at least region by region. Of course we all know it is not uniform country by country. We have new players in science, engineering and industry these days. This little graph that I got from a U.S. organization called the Council on Competitiveness— with data from 2007— would probably be even a more stunning today. It asked the following question: "Where are the young professionals in the three areas of engineering, life sciences, and what's broadly called finance and accounting, or management? "Young professional" is defined as a woman or man within seven years of graduation, working in these various fields. The council compared three of the world's large countries and large economies, China, India and the United States.

If you look at the blue bars, you will see something that I think we all know: there are a lot of engineers in China, lots of people out in the workforce within seven years of their graduation. There are a modest number of young engineers in India, and a little bit more in the U.S., but there's a big domination here by China, and we'll return to that. If you look at finance and accounting, India by far in absolute numbers exceeds the other two nations, with the U.S. coming in second, and China, third. In life science, the United States has traditionally had the most scientists, before the last decade or two. Only in life science does the United States lead, and that's very slightly. That number is close to being uniform across the three countries.

So new investments and lots of new educated talent are coming into the workforce. As President of the National Academy of Engineering, you'll forgive me for putting a little emphasis on engineering, but this is something that is very important for industrialization, for development, and for competitiveness today. The big story is the rise of the number of engineers graduating in China. If you look back to the early '80s, the left-hand side of the graph, comparing three countries— the U.S., Japan and China— you'll see that we were all educating about the same number of engineers each year, about 70,000 at that point. But then, as we came into the early 2000s, there was a terrific rise of numbers in China, a modest increase in Japan, and a decline in the United States. These data a couple years ago were rather controversial, because everybody thought that the estimates for China were too high. This is the most conservative figure. It comes from the U.S. National Science Foundation, which I will use, as I have learned it is the same number the Chinese themselves use. But here is what has happened in the meantime. This rise in absolute numbers is huge. Talent, education and investment in research and development are spreading around the globe. New investments, scientific engineering and business talent are all spreading around the world. Of course, underlying everything we think about is the concept that people everywhere are smart and capable. They just need to be given the opportunity.

Who provides primary opportunity? I believe at the level on which I'm discussing, it is education, and in particular, our research universities. So it's a fair question to say, "If everything's beginning to move around the world, and we know that economies and production of goods and services and so forth are all virtually fully globalized these days, what about our universities?" Well, I see two phases of this. One is pretty much history, although it comes up to the present moment. The other is what we're doing now and moving forward. Phase one, I will call diffusion. The basic concept of the research university as we know it today, that is intimately coupling teaching and research, really came out of Germany in the 1800s, specifically from Humboldt University. This concept was ported across the Atlantic Ocean to the United States. Most people would point to the Johns Hopkins University as the first university to fully embrace and build around this concept in the US.

In the century and a half after that, we saw a great diffusion across the United States of large-scale public universities: Berkeley, Stanford, Michigan— Stanford is private, but the University of California, and so forth are public— and also some somewhat more focused institutions, like MIT, Caltech and Rensselaer Polytechnic. This idea began to

spread, took on its own shape, and became the core of higher education in the United States.

I have to tell you this story. In the year 2000, I was at a dinner, and was seated next to the rector of Humboldt University. Halfway through dinner, he looked over at me and in all seriousness said, "Do you think that this idea of the research university you guys have in the United States could be adapted to Germany?" I still kid him to this day. He was absolutely serious in asking this question. But there has been some continual feedback. Much more important to today's meeting, this idea began to be adopted and spread all over the world. I point particularly to the Indian Institutes of Technology, which I think comprise one of the great success stories in higher education of the last century. But also it's now accelerating through Asia, through the Middle East, and of course in Europe, some interesting related concepts, such as the Bologna Accords and so forth, are coming into place.

Starting with its origin in Germany over two centuries, the idea has spread, been adopted, and been changed, depending on context and location, but remains a real driving force in the world. About a decade ago, I was on a panel of higher education leaders, and the question put before us by the person chairing the panel was, "Which university will be the global university of the 21st century?" This sort of competitive view is, I believe, really the wrong question. I think the right question is, "What is going to happen to the research university, and what does its globalization mean?" Because I don't think it's going to be a matter of a single university that becomes the leader and drives everything.

That brings me to the second phase, and to my own view of the world, which is that we are now moving into a second phase that is based on cooperation and openness. Lots of things are going on. There are many ways of interacting globally, from a given university. You can have a physical presence in other countries, building campuses and building laboratories. You can forge strategic alliances among universities in country A and country B and country C, and work jointly on educational or research projects. Or you can use technology— as all of those of you who are gathered here today do, to have some sort of a virtual presence in other countries— through distance education, synchronous or asynchronous, or through the dispersal and dissemination of open content: teaching materials, scholarly archives, tele-present laboratories and so forth. That is what those of you in this room are engaged in, and it is something I am very passionate about. I believe that we are seeing the evolution not of a university that is the global university, but something I call the meta-university, something that's above all this, something that is enabling.

As Dick said, maybe not exactly in these words, at MIT I became very passionate about the concept of sharing education, a passion, by the way, shared with amazing uniformity across the faculty of this wonderful institution. The reason I'm so passionate about this is that I believe the role of universities is to create opportunity, pure and simple. We create opportunity for the young people we educate, for our cities and regions and nations, through our economic-development related activities. Everything we do is, or should be, about creating opportunity. I said a minute ago, people everywhere are smart and capable. They need to be given opportunity. Therefore they need to be given education.

One of the things that we were fortunate as a faculty here to pioneer was MIT's Open Courseware initiative. I know you all know about it, but the concept was very simple. Put the teaching materials on the web for all 2000 subjects that we teach here, for anyone to use, anywhere, anytime, free of charge. I learned that many people sought this knowledge. So you see over time, the use grows relatively dramatically. The different color bands here represent language. The lowest and largest band is in English. The higher bands are translations of our MIT materials into other languages. OCW materials are used all over the world, and they are appreciated. When we first launched this activity, we got literally thousands of extraordinary emails. I've quoted one here that came from someone in Latvia in 2002: "MIT OCW is the eighth wonder of the world! My sincere, heartfelt thanks to all of you out there who have been involved in the making of this project. Keep up the excellent work!" A couple of the letters, and actually one newspaper letter, referred to it as being the equivalent of the invention of the printing press. I wouldn't go quite that far, but it is an exciting idea. It is so rewarding to see that it has begun to spawn additional initiatives in the intervening years, because others clearly think it is a good idea. Today MIT is less than a third— it is close to a fourth— of all the serious, well-structured, open courseware activities of universities out there. There are many, many other examples. I know that in all of the talks and discussions here, a huge number of these things are coming out, so I didn't attempt to summarize them, but there are many other things that are open today, either freely or inexpensively, rather openly available on the web: entire libraries; all sorts of scholarly materials, from artwork to specialized journals; online education in both the for-profit and nonprofit sectors; even at an embryonic stage, the accessibility of laboratories that can be operated by students around the world, through the World Wide Web.

The philosophical point I would like to make is that in my view, this is all about openness and sharing resources in higher education. It is the true spirit of education, democratization and empowerment. It is not a spirit of control; it is a spirit of working, and thinking, and learning together. Openness underpins innovation, cooperation and competition worldwide. After all, in today's world, we are forever balancing cooperation and competition. We want to compete in order to drive excellence. At the same time, we want to cooperate to build things up. So we have to find that balance. It is quite an interesting exercise. Openness in higher education enables sharing and accessing expensive and intellectually intensive materials. That's what this open movement is all about: making big investments of time, money and intellect in one place, and then letting it be accessible to others in return for making this a two-way path and sharing.

Finally, it speaks of institutional and national values. Now, we all know, if we concentrate for just a moment on science, that the open flow of scientific information is essential. That's been accepted for two centuries or more. Science thrives through unfettered communication. It's an international culture, and it requires criticism, testing, and repetition for its actual conduct. In a sense, that's not new, but what we do have now is the open flow of educational resources. You might say that educational resources have

forever been flowing around the world, from the days of wandering professors in Europe, to the promulgation of textbooks, to meetings and conferences. But what has really happened, of course, is that the Internet and the World Wide Web have given us unprecedented scope, reach, speed, and increasingly, interaction.

I think something very fundamental is happening. I call this the meta-university. What we are observing, I think, is the early emergence of a meta-university, a transcendent, accessible, empowering, dynamic, communally constructed framework of open materials and platforms on which much of higher education worldwide can either be built or can be enhanced. This will enable, not replace, traditional universities. It will bring cost efficiencies to institutions through shared development. It will be adaptable and not prescriptive. If there's one thing I want to underline here, it is that. The idea of open materials is: use what you want, add to it, subtract from it, and shape it for your own uses and contexts and locale. Be adaptive, not prescriptive. That will serve both teachers and learners. It will speed the propagation of high-quality education and scholarship, build capacity for economic development, and build bridges across cultures and political boundaries. Heaven knows that is something we need today. It will be particularly important to the developing world, to accelerate their climb up to better health and quality of life.

Out of this came another great thought, which is really the logo, if you will, or the byword, for LINC: "With today's computer and telecommunication technologies, every young person can have a quality education regardless of his or her place of birth." Note how that relates back, in a more structured sense, to what I said about the University of Michigan providing an uncommon education for the common man. Therefore, LINC and BLOSSOMS were born, bringing consortium and partnership with nations, and expanding to secondary education - broad learning - not just at the highest level of education as we do at a place like MIT. BLOSSOMS, bringing specific partnerships with Jordan, Pakistan and now Lebanon. And I would put a big emphasis here, Dick, and I think you will agree, that it is really the human-technology interface, the interaction of people and technology, for the purpose of learning. Learning videos by volunteers is a really nice, and I believe, at this point quite a successful undertaking.

Now I would like to take a moment to relate all of this to something else that I am engaged in this year as President of the National Academy of Engineering. We established a set of grand challenges for the world that require at their core, engineering, and as you will see, many other things. How did we do this? We put together a committee. It was chaired by Bill Perry, former Secretary of Defense of the United States in the Clinton administration. You may recognize some people here. It is a quite diverse group. What they have in common is they're all really highly accomplished folks: Bernadine Healy, who ran the National Institutes of Health; Sir Alec Broers, former Vice Chancellor of Cambridge University; the great inventor and engineer, Dean Kamen; Calestous Juma from Harvard, who is a great scholar of technology in the context of Africa; Bob Langer; and Jane Lubchenco, down here in the corner, who now is head of the NOAA in the U.S. Federal Government. You will see there: Mario Molina, a Nobel laureate who figured out, together with Shelley Rowland, the problem with CFCs in our

atmosphere; Larry Page, one of the Google twins; Craig Venter over here, who has been in the newspapers constantly for the last two weeks, with his more or less artificially developed cell. They are a lot of really terrific people. The committee came up with 14 grand challenges. I'm not going to walk through each and every one of these, but just point out that they fit into a set of four boxes, having to do with energy, global warming, sustainability; healthcare; security against both manmade and natural threats; and finally, a set of challenges that just have to do with expanding and enhancing human capability and joy.

So why do we want to do this? Why do we want to inspire, challenge and educate? There are two reasons. One, we need to build a vision of exciting futures for young men and women. And second, in a very serious way, almost all of these challenges are associated with survival on this globe. Through education and innovation, we can create exciting futures for young men and women. I would say, without any fear of contradiction, that this is the most exciting era in engineering and science in human history. Engineers and scientists together create the tools of scientific discovery. CERN, which some of you have visited, and certainly all of you know about, is just beginning to be wound up toward full-scale operation. One of the other challenges, re-engineering the brain, has to do with increasing interaction between the human brain and mind and computing, each learning from the other. Making solar energy economical— this is a photograph from China, as a matter of fact. But I wanted to end by pointing out the things that have to do with our ability to survive, or at least survive with a reasonable quality of life on this earth, as our population approaches nine billion people.

These are really profound challenges, but in them, as always, are great opportunities for contribution to human advancement. So again, some of the challenges are associated with improving global health. By the way, you may have seen that there are some actually encouraging statistics out this last week about the work the Gates Foundation and others have been doing worldwide. We're beginning to see:

- Much lower mortality rates among infants
- Provision of clean water, something we are all going to be living with over the next decade, as are our children and grandchildren
- Urban sustainability, and of course, dealing with all the carbon energy and climate problems
- On the security side, securing cyberspace, something we all care about
- Advancing personalized learning, something that LINC and especially BLOSSOMS are directly engaged in doing
- Enhancing virtual reality and restoring and improving urban infrastructure.

There are so many exciting challenges out there that can form the basis of educational programs, and help us to educate the young men and women who are going to need literally to save us here on earth. Well, I am an optimist. There are lots of reasons to be worried these days, but I think the world continues to get better. I believe that if we can learn together, we can also meet big challenges together. So learning and problemsolving are obviously related well to one another. People become educated and then can

solve problems. Things we learn, solving problems, feed back into education and learning. And all of this is speeded up and spread around through the digital world.

So this is really a very exciting time to be undertaking the kind of things that LINC is doing and that have brought all of you here to MIT today. And I am an optimist because here's my view of the future. This is a term you all know from your own local context, "brain drain." This mostly refers to the United States, which for three or four decades has been extraordinarily fortunate, because of our tradition of openness and welcoming, to have attracted many of the best and brightest young women and men from all around the world to come to this particular country to study, and frequently, to stay and work, to be faculty members, to be entrepreneurs, and so forth. It really is the single greatest factor of success, I believe, of the United States.

But many people have a more negative view of this. They say, well, yes, that's great for the U.S. To some extent, that helps the world, but you know those brains are needed back home, in many cases. So they think of it as a brain drain, rather than as a positive thing that we see here in the U.S. But I think today we are slowly but surely beginning to move towards an era, which is better called "brain circulation." People are moving around. They work in country A, then they move on to country B, and so forth. Particularly among the newer generation, a lot of folks moving around, which in the long run is probably going to be good. But my closing point is really this: I think what comes next is what I'm going to call "brain integration" and in a very real sense, that's what LINC is all about. It's about making use of technology to bring people and ideas, minds and brains, to bear, commonly, in this case, on education. It is also going to be happening in the way in which we will approach the solution of these grand challenges, believing that people and technology together can share ideas, build a synthesis and synergies in ways that we've never been able to do before.

We cannot undertake this naively, because we don't want the technology controlling the minds, but I think this really will characterize the coming era. Brains will not only circulate around throughout human lifetimes, but also, we'll be literally connected and working mutually in brand-new ways that we have hardly thought of.

So to conclude, thanks to Dick Larson and to all of you in the room here. Today we are LINCed to learn. But we can also be LINCed to meet grand challenges that are facing this world, and improve it for all people. Thank you very much.

Where is My Teacher? The Evolution of the Digital School And its Impact on Global Learning

Mohammed T. Al Sellemi, Director Human Resources Services Department Saudi Aramco

Good afternoon, ladies and gentlemen. Thank you, Professor Larson, for your kind remarks. It gives me great pleasure to be with this distinguished group of educational leaders and professionals at this prestigious educational institute, MIT. Originally, Ms. Huda Al-Ghoson, General Manager of Training and Development at Saudi Aramco, was supposed to be here, but due to an unforeseen business requirement, she had to attend a board meeting. This has afforded me the great pleasure of being with you here today.

At the same time, I am very delighted to inform you that we at Saudi Aramco, starting with our president and CEO, Mr. Khalid al-Falih, and extending throughout our corporate management and HR professionals, are very much excited and supportive of MIT's initiatives and efforts in developing, facilitating, leading and providing quality education to global communities, including those with limited resources.

Over the next 20 minutes, I will share Saudi Aramco's experience as a case study in creating a corporate culture for its employees, families, dependents and the local community. It is important to highlight at this point that this could not have been achieved without the existence of critical enablers, one of which is the continuous development of teachers to become facilitators and agents of change. I will share more with you about these critical enablers at the end of the presentation.

The outline of my presentation is as follows: first I will go over some historical milestones; then I am going to dive into Saudi Aramco Learning: road map, online resources, e-learning, blended learning; I will talk about enabling quality learning within Saudi Aramco; then I am going to share with you some of the projects we have as part of our social and corporate responsibility. I will conclude with the challenges we will face in the future.

Now, during the meetings we had yesterday and today, we had some very interesting discussions. One of the issues we raised was around teachers: How can teachers change to accept the new technology and learning. How can society accept this new way of providing education? There are those who support it. There are those who do not see it and do not accept the change, because of the way they are and because of their frame of reference. This is not new. It has been this way through history. If we look back at history, we will find that what is happening today has basically happened in the past, but the journey continues still.

Let's look at this quote, from the year 1703: "Students today cannot prepare bark to calculate their problems. They depend on their slates, which are more expensive. What will they do when the slate is dropped and it breaks? They will be unable to write." Or from 1815: "Students today depend upon paper too much. They don't know how to write on a slate without getting chalk dust all over themselves. They cannot clean a slate properly. What will they do when they run out of paper?" 1815? You are talking about change. Now, from 1914: "Students today depend on these expensive fountain pens. They can no longer write with a straight pen and nib..." Or from the 1950s: "Ballpoint pens will be the ruin of education in this country." And look at the last sentence: "Businesses and banks will never allow such expensive luxuries." Even as recently as 2000, we see: "Students who use computers in the classroom at least once each week do not perform better on reading tests than those who use computers less than once a week."

The point is, whenever a change is introduced, it has to be coupled with and supported by a change management in order for it to be successful. The way we apply this today for elearning is that in order for an institute to accept a change, and for teachers and society to accept it, we have to have a change management. That is what I will illustrate for you within Saudi Aramco. I will show how we have journeyed from the 1940s until the present day and the change management that we have employed.

After the discovery of oil in the 1930s, the first school Saudi Aramco had was in 1941. This is the one you are looking at. (See slide #9) However, if you look inside, you will see that we utilized the latest technology at that time, too. (See slide #10) Then we moved on. (See slide #11) This is the first official well-known school that Saudi Aramco managed, with the purpose of training its employees to operate the complex facilities that we have within the Kingdom of Saudi Arabia. Then things evolved, and we expanded. Our facilities grew, our production increased, and the complexity of our technology also became very sophisticated.

So education is becoming a cornerstone of the strategies that we have within Saudi Aramco. We operate in remote areas, like Shaybah. Shaybah is basically in the heart of the desert, the empty quarter. We made it like an oasis. Part of the obligation we have, based on the values we uphold within Saudi Aramco and the vision for HR, is that every employee in the company— she or he— has the right to have access to education and to training to maximize his or her full potential.

So with e-learning, with the technology that we have employed, we have become able to reach all of our employees 24 hours a day, seven days a week. We require this because we operate our facility 24 hours a day, in different areas.

The road map that we follow, and the principle behind it center on lifelong learning. We started in the 1950s with very basic training, merely basic operating training, basic English and basic math. We tried to Saudize all the positions we had through very structured training. We started building what we called training centers and training resource centers throughout the company, in order for the employees to have access. We moved into computer-based training—CBT, as it was known at that time— buying

some of these CBTs off the shelf. We started converting some of the programs we had on CD. Then in the 1980s, we went to online learning. We followed all the developments in the market and started buying off-the-shelf materials.

The major shift in the way we have created and recreated the culture of learning in Saudi Aramco started in the 1980s with self-development. So we came and we started building a culture. To our employees we said, "Listen, we are not the main source of knowledge for you. Development is not our responsibility as an HR organization. We can provide the resources, we can provide the culture, but it is your responsibility as an employee to be self-developer, to go and seek the learning you want. We will provide it to you." That shift required lots of changes in the management of culture. For years, people were dependent on teachers, on trainers, on consultants to provide it. But all of a sudden, we said, "This is it. Now you are on your own, and we will provide it."

The resistance we met was not from the learners themselves, but from the line managers. They were saying, "Listen, in the past I used to send my employees to you for training and education. And now you are telling me 'no'? They have to do it, and I have to be the mentor and the leader?" So we have done lots of cultural change, and we have tried to influence it positively by changing our policies, by changing our procedures, by introducing new incentive programs and recognition. I think we have come a long way. I will show you a statistic that shows where we are today from this journey that we started.

Then we started in 2000 with blended learning. Now, most of our courses have both online and conventional training. We have more than 2,000 online courses, some of which are compulsory. We made it compulsory as part of the policy, so as to encourage people to go and enroll in these programs.

Let's look at the statistics of active users of e-learning courses within Saudi Aramco. (See slide #14) If we compare between 2003 and 2009, you will see the difference. Now, this year we are projecting the number of active users at 125,000. By the way, the total number of employees at Saudi Aramco is around 55,000 employees.

Now, we looked at age. We are using this graph just to show the comparison between 2008 and 2010. We see that the younger generation, the younger employees coming in, are more into e-learning, more into IT, more into the Internet. They would like to stay away from conventional courses as much as they can.

The number of completed online courses in 2009 was 288,073. That tells you, if you look at the story from 1941 until today, that there has been a major shift, a major achievement in terms of how we as a company— and we are talking about just a company, not a whole society— can effect a change. As a company, how can we change the culture of our employees and our line managers to accept the new technology of learning, to accept e-Learning, to accept online as the way of operating our facilities? This is the way for the future as well.

Of course, this goes with the vision that we have as a company, as well as being a business requirement. We operate locally, within Saudi Arabia, and we operate internationally— we have offices in Houston, in London and in Riyadh. We also operate offshore and onshore, in Shanghai, Malaysia, Dhahran and elsewhere.

Based on our company's values, one of our objectives is to ensure that employees always have access to training and development. So by doing this now, our employees, regardless of where they are, have the necessary access to complete their course requirements as part of their development and promotion planning. We do not just provide access in Dhahran, and require employees to move into Saudi Arabia in order to complete their course requirements.

One of the tools and the means we use is MOODLE. This tool helps us to interact with our teachers, trainers and students during and after working hours, during weekends and workdays. Of course, we are supporting this within a very structured curriculum development within the HR organization of Saudi Aramco, where we develop our programs up to a certain standard that we then maintain. Then we have a hard copy and soft copy, and all of our employees have access to it.

Now, from our experience, in order to have a very successful transformation of a culture of learning, and the acceptance and support of those who are receiving it, there are five key enablers that have to be in place. This is a reflection of our own experience within Saudi Aramco. The first one is that there has to be a clear vision about educational learning. I think we have it within our company. Not only this, it has to be strongly supported by management— corporate management.

The third enabler is that you have to have appropriate infrastructure. Within the company, we have a state-of-the-art infrastructure, and it is always developing. Once the IT solutions, or the IT infrastructure, or the e-learning infrastructure, develop in the world, we always develop with it and we move to the state-of-art technology.

The fourth enabler is continuous staff development. When I talk about continuous staff development, I mean teachers and trainers. In one organization that is providing technical training within Saudi Aramco, we have about 820 teachers and trainers. By the way, the average number of years of service in the company is about 31 years. So we have built a culture. We do not always hire directly from outside; we hire high school kids. Then they go to university, and they will stay with us until the age of 60. So just remember this. With all of this, we have been able to motivate them, we have been able to change the way they think and help them to accept the new realities of learning, and the new ways and the new tools.

So within the organization, under Dr. Aaaam and his team, we have an organization that is fully dedicated to training and certifying facilitators and teachers in new technology. No teachers or trainers run our classroom unless they are certified. Of course, it is not all sweet and dandy. Some are still struggling with it, especially with the new technology. But we are accepting it as a reality and we are telling them that we are moving with it. We have the culture of keeping our employees with us, but we are telling them also that this is the way we are, and this is the way the future is going to be.

So from this, to summarize, it has not really been an easy journey. It is a reflection of what has happened historically, as you have seen. We are just a smaller example of the reality in the world. But we had a clear vision, we had commitment, and we had a culture that said this is the way we are going to go, and we are supporting it, and we have moved a lot.

From 1941 until today is a short time span, but I think we are very proud of what we have done in the field. Today as we speak, we have in our training centers 5,000 high school kids - high school graduates - studying. They are actively enrolling in our training program to become employees. Plus we continuously have about 1,000 employees every day who go through our training program. We are talking about 6,000 individuals that we are training daily by using the technology that is helping us. Having said that, there is also an obligation and commitment from the company to the local communities when it comes to educational learning. That is part of the value we have and part of the culture that we are promoting.

Maybe you have heard that about three years ago the King of Saudi Arabia entrusted Aramco with building King Abdullah University of Science and Technology. It was built from scratch by Saudi Aramco, and I think that was an honor for us. It demonstrates a belief in our capabilities within Saudi Aramco. It also aligns with the culture of social responsibility that we have. However, that is just one example. Now, to develop the communities in different fields, we have different initiatives. One I would like to focus on and show you is that education is a primary ingredient of social development, and it is the obligation of everybody involved to expand on it and to give it to others.

If you look at this slide, you will see that before the Internet - and before e-Learning and the connectivity that we have - Saudi Aramco developed what we call a mobile library. (See slide #20) This mobile library is very scheduled. We go to remote areas, to small towns and villages, and we have our books with us, and we lend them to the people. So we go to a small town— sometimes it is really in the heart of the desert— and we stay for one week. We take with us science books. We take with us stories for the kids. We have done this for a long time. Now we are embarking on some online training in math, science, and other subjects to provide to the local community. We believe if the local community has access to education, then those who are the feeder stock for us will be adding value to us as well

So the question that I posed in this presentation is, "Where is the teacher in all of this?" This is a quote that we had from our own teacher just three days ago. He said, "A teacher will never be replaced by technology. However, a teacher who understands and uses technology will replace a teacher who refuses to use it."

This is the lesson, and this is the moral of the story, which we need to communicate to all our teachers and trainers. The message to teachers within Saudi Aramco is that we are not going to replace you, but that technology is the future, is the way we are going. We will provide you with access, we will facilitate your learning and we will have incentive programs for you. But if you are not going to be with this stream of development, others might come and take your place.

With this, I conclude my presentation. Thank you very much.

The Top 10 Global Trends in ICT and Education

Robert Hawkins Senior Education Specialist World Bank Institute Washington, DC

It is a pleasure to be back here. My name is Robert Hawkins. I'm with the World Bank and I had the pleasure of being at the first LINC conference, seven years ago, and it's great to be back. I have spent the interim with the World Bank in our South Africa office, working on science, technology and innovation with a focus on education and ICT. I'm going to share with you a paper that I wrote recently around ten global trends that we've seen throughout the world in ICT and education.

The first one is mobile learning. I hope everybody has their cell phones off and are not using them right now. Beyond cell phones, we also look at smart phones, iPads, netbooks -- the proliferation of devices that students and teachers can use to bring knowledge and information directly into their hands. These statistics are well-known: four billion subscribers, 2/3 in developing regions. An incredible growth in this technology, particularly in the poorest parts of the world, with a billion new cell phones produced every year. The iPhone alone already has 150,000 apps, which provide a large amount of educational content. So the question becomes: what happens when these devices get into the classroom? There are a number of pedagogical techniques and strategies for optimally using the cell phones, and let me take a look at one now.

[Watching "Angry Professor" YouTube video in which a classroom professor smashes a student's ringing cell phone]

OK, so that's one technique for integration of technology into the classroom! Perhaps there are other uses of the mobile phone for learning, and perhaps we should re-think the definition of the classroom. Indeed, probably the best examples of the use of this technology have been out of the classroom: 24/7 information access to support wherever, whenever learning; a data collection and sharing tool; and for delivery of traditional lectures over podcast. Many of these applications are not well suited for lecture-style presentation in a classroom. They are suited for a more active, out-of-classroom experience. Here are two examples of the kinds of applications being developed: (1) a walking tour through time, allowing you to download historical maps to physical locations where you happen to be and listen to an audio tour of a city; and (2) being able to send a text to a Wikipedia linked site with questions and receiving a text answer back on your cell phone. The latter is being piloted in South Africa.

The second trend that we see is around cloud computing, and again, what do we mean when we talk about cloud computing?

[Watching "Cloud Computing" YouTube video in which software engineers describe cloud computing as "magic"]

So our second trend is magic! The magic of cloud computing. Cloud computing has a number of useful applications for education. One is particularly relevant in developing countries where capacities are thin. It supports the first trend, which is the proliferation of cheaper devices for mobile learning, where less power in computing memory is needed. It also allows for third-party services and technical support, that is decentralized IT support – reducing the need for technical expertise in a specific school or location. It is device- and location-independent. In terms of developing countries, where capacities are thin in terms of technical support, being able to move that support to a third party is extremely useful and cost-efficient. The challenge is ubiquitous connectivity. You need to be able to connect in order to use the cloud. There are also the issues of privacy and control-of-content concerns.

The third trend I want to share is one-to-one computing, and when we talk about a device-- this could be, again, a smart phone, a netbook, a tablet PC, an XO-- they are becoming many and varied. One example is in Uruguay, one of the first countries to put computers in the hands of children at a massive scale in all primary schools. The program is called Plan Ceibal. There are around 380,000 XO laptops with primary kids throughout the country. They started this program not in the urban cities such as Montevideo, but in the rural areas, and moved towards the capital. They look at this program not just as an educational program, but as an opportunity for societal change. They've opened up the schools as resource centers to the community and are encouraging the sharing of the knowledge with families and parents when the students go back home.

Some of the early evidence has shown that eight-year-olds are acquiring the same level of technical literacy as eighteen-year-olds, and that it is really questioning what might be called a 'hidden curriculum of discipline.' When you put this many computers into the hands of kids in every school in a country, there is a certain amount of chaos that ensues. I think one of the main challenges that the Uruguayans are grappling with is bringing the teachers up to speed with the advances and the capacities of the students.

Obviously there is the cost issue. There is the impact. There still isn't a lot of good data around the impact of ICT in education, particularly one-to-one computing, and the down-road issues of e-waste. One of the most important things, though, is the need for a comprehensive plan-- the need to look beyond just the hardware, to look at the teacher training, the content integration, and what Uruguay is doing in terms of opening it up to the community as well.

The fourth trend I want to share is this idea of ubiquitous learning. Through the first three trends, we have opportunities for just-in-time learning, peer learning, informal learning, learning through mentors, virtual learning, deeper learning, self-paced learning and being able to go into topics at a much deeper level than possible in an ordinary forty-minute classroom. There are examples around the world. In Korea, they have developed a digital textbook geared towards helping students when they go back home. The private tutoring industry in Korea is massive, and one of the issues they want to look at is ways

to help support families to get that private tutoring after school hours on a more costeffective basis through the use of technology.

The fifth trend I want to share is smart portfolio assessments: different ways in which to assess how we learn and how we measure learning. As I was flying over last night, I picked up a *Forbes Magazine*. This information is so just-in-time, it hasn't even happened yet. So, a *Forbes Magazine* published June 7, 2010, has the front page article, "What Schools Can Learn From Money Managers." One of the interesting quotes was: "Innovative schools collect data, look for small changes, intervene quickly, and move resources to the formulas that work." So more schools are adopting some of the techniques of businesses -- like Walmart-- to be very focused on data - understanding data, analyzing data, and using data to adjust their pedagogical methods.

The collection, management, sorting, and retrieving of data will help teachers to better understand learning gaps and customize content and pedagogical approaches. Moreover, the concept of a portfolio as a collection of your learning-- as opposed to a single examination-- provides opportunities to measure the progress of the learner. Tools are increasingly available to students to gather information in one online portfolio, and to aggregate information wherever they might create it - whether it's a Tweet, a blog post, a photo, an online service, et cetera. Then these services can be peer-reviewed, assessed by a teacher, a mentor, parents, et cetera. It is opening up the scope of people who are able to assess the students.

There is another example, in a magazine coming out this June. *Wired Magazine* has an article on Pixar. "How It's Done: Inside Pixar's Creative Magic." I think Pixar is interesting in that they are at a place where many companies would like to go. They'd like to create a company that is creative, entrepreneurial, interdisciplinary, and takes innovative ideas and creates something new. One of the interesting quotes out of this article was that Pixar's philosophy is all about failure, that screw-ups are an essential part of making something good. That is why their goal is to screw up as fast as possible. So the question is, should our schools be as draconian in our pass-fail attitude towards assessment, or should we look to help students screw up as fast as possible and fail much more often?

Assessment to accommodate this, which is a good thing, is increasingly moving toward a more frequent, formative assessment, which lends itself to this real-time data collection, analysis, and reaction, and less on the high-pressure exam as the mark of excellence. A couple of questions here: 1) Should failure be seen as essential in our schools? That is, the concept that you don't really know how much you've pushed yourself until you fail. Should this be an objective of how we try to teach our students? 2) Should failure actually be eliminated from our lexicon? If you look at some of the statistics around the world, particularly in Africa, four out of ten students don't move on to secondary education. Of that cohort, less than 25%-30% complete junior secondary education. And of that cohort, less than 15%-20% complete senior education. This is a system where the majority of the students fail, and not in a good sense. In terms of looking at our global education system, we're excluding huge numbers of minds from a formal system that

could potentially be co-opted with different thinking about assessment and ways in which to address the learning needs.

Let me move on to our **sixth trend**: personalized learning, which feeds off the fifth trend. Education systems are increasingly able (through technology) to better understand students' existing knowledge base from prior learning. Teaching can be tailored to address both learning gaps and learning styles so that teachers and schools can more adequately adjust the learning-- content, pedagogy-- to the student needs.

This focus transforms a classroom from being one that teaches to the middle -- which most of our classrooms do -- to one in which the individual, strong or weak, is the focus, teaching to his or her needs. A number of schools are beginning to look at this issue. Achievement First is a charter school in New York that looks at K through 2 students. They give them a reading comprehension test every six weeks, and individual students are given extra lessons based on that test. The School of One is a program that looks at different pedagogical methods to provide educational content choosing between computer instruction, traditional classes, remote tutoring. Some of the early scores on this program have been very positive. And then Wireless Generation is a company that helps with assessment system software to monitor student and teacher performance in Chicago, D.C., and Indiana. They are compiling information around effective pedagogies and techniques for teaching specific educational problems. We'll see more of this as school systems begin to use technology more effectively to collect and use data to tailor teaching to students and individuals.

The seventh trend is the redefinition of learning spaces. It is looking beyond the thirty chairs in a classroom, five rows of six, industrial style of learning, to a place where we open up spaces for more collaborative engagement between students and teachers--learning environments that are collaborative, cross-disciplinary, and student-centered. We are seeing more focus on lights, colors, circular tables, individual spaces, open learning spaces, and areas that foster collaborative, project-based learning. Summarizing the challenge as: how do we make our schools less like prisons and more like art galleries?

The eighth trend is around teacher-generated open content, and MIT is one of the pioneers in opening content to the world. This trend is gaining momentum at the individual teacher level throughout the world. School systems are increasingly empowering teachers and networks of teachers to both identify and create learning resources that they've found most effective in the classroom. Being able to tailor what you know best and being able to deliver that to your students is a common theme. Also, the idea of remixing content-- there are many online texts that allow teachers to add, edit, or otherwise customize material for their own purposes, so that their students receive a tailored copy that suits the pace of the course. One company that is doing this is Flat World Knowledge, for instance. This approach is also a good service as a teacher-training tool. It provides an opportunity for teachers to collaborate, share information with each other, and learn with each other, thereby creating collaborative networks and communities of practice. Obviously, there are copyright issues that challenge our

traditional notion of copyright, and these are continuing to evolve, through Creative Commons licenses and others.

The ninth trend is the concept of teachers as managers or mentors. When the classrooms change with technology, when teachers are asked to deliver personalized training, when teachers are asked to think about the student as an individual and look at his or her own strengths and weaknesses and learning styles, when education becomes 24/7 -- then the role of the teacher goes beyond that of just a lecturer during a forty-minute classroom period. It becomes one where he or she becomes an instructional manager, helping students to find their individual learning pathways and to identify creative and relevant learning resources. The teacher's role includes creating collaborative learning opportunities with students and providing insight both during formal class and outside of this forty-minute class. This is the toughest part. Obviously the teachers are key to any successful education reform. Teachers are traditionally very conservative, and it is a challenge to change the approach of teaching and the way teachers interact with both knowledge and students. More energy and effort need to be spent on the humanware of ICT in education.

The final trend I want to share is one that we've been experimenting with over the past few months at the World Bank around the idea of gaming and how games can be used as pedagogical tools. When I introduced this to some universities in South Africa, the first reaction was, "Gaming! We don't want to bring gambling into the school!" So there was a misperception of what gaming actually was. The reality is that we are with a generation that has spent most of their lives, at least in developed countries, interacting with technology, interacting with games. Some of the statistics show individuals spending about three billion hours per week playing games, and that a young person spends around 10,000 hours playing games by the time she or he is twenty-one years of age. That is almost equivalent to the amount of time they spend in a traditional formal education system. Is there an opportunity to channel this energy into constructive thinking and learning? A genre of games called 'serious games' has emerged in attempts to address this issue.

I am going to talk about a game that we've created called Evoke. Evoke is a massive multi-player online classroom with over 19,000 students of all ages learning about social innovation with no teacher, no classrooms, and a fictional comic book set in the year 2020 as the center of the learning process. Getting this off the ground in the World Bank required some diplomatic skills! Obviously, this is something very new for the Bank, and it was an experiment that we were very interested in learning more about. But I imagine, if it's new for the Bank, it's new for other institutions as well, including your own, and it's been an interesting process. We've just finished the game last week and the evaluation and data are coming out, but I'll share some of the experience with you now. To give you a sense of the game, we start off with a trailer to kind of enthuse and engage students, which I'll play for you now.

[*EVOKE TRAILER* See 30:33 in video http://techtv.mit.edu/collections/linc/videos/7596-the-top-10-global-trends-in-ict-and-education]

So this project started as a response, when I was working in South Africa, to universities that had a number of service learning programs and were looking at ways to engage their students to think about community issues in a more creative, sustainable way. We began to introduce some concepts of social entrepreneurship into their curriculums. After a series of workshops and conferences, what they asked for was really an information sharing platform so that these educators -- who were working in isolation in the universities on community engagement, the forgotten third pillar behind teaching and research—would have a way to connect in a common framework, to engage their students in community issues. Instead of putting together a standard information-sharing website, we decided to create this game, which looked at a way to reach out directly to students, to get them thinking about community issues, learning about challenges around the world, and eventually coming up with an idea of how they would like to address a challenge in their community.

The numbers on the game have far exceeded our expectations. We originally expected about 5,000 students globally, or players globally, to sign up. We've had over 19,000 students, more than 2.3 million page views. The time that people spend on the site was higher than Internet averages, including the number of pages they looked at-- seven pages and about eight minutes per visit. We had around 177,000 unique visitors. And from this community, they created 25,000 blog posts and 4,000 photos, and about 1,500 videos were uploaded to the site during the ten-week learning course.

The idea of the course was that each week the students would learn about a different social issue -- whether it's energy, food security, or women's rights -- and they would engage in three missions. One would be an act, another would be a learning, and another would be an imagine mission. They would post the evidence of their work through these missions onto the site, as blogs, photos, or videos, and then the community would evaluate each of the posted contents across ten fields, from creativity to social impact to entrepreneurship.

Here are some conclusions from the game. One, they came. We wondered whether people would actually sign up for this, and again, the numbers exceeded expectations. Two, would people actually do anything? Would they work? And they did. As you can see from the amount of content that was created, they came and they worked. They also gamed. They had fun engaging in this type of platform. They also gamed the system. We had to adapt many times during the course of the ten weeks to prevent people from creating fake accounts and voting for themselves, or from putting up bogus information to get points. So there was a lot of gaming of the system.

They also helped each other. They collaborated with each other. They insulted each other. They yelled at each other. Any time you bring 19,000 people together, there is bound to be some social dissonance and discourse that is out of the realm of being polite. They

shared, they created, and they acted, which was really our ultimate objective. We wanted students not just to learn, but also to take action in the context of this game.

One interesting thing is that the players took on the game themselves and began to do activities that were outside of the original scope of the game. They created Wikis, they formed communities, and librarians donated time to help others do research in developing countries. They planted gardens. These are some of the projects that they worked on during the course of the ten weeks.

- Hope Phones donated old phones in developing countries.
- Working on Kiva raising awareness of the benefits of microfinace
- Putting together aWiki for EVOKE.
- An Our Farm network.
- Learning Centers for Afghan women.
- Evoke chat tests ideas on bringing chat to EVOKE
- Seed a sustainable living project
- Developing sustainable communities.

There are hundreds and hundreds of these projects created by the players during the course of the game. Now, what are the lessons we have learned? We wanted to look at narrative as a pedagogical device, with the concept that we remember stories and their lessons, and the importance of putting students in the frame of mind where they are heroic, capable of acting and doing incredible things. This was an interesting aspect of the project. About social networking, we learned that students who have spent a lot of time on social networks such as Facebook found this platform useful as an alternative community for talking about serious issues, things they otherwise wouldn't talk about on Facebook or MySpace.

In terms of assessment, we are looking at action-based learning, the objective to actually do something and at assessment, the effectiveness of peer assessment. These are things we're looking at in terms of the evaluation, which is under way right now. The evaluation is also looking at crowd-sourcing ideas, focusing students on real world problems and trying to leverage the community of 19,000 to find solutions.

We have found that the rule of Wikipedia applied to this game as well, the 90/9/1 rule, where 90% of the people were lurkers. They would read, they would make some comments, but they wouldn't actively engage in the game. You had about 9% that went through the missions and completed a minimal amount of the game, and then only 1% that were really heroic and completed every mission in the game. This is roughly the same as the community on Wikipedia, where you have 1% percent that are high-level contributors, 9% percent providing light contribution, and the vast majority of people reading and providing some comments.

We are also looking at the idea of redefining the notion of a teacher, looking at how the entire community can become the teacher, looking at the role of mentors to help students online, and then looking at a global community solving real world problems.

So again, to summarize some of these ten trends: decentralized, individualized, datadriven, 24/7, anywhere, empowered, multiple competencies, interdisciplinary, collaborative, learn, try, fail, review, relearn, try again, real, and global.

Thank you.
The Case of the Virtual University of Tecnológico de Monterrey

Ing. Patricio Lopez del Puerto, President The Virtual University of Tecnológico de Monterrey Monterrey, Mexico

Thank you very much for being here and listening. I have an experience to share with you, which is the Monterrey Tec Virtual University, and Monterrey Tec itself as a system. Monterrey Tec is a private university. We started back in 1943, so it is 67 years now since we were founded. We began in 1943. This is the original house that was Monterrey Tec in 1943. This is Monterrey Tec now. So we have come a long way just in the Monterrey Tec campus in the city of Monterrey.

Now we, like many universities in the United States and other places, have grown in the same city in which we were founded. However, at the same time— and this is interesting and unusual— we ventured outside of Monterrey. We decided to go to other places, to other cities, and to other levels at the same time. So we created a system in which currently we have 33 campuses throughout the country. Those are the white dots that you see in there. We created a different university system, which we called TecMilenio, which already has 32 campuses and 25,000 students. We began this about six, seven years ago to reach people who could not afford to pay for Monterrey Tec. Then, 20 years ago, we began the Virtual University, which is already reaching 23 countries and offering mainly master's degree programs. However, we do some other things that I will relate to you, and we currently have more than 12,000 master's degree students all over the world, in 23 countries.

These are some of the campuses of Monterrey Tec. We decided to go with campuses that were as good as the ones we have in Monterrey, and those are some of the cities in Mexico. You may recognize some of those names and some of those campuses. We decided that to be big is not contrary to being good. In some institutions, in many places around the world, there are those who think that there is a contradiction between being big and being good. We do not believe that to be the case.

We also decided that TecMilenio, a smaller, less expensive campus, nevertheless had to be good, nice, and oriented toward the students. TecMilenio has a different educational approach. This is a typical classroom within TecMilenio, and this has something to do with what Robert just mentioned, about having a classroom in which it's more like an art gallery than a prison. This is a faculty member interacting with students, very collaboratively, in activities within the classroom.

This is where we have reached so far in Mexico. We are a prestigious university, being big, reaching a lot of people, and having different levels. Moreover, one of our accomplishments is that 22% of the CEOs of the largest corporations in Mexico are Monterrey Tec alumni. We also account for 22% of the state governors. We don't know whether that's good or bad, but that's a fact. We did not intend this to happen, and pretty

soon we will be blamed for the troubles of the country, but that's how it is, and we are trying to do something about it. It is also interesting that 51% of our alumni have owned a business after graduation. We are very much involved in entrepreneurship programs and in trying to instill in our students these capabilities. All of these campuses represent only 3% of higher education in Mexico. Out of the three million university students in Mexico, we have 100,000 of them. That's our share of the higher education program in Mexico.

Every ten years, we do two things: we define our mission, and we identify the challenges that we can help solve. The last time that happened was in 2005, so we're halfway to our 2015 mission. We defined our mission at that time— in 2005, and it still holds true— to be as follows: "Monterrey Tec educates persons with integrity, high ethical standards, and a humanistic and social perspective, who are internationally competitive, and who are citizens committed to the well-being of their communities."

We do things explicitly to accomplish these three things. We not only have very good lectures and very good teachers, but activities for the other two aspects of our mission. We try to provide our students first with some basic skills and competencies like math, physics, chemistry, some specialized engineering tools and knowledge, and then also with a series of competencies for life. These competencies are well defined, well established within the curriculum, and properly assessed. Actually, if students do not acquire these types of competencies, they cannot graduate, just as they cannot graduate if they do not get the basic or the specialized skills they need for their own professional life. So this is consistent with the mission.

We also identify the challenges of Mexico. There are many challenges in Mexico, including security and narcotics, about which there is little we can do. But there are some challenges about which we *can* do something. We decided that there were four societal insights— because we've defined this in consultation with society— that we could do something about. Those were: improve the competencies of Mexico, based on the knowledge economy; help with job creation; strengthen public administration and public policy; and develop educational and sustainable models for Mexico.

For the first insight, we decided to create a series of research centers all over the country to improve competitiveness. We have been quite successful so far in creating these centers in different cities, as you can see there.

For the second insight, job creation, we decided to create a series of incubators and technology parks. So far, we have eight. We will have 13 within the coming year. We have already had an impact on about a thousand enterprises. All these companies have been helped by Monterrey Tec faculty, students and administration, in the incubation acceleration of companies in Monterrey. We so far have generated about 62,000 direct employee jobs. However, this has, of course, many indirect effects that are not reflected here. These are some of the enterprises we have created all over the country, and you see, in Mexico City, Guadalajara and other places, in both institutions.

Thirdly, to strengthen public administration and public policy, we created the Graduate School of Public Administration and Public Policy. That was five years ago. We offer eight master's degree programs, and have about a thousand students. There is one Ph.D. program. We do this in collaboration with other very prestigious institutions around the world, including Harvard, Georgetown and the University of Barcelona in Spain.

Finally, in developing educational and socially sustainable models, we decided it would be interesting to take all that we have learned, especially using technology that I will mention in a moment, and use it to help the poorest people of the country. As a university, we have to strive to be leading edge, with high technology, biotechnology, research centers, and similar areas of expertise. But we cannot forget about people at the very end of the societal ladder, and those below the poverty line. Within the gap between the haves and the have-nots— or as important, in the difference between them— lies the measure of the level of prosperity of the country.

So we decided to go and take care of them, and we created a series of community learning centers to provide education, to foster entrepreneurship and to provide some applied knowledge, especially for our students. Our students, as part of their social development, have to work in these community learning centers. They have to work in these incubators, and be the tutors using technology to provide all these kinds of educational materials, including to middle schools and high schools. These places are in very isolated communities around the country. When we began this project, the government said that it could not be done. "If rich people cannot learn using technology, how are poor people going to learn?" We answered by saying, "Well, they are poor, but they are not stupid, and they are probably more likely to learn because that's the only way they have to learn." And that proved to be true.

We began with 32 centers, some nine years ago, and have grown, within Mexico, to more than 1,600 centers. You'll see them all over the country. Plus, we have clustered them together in 63 social incubators, to incubate community projects, very small projects—\$500, \$1000 projects, even \$100 projects—for them. These centers have really made a difference in the communities they are in, as people begin to find out what they can do by communicating, using the Internet, with people who are in other places. By the way, these are the centers in Mexico. We already have about 300 centers in the United States, because the Hispanic population needing knowledge is not limited to within Mexican borders. We have centers in the Dominican Republic, in Columbia, and in other places as well, with the same model.

So these are the four challenges, and we decided that we are very committed to making a difference in the country. All of these challenges are being surmounted by technology. We have, from the very beginning, embraced technology as something that can help education and can help our goals. We have a long history of using technology in Mexico. It began back in 1963 with the first computer and in 1968 with the first computer science degree. We set up a satellite system to deliver education back in 1989, so we're already 21 years into it. We then decided to require all of our students to own a laptop— that was banned back in 1998— and we set up the community learning centers, as I mentioned,

some seven or eight years ago. Our corporate universities have wireless networks, and you have them.

Every year, we ask ourselves again how newly invented technology and the availability of new communication speeds can be put to use for students within our campuses, and for students outside our campuses whom we now reach through what has proven to be a successful idea and enterprise, the Virtual University. The Virtual University in Monterrey Tec is a little bit different than virtual universities in other places, in that we decided to put all the prestige, all that we have as an institution, behind it. We took that risk, and it has had a big payoff, because now the Virtual University is a very integral part of Monterrey Tec. Everything we do is supported and backed up by the top level of the administration at Monterrey Tec.

We service students from different levels. We have, with the private sector, of course, the longest continuing education and master's degree programs. We also have public officials, because we decided to offer a master's degree especially for them. We have nongovernmental organizations — NGOs — and journalists. We have elementary schoolteachers. We are training about 22,000 elementary schoolteachers every year to do a better job with their kids in their classroom. We try to instill in these schoolteachers some of the ideas that Bob just mentioned in his presentation about how to use technology and modern pedagogy to teach kids. We are helping, beyond the community learning centers, undeveloped communities. We also have courses for our own consumption, because we are so widespread around the country that some content cannot be delivered in every campus face to face. We use technology to teach the undergraduate students at these places.

We have an educational model in this endeavor. Some of the ideas here you've already heard from Bob. The educational model has to do with the creation of virtual communities. That's the best way to learn: by sharing knowledge, by helping others to learn. So we establish communities of several students working together, helped by a professor and/or a tutor, remotely. The learning strategies involve collaboration. The students engage in problem-based learning, project-oriented learning, collaboratively, in the cases studied. These are the typical activities that students undertake while they're taking a particular course.

This self-learning and collaborative learning — and here are some examples of selflearning activities — are not unlike the types of things done by other students in other university systems. In collaborative activities, working through the Internet using whatever media they have — whether it be chat, blogs, Wikis or whatever they have they engage in problem solving and project development, case studies and what-haveyou — all collaborative activities. All these activities, of course, are supported by a series of educational resources: multimedia, databases, the media library, podcasts — "the whole enchilada," as we say in Mexico, for these types of activities. Anything that we can make available for the students to render the learning more meaningful and participatory, we do. And of course, all this has to be supported by the technological platform. How do we produce all this material? Well, it's very labor intensive. We have found that this is the most important part of what we do, not the most important per se, because the tutoring and the participation of the faculty are very important, but in terms of the quality of the program that we present to the students that in the end makes the course more attractive and makes the students more committed to it.

So we have a production team— actually we have several production teams. We have about 200 people working here, and these are world-class production teams. They really are. When I get people in Monterrey and show them what they need to do, I always say, these are the guys that make the magic of the Virtual University, of distance education. We have to put together a group of people, not only the faculty member, but tutors, web editors, instructional designers, and graphic designers. We put them together in a room for 12 weeks, and say, "Well, you don't come out of there until you have a beautiful product that you can show off to the world." And they do.

They do this constantly and consistently. We produced, for example, during 2009, 580 continuing education courses, and 221 graduate-level courses. These are full graduate level courses. It takes a lot of time to produce a quality graduate-level course. We produced that many. We produced over 124 social-program courses and 78 high school, graduate, and undergraduate programs. So this is a big effort, very well regulated, and very well established. I think that if somebody is going to found another virtual university, there is a lesson to learn from us, and that would be to invest as much as you can in quality people to produce high-quality courses. This investment always pays off very handsomely.

How do we deliver the courses? Well, we do so with the students at the center of the educational process. We have to provide them with a series of administrative and academic services, and we do this online, of course. Students interact with three types of real persons. First is the faculty member, or the professor in charge of the course. However, this professor may have— as we had this semester, in one particular course—1,600 students. It's therefore impossible for the professor to communicate, even with "chat" or other media, one-to-one with his students. So for every 25 students, we have tutors, who are coordinated by the professor— by the "guru," as we call him— and they are the ones that maintain day-by-day communication with the students.

However, students felt that nobody knew about them at Monterrey Tec because they had a new faculty and new tutor every semester, every course. Because they are remotely located, they have no faces to associate with. Well, they may have a picture, but no more than that. So we decided some years ago to develop the academic counselor. This counselor is assigned to students when they register, and stays with them for the whole curriculum— for the whole master's degree program or the whole diploma, whatever it may be. The counselor knows things about the students that the tutor or the faculty member doesn't know. He is the guidance inside the program, helping the students decide which courses they are going to take. To give you an example, every time I meet with an academic counselor, I begin to ask questions about the students. I think of random names, and say, "Tell me what you know about him." And they begin by telling me, "Well, he is taking these two courses." And I say, "Well, I can find that out by looking at his file." They may reply, "Well, he studied previously for an electrical engineering degree," and I reply, "I know that. I have his file in front of me. Tell me something that is not in here. Tell me, when did he last go for a vacation? Does he have a pet? What's the name? How many kids does he have?" This is the type of thing that you need to know. Being a student online can be a very isolating experience, because you are by yourself, and we have to take that into consideration for the design of the course.

I always say that we have about 20 volumes of experiences in Monterrey Tec. Nineteen of them are our failures. We have probably one with something that could be considered our successes. What we are always trying to say is, if you want to learn about failures, come to us. We have a lot of them to show to you, and please don't go to them again. Try to avoid as many as you can of the mistakes that we had to go through in these last 20 years. The academic counselor was an idea that has proven to be very successful.

We have 100,000 students, remember— face-to-face traditional students— and about 12,000 online students. In the evaluation of the learning process, or the academic process, the survey that we do every semester, we consistently show better results with the online students than with the face-to-face students. This is because of the care that we take to make their education as good as possible. Moreover, to foster, to encourage that dialogue, of course we have a series of learning resources that you may know of: evaluation, lectures, simulations and the like. We have a series of technological resources available to help students, faculty and academic counselors to communicate, and we have a technological platform that ties all this together.

This has been an experience that we have had for the last 21 years. It began, not as a great mission, but because we required it due to our geographical dispersion. Having to deal with these different teaching capabilities in different campuses around the country, wanting to have a standardized quality, we said, "Let's establish a system that helps us to standardize the quality of teaching of Monterrey Tec all around the country." We have grown out of that, of course, by far, by going to other places— to other cities, to other countries— and having students from around the world. I think that this is an irreversible path. We agree with Chancellor Clay's words about this being something that is good not only for students without access to a traditional university, but for everyone.

We have a commitment now with Monterrey Tec that all students, by the time they graduate, should have taken at least two courses through distance education. They will do this not because they cannot take them locally, but because of what they will learn from the actual experience of taking distance education courses. They will develop skills that are difficult to develop otherwise. At the very least, it ensures that students will acquire capabilities like finding things on the Internet, communicating properly among

themselves, working collaboratively, and working with people from other cultures and from other worlds.

We think that this is a good experience so far, and I think that this teaching model, to reach— as we have found— not only upper, higher-echelon students, in terms of economic power, but all students. We, or rather, you, can go a long way. We at Monterrey Tec are really committed to having all students, as part of their training, embrace the use of technology to help the poorest people in Mexico. With that, I thank you.

Assessment of Large Student Cohorts In a Formal Distributed Learning Environment

Naveed A. Malik Founder-Rector Virtual University of Pakistan

It really is good to be back. I am going to talk about a real practical problem that we have faced, and how we have tried to use information technologies to tackle it. I will give you a brief background of the university, 30 seconds worth. We have already spoken about it many times. Then I will define the problem, and I would like you to appreciate the dimensions of the problem before we go into the solution, which is quite straightforward, but innovative. I'm going to talk about the fact that we are a virtual university. We use e-Learning online, television broadcasts and internet, for interaction. But what is critically important— and I mentioned this, I think in our 2005 talk— is that perception is actually defining reality.

What we need to do is to make sure that our degrees are accepted, and that happens if we have complete transparency. As far as our courses are concerned, they comprise video lectures. These are already being broadcast over free-to-air television, so in a way, we have opened the doors of our classroom, and said, "There's the professor, there's the content, look at the quality." That is the first half.

The second half is, how do we assess the students? So we decided, as a design principle at the Virtual University from day zero that the assessments would be done in a very conventional manner. We will define exam days. It is a semester-system-based university, so we have midterm and final term examinations. Students would physically come into an exam center, sign up in a proctored environment, and sit down and take their test. It would always be conventional, visible and above board. Formal, proctored examinations would have to be done twice a semester, conducted at dedicated exam centers, face to face.

Let's look at the dimensions of the problem. When we started out with a 500-student cohort, it was fairly straightforward. Now, we are talking about 60,000 students, all over the country. We are in more than 95 cities. I can't even name some of them. We have an admission intake every semester. In spring and fall, we induct new students, which implies that all courses are being offered every semester. This is important to understand. In a normal, once-a-year induction, you have the spring courses and you have the fall courses. With twice-a-year induction, it means every course is being offered. We are talking about 160-plus courses.

There are additional dimensions to the problem. We have full-time students, young high school graduates who come to the university and are taking a full load -- five or six courses. They normally follow a defined schedule, which is fairly easy to handle. Then we have working professionals who have come in as students at the Virtual University.

These working professionals are taking a course load that suits them, sometimes a partial load. Sometimes they take one course, and then come back and take three or four in the next semester, and so on and so forth. So there is a variety of course distribution that happens. These professionals, of course, have limited study times and exam dates. Of course, in any university you find stragglers. In a virtual university, you find more, and they can take essentially any course in any semester.

Our problem basically began with the fact that as the student numbers increased, how could we actually stay with the academic calendar? In other words, how do you complete a semester on time, having to conduct two formal examinations? We have 60,000 students, each one taking three, four, five, six courses, which are happening all over the country, in 95 cities or more. We are trying to conduct these courses in a time-bound manner, without losing the sanctity of the examinations. Do you distribute paper? Do you do that on a computer? How do you do that? The major issue was the exam schedule. I think everybody who is into academics would understand that creating an exam schedule that satisfies all the students is almost an impossibility. Somebody is always going to complain, "Well, you've given me an exam in the morning, and one in the afternoon. Couldn't I have a break between papers? I would like to pace them out," and things like that.

In our case, we have an issue in terms of the mix of student population that also brings an additional complexity into the picture. We had to worry about secure distribution of question papers across the country, maintaining the sanctity, efficient and secure collection of answer sheets, and grading within an acceptable time frame, because students need to know their results before they move on. We have a series of conflicting demands. We would like to run the examination tent, like this little auditorium, in full capacity. Every seat should be occupied. Therefore we can minimize the number of days it takes to conduct the exam. But working professionals coming in would say, "Look, I can't take every day off for the exams. I would rather do that in the evening." Or, "Can you examine me on Sundays?" Full-time students— "10:00 a.m., Mondays, Wednesdays, and Thursdays. That's when we would like to sit for the exams."

Then we have additional complexities — commuting students. In the interior part of Sindh, which is one of the southern provinces of the country, we've got students who have to commute about two hours to come to an exam center. They say it can't be very early. It can't be very late, because if girl students are traveling, "We don't want to travel at night, and we can't leave at dawn." There are many dimensions to the problem. And of course, many student would like to pace out there examinations, so they would like to have gaps between papers.

From a management perspective, we have something more to look at. If I use the same question paper across the country, an exam in Islamabad starts a little earlier than that same exam in Karachi. Okay, this is the e-world; the questions have already been transmitted. The kids in Karachi, before they even enter the exam hall, have the question paper in their hands, so the sanctity is compromised. Ensuring proper invigilation all across the country is a nightmare. It is impossible, for example, for us to find IT-literate examiners or proctors. The kids are sharper on the computers. They would be running our

presentation in front, and chatting in the background: "Okay. This is the question. What is the answer?" Somebody in cyberspace is helping them along. We put in blocks on the servers, and things like that, but there was an interesting situation there as well. So, what is the idea?

The idea was that they were complaining too much about the exam schedule. We call it the date sheet. Why not let them create their own date sheets? So you decide, "I'm taking Programming on Monday morning at 9:00 a.m." Somebody else says, "I'm doing Economics on Monday morning. I'll take Programming on Tuesday evening, at 6:00 p.m." So how do you manage that? The first thing is, if you allow the students the flexibility of creating their own exam schedule, first of all, the noise of the complaints goes away. Everybody is choosing a time and place of their own convenience.

But there are some requirements. The other dimension that is written here is, "first come, first served." This makes sense. You find a seat of your convenience. If you don't find a seat, you were too late. Then you sit wherever it is possible for you sit. The other one is to try and reduce the time taken to conduct the exams. We needed to run the exam centers at full capacity. Now, in a conventional system, when we say, "All right, Economics is Monday morning," and three students are taking economics -- so a full hall has just three students sitting for the exam. Let's say an introductory course in computers might have a full hall. You have this fluctuating attendance in the exam centers, and this actually is increasing the number of days or hours required to conduct the exam -- when we would like to run it totally, fully occupied. So what do we do?

If we allow the students to create their own individual date sheets, on a first-come, firstserved basis, it can only work if the students receive distinct question papers. Because if you think about it, it implies that every potential exam session has every subject being examined. So at 9:00 a.m. every Monday morning, you've got economics, Islamic studies, Pakistan studies, Mathematics and Computer Science being examined. At 11:00, the same thing repeats. Tuesday morning, the same thing repeats. So we have to have distinct question papers. How do you create distinct question papers? You use a question bank. So we started, about two and a half years ago, defining, creating, and then populating a question bank, and then automating the process. So in terms of key concepts of what we have done, we have created a question bank.

We have students create their own individual date sheets. We have distinct paper generation, so each student gets a different question paper. We have all kinds of encryption and security measures in place, because we need to distribute it to 95 different cities or more, and then bring them back. We have to conduct the exams, and we have to grade them. Anybody who has graded exam papers would understand that there is a hidden nightmare sitting here, in that every question paper or answer script that you are trying to grade is different— I mean, the brain goes crazy when you try to do that. Then we have to declare the results in a time-bound, efficient manner. Let's take a look at the question bank. It includes multiple choice as well as essay-type questions. We have categorized them and identified them according to which topic of the syllabus they cover, which lecture they cover, the difficulty level, and which cognitive skills they challenge. We have also determined how much time it would take to solve, how many points would

be awarded for the answer, and then a grading rubric to go along with the question. All of that goes through a quality-assurance process, and then the question is inducted into the question bank.

Throughout the semester, we have new questions being added daily. Every tutor, every instructor, has to contribute three to four questions every week into the question bank, so the bank is constantly being replenished and renewed. Each question carries a use count. Since the paper-generation process may use a certain question ten different times during an exam cycle, the question would have a use count-up. Beyond a certain point, we would retire that question, saying, "The entire student community knows about it. Let's take it out of circulation."

Planning the examination is an interesting process. We have to determine the paper slots. The students, times the number of subjects each student is taking, is the number of seats that we require in the exam sessions across the board. Everything is conducted on a computer. It is not a paper and pencil exam, but it does include essay type and all kinds of different questions. The capacity of the exam center is really the number of computers available, and we have a five-percent buffer for breakdowns and things like that.

Therefore, we can straight off calculate that we've got a capacity to examine 60,000 students in 12 days. That is the exam duration. Then we say, from morning to evening, we will have a session at 9:00 a.m., another one at midday, another one at 3:00 p.m., and one for working professionals at 6:00 p.m. We can have four sessions, "n" days. We can actually compute exactly what our capacity is to conduct an examination.

In terms of making a date sheet, students log in to a particular website, which is going through the learning management system itself. They use their own credentials: log-in name and password. Interestingly, on the first line, they choose the city where they want to be examined. For example, they may be studying in Karachi, but it turns out that they are attending a wedding of a relative in Lahore, and they will be in Lahore during that period. So they can get examined in Lahore, no problem. It is a big thing for the students when we let them choose the city in which they are going to be examined, but practically speaking, we find only a tiny percentage actually change cities. They normally get examined where they are studying.

Within the city, we have many exam centers. So Karachi and Lahore have multiple exam centers, and the students will have the facility to choose that center. Obviously, it is an IT-based system, so the system will display exactly the subjects that they are registered for during the semester. They would start defining, on day x, y, z— "On that date, at this time, I would like to sit for that exam." And, of course, the system is keeping a tally of the attendance in that center, so it can type easily and tell them, "Sorry, this session is full, choose another session." So it is a first-come, first- served making of a date sheet. For each subject, they can select a day and a session and then confirm. So it is entirely in their own hands, and they can't come back to us and say, "Look, you're giving me exams that are too close together."

So here is a view of the interface. There are some instructions, and you go and log in. To protect privacy, I have blanked out this student's face and his ID, but if you look, you will see that he did it right: He took Wednesday, Saturday, Wednesday, Saturday, Wednesday, Saturday— six courses, very well paced out. He selected 10:30 a.m. for all of his papers, a very convenient time. He was one of the early birds—came in, registered, got his date sheet set. Last person aboard takes the 5:00 a.m. bus.

Once this date sheet has been defined, we have all the information we need. We know that in Karachi on May 26th -- which is the next midterm examination - at 9:00 a.m., I need ten Introduction to Programming question papers, I need 15 Economics 101, I need 25 English Comprehension. I have complete statistics at my disposal. We do this process of date sheet generation about ten days before the start of the exam. The students have come, created their schedules and gone away. We get busy. The academic staff will provide the question paper parameters.

Maybe I can go into the details later, but the parameters are more like, "During this midterm exam, we would like to cover lectures one through 22, and within these lectures, I would want to have about 30% multiple choice questions, five short-essay, two medium-essay, one long-essay question." Once the teacher defines those parameters, the system already knows what the total score on the exam is, what the total duration of the exam is, and that's it. It does not matter if the final exam is worth 62 points. It does not have to be 100 points. It does not matter if it is 93 minutes. It is 93 minutes across the board. We do not really worry about those details, but it all works out. Then the system gets to work, and starts churning out these distinct question papers. There is a complex algorithm at the back that makes sure that there is an even distribution across the syllabus of every selection that is made. This generates 250,000 or 350,000 different question papers as required.

This entire process, by the way, is happening in an encrypted fashion. All the questions, all the data that's sitting inside the database, is also encrypted. So you can't read it. Nobody can read the question. The question just has an ID, and some gibberish in front of it. All e-papers then for a particular exam center are collected. You create an electronic bundle that is sent out by email, with an encrypted attachment. There are multiple layers of encryption in there. It is actually a database back-up file that goes out. It is burnt to a CD, and physically dispatched by courier -- just in case somebody has problems receiving a 10-megabyte attachment. There are sometimes issues in terms of connectivity of bandwidth, so CDs are sent out.

What happens at the recipient end -- the exam center end -- is that the center superintendent loads the CD on the exam server. They can load it; they can't open it. It can only be opened on the first day of the exams. It is opened through a password, and the password delivery mechanism is separate. It happens on the day of the exam, either by email to the superintendent or via SMS text message to the superintendent, each one getting a different password for that session. You've got lots of levels of security.

Once the file has been loaded, then only an individual session can be unlocked. Monday morning at 9:00 a.m. You cannot unlock the noon session because only the 9:00 session

will happen. Then as I said, the questions are being encrypted anyway. The other interesting part is, if on Monday morning at 9:00 a.m., we had ten kids in one particular city, in one particular examination center, taking the Introduction to Programming exam, there would obviously be ten question papers on the database server. But they still do not know, and we do not know, who is going to get which paper. It is only when they actually log into the examination application that one out of those ten is randomly taken and delivered to the student. It is stamped inside with the student's ID and is associated with the student, so it is quite random.

At the end of each day, rather than at the end of each session, we collect all of the student attempts. Again it is all electronic. We are talking about technologically challenged proctors, and superintendents, so we give them one big button on the screen, "Press here." It collects all the data, encrypts it, puts it into a bundle, attaches it to an email, and sends it out. The superintendents do not have to do anything. They just press a button.

Upon receipt, what do we do? This comes back to the academic grading question. We have an army of tutors and instructors waiting to grade. They are dreading the fact that every question paper is going to be different. "How do I get my brain to function?" What do we do? We take all the answer attempts from the students and we separate them into piles of identical questions. Since the questions were created from a question bank, there is a certain amount of reuse that is happening. So if question ID 1023 was used on Monday morning and Tuesday afternoon and Thursday evening, all the question numbers 1023 would be put into a single pile. And that one pile is given to a grader. You are grading the proof of the binomial theorem. Start in the morning, and until evening, you are just grading the proof of the binomial theorem question. So you get a lot of consistency in the grading.

It's not just that. As soon as the grader brings up a question to grade, remember the grading rubric that went into the question bank at the beginning? That comes alongside. So the first indication is, if the student did this right, give them two marks. If they missed this step, subtract a mark. So in terms of consistency of grading, it is very simple. You do not have to worry about switching gears, talking about a program at one, and a theory at the other, et cetera. You grade one question. When you are done, you will be given another question to grade.

It also leads to complete anonymity. The graders do not know whose attempt they are grading. They just have a proof, or a derivation, or a code or an essay in front of them.

Of course, IT again takes over. The result is collated by the system. Magically, when you say "Go," it appears in the student's grade book. The whole thing is done using IT. Semester- and subject-wide positions and campus-wide results are declared. And it worked. IT works.

Developing and Delivering Online Math and Science Teacher Education Programs With Ten African Countries

Dr. Bakary Diallo, Rector African Virtual University

Good morning. I am very happy to be here. Thank you, Dick, for inviting the African Virtual University. The AVU and MIT have shared a very long and important collaboration. I'm very happy to be here today to share our experience in developing and delivering online math and science teacher education programs with ten African countries.

During this presentation I will briefly introduce the AVU, but I will also share with you the reason we are trying to increase access to education, especially higher education, in Africa using ICTs. The reason is that there is a strong link between economic development and higher education, and one of the problems we are facing in Africa is a lack of graduates from higher education institutions, especially in mathematics and science. I will talk in-depth about the collaborative approach to course development and delivery in ten countries.

The AVU, for your information, was a World Bank project. It was created twelve years ago as a World Bank project. Then in 2002, it was transferred in Kenya. Since then, the AVU has become an inter-governmental organization, meaning that its charter has been signed by different African governments. Our vision is to be the leading Pan African Open Distance and e-Learning Network. I have been at the head of AVU for the last three years, since August 2007.

I have found that the biggest asset of this organization is its capacity to work across boundaries, in 27 countries of sub-Saharan Africa. We work in Portuguese, in French and in English. AVU has established more than 50 partners in these 27 countries. This slide will give you an idea of where we are located in Africa, where we have learning centers and partner institutions. In green, at the top of the graphic, is North Africa. We are not yet there. We are trying to move into North Africa. You will see also that we are not in the southern part, in South Africa. We are not very active in that part of the world.

What the AVU has accomplished since its inception is the development of distance and elearning programs, management of e-learning consortiums, and development of Africanbased educational content. That is what I would like to talk about today: setting up distance and e-learning centers, higher education resources, quality assurance policy formulation and the digital library.

As I said at the beginning, there is a strong link between higher education and economic development. A country, a continent, has to have a critical mass of university-educated people in order to sustain economic development. This study from 1995 proves this link.

If we look at the next slide, in terms of the number of university graduates around the world, on the extreme right you have high-income countries like the United States, Canada and Europe. As you move left, you can see Latin America, the Middle East, and Eastern Asia. When we reach sub-Saharan Africa, the numbers are extremely low. This is a concern. The first thing you might be thinking of when you think about Africa might be lack of resources and poverty. We are all trying to do something to develop this continent, but with such low numbers of university graduates, what can we do? I do not think that aid will be helpful if we cannot do things ourselves in Africa. That is why the Africa Virtual University is striving to increase access to higher education. We are doing that through the innovative use of information and communication technologies. The AVU is therefore trying to fill a gap in terms of capacity building and also in terms of developing programs. We are striving to be the leading pan-African e-learning network and also to increase access to higher quality education and training through the innovative use of ICTs.

I would now like to talk about what we call the Multinational Project. It is within this project that we have collaborated with some ten countries in sub-Saharan Africa to develop math, science and teacher education programs. This project is funded primarily by the African Development Bank. It has four components. The first component is the establishment of e-learning centers. This is important. One of the major hurdles to delivering e-learning in Africa is actually access to computers and to the Internet. AVU in the past has installed distance e-learning centers in various partner universities in different countries to allow AVU and its partners to deliver courses.

The second component of this project is the AVU Capacity Enhancement Program. This program builds the capacity of faculty members to be able to develop content and put it online, to deliver the content through an e-learning platform and also to manage e-learning projects.

The third component is an ICT-Integrated Teacher Education Program. This is the one I'm going to talk about in greater detail.

Finally, we have gender main-streaming in modern science. I have been very inspired by Dr. Wood who is sitting here. We did our doctorate together at the University of Ottawa. She was working on gender in math and science. We shared the same office, so I was very well aware that this was something we needed to do. It is not just an African problem, but in math and science, I think it is very important to mention gender -- especially in the African context.

The participating countries in this project are Kenya, Uganda, Tanzania, Ethiopia, Mozambique, Zambia, Zimbabwe, Madagascar and Senegal. I am happy to have seen one of our partners here today, Dr. Bakari, from the Open University of Tanzania, one of our partners in Africa You can see from the group that we have actually two Francophone countries - Senegal and Madagascar - and one Portuguese-speaking country - Mozambique.

As I said at the beginning, the main purpose of the distance and e-learning centers of the AVU Capacity Enhancement Program is to serve as a physical hub to complement teacher education in math and science. A center is actually the hub, the place where our partner institutions can set up servers, computers and every piece of equipment they will need to be able to provide these courses online. This is a picture of a computer center. It is in Nairobi, Kenya, at the University of Nairobi. As you can see, there are desks and computers, and there is a piece of equipment that is very important at the bottom right. This is a power generator. I don't know if you are familiar with the African context, but power is not always reliable. If you want to do online education - have your resources available online 24 hours a day, as Bob Hawkins said at the beginning - you must have some kind of power back up. It makes our courses and our programs very expensive because we have to invest more than you would in Canada, in the States or in other developed countries.

Regarding the Capacity Enhancement Program, in each of these 12 universities in ten countries, we have trained six faculty members in content development, in the delivery of e-learning programs and in the management of e-learning programs. Each of these six faculty members is training 30 more. This will help to build the capacity of the university and to have a critical mass. In total, we have 133 trained university staff from 24 institutions and 17 countries. This is one of the workshops we held in Senegal, in Dakar (See slide #19). It was a Francophone workshop, and the Minister of ICTs presided at the opening ceremony. This is another workshop we held in Nairobi for the Anglophone and Portuguese-speaking countries (see slide #19).

Now I would like to spend more time talking about the Teacher Education Program. It is an ICT-Integrated Teacher Education Program for Math and Science. The program itself is labeled "Teacher Education Program," but what is it exactly? It is a program for developing content in mathematics and science— more specifically, mathematics, biology, chemistry and physics— and then teacher education foundation in professional courses. The purpose is to make these courses available in different formats - on online learning management systems, on CD-ROMs and also in print format. The objective of this program is to improve the quality of teaching and learning in schools through the use of ICTs, and to increase the number of math and science and ICT-based skills. Why math and science? Math and science are very critical to Africa because it is a continent that needs engineers, doctors, -- all these people that you really need to build the continent. It is very important that we have enough math and science teachers in schools to be able to train these young Africans who will be engineers, mathematicians and so on.

We had to develop and promote research in teacher education to inform future curriculum reform and to establish and strengthen relevant partnerships with other initiatives in Africa, in terms of teacher education. How did we do that? As you can imagine, we had 12 universities, in ten countries in Africa -- countries that had their own different education policies. Also, each university has its own policies. We had three different language groups. How did we bring them together so we all could develop a common curriculum? That was a challenge. I was not at AVU then. That was in 2005.

The first thing they did was to organize a policy and curriculum conceptualization workshop. The Ministers of Education were present. They also invited the university leadership, the faculty, the heads of the math and science departments and the heads of the teacher education department. Then they agreed on the policy framework in the ten countries and how they would like to work together.

Once we had done that, there was a curriculum design workshop. In the curriculum design workshop, AVU coordinated with the 12 universities in the ten countries to bring their curriculum in mathematics, chemistry, biology and physics. There was a curriculum mapping process. They determined what they had in common and what their differences were and agreed on the structure of the proposed course modules. We adopted a modular approach like the North American one, where a course - or a module - would be 120 hours, with 40 hours of instruction, worth three credits.

Once that was done, we started developing the content. Those who wrote the content came from the different universities. We had a team of about 200 people participating in this process. This was important because the African Development Bank that funded this project and the AVU, we wanted to make sure that this program actually is adopted as the university program to the senate. So it was very important that we engage with the staff members of each of these universities so they could participate in writing the content. We have now completed this process. We have developed 296 modules -- 73 in each of the language groups.

It was very important also to design and develop a quality assurance framework. Quality assurance is a key to quality higher education. But I have found that most of our partner institutions do not have this culture of having a systematic quality assurance framework.

Now we are enrolling the programs, meaning that we have what they call intakes. Cohorts have been taking the programs. We came up with program teams in each of the universities. In the program team, there is a program called Program Coordinator who is mainly— most of the time—the Dean of the Faculty of Education. We have course leaders in mathematics, in chemistry, in biology, and in physics. We also have a national coordinator based at the Ministry of Education. The program team helps us at AVU. At AVU we are a small number, about 20 people at the headquarters in Nairobi. This team will help us implement this program in each of the countries.

With this project, as with most projects, you are always thinking about what will happen when the funding is over. The universities came together and said, "We don't want this to go." This has been a fantastic learning process, and we would like now to create what we call a teacher education virtual consortium. We will be carrying on these activities. This project is ending in a few months, in September, but we have plans to carry it on.

Before we unroll the program in the ten countries, we ran pilot studies in three countries. We conducted one study in Senegal because we wanted to see what the courses we have developed looked like there and what lessons we could learn by starting it at a small scale. We ran a pilot at the University of Nairobi in Kenya. One of the countries we are involved with is Somalia. I don't know if you are familiar with Somalia. It is one of the most challenging countries I have been working with. It is a country that really needs education, because their education system collapsed about 20 years ago. Basically, they have universities and the vice chancellors of the universities want very much to do something. So we are working with them. We decided that we will have two universities in Somalia that will actually test this program.

We also have, at a governance level, what we call a Teacher Education Advisory Committee. The Teacher Education Advisory Committee is a kind of quality assurance mechanism body. We meet once every year. The leadership of the universities, AVU, and the Deans of the Faculty of Education participate in this.

As I said, we have 73 modules in math and science, in three languages. The total is 219. We have structured the content that has been developed into four Bachelor's degree programs— Bachelor of Education in Mathematics, Chemistry, Physics and Biology. The developers from participating universities engage in peer reviewing. It is part of the quality assurance mechanism. We pick up the peer reviewers from the participating universities. For instance, if Biology I was developed by someone from the University of Zimbabwe, then it will be reviewed by, let's say, someone from the University of Zambia. In this way, we actually work with— if we count the peer reviewers— some 300 African academics, all participating in developing and providing quality assurance for this material.

What are we doing now to deliver the program? AVU has— well, we used to have— a commercially licensed learning management system that cost a lot of money. Money is not really something we have, so we tried to change and go to Open Source. Nowadays we are using Moodle. Also, we try to enhance the capacity of what we want to do with Moodle. I don't know if you are familiar with Elluminate. We are also integrating Elluminate into Moodle so we can do more videoconferencing and some other things. That is the new learning management system that we are using. It is already online. We have installed mirror servers for Moodle in the ten countries, so each partner institution actually has the capacity to deliver the courses on their own. Also, the student can access the courses directly through the AVU learning management system. Developing all this was not an easy task. It required a lot of time to do this.

We are still uploading the content into Moodle. We have [challenges to translate the modules?]. This was very, very hard. We realized that if you develop, for instance, a course in mathematics, then to translate it into French you need a scholar who understands mathematics, French and English. We could not just send it to a translator because the content would not make sense. So it made this process very interesting and very hard. Portuguese was where we had a serious problem. Fortunately, we had some colleagues from Brazil and Mozambique who helped us to do this.

Most importantly, I think one of the greatest achievements of this project is that all the courses that have been developed are Open Education resources. They have the Creative Commons license, meaning that anyone in Africa can use it; anyone in the world can use

it. We are currently building an online repository at AVU to host these 219 modules. We will be working with these African academics who will be using the material. They can download it, but also what we wanted them to do is contribute to the repository. The latest figure I have received about the recruitment of students in our partner institutions is that about 3,000 students are currently going through this program, either at the Bachelor level or at the certificate level.

The biggest success came from University Cheikh Anta Diop in Senegal, Dakar. Senegal some 15 or 20 years ago decided to hire teachers that did not have pedagogical knowledge or skills. For instance, to go teach in high school in mathematics, you would just need to have a Bachelor of Mathematics. There is a current political situation in Senegal where these teachers are not recognized as full teachers, or they are not getting the salary of full teachers. There are about 6,000 or 7,000 like this, and with the unions around, it is a political problem. When we started the program, the faculty of education at Cheikh started with a small number to test providing the courses online, because most of the teachers are in-service teachers, meaning that they are spread in the country and they are teaching. It was a success, and now we have about 1,500 students online taking these courses in Senegal. In several countries, also we have over 1,500, and this is just the beginning. Actually, we started enrolling this course only four months ago.

We have what we call a Consortium Program. This is from our website. This Consortium Program is structured in a way that each university, in the 12 universities and the ten countries, is offering this program as its own. AVU is supporting this through the learning management system program. Also, students can access all the resources through our website. Through our website, you will also find the courses online in biology, chemistry, mathematics, physics, and so on.

The lesson learned out of this process: I just wanted to remind you that increasing the numbers of university graduates in Africa is not an easy task. It is not an easy thing to do, but I believe that it must be done. To do that we need to collaborate. Working across three languages is hard. Actually, working within one university with colleagues, academics, is not easy. We do that with 12 universities, in ten countries and with different languages. It is not easy, but I think it has to be done, and it is possible. The sociopolitical environment in Africa does not always help. I remember that in the beginning of 2008, in Kenya, there were political issues. We could not work, so we had to transfer our workshops to Senegal. It cost us a few more thousand dollars. But it is like that. In Madagascar these days— we have launched the program in Madagascar - but the political situation is such that it is not easy to do it right now. So when we implement these kinds of activities I find myself getting involved with social problems, political problems, violence, and war. It is part of the environment, and we should work to deal with that.

We have learned, also, that it is possible to achieve regional integration through projects. What has happened is we have about 200 scholars across Africa, across the language divide, and they are all communicating. We have an online forum where they communicate. It has helped with the mobility of teachers and students because of the fact that they are going through a similar curriculum. What is the way forward? What we are trying to do now is to duplicate this and have more countries join this teacher education consortium. Also, we hope to expand the usage of the courses to math and science units because AVU has been - and the financial donor has been - targeting mainly teacher education. But after that, as I said, they are math and science courses, and then we can do that, we can involve more math and science faculty.

The OER@AVU online interactive repository, I think should be online in a couple of months. You can find this information on our website. If you go to our website, avu.org, everything I said here is described in a more detailed way. Thank you very much.

A Study of the Creation and Use of Open Educational Resources in Some Parts of Asia

Gajaraj Dhanarajan Former Vice Chancellor Wawasan Open University Malaysia

Ladies and gentlemen, good morning, and Professor Larson, thank you very much for this invitation to be here as a fresh face. I'm really delighted, and terribly impressed, by both the diversity and the richness of the conversations that have been taking place since yesterday. It's absolutely wonderful to be part of this very eminent community. Professor Larson said that I have vast experience in e-learning. I just wish to make a slight change to that. It's more to do with distance education than e-learning. I am a neophyte in terms of e-learning, and that probably will explain why I am a little bit nervous, both with the technology that I'm using, as well as the audience I'm talking to.

Clearly, where I am coming from this morning is to look at e-learning, or OER, in the context of the bigger picture. For me, for a lot of years the "bigger picture" has been access and equity in distance education. This presentation will have just three parts to it: an introduction that gives you the background to the situation for some parts of Asia, and then a research proposal that we are currently working on. I would be enriched by commentary that you may have on the proposal itself as we begin to understand this phenomenon called OER and its practice in Asia.

Asia's deprivation in terms of education, especially amongst its rural communities— that is, perhaps about 60% of our continent of about four billion people— still continues to be very, very high, despite significant gains during our first nine years, and now our tenth year, since the launch of the EFA and MDG targets. This deprivation exists in educational provision both in the formal and the non-formal— or informal— sectors, especially so in the context of education itself. Education has been changing dramatically, requiring expansion and reshaping, as many of the countries position themselves to sustain growth and raise productivity and performance, resonating with what Dr. Bakary Diallo just said about Africa. The change is brought about by the pressures of a globalized market, direct foreign investment, greater and transparent participation in government, and democracies.

The nations that make up the big continent called Asia, putting aside Japan and maybe South Korea, in order to get themselves to the next level of economic and social development, do accept the principle that providing lifelong learning— the theme at this particular conference is one aspect of this— for all levels of society, especially with the focus on the deprived part of our society, to less-skilled and low-income groups, is critically important. Although there are about 50,000 or 60,000 institutions of higher education across the continent, unfortunately, most of them are conventional, face-to-face systems, and lack the capacity to respond to this call to provide lifelong education to the larger parts of our communities. This is perhaps due to the size of the population itself, the demography, economic or social barriers, gender barriers, geographic barriers— you name it, it's all of that. This is particularly so in many of the transitional economies or countries: Bangladesh, Nepal, Cambodia, Laos, and to a certain extent, Thailand and the Philippines. While on the one hand, that demand for access and equity has been increasing along with provisions for quality education, on the other hand, the pressures on governments have been increasing. This process is both economic and social. An outcome of it is that many of the countries are beginning to say, "We better start looking at expansion in the context of what some years ago the ILO— the International Labor Organization— declared as four approaches to lifelong learning." These four approaches are as follows:

One: To expand access to lifelong learning opportunities to all groups of people, with special attention to the poor, women, young workers, low-skilled, long-term unemployed and older workers, and people with disadvantages. That's a very big canvas to address.

Two: To utilize — perhaps sensibly leading from one to the other — information and communication technologies as well as distance education. There seemed to be a separation on that point in 2003, but going by what we heard yesterday, and certainly today, that line in the sand differentiating ICT from distance education is clearly beginning to disappear. Consequently, we are looking at distance education using the tools of ICT in a much more effective and efficient manner. Such approaches using technology may, we hope, revolutionize lifelong learning and training, especially in the non-formal sectors.

Three: To look at developing innovative partnerships within public and private institutional enterprises such as universities and industries, and at the same time, look at approaching and providing access to learning or training in the workplace itself. These are conversations that are beginning to happen, and beginning to happen in a fairly serious manner throughout the continent. These approaches clearly would suggest— and as an advocate of distance education, I'm really thrilled with it— that distance education supported by ICT opens up the potential for most Asian countries to boost education. They can do this by, on the one hand, overcoming the problems of access to lifelong learning and training faced especially by remote communities, and on the other hand, by reaching out to people with various disadvantages and those who for various reasons could not participate in conventional learning settings.

Distance education itself is not necessarily a panacea to solve all of the challenges confronting the provision of education, but it is a valuable tool, amongst many other such tools. Over the last 40 years or so, distance education in Asia generally has been moving perhaps from the sidelines to center stage as an educational resource, and I'll come to that in a minute. There are many good reasons for this. A most important factor is its propensity to achieve economies of scale. This has been a very attractive feature. The outreach power of distance education seems to be an important element in distinguishing it as a strategy or tactic.

While in many instances, the application of distance education on the continent that I come from has been mostly in the higher education sector— and in some instances, in perhaps basic and primary education— educational innovators are now beginning to say, "We can test this. We can test distance education in the context of lifelong learning, including areas such as health and agricultural extension, the education of women and girls in especially vulnerable communities, teacher training, as you have just described in sub-Sahara, and the training of professionals in radio and television." The new ICTs themselves have all been applied in experimental ways, or in some cases, in substantive ways, in countries like India.

The range of experience and research results confirm for now that distance education, in the context of lifelong learning, has many capacities. These would include, and certainly, we are reiterating the point, reaching out to marginalized groups, which can be very much learner-driven, or learner-centric— allowing the person to decide when, how and where she wants to learn— as well as reaching out to remote villages and nomadic tribes in places like Mongolia. As the herds move, education can travel with them to support families. This is happening. Also, distance education can facilitate greater interaction between learners and learners, learners and mentors, as well as learners and content. The promise of these various experiences is beginning to show that there is a value. This value in distance education can be enhanced by the tools becoming available for our use literally every other day.

Despite the many accomplishments of distance education, there still remain considerable concerns and challenges. The concerns have to do with quality — Naveed spoke about it this morning a little bit — and the effectiveness and efficiency of using technology for lifelong learning and training, especially in that the rapid development of ICT-supported distance education requires very robust frameworks for quality assurance in various settings, including the non-formal sector. The challenges for us have to do with increasing access, reducing cost to the user, ensuring availability of hardware and software support, improving institutional abilities and staff skills to deal with a new type of teaching, and administering the phenomenon. Further, as new technologies keep emerging, we have a great capacity to reach out, reach far, and improve the quality of educational innovations required to test them, in almost a perpetual quest. It's almost something we must continue to do all the time to make quality lifelong education available to all.

The progress of distance education as a method for human resource development in Asia is fairly well-recorded. There is considerable literature on the subject. With over 56% of the global population there, it's not surprising that distance education has found itself a niche, or inroads to the sector. Asia has about 70 or so dedicated distance education institutions of one kind or another. Some of you may recollect an earlier comment that seven out of the eleven mega open universities of the world are located in that continent. A mega university is something that's described as having a population of over 100,000. We have at least two or three universities that claim to have enrollments of about 1.2 million or 1.3 million students. That's mind-boggling for someone who comes from Malaysia, but not so much so for someone from India, or even Turkey. Yesterday, I heard

that they, at university alone [the Indhra Ghandi National Open University] have about 1.6 million students. These mega institutions, along with their counterparts, have something like six million to seven million active students. Along with them, there are also a large number of dual-mode institutions, which handle both on- and off-campus students. It's not to the extent and the degree of sophistication of Monterrey, but in many different ways, they are serving a purpose. That purpose is to provide access.

Increasingly, cross-border education, especially via e-learning, is becoming possible throughout the Asian region. Some of the biggest intrusions are perhaps from Western Europe, especially the UK, from Australia, and in a selective way, from institutions in the US, which see Asia as a potential source of market growth via e-learning. A third factor that is beginning to also help enhance the role that distance education - and now, elearning- can play is the development of formal, professional associations, both intergovernmental, and inter-institutional. These organizations are all identifying distance education as an important area of support. As I mentioned earlier, distance education efforts in Asia have always involved the use of technologies. The earlier technologies were mostly analog - print, radio, broadcast television - but they had severe limitations in terms of a lack of interactivity, difficulty in repurposing content, updating content, and restricting collaboration. The advent of the Internet and the transformation of information into digital format have made it possible to overcome most of these limitations. The emergence of newer technologies such as Wikis, blogs, podcasting and mobile phones has also begun to influence many dedicated distance education institutions in Asia, as well as their counterparts in conventional institutions, to consider an even more important role for ICTs.

Until very recently, these developments have mostly been seen in the high population countries like Pakistan, for example, and India, China, South Korea and Japan. This is changing. Lately, many other countries with smaller populations, such as those in transitioning economies— Bhutan, Cambodia, Laos, Tibet, Nepal, the Philippines, Mongolia, and of course, Vietnam, where you had your conference not too long ago— have all begun to explore and experiment with innovations, with a very serious purpose: how do we now scale this up? Learning from the experience of city-states. Urban economies like Hong Kong and Singapore have shed some light as to how you can actually utilize— in a very Asian context, with its traditional views about teaching and learning— these technologies for effective access and equity.

From its very beginnings, the business of education practiced in Asia has had many things to cope with. Some of these issues are related to policies, and others to outreach, together with quality and technology. It would not be incorrect for me to state that given that Asia is not a homogeneous entity, you will see different challenges in different contexts in different countries. For instance, policy clarity on technological media and education is not forthcoming in many South Asian countries, except maybe India. The access to and ability to apply new and emerging technologies, both at the provider end and the user end, has challenged many South Asian and Southeast Asian countries, except maybe Malaysia and Singapore. Countries like India have started using distance education quite successfully, at the pre-tertiary and non-formal level. Those in Southeast Asia are beginning to realize the potential now while they are using it in the tertiary sector. Instructional design and pedagogic quality have been a problem in China, while management efficiency and technology reliability has been a problem in South Asia. All of these are examples that are simply meant to show that while it's an exciting niche, it's a niche that is also complex in many ways.

It is perhaps in this very complex situation, that a group of people who call themselves PANdora- the Pan Asian Network on Distance and Open Education- organize themselves to tease out, in very broad terms, the necessary conditions at policy and practice levels, to establish, develop, manage, and deliver effective distance education. The doyen of the group, Naveed Malik, presented a paper this morning to you on assessment. Naveed is my current boss in terms of this particular project that I'm describing. From 2005 to 2008, they looked at about seven or eight side projects that were carried out on a wide range of research topics encompassing policy, pedagogic, and technological questions. They were also looking at the impact of technology-based distance higher education by mapping the acceptability and accessibility of provision, including reviewing policies on distance education in the developing economies of Asia. Some of these studies involved the development and testing of software and content in particular need areas, such as localized technology-based learning management systems, short message systems and technologies, e-assessments, and repositories of learning objects, as well as capacity building. This specifically addressed the challenges of instructional design.

The findings of PANdora are as follows: There is a lack of access to institutional infrastructure. If you are a remote learner, how do you access, say, the Virtual University of Pakistan's programs? That has certainly marginalized many people. It's not just access to the technology, but the capacity to use the technology effectively as a learner that is the problem. While I think emerging and newer technologies are beginning to provide solutions for addressing these barriers, wireless communication and personal handheld devices are relatively new. They may have a wider appeal, but I think cost is certainly very much an issue.

Certainly, the quality of distance education programs is seen as a bugbear. I think it has been bothering distance education in Asia, right from the late 1960s, and it still continues to be a bother. People are pressured to do more, to do it fast, and to do it cheaply. Sometimes these three things do not come together well, and I think we suffer as a result of that. Finally, we advocate the use of the new instructional information arrangements: granulation of course content, reusable learning objects, and creating and participating in an open educational resources arrangement. Those are the PANdora findings. I think out of those earlier studies, new research questions started emerging.

Countries needed to know whether barriers to using technology for learning lie in educational underachievement due to economic, social, political or geographical factors. They needed to know what knowledge and skills are required of the institutions themselves: what collaborative partnerships can be arranged? When these questions were raised by policymakers, we started asking some new research questions. Research

question one: How best can the newer technologies and arrangements such as OERs be applied to design, develop, and check curriculum, and at the same time, to review methods of assessment and evaluation? Research question two: To what extent could ICT support of distance education be a viable solution to the problem of expanding openness and access again, especially in the tertiary education sector and access to lifelong learning? Of these, perhaps, I think the first question is probably more relevant to this particular group of discussants.

I thought I'd share with you the broad framework of what we are hoping to do, in terms of our study of OERs in the subcontinent. There are about six or seven objectives that we hope to achieve. Firstly, to determine the demand for OERs clearly is a case that we need to establish first in many parts of Asia. There are sporadic and certainly episodic instances of the use of OERs, but how many are there, how far, and where, and when? Then, we have to examine which capacities we need to develop to promote and enhance the application of open educational resources. Thirdly, we must determine, list, and describe the range of OER activities in the region. Fourth, we must list and describe the methods adopted for the creation of OERs. Fifth, we must enumerate and describe the use of OERs by providers and users of learning. Sixth, we must examine policy issues, legal issues and technological issues. Lastly, we must determine the quality requirements in the OER environment, and along with it, organize capacity building workshops for the region, the first of which will actually take place in Hanoi in another two weeks. That is a background and a quick sketch of what we hope we can report when we meet again, if you should invite me to participate in the coming years. Thank you very much for your tolerance.

Three Hundred Libraries Later: Evaluating the eGranary Digital Library and Off-line Information Delivery in Education

Cliff Missen Director, WiderNet Project University of Iowa Iowa City, Iowa

Thank you very much for having me back this year. I am delighted to be here to share the ongoing adventures of the digital library and the WiderNet Project. One of the things I enjoy about coming here is hearing all the other adventures that people are having in your work.

The American philosopher Thoreau said, "It is not enough to be simply good. You must be good for something." The eGranary Digital Library, which I'll be presenting in a minute, is good, but the 'good for something' is the work that you're doing in the field. I enjoy this collaboration in terms of learning what you're doing, and what we can be doing with our technology, to improve the work you're doing. I'm saying that partially because I changed my presentation to answer questions raised earlier.

The WiderNet Project has been around since 2000. This grew out of a year I spent teaching as a Senior Fulbrighter at the University of Jos in Nigeria back in 1999. It grew out of visiting people trying to do education with technology and being frustrated with that technology. We founded the WiderNet Project as a way to support our colleagues who were doing work in developing countries. Our biggest focus is training people.

When talking about the total cost of ownership of computer systems over a five year perspective, the computers are about 25%, training people is about 30%, and staffing is about 30%. So we focus on those two big pieces: training and staffing. We've had over 4,000 people go through our training programs since 2000.

At the same time, we work with mostly American corporations and individuals to get donations of hardware and software that we ship off to our partners. We've had volunteers at The University of Iowa refurbish and ship over 1,200 computers so far. Whenever we ship a cargo container of computers, we pad the computers with thousands of books. So, we get a lot of value out of that.

Our focus is on practical, cost-effective solutions. There are a lot of people who like to talk about a digital divide. I think the term 'digital divide' is a luxury afforded to people who have digital technology. When I go around the world, I see refrigerator divides. I see antibiotic divides. I see healthcare divides. I see good governance divides. I see it, really, as a large economic divide. Hence, a lot of the work that we do at the WiderNet Project focuses on coming up with cost-effective solutions for using IT.

Out of this has come this device called the eGranary Digital Library. I have one hooked up right here. This started with me sending CDROMs to the universities we partnered with in Nigeria, full of Web sites that we'd copied. They said, "That's really cool. Can you send us more?" No good deed goes unpunished. So we started sending more CDs and people started asking for more content. Pretty soon, it was, "Can we have the entire Wikipedia?" Whoa, that's kind of big.

Let me grab the pointer here. This is a chart that shows Internet uptake from 1990 and 2005. We see regular Internet use going up to 60, now 60-plus percent of the population in the wealthy countries of the world. Then middle income countries. And then finally, the poor countries of the world, with Africa at the bottom, in the blue line.

This is one of those glass half full/half empty sorts of things. I'm interested in the 30% of American families who don't have the Internet and the 98% of the population of Africa who don't have the Internet. Everybody has information needs and there are solutions if we think creatively about this.

The reality of the cost across Africa is that it's expensive. I just visited a university that spent \$150,000 last year, for their one-megabit Internet connection. That's an insane amount of money considering all the needs that the university has. I have a friend in Nigeria who has a hole in his head, delivered during a student riot because he wasn't able to pay salaries on his campus. He had spent a ton of money on networks and computers the previous year. That put him in a position of not being able to pay salaries. These are real choices that people are making about using the technology.

I have a term: "bandwidth blackmail". It bothers me a great deal when I hear experts from afar tell people in poor countries, "Everything's free. You just have to get on the Internet." Advising someone who doesn't have books, or access to information, that they should be on the Internet is like advising somebody who doesn't have water that they should drink Perrier. In many situations, it's the most expensive option. We have to be careful about that.

I call it the 800-pound gorilla effect. Do you know the joke about the 800-pound gorilla? It's an American joke. Where does an 800-pound gorilla sleep? The answer is: anywhere he wants. I see foundations; I see corporations who are serving the bottom of the pyramid. I see individuals, like myself, who show up in suits and ties as experts, wandering all around developing countries telling people, "You just need to get the Internet." And they don't understand what that means.

The reality of Internet connectivity across most of the developing world is that even if it exists, it's not reliable. It's rarely there 24 by 7. We've done some testing to show that in Africa, many institutions are hard-pressed to come up with six hours a day of connectivity. That's because the power goes out, or the satellite dish goes down, or any number of other problems. In my teaching, when I teach from Iowa to Africa, my students will disappear from the radar for weeks at a time because of one failure or another.

With the eGranary Digital Library, we replace bandwidth with "storewidth". We get millions of resources, put them on a hard drive, and put them inside the organization. These are all educational documents. We don't do popular culture. We don't do pornography or anything like that. No sports scores (sorry), just good educational materials, curated and collected by volunteers from around the world. We put it inside the institution's local area network, where their local area network is very fast. They might have a tiny Internet connection outside, but inside, they've got fast connectivity, which means that video, audio, and multimedia can be employed.

Right now, we've got the eGranary Digital Library in 300 locations across the world. It's growing, which prompted us to stop and ask the question, "How are we doing?" I maintain a list of about 150 features that we want to add to the eGranary, because every time I travel, I meet people who have not just content, but features that they want to add. So, we're constantly growing this thing. Thanks to the folks of the Rockefeller Foundation, we had a chance this last year to ask people this question and get some good feedback.

This is the model: the eGranary is hooked up to a local area network. Everybody has free and fast access, even when there's no Internet connection. I did a focus group at the Dalai Lama school in Dharamsala, India. They had been working for years on setting up a wireless network around the valley there. They had experts come with inexpensive wireless equipment and hook it up. It was amazing that on good days, with good weather, they were able to get a signal from one part of the valley to the other. It was impressive, but not useful. The teachers were beating themselves up because the outside experts had come in and said, "Get the Internet and everything will change." Well, they did get the Internet. It took a lot of time and money, and little changed. It was frustrating for them.

When the eGranary was hooked up, the educators in the room instantly said, "This is it. This is change. This is real information access." We have people taking this connection, adding wireless access points around their community to it, and turning it into what we call a knowledgesphere. It's turning into a free public wireless library. Anybody with any Internet-enabled device like a cell phone or laptop can hook up and use this free library.

This is the interface of the eGranary. This is what the eGranary looks like to somebody who's hooked up. I'm not connected to the Internet here. There are plenty of wires, but none of them are connected to the Internet and there's no wireless. I'm just using this hard drive right here. We've written an interface so that it looks and acts much like the Internet. So I'll click on—say, books. It comes up and says there are 30,000 books in here.

Scroll down a little. Say I'm interested in children's literature. I click through the books here and find *The Adventures of Ulysses*. It opens right up. Click on a chapter. As you see, it opens instantly, because, again, we're using the speed of the local area network.

I'll do a search on the catalog and look from my favorite project, Mutopia. Here we go. These Mutopia folks have gathered almost 1,300 pieces of music. Let's say that this morning, I'm in a Mozart mood. Click on Mozart. Here are the works of Mozart. If I want to hear it, I'll click on the midi file. It will open up and play. Terrific. Let's go onto the PDF file. And there's sheet music, opening instantly.

In Africa, there's something I call PDF paranoia. When somebody has downloaded a Web site, it takes five minutes to get the Web site. The next click is five more minutes of their life. If they click on a PDF file, what happens? It could take five hours...or five days. You never know. You can't hit the back button, so you have to quit. My job as a trainer is to walk around behind people, and nudge their elbow so they click, because in this model, you can open PDFs without worry.

I'll do one more demo. I'll go to a video. Here's one I'm familiar with, a 126-megabyte video. How long would this take to open at your home? A few minutes? A few days? Click on that. It opens instantaneously. As instructors, this is our dream. Right? An instructor, turning to her 50 students in her human anatomy class says, "I want the 50 of you to go online, watch a video, and take a tutorial. We'll talk about it tomorrow." That's doable now, even in the furthest reaches of the world.

We have permission from over 1,200 authors and publishers so far: MIT Open Courseware (thank you very much), Wikipedia, and the World Health Organization. We have librarians working around the clock to identify good content and bring it in. This collection is over 14 million documents so far. It has tens of thousands of books, and people opening these documents 5,000 times faster than if they were hooked up to their Internet.

This slide here shows individual Internet connectivity speeds across the world. We measure what the user experiences, not what the institution has purchased. This speed here is a typical connection at a university in the US. About 17 megabits per second is what the individual experiences at their desk. The typical corporate desktop is experiencing 2.5 megabits per second; they're not so liberal with Internet connectivity there. eGranary users are experiencing 65 megabits per second, almost five times faster for everybody. We have fast computers. We have fast networks. The weakest link is our Internet. We take out the Internet and everything is fast.

We've done an evaluation program, a series of online surveys and paper surveys delivered to some institutions that didn't have the Internet. There was also a series of onsite focus groups and a couple of focus groups over Elluminate, people connecting and talking online. Then we also grabbed logs from servers so we could assess how much the materials had been used.

There are a number of stark things that stood out for us. One, it's really hard to carry on a survey in Africa where people don't have this kind of connectivity. We have a database of about 5,000 emails. When we sent out our first request, about 4,000 came back as

undeliverable. So we had two students spend several months phone-calling and emailing, trying to find other people's email addresses, because they change so much.

What we found is that about 70% of the sites that reported said their eGranary was working fine, thank you very much. But we found that implementation usually depended on one person who had the enthusiasm to make it happen. There are a number of cases where somebody said, "Yeah, my eGranary is working." And I asked, "How many people are using it?" And they said, "Nobody right now, because I keep it in the desk drawer so that it doesn't get stolen." In all the cases we looked at, it's about one individual who gets on fire about it, usually a young person who takes this technology and spreads it around.

Many of our subscribers do not expect or use technical support. I knew this from wandering around Africa visiting server rooms that had brand new servers in boxes, in corners, unopened and unused, because something was missing, something hadn't arrived yet or no one had figured out how to open it. In the American corporate world, we call that FUD: fear, uncertainty, and doubt. There was a lot of FUD in the way. There were many times when we'd work with somebody after learning that their eGranary wasn't working and the fix was less than five minutes. It was, "You need to push this button or switch that switch." But when we asked people, "Why didn't you contact us?" We got a lot of different responses.

From that, we've learned to have local people do the installations and the training. We've started implementing this in Nigeria, and will in Uganda soon. Then it's not something coming from Iowa. We have a young woman in Nigeria making about five times this year what she made last year, and last year, she made twice what she made the year before, wandering around installing eGranaries and, most importantly, teaching people how to use it.

The other complaint that we received was that there were not enough access points. Once they have this up and running, if an instructor wants to use it in their course with 50 students, they need 50 workstations. A couple of people have talked about that already this morning; the challenge of getting enough of what I call "face time." Sitting in front of the computer and learning from that computer is rough.

We did an installation at the University of Liberia last year at the medical school. With volunteers, we went over with 12 donated computers and set up a lab. We trained the second year medical students how to do all this. At the end of the week of training, I pulled out a wireless access point, plugged it in, and hung it on the wall. I said, "There, now you have wireless." And the students said, "No way." I said, "Yeah." The next day, five students came into the library with laptops, and the dean was sitting there shaking his head. He said, "I had no idea these kids had laptops." The next day, the dean brings in his own laptop. So we'd grown from a 12- to a 17-computer lab overnight, without having to buy a single piece of technology.

But the number one conundrum that most people face is information literacy. Those of us here in the US who have been on the Internet for the last 5 or 10 years have lots of experience under our belts doing searches and working our way through the wealth of information that's out there.

One librarian put it to me clearly. She said, "This is what happens every year. 7,000 new students come to my university. I go into a lecture hall with no electricity. I've got students piled up to the walls, hanging out the windows, and I'm telling them that the best resources on campus are in the eGranary Digital Library." Most of these kids have never seen a computer before. That goes right over their head. It's the same with the Internet; right over their head. That's what I have to start with: not enough access points, not enough computers, and students who have never used this technology before." We were asked constantly, across the board, for more training material, more resources, and more training for libraries and instructors, so they can master these technologies faster.

Across the board, everybody had more content that they'd like to see, too, but no one agreed. That's to be expected. They wanted more veterinary science, more agriculture, more whatever. That's our day-to-day job: finding more content.

There are a couple things we've done with the recent eGranary that address these. We were doing evaluation programs and building the Community Information Platform at the same time. The Community Information Platform or CIP is sponsored by Intel, which is a great gift. One of their Vice Presidents heard us giving a presentation at a conference, and came up and said, "We spend \$2.5 million a year caching the Internet inside our company. That saves us \$7 million dollars in connection fees." They understood immediately why we'd do something like this. And they came out with a gift. They said, "What do you need to do next?"

We've added Web 2.0 capabilities to this drive. Now it has LDAP security. One can log into the drive. It's easy to upload and share locally-made content. We put information into silos so people can have their own silos and add their own information. We've made a dynamic with MySQL and PHP, which means we can run programs like Moodle, Drupal, and Word Press, which are all in there and ready to go. In terms of scaling this, asking an institution to install the server and run these services is almost a commitment to two or three full-time IT staff. Most of them couldn't afford that; these small schools and small clinics weren't going to be able to do that.

We're trying to aggregate that and put the best practices into the box so that someone can plug this into their network and start making Web pages. The built-in Web tools are my favorite part. It's got a browser so you can log in. You can move, upload and download files. It's got a building Web editor. You simply click on a page. It opens up in a Web editor and you can edit and save it. I beta-tested this on my own students at The University of Iowa where I was teaching some teachers and librarians. When they went back to their schools around Iowa, they had their students using my server. They set up individual Web sites for all the students and had them making their own pages. It's an easy tool. It makes it easy for someone to click a button, upload a PowerPoint, make a link, and share it.

We've also been working on improving the interface. Again, most of the people using the eGranary haven't used the Internet before. If they have, they haven't spent as much time as we'd like on it so, we've been doing a lot of work with librarians to catalogue the items in the eGranary, making them easier to find. As you saw earlier, I went to the Mutopia site. It was simply a matter of typing in a quick search, and boom, it popped up. We have a catalog of items that a librarian has marked and viewed. We have a word search, which is 14 million documents worth of words. We have something we call portals. All this is making a user-centered view of information on the eGranary.

When we asked users out in the field the best ways to find information in the eGranary, the number one use was portals. There was a university in Ethiopia that, through the magic of a technician hitting the wrong switch at the wrong time, was serving up the eGranary interface, but when you clicked on the item, it went out to the Internet instead of to the eGranary. But the professors at the university, who had lived with this for a month, said it was actually better than the Internet alone, because they could usually interface to find what they want, and get directly to the item.

I'm going to pop back over to the eGranary for a second here and show you. I'll click on portals. Here, for example, we're working with the University of Alabama and the University of Zambia to put together a portal for training healthcare workers there. They've gone out and identified over 500 resources that fit with the curriculum they're teaching. If we click on 'Browse by Category' here, we see a list of topics. I go into Public Health Nursing and click on Environmental Health, and there's a list of links that take you directly to...MIT Open Courseware. Yeah! That was not planned or rehearsed.

The idea of portals is that we ask the users, "What do you need to know and what do you need to get access to?" so now everybody doesn't have to reinvent the wheel. This is the time-honored tradition of professors making syllabi. We take our students into the forest of information and we pick out the pieces that we think that they should use.

The other thing we're doing now is building training tutorials in the eGranary itself. We're making modules in Moodle and one of our objectives is to be lazy. First, we found and copied lots of resources other people had put together for doing basic Internet training, and the like. We brought them into the eGranary and now we're making Moodle courses that link to these modules people have created, and we're creating complimentary modules.

Our aim over the next year is to develop this so that that librarian who has 7,000 new students walking in the door can set up an incentive system for them to spend time with the computer, go through the module, get their Internet driver's license, and understand better how to use these technologies.

That's what we've been up to: spreading information. We now even have eGranaries in some prisons here in America. We're finding many populations where people need access to information.

I have an eGranary on my cell phone. I have a chip in here that's about the size of my fingernail that has 36,000 documents on practicing medicine. We're making little eGranaries like this one here, a USB key. I think this one has 25,000 documents on it. This is offline information delivery. There's a large amount of potential here. We're finding that the great challenge is making it presentable, and making the information findable when people get their information store. Thank you very much.

Open Educational Resources and the Bull's-Eye: Opening Access to Knowledge AND Improving Teaching and Learning

Catherine Casserly, Senior Partner Carnegie Foundation for the Advancement of Teaching

I am honored to be here. I was reflecting back, as I arrived late yesterday from California, that the first meeting I had with Dick and Liz here was on a very snowy afternoon. The city was essentially shut down. No one was around campus. I did find Dick's office, and the three of us had a great discussion about BLOSSOMS, exploring the vision, and the leadership required to move it forward. It was very much an early vision, and the program has moved at an incredible pace over these past few years. I really want to acknowledge that accomplishment. I am delighted that today's weather is better.

Today I want to talk about open educational resources (OER) and what I call the "bull'seye." When OER was initially launched, we had two primary goals when we were thinking about opening access to knowledge. Certainly, MIT OpenCourseWare was one of the very first big instantiations of what could happen if knowledge became open. We unlocked the treasures, both at universities and at the Hewlett Foundation. In the early days, we sought to test out a variety of content, materials and licenses to seek and understand the space in a very significant way. While our first goal was to open access to knowledge, ultimately this is a precondition to reach the ultimate goal, to improve teaching and learning. We do not want open educational resources to become the next passing fad— the laptop in the classroom, the technology that not everyone knows how to use. Its end goal is to improve teaching and learning. In this context, I am going to highlight the work we are undertaking at the Carnegie Foundation with respect to improving teaching and learning.

This PowerPoint slide is of the Carnegie Foundation for the Advancement of Teaching. We are a hundred-year-old institution. We were chartered by an Act of Congress in 1905 to improve the mission of teaching. Every ten or fifteen years, a new president joins the Carnegie Foundation and the 9th President is Tony Bryk. I was one of his first hires because I love to build and explore new territories. We are building a new program of work for the foundation for the next fifteen years. This is a photo taken when we had the opportunity to work with the Stanford Design School. We had the design school come in and help us think about our R & D field building and community college focus work from a user-centered perspective. The Carnegie Foundation has historically focused on higher education. Tony Bryk, the president, has worked historically in K-12. Community colleges in the United States serve 47% of all students in higher education. They are the huge source of accredited education. They are also a great area to explore and innovate because they do not have some of the constraints that other higher education institutions have.

Next I want to talk a little bit about our overall conceptual framework. For community college students, we are focused on creating alternative pathways through developmental, or remedial, mathematics. I will talk in greater detail later about the mathematics and

statistics pathways. What is really important, though, is our R&D design, which helps us explore this space through a different lens. As we approach these educational challenges, we will blend the potential of openness, the power of networks, and the use of data and evidence to drive practice. What has typically happened in higher education, and just happens as a natural instinct, is that work gets put into silos.

With respect to the practice of teaching: faculty tend to sit in the classrooms alone with the students day by day. The faculty are isolated, tend not to interact with researchers, who themselves are conducting terrific studies in isolated laboratories and developing great designs. What the researchers learn through their studies typically does not feed back well into the classroom. Then we have commercial partners, who think about scale. We tend to put them into a yet a different circle and not integrate them as well. What if instead of having these three silos, we were to bring these groups together? What if from the very beginning we were to design for scale, use principles of openness, think about evidence and data, and bring that back into the practice of teaching?

Then we would not limit faculty to just being the users of content or materials; they would be actually co-developers. What we have then created is a co-development scheme. We are trying to pull these groups, these hubs, together within the Carnegie Foundation. We will have an information infrastructure, that we are now developing, which will be the technology, the backbone— the technical and the social, webbing that will bring us all together. At the same time, while we are trying to tackle particular problems of practice in education, we are thinking about "the whole elephant." I think I need another term, but we are thinking about policy engagement from the top-down as well. We cannot leave the scale and policy plan until the end, until five years out, and then consider how we think about spread. We have to design for it, really, from the very beginning.

The particular goal we are focusing on, and the first problem of practice that Carnegie is tackling, is to prepare students mathematically for the 21st century. We want to do this in a way that is holistic. In the United States, and most certainly in many other places in the world, there are issues of language, there are issues of literacy, and there are issues of how best to "do college." We want to be very focused and data-driven. Many community college students in this country are the first generation in their families to attend institutions of higher education. They tend to be from less affluent backgrounds. They do not have families who can help them navigate the system, so they need guidance. It is not only speakers of English as a second language—we have many languages, obviously, in this country— but those who do not have the academic language to be successful in school as well. So we are trying to think about the issues holistically as we solve this problem of improvement practice.

This PowerPoint slide denotes our current pathway through mathematics in this country. What we do is we direct everyone to calculus. This developmental math sequence is what approximately 70% of community college students in the United States enroll in before they transfer into college level courses. They tend to spend a fair amount of time, money and energy in these courses before they move to the transfer level. Some students' skills
start out in as low as arithmetic — which is really about grade three — then move into elementary algebra, intermediate algebra, and then into the calculus, pre-calculus sequence.

I was discussing this with someone recently, and they said, "Well this is kind of like what we used to do with Latin." Everyone used to need Latin. I took two years. I am sure there are many in the audience who also took several years of Latin. We have come to learn that perhaps Latin is not needed for all students, for many different reasons. I also always say this: I was a math major. I never want to preclude anyone from the joy of taking calculus. Everyone should have that experience if they so choose. But I think there should be alternative pathways for students, and that is what we are working to design at the Carnegie Foundation.

We are creating alternative pathways. One is called "Mathway," which will integrate quantitative reasoning with the arithmetic, pre-algebra knowledge base and redesign the course to be much more conceptual, much less procedural, and prepare students to move along into college-level math courses. This other one, which we are starting with first, is called "Statway." It is a one-year sequence to prepare students for quantitative reasoning and probability and to build in the important concepts around algebra into the statistical problems as they move ahead, but in a very conceptual, rich problem-based course design.

We call this next PowerPoint graph the "Survival Curve Graph." The senior team at Carnegie recently spent a week at the Institute of Healthcare Improvement, which is here in Harvard Square. They are an incredible organization that has worked for over two decades to use data for the science of performance improvement. We are an organization attempting to apply the same science to the education space. If we think about the survival curve for students in developmental math, 100% start out in the fall, and by the spring we have lost students, and we are down to 70%. By the following fall we are down to 57%. At the beginning of year three, we are at 42% students still "surviving". We thus waste an incredible amount of resources and energy through these classes and lose students along the way. If we were a business, we would be shut down. We have to create new ways to serve community college students, because obviously, what we are doing is not effective.

I wanted to share this video of Myra Snell with you. She is a professor at Los Medanos Community College in California. She has designed a one-year statistics course and is piloting an early implementation in her classroom. I think, as we sit here and talk about higher education, it is really, really important for us to remember that it is about the students. We can all bring technology to bear on this, but it is also really important to see the power of what really effective teaching stimulates for student learning.

[Link to five-minute video segment: begin at 12:42] http://techtv.mit.edu/collections/linc/videos/7600-open-educational-resources-and-thebulls-eye-opening-access-to-knowledge-and-improving-teaching-and-learning CASSERLY: I think I enjoy sharing this because it captures the students significantly engaged with the coursework. Any quick comments on the video? Any thoughts?

AUDIENCE: The music's too loud.

CASSERLY: Music's too loud. Okay, we will fix that.

AUDIENCE: You miss some of the content.

CASSERLY: Some of the words are very hard to hear. Yes, one of the students created the video. More importantly, does that look like a typical math class?

AUDIENCE: No.

CASSERLY: Not at all. So what's different?

AUDIENCE: The interaction.

CASSERLY: Interaction.

AUDIENCE: Team play.

CASSERLY: Team play.

AUDIENCE: Critical thinking.

AUDIENCE: They coach each other.

CASSERLY: They coach each other. Who? So who's the teacher in that classroom?

AUDIENCE: The students.

CASSERLY: Right. Peer to peer teaching.

I love the girl with the big eyes. She is saying, "Wait" and "But what are you saying?" And for her to take that risk in a classroom and say, "Hold on. You know, I don't think we have it right." Or for her to step forward and say, "This is what I think is right." And to take the risk of being wrong, without fear of failure, of failing in front of your classmates. Having the comfort zone to do that. I think this is a great example of what we obviously want to work towards as we move forward in 21st- century teaching, as we think about how teams work, as we think about cooperation in the workplace, and leadership.

In our occupations, we are not tested just to fill in bubbles, like this CAOS exam in the video. It is terrific that Professor Snell did not initially realize that the answer was wrong.

The students figured it out themselves. They began a dialogue in the classroom, they knew enough to think critically, and found the test error on their own. Then the teacher had to also stop and say, "How am I going to use my time?" and decided, when she went home that night, that the next day they would revisit the same question, they would create their own data sets, and they would use the precious class time to solve this problem in a deep and meaningful way.

As we consider this, we also want to be thinking about how we can bring this into classrooms overall. We have open educational resources, and we know what is unique about them. We create them, we can share them, and we create the efficiencies that Dr. Vest was talking about. We can improve them, which is critically important. I can take your assets and I can build on them, so I do not have to start from scratch. I can take your lesson plan and localize and adapt it to my student population. Then we can redistribute. So this is really, again, a science of performance improvement. We have resources now that we can improve time and time again.

Thinking about the future... Carnegie has an old logo, which is a tree, from when we were founded in 1905. For a long time, the tree of knowledge was where people came to get knowledge. This is where we have been for a long time for much of our history in education. Now as we think about learning, we have knowledge coming at us from all directions. Within five years, it will be in the cloud. Data will be in the cloud, assets will be in the cloud. We will be able to pull them down from wherever we are, onto any kind of digital device that we might be holding. How do we begin to think about moving from the setting where we have had these very stationary places of knowledge? President Vest's discussion focused on the meta-university, where knowledge is then distributed in many different places. We can gather it in many different ways. We can gather it formally in the classroom with our classmates, we can gather informally through our friends, through Facebook, and our other colleagues. As we move ahead, we should be thinking about this cloud, this experience, because this is what the world will look like in the not-too-distant future.

This last PowerPoint is a map is our networked improvement community that we will be building here within the United States. All the assets that we are creating are going to be openly available. The effort is starting with 19 community colleges that will be coming together this summer at an institute at the Carnegie Foundation. The idea is that we bring teams from each of the colleges to Carnegie to work with the academics, to work with the commercial partners, and to develop content. The initial content for these new materials will be under a Creative Commons Attribution license. As we build the content and we have modules, we will also collect evidence on the effectiveness of the content for different students— what works for which student in which setting— so that we can begin to personalize education in a way that we do not do right now. As we begin to learn and understand this, we will continually improve the content and redistribute. It is through the collective community and the open community that we will be able to figure out what works. What we really have to do is break down these silos that we have and figure out how we can work in a much more networked way. Clearly, we are all doing that in this audience — I am talking to the audience who understands. Our work at the Carnegie Foundation is to help community colleges build new pathways worthy of mathematics, worthy of the students, and worthy of their institutional missions. We can certainly extrapolate this to other educational missions as our collective work moves ahead. Thank you.

Moving to Anywhere, Anytime Learning: Institutional Strategies for Meeting the Online Education Needs Of Lifelong Learners

Andy DiPaolo Executive Director Stanford Center for Professional Development

Good morning. Let me start by asking you a question. Where is this photograph taken? It is Bangalore. I have been spending a lot of time in India and China, trying to figure out ways that Stanford can lend educational assistance to professionals and managers in companies and government organizations Now, if you visit Bangalore, let me show you the traffic and what it is like to get to Electronics City, the home of many high tech companies.

When I met with the Vice President of Human Resources for Wipro, a large IT company I said, "It took two hours to get to your location! Isn't that a problem for your employees who travel every day?" He said, "That's a learning opportunity." I said, "What do you mean?" He said, "We know we have our employees for four hours a day, sitting in cars and buses so we provide them with online education programs while they are in transit. For example, if you work in a call center, you can get accent training. If you are a manager, you can access training on how to do performance reviews. If you are an engineer, you receive technical lectures. What a fabulous way of taking a problem and converting it into an opportunity for online learning!

We here, over the last few days at MIT, have seen many examples of what is happening with online learning or e-learning. Clearly, it is a success story. It is working and here to stay. You have heard your colleagues offer presentations on how online learning has become an important part of an institution's portfolio. Now, it also includes many kinds of providers— traditional universities, consortia, as well as start-ups and entrepreneurs. When you ask learners what it is they look for in an online provider, they say a few things. They look for quality and cost, but at the end of the day, when you drill down, especially for the people that we work with who are working professionals, they indicate they select an online education provider who can help them in their employment and in their career growth. That makes sense.

I would like to do three things today. First, I want to talk to you about the impressions and the advice from the demand side, from the students' side. As educators we indicate that we know what is best for students. I want to flip that and ask the students what advice they can give us. The second thing I want to present is a profile of Stanford University and how we provide ongoing, lifelong education online to professionals and managers. Third, I want to offer ten recommendations if you are planning to start an online education program or examine a program that already is in operation. The photographs you see in the slides I am using are real students in Stanford's online programs delivered to industry. These are people like you and me, working people who are very busy, mobile and have family responsibilities. So, if you ask questions about education needs and interests – and we do -- here are the kinds of things that we are hearing First, they have limited time to take courses due with work commitments, but are willing to assume responsibility to learn. They know they need to continuously learn in order to keep their job and advance in their career. Second, they want to access their learning wherever they are, and whenever they need it. Learners want a mobile, on-the-go, 24/7 connection to education and are using the open parts of their day to learn. What I like to say is that the industrial age, we went to school and in the communication age, the school comes to us. So we are now using the model of delivering the university to the student wherever they are and whenever they need it.

One of the industry students we interviewed said, "I want to treat my university like I do my bank and my supermarket." I asked, "What do you mean by that?" "Well, when I need to use my bank, there's an ATM available at anytime and in many places. I know it will work, it's reliable, and I can gain access to banking services whenever I need to. Why can't a university act that way? Why does it have to be restricted to certain hours? I want it open all the time! Especially if I'm living in other parts of the world, it needs to be open all hours." Lifelong learners are asking for convenience and flexibility with a range of course and delivery options and multiple avenues for learning.

Other things we are hearing from students are, "I want you to offer a variety of ways for me to learn. Don't simply think about a 30- or 45-hour class, but think about breaking down content into smaller increments and let me choose an independent path to meet my learning needs." Stop thinking about courses; let's start thinking about chunks of learning, of learning experiences. The push is for short, focused modules and "learning experiences" versus courses. At Stanford, the curriculum for the master's degree consists of 15 courses. Each course has 30 hours. Well, might that curriculum be broken down into smaller chunks or pieces, where a student can then take what is need in a customized way? Students are also asking for a wide range of online degree, certification and careerbuilding programs with flexibility around when programs start and end. The term we are hearing most often is "choice." Let me, as an adult, make a choice about where and when I want to learn, and the kinds of things I want to learn. Why do I have to start a course in September when I need the course in May? The University of Phoenix, the largest online provider in the United States, starts courses every week.

Another thing we are hearing from students is that they want the course activities and assignments to be directly related to their work. They want project-based learning and assignments which support work responsibilities. They also want to learn in a way that allows them to participate in a group, especially in project activities. They are asking for courses that are well-designed, engaging, relevant and continuously updated which facilitate the transfer of learning to direct application. Rapid mastery of knowledge and skills – practice oriented education – is the desire.

I have a son who is a gamer. Last week he had on a headset and was playing a militarytype game with a group over the net. I asked, "Let me listen to what's being said." I could tell the participants were of different age levels ranging from teenagers to adults. After a few minutes I asked my son, "How do you succeed at this game?" He said, "Well, first I have to test to get in, to determine if I am the right level to play. Then we have an assignment. We have an objective as a group." And these are people scattered all around the world. You don't know who they are. "Then we give each other advice as we work our way through the assignment." "Then, when we make a mistake, we learn from that and get better and can advance to the next level." What a great learning experience that is! Think about that: groups of people working on a challenging objective, helping each other, advancing as fast as they can, succeeding because they failed, because they learned from failure. That is what people are telling us they would like to be able to do in an online education course.

Other things students tell us: I want to go as fast as I can and eliminate university inefficiencies. Students want demand-driven learning with control of the sequence and pace of learning. We as adults don't tolerate inefficiencies when dealing with a service provider. We are impatient. So why does this happen at universities? Why do they make it difficult at times for students to register, to work through the payment process or get assignments submitted, reviewed and returned? Adults, you and I, are asking universities to break down these types of barriers.

In the United States we have a system called TiVo. It is a digital video recorder that will, if you want it to, track the preferences of what you like to watch on television. So not only can you record something for later viewing, but this device knows over time that you , for example, enjoy World War Two history, because you're watching a lot of shows on that topic." That device, over time, will learn your preferences and your likes, and then begin to download and prioritize programs for you. Originally television was "just-in-case" where you turned it on and maybe discovered something you wanted to watch. Then it became "just-in-time", because you could set up a videotape recorder and watch it when you wanted to. You could time-shift it. And now with TiVo and similar devices it is "just-for-me." And students are asking "Can you create similar systems that will know me as an individual and begin to craft a customized education experience matched to my job needs and career goals?" Personal learning paths based on assessment of knowledge gaps, learning styles and preferences will be the next wave in online learning.

Online students want electronic advising, counseling, mentoring and to be part of a learning community. They want to work in peer-to-peer learning relationships and participate in groups. Certainly now, with the new kinds of social media, that is easy to do. In particular, what we are hearing from companies, from the student's employer, is, "Let students engage in international online learning. Let them work with students from other countries in groups, because that is what we want them to do at work."

We are also hearing that students don't care where the curriculum or the content comes from, as long as it is relevant and makes sense. But what they do want is an aggregator.

They want somebody to bundle the content and to receive a certificate from an institution with a recognized brand and reputation. They also want to preview a course, read course evaluations and have experts comment on the relevancy of the course to career development in order to make an informed purchasing decision.

Other things we hear from students: I want to be able to create a learning portfolio that will be accessible throughout my lifetime – and I want to be able to share it with employers when I apply for a job. Adults - lifelong learners – are also asking for competitive and variable pricing. For example, they ask why I should pay full price for a 30-hour course, when I only want two hours. Can you break this course down into smaller modules and just charge me for that?

There is strong movement towards using mobile devices -- such as those that you have in your hands today – for online learning People who are traveling around the world want to be able to use those smarter, faster and cheaper devices to be educated when and where they need it — whether it is in cars and buses in Bangalore, here in Boston, sitting in Palo Alto, on a Lufthansa flight to Germany or an oil platform in the North Sea.

Adult learners want educational renewal throughout their careers. Certainly in the United States, when you graduate from a university, you receive some type of follow-up communication. What do you think that first communication is? It is for money. "Somebody contributed prior to your coming to this school and you need to do the same to help the next generation student." I believe that is a mistake. The first message should be, "We want to follow you throughout your career. We're going to provide you a learning opportunity so you can be successful." Maybe we will give them their first course for free. Wouldn't that be great? Then when the development people call, they might be more likely to contribute!

These are the kinds of things that we are hearing from the students that we work with in industry, people like you and me. The challenge to universities is that these are the kinds of people who want lifelong learning – and if we don't offer it we do so at our own risk. Here's an example of what I mean. Last year I received a prospectus from a firm wanting to create a new online university. Let me tell you what the private side thinks about lifelong learning in higher education:

- Higher education is one of the most fertile new markets for investors in many years
- Lots of opportunity for scale.
- Many disgruntled current users.
- Large amount of potential revenue on a global basis
- Poorly run, low on productivity, high in cost, and relatively low technology utilization.

I especially like this one:

• Existing management is sleepy after years of monopoly; the field is ripe for takeover, remaking and profits.

What can they do that universities have difficulty doing? They have more money and investments. They are nimble, responsive and very fast in creating courses and programs based on a deep understanding of student needs. These online education start-ups know how to design interesting, challenging and relevant courses. They know how to market and to sell. They know how to effectively apply technology. And they do not have the constraints of a university bureaucracy. You know how long it takes something to get done at the university. These people don't worry about that. They crash through it. They look at education as a commodity. I am not saying they are right, but it is a terrific challenge for us as educators break out of our traditional ways of doing things, knowing that the people on the private side are challenging us and plan to move forward in their own way to meet the needs and interests of lifelong learners.

The University of Phoenix in the Unites States -- the largest online provider -- didn't exist 15 years ago. Schools you may never have heard of — Cardean, Capella, Jones University, all private start-up universities — but they are all doing what I mentioned. You can receive accredited degrees online. People are not quite sure yet of the value of the degree over a career, but they are very serious and very good at accomplishing the things that universities struggle with around services and support for online learners.

Let's talk a little bit about Stanford. How do *we* do it? I wish I could do everything I mentioned that students want. Obviously we can't. But we have done some things. First, let me tell you we take seriously our interactions with industry. Stanford fosters a climate where collaboration with industry thrives, generating both breakthrough discoveries and the science and technology that can support continuous innovation. We have a long history of very productive relationships with corporations of all sizes, from startups to mature, successful enterprises and provide firms with education, research partnerships, consulting, and connections to faculty and students. My center -- the Stanford Center for Professional Development -- supports academic departments in the offering of graduate degrees and courses and professional education programs online, on campus and at work to meet the lifelong education needs of technical professionals and managers. We have 52 masters degree concentrations, 40 graduate certificates, 65 professional education courses and thousands of hours of free programs online. About 10 percent of the master's degrees earned annually in the School of Engineering at Stanford are earned online.

We are also engaged in an OpenCourseWare-type project called Stanford Engineering Everywhere or SEE. We have fewer offerings than MIT, but they are complete courses which include video-based lectures, notes, handouts and exams.

I also want to mention a national group where I am a board member. If you want a place where you can find a great deal of information on online learning I recommend going to the web site of the United States Distance Learning Association.

The last thing I would like to offer is a series of recommendations – based on lessons learned at Stanford and elsewhere -- if you are planning to start an online program or examine what you are doing today:

- First: make sure what you do is consistent with your university's mission, values, strengths and areas of distinction. Build from tradition in new ways.
- Second: make sure you are close to the core faculty when developing an online education program. When you examine why some online university programs failed, they did not seriously involve key faculty in the early planning and development. And then the faculty said, "Why are we doing this?" and pulled out. The key is to identify faculty champions early in the process and work with them.
- Third: You want to position your online education initiative as a way to extend and enhance existing programs. You should also try to develop a unique niche to meet a local, national or global market need. For example, University of Kentucky: thoroughbred horses; Penn State University: turf management; Espoo in Finland; telecommunications. What is your university's distinctive niche?
- Fourth: What is your sweet spot? Find the intersection of audience needs and wants, institutional strengths, faculty interests and what people will pay for. Develop your online program based on that.
- Fifth: Think course-to-certificate-to-degree progression. Online versions of existing courses are easier to create than new ones. Continuing and professional education is a good place to start because you have more flexibility than a standard credit-based curriculum.
- Sixth: Recruit and train faculty by offering incentives and rewards supportive of innovation. For example, the faculty in the Computer Science Department at Stanford are busy people. How do you get their attention to teach online? If you teach a Computer Science course online at Stanford you receive 1.5 course credits for your teaching load. That is an incentive! You also need to address faculty concerns regarding ownership of intellectual property, increased student demands and impact on workload.
- Seventh: Develop a financial model covering costs and investments with revenue distributed to participating departments and faculty. At Stanford much of the money received from online education is returned to the departments and faculty teaching the courses.
- Eighth: Start small: pilot with existing students, alumni and focus groups. Experiment, adapt, improve and incorporate best practices. Grow carefully in order to scale and sustain. Publicize only when ready and showcase success stories. Don't promise more than you can deliver, but deliver more than you promised.

- Ninth: Don't do it all locally. Work with faculty to develop online courses using their own materials blended with others that are free or purchased. For example, there are many places to obtain teaching and learning materials OpenCourseWare, Connexions, MERLOT, Stanford Engineering Everywhere. Companies will also sell you material.
- Last: Identify every possible service interaction so that online students and faculty have a productive, positive and rewarding experience. Be fast, flexible and attentive.

Let me end with three points. First, what I discussed today is not about technology – it is about innovation to improve learning! Second, you need to question everything like an entrepreneur. Think daringly, execute steadily. And last, appoint faculty and staff with vision, passion and a willingness to take risks. I hope you are willing to be innovative and entrepreneurial in moving forward to create online programs that will make a difference for people throughout their careers.

Education Nation: Six Leading Edges of Innovation in Our Schools

Milton Chen, Senior Fellow George Lucas Educational Foundation

Good morning, everyone. Thank you, Liz. How many of you have heard of George Lucas? I think one of his films is in the theaters right now. How many of you have heard of the George Lucas Educational Foundation? I know this is an international audience. Most of our Web traffic and use— since we are based upon mostly American stories of innovative schools— comes from the U.S. But about a quarter of our Web traffic comes from other countries, especially other English-speaking countries in the UK, Canada, Australia and Singapore. So I am very pleased to introduce our work to those of you from other countries. Someone was asking me just now if our work was open and free, and indeed it is. We are a nonprofit, operating foundation. An operating foundation does not give grants, and we are not a grant-making foundation. We use our funding to operate a program, and the program that we operate is a website called edutopia.org.

Edutopia.org is a multimedia website. We work for a filmmaker, so we make films about what innovative learning looks like. This is the contribution that George Lucas and the George Lucas Educational Foundation make to this whole global movement to create 21st-century schools, universities and colleges. We use films to show you, as Cathy Casserly just did, what it looks like in the classroom. We can talk a long time about project-based learning, student engagement, community involvement, and performance-based assessment. However, in order for these changes to actually take place, we - and especially policymakers, parents and perhaps faculty as well - need to understand this change. Edutopia appeals to a very broad audience of teachers, principals, parents, policymakers, foundations and state education officials. We want everyone to understand what this change looks like, so we use film and the visual media to show that.

George Lucas once told me, "You know, a picture is worth a thousand words." I said, "That is why you're George Lucas. That is brilliant." And that is what we do. I thought I would just start by showing you one of our films. On our website, we have profiled over 150 different schools around the U.S. and some around the world. I represent the voice of the younger children, the preschool through high school students, and we work to get them ready to go into the kinds of community colleges, four year universities, graduate education, lifelong learning and professional education that you have heard about this morning from Andy and Cathy and Dr. Vest. I am the third in your California speakers this morning. I am very pleased to be here at the Stanford of the East. Some of us— I think almost all of us— have connections with Stanford.

I am going to show you a film, if you want to know what this kind of 21st-century collaborative learning looks like at a high school that is focused on STEM but also focused on global learning. I like these schools that do not define themselves too narrowly, because there is a lot of connection between the humanities and the sciences.

Communication, the ability to speak, read, and write well, to understand story — all this comes from the humanities and is very useful in science, technology, engineering and math. Here is a school from Chicago called the Walter Payton College Prep High School. This will be a test of how American this audience is. Does anyone who is not from the U.S. know who Walter Payton is? I once asked this question in Scotland, and there was a fellow in the back who knew that he was a Chicago Bears running back, one of our very best football — American football — players. So they named a high school after him. This is a high school that calls itself a STEM and global learning academy, trying to do both: learning a number of international languages and also focused on science, engineering and math. So let's have a look. I will be interested in your feedback on it. This was part of the Chicago Public Schools, and we filmed this about three years ago when a fellow named Arne Duncan was the CEO of the Chicago Public Schools. He is now our secretary of education.

[Link to seven-minute video segment, duration] <u>http://www.edutopia.org/payton-college-prep-global-language-video?page=1</u>

Great, so there are a number of features that characterize a 21st-century school. I would like to show you six of these kinds of features, which I call leading edges of innovation in schools. (See slide #2) I think everyone here is trying to figure out how you bring these kinds of schools to scale. I think all of you must have schools in your nations that have features of this kind of learning, but they are not yet at scale - where technology is used in a very ubiquitous way. This demonstrates a kind of videoconferencing that has now gotten so inexpensive and can provide students around the world with connections to each other. I think this is one of the most important things that technology can do. So we are all trying to figure out how to bring this to scale. Can we create an education nation? Think about a kind of a place where it is a learning society, there is vision, there is hope for a nation that really does emphasize education at the same level that it emphasizes its economy, its jobs and its military. Thinking especially of the United States, can we make education the same kind of priority as we make everything else? Because in fact, those things— economy, jobs and health care— rely in the end on education and an educated citizenry.

Can we create this ladder of learning from the very youngest ages all the way through high school and into college and career? A system where students take advantage both of formal institutions - of school courses - or of just-in-time learning of the sort that you heard about this morning from Andy DiPaolo. However, there are also more informal kinds of learning experiences from museums, cultural institutions, nonprofit organizations and public libraries. I think the digital divide - the achievement gap in this country - is largely a question of both differences in the kinds of schools kids go to and also in the kinds of informal learning that goes on.

We are coming up on June 1, and here in this country it is summertime - a long, threemonth vacation. I think most education systems around the world have this, but of course that goes back to an agrarian society. It is amazing how we, at least in this country, cling to the same schedules. Earlier today the question of the 45-minute class period came up - the school schedule or the tyranny of time when it comes to education. So I call this the third semester. Some parents, some families, are able to give their kids a very strong third semester of learning in a more informal way. They pay for their kids to go to museum programs and summer camp. They take special lessons in the arts and music. All of this contributes to an educated citizenry and to their performance in school. However, while middle class families can do it, families with lower income cannot. So here in this country I think one of the most exciting things going on is the Center for Summer Learning, an effort by a number of organizations to provide that third semester to kids from lower income families.

Universities are involved in this effort. The University of California in our state does a program called Cosmos, where kids come to their campus and learn more science in six or eight weeks than they do in the preceding 30 weeks. How is this possible? Well, you can imagine. They have qualified instructors — not just qualified, but expert science, engineering faculty. They have labs, resources for field trips, and the kind of mentoring that is so important for young people. Universities can provide this during the summer and during some weekend programs, but many K-12 schools cannot. We still have many schools, and I am sure many nations have the same problem, where we do not have qualified science instructors and instructors in foreign languages, like the ones you saw in this film.

If there is one way of summarizing what our work stands for at Edutopia, it is just to make school more authentic. We have created schools that are very artificial environments for kids. More and more kids are saying, "I have to power down when I come to school. At home I have a learning environment, access to the Internet, I can talk to my friends, I can talk to experts, I can get information quickly, but when I come to school, I do not have that access." We just want the school to become more like what kids experience in their own daily lives. Sometimes people have said, "Oh, you have these core concepts at Edutopia." We have project-based learning. We have something called comprehensive assessment. We stand for technology integration. We have six core concepts and teacher development for these kinds of practices, but it really does come down to these four words and an equal sign. (See slide #3) We just want school life to be more like real life. We want schools to be less isolated from their communities. We want the school to go out into the community for learning, and we want the community to come through the school. We especially want parents and other experts from the communities to come in and help mentor the kids and help teach the kids.

I like this metaphor of looking to the edges of a market or a system for innovation. (See slide #4) It comes from a book by John Hagel and John Seely Brown. They were thinking about businesses. They were saying that if you want to innovate in a business or in a government agency, look to the edges of what your system is doing, and regrind your lenses so you can see clearly what is going on there. That is what Edutopia has done over the past 15 years. We have kind of looked to the edges of school systems. The kind of school you just saw, Walter Payton High School, still is pretty unusual, but we say, "Here is a model, and if we can film it and share what it does, then more people will say this is what is possible."

I still run into educators who often say they don't think a certain topic or a certain course can be given to a certain-aged student because it is too hard for them, that there is little achievement data and research on this to date. With regard to the idea that high school students in Chicago could learn Mandarin Chinese, a lot of educators would say, "Well, that's not possible." I have heard very progressive, very well informed educators, principals of schools, saying, "Asian languages are too difficult for American students. It takes nine years." Apparently someone has done a research study that says it takes nine years for an American student to learn Chinese, Japanese or Korean, because it is a different kind of language, with different characters. So we stick to teaching the romance languages.

My response to that is that if it takes nine years, we better get started right now. We have got to create this global society where American students understand the rest of the world. I, as a Chinese American, believe strongly that this U.S.- China relationship that you are seeing so much news about every day now is probably the most important bilateral relationship for our nation. If we are going to survive— we talked about sustainability and global survival over the next generations— we have got to make sure that this relationship is a strong one. Certainly you could look at what is happening in the news right now and say it is not going so well. We need much better mutual understanding between our two nations and that has to start with the young.

I have summarized a lot of our work in a new book called *Education Nation*. It is coming out next month. Every five or six years, we like to publish a book. We do a lot of work on a monthly basis on our website, but not everyone is watching our website on a weekly or monthly basis. So we like to put it out in book form. We had a magazine called *Edutopia Magazine*, which came out six times a year. We like these compilations, collections, the "best of" our work. We like putting it together so people can look at the 30 or 40 best stories that we've done. That is the point of my book. I tried to use this metaphor of the edges of innovation in the book. Here I list six of them, and you see them all in the story of Walter Payton High School. You see them in a number of stories we've done. The first edge of innovation is really changing our thinking. (See slide #7)

As I was saying, there is a lot of thinking about what students can learn at certain grade levels. My argument there is that the problem is it is not usually well taught. Calculus at high school level can be taught, but usually it is not well taught. Certainly most science and engineering and mathematics that is taught in our schools today is not really science, mathematics and engineering. As I think the gentleman from Nigeria said, we have a lot of classrooms that are just like your Nigerian classroom, where teachers lecture and present, where the textbook is the source of learning. I sometimes say, "The teacher does not have to be Google." We have Google for that. But in most classrooms the teacher believes that what they have between their two ears is what students need to know. It is important to have knowledgeable teachers who know their subject areas, but it is clear to us now at this conference, and has been clear for the past decade, that the real knowledge that students need to access is outside of the classroom. It is on the Internet. The sources of information, the collections of information, the databases, the museum collections—

all of that is on the Internet. The Internet does change the role of the teacher. One thing we have been trying to advocate for is for teachers to understand a new role. It has been very difficult to change their thinking about not just communicating what they know, but helping students to go out to the Internet and filter information, find the best sources of information, and create something based on the information they are gathering.

On the point of learning Chinese language, we now have an AP exam, a College Board advanced placement exam, in Chinese. It was announced about five or six years ago and has very quickly caught on. At the announcement of the AP in Mandarin, one of the Chinese ministers of education stood up and said, "I know in America you think that Chinese is a very difficult language to learn, but in China we have 1.2 billion people who speak it." It is all about placing the learner in a natural environment for learning, and that can now be a virtual environment for learning. So the first edge is really changing our thinking and there are a number of examples about "either/or" ways of thinking that we are trying to hybridize. I like this idea of hybrid thinking into "both/and": you can do both a STEM school and a global learning school. But it does require rethinking the curriculum. As you saw a bit in the Payton High School example, they are globalizing the curriculum, not just in math and science, but in history and literature. It is a way of looking at the entire curriculum, not just a course on global studies. Every course can draw on global content.

We are involved with a project-based "learning experiment" in Bellevue, Washington, where we are redefining an AP cours in U.S. Government and Politics, which, again, has been very textbook-based and very focused on passing the AP exam. But we, along with many others, are saying that the AP exams need to be modernized for this century. Many of these exams are very textbook-based and very memorization-based. So we have tried to convert the AP course in U.S. Government and Politics into a project-based curriculum. Certainly, the idea of all Americans now becoming fluent in a second language - and maybe even a third— is revolutionary! Those of you from other countries know that it is very unusual to meet an American who is fluent in a second language. We expect you all to communicate with us in English. So as part of this globalization approach, we do want our students to learn a second, and maybe a third language. That has to start early and not just in high school.

There is a lot to be said about technology. I know we are trying to focus on the role of technology here. I think many of you are familiar with one-to-one programs. I do believe that we should think about them as the "weapons of mass instruction," as they are sometimes called. Every student needs to have access to the Internet. Eventually, every student needs to have his or her own personal device. It is amazing to me that here in the world's wealthiest nation we still do not provide our students with a digital device. Maine is the only American state where you can walk in there and every middle school student has a laptop computer. That started about eight years ago. I thought that this would quickly demonstrate to other states that they needed to move towards this, but still, eight years later, we have not seen that. We have done a number of films about the Maine Learning Technology Initiative. You can see it on our website. We are seeing a number of really exciting things related to handheld devices.

If you look up the iRead project-- I just did a little blog entry on our site. If you just Google iRead, it is the use of the iPod for language learning. Again, in the world's wealthiest nation, we still have trouble getting nine-year-olds to the fourth-grade reading level. We have a very unenviable record when it comes to reading levels with young children. If they do not make it to fourth-grade reading level, chances are they will not make it to eighth grade or 12th grade. That gap opens up very early on. Something goes wrong from kindergarten through third grade, where we cannot get our children to a fourth-grade reading level. So iRead is a very interesting new project which uses the iPod for literacy - for reading and writing. I daresay this is mostly an audience of digital immigrants. I am in my 50s, and it is hard for me to imagine, when I first heard about iRead.. How would you use an iPod for teaching reading and writing? The iPod is something that we all use to listen to music, right? But this is an audio device that can be used with a little microphone to record a teacher's reading and to record a students' reading - so they can listen to themselves.

It is a breakthrough when it comes to teaching reading and writing. If you just try to teach kids to read using a textbook, some kids will get there, again with support from their families. Well, the figures show that some bedrooms of American children have more books in their bedroom than some school libraries do. One individual American fourthgrade student has more books - hundreds of books - in his or her own bedroom than some school libraries now have in the United States. That is the gap. There is a project in two school districts - in Canby, Oregon, and Escondido, California -where kids use this lowcost device ---- it especially works well with the iPod Touch with Internet access --- where the key breakthrough is that teachers can listen to their students read and students can listen to each other read. As you saw earlier in that community college piece, one of the real strengths of this new learning environment is having students listen to other students. To listen to other students – how they learn, how they think about problems, whether it is mathematics or reading. This is a real breakthrough that our 21st century classrooms need to create. You create a community of learners. So in the iRead classrooms, every teacher uploads these files into iTunes. Every student has a playlist of their readings. By listening to themselves, they can improve their own reading. This is a key thing in language learning, and I would argue, in a lot of different areas.

Artists know this. Artists are constantly performing and recording their work. Athletes do the same thing. So some of the best ways of learning come from the arts and come from sports, where it is all about performance. In order to improve your performance, usually you have to record yourself performing. The iRead project has done that, with pretty remarkable increases in students' reading achievement. It is still early, but what they are showing is this idea of accelerated learning, of kids learning more in six weeks than they do in 12 or 18 weeks. This is the acceleration that we would like to see in students' learning that technology can offer. That is one of my favorite examples, and I wish I had more time, but there are many more examples on our Edutopia website about the use of technology.

This fourth edge is one that is a little — how should I say? — non-obvious. But we are changing the places and the times when students can learn. It was just mentioned this morning that adult learners want learning "just in time." They are mobile. They want to be accessing their own learning, their portfolios and course content in a 24-7 kind of way. All that should be brought down to K-12 schools. As I listened to the presentation this morning, I asked myself, how can we design a kind of meta-school? As we are talking about a meta university, is there a kind of meta school that we could create that is built over the current school structure, but enables students to learn anytime, anywhere? How can we create this time-place edge of students learning whenever and wherever they are? There are lots of other learning places where kids learn. One of my favorites is school gardens. In many ways, this kind of 21st-century learning is not just about technology, not just about high tech; it is about reconnecting kids to the land, to the places where they grow up, to learning about their own communities, learning about their own families. Somehow, we have divorced all that learning from kids being in the classroom with reading primers.

In California especially, we have a whole movement to create school gardens. It is amazing what can happen when schools teach students to grow things. It has a lot to do with environmental education. It has a lot to do with understanding the environmental issues we are facing. One of my favorite examples is something called the Edible Schoolyard. If you Google that name, it is a project in Berkeley, California, that was originated by our famous organic chef, Alice Waters. She was walking past a middle school on her way to her restaurant, Chez Panisse. If you ever go to Berkeley, please go there. It is the world famous organic restaurant that Alice has created. She was on her way to work in Berkeley and she saw this asphalt playground at the middle school. She said, "Wouldn't it be better if there were a garden there?" These kids from the earliest middle school grades could learn to not only grow things — fruits, vegetables and herbs — but her point is to have them make their own food. So there is a lot of learning that goes on in what she calls a complete seed-to-table experience. We have made a film about it, so please look up "edible schoolyard."

I will just try to condense these last two edges into two sentences. The question of schools of education came up. It is a big issue, hard to change, but here is something that could happen tomorrow if teachers began to form teaching teams. Just as we want students to work together in teams — you saw that in the film from the community college — we want teachers to make teams to teach: to bring in parents and local experts to teach; to create the co-teaching edge. Then finally, the biggest edge today is of our young people. I like to say they are carrying this change in their pockets. They have devices, like the iPod Touch. If they were just allowed to use them, they could really accelerate their learning.

We have done a number of stories about digital learners with support from the MacArthur Foundation. There you see three of them: Cameron, Nafeza and Louise. You can go to our website and see these documentaries. When you see these kids learning - inside school, outside of school, online - you just say "Wow." There is a new way of learning these days - a new world of learning - and that is what we need to create. I like Virginia

because she was spending hours on Facebook and she decided to go on a Facebook fast. She is a religious girl from Georgia and she gave up Facebook for Lent. This is a story of how she did that. It is also a story of how she teaches other students. Part of the coteaching edge and the youth edge is getting students involved in teaching and learning. This is redefining the role of the teacher and the role of the student. I think one of the most exciting things that happen around technology is that kids can help teach younger kids. We have a lot of films of high school students teaching elementary grade students. Virginia, as a middle school student, taught some elementary school students about Internet safety. I will pause it there, since I am getting the red alert! Thank you for your attention.

BLOSSOMS Experience From Production to Implementation

Rana Abu Zeid Qubain, General Manager Investment World for Development and Technology Amman, Jordan Project Manager of MIT BLOSSOMS

I am very proud to be here. Thank you very much, Dick and Liz, for inviting me to this presentation. I will shed some light about the MIT education initiative BLOSSOMS, with Jordanian collaboration, and how we started this and where we are today in Jordan. The MIT LINC 2007 conference was the seed for this project. It was attended by a number of educators from different countries. This is a picture of the opening of LINC 2007. It was attended by more than 500 different educators. It was sponsored by Her Majesty Queen Rania.

This project started by three countries: U.S.A., Jordan and Pakistan. The idea was to develop a large, free repository of blended learning video modules— "blended learning" the BLOSSOMS way. It was developed to create deeper and richer skills in students to enhance their critical thinking skills, encouraging education in math and sciences.

The BLOSSOMS goals are basically to offer an alternative approach for grasping different ideas, especially in the sciences, and to understand how they are applied in real life. This is where I feel we have made a difference - in the way we teach sciences. Most students are taught science for the science itself; they are not taught the real implications or applications of what they know. With BLOSSOMS, we teach abstract concepts through the joining of observation, experience and discussion. We want to stimulate the development of their critical thinking skills. We want to generate interest and spark imagination about the different subjects that they are learning. The idea, as well, is to attract a large number of students to study math and sciences. As we saw in the morning, the number of students studying engineering is decreasing.

Blended learning the BLOSSOMS way is unique. The idea of BLOSSOMS is that we want to explain a concept through the creation of five to six videos. Each video provides a continuation of an idea to explain a certain subject that is usually hard for students to understand. The modules are intended to enhance the in-class teacher, not to replace the in-class teacher. The BLOSSOMS module usually starts with a question or a puzzle to attract the students' attention. I will be showing a sample of every single aspect of the different video modules.

[two-minute video segment plays:

http://blossoms.mit.edu/video/nigmatulina/nigmatulina-watch.html start time: 1 minute, 10 seconds]

Rana Abu Zeid Qubain: This was a sample of one of the segments, showing how you start. Then the in-class teacher will work with the students after having presented the question.

The other aspect of these video modules that it can be implemented using very simple tools, so anybody in the different countries who would like to use these modules will be able to do so regardless of where they are located. I will show a video featuring a person that you all know, demonstrating how to utilize simple tools. [http://blossoms.mit.edu/video/larson.html start time: 1 minute; end time: 1 minute, 50 seconds]

Each segment usually ends with a question that the in-class teacher can work on with the students. I will show you a sample of the implementations that we have conducted in Jordan. How did the teacher engage the students after utilizing a question?

This is in Arabic.

[15-second video segment plays: <u>http://blossoms.mit.edu/video/al-juwhari/al-juwhari-watch.html</u> start time: approximately 6:00 minutes

Rana Abu Zeid Qubain: This shows how the students implemented what they saw in the video lesson, replicating the simple tools.

The in-class activities are up to the module producers, according to how they see the engagement between the teacher and the students and how they would like the implementation to be. At the end of every module, there is a teacher's guide that can inform the teacher in how to use this module and also provide various resources that he or she can utilize.

I will be going through the Jordanian experience - how we started and where we are today. We started by conducting awareness sessions, attended by Professor Larson and Liz, for the top two universities in Jordan in order to attract different professors as volunteers to do the work. After working with the 12 original university professors, we said, "Why don't we try to attract high school teachers, to consider their input in this project?" So we held another awareness session for the different high schools in Jordan. From there we collected around four or five different modules that we could utilize within the BLOSSOMS project, observing, of course, the BLOSSOMS codes and pedagogy within this.

After coming up with 17 modules, it took us from December to April in order to decide whether they were acceptable, what changes should be made, how to follow it up, and so on. Then we carried out the videotaping, which took around one month. That was the easiest part in the end, although it was the scariest at the beginning.

I will show you a sample as a tour. These are the different modules that we have done in Jordan. We have done five in biology, three in chemistry, three in math, and six in physics. This is a very quick tour for the modules created in Jordan.

[two-minute video segment plays: <u>http://techtv.mit.edu/collections/linc/videos/7664-blossoms-experience-from-production-to-implementation</u> begins at: 9 minutes, 58 seconds]

Rana Abu Zeid Qubain: In March of 2010, we held an appreciation event that made a lot of difference for all the producers, as well as the in-class teachers, in Jordan. The event made a big difference for all of them. This was attended by our Minister of education, as well as by Professor Larson and Liz, to show appreciation for all the different workers.

In April, we conducted three sample implementations, to receive feedback from students regarding these modules. I will show you a sample of this implementation.

[one-minute, 15-second video segment plays: http://techtv.mit.edu/collections/linc/videos/7664-blossoms-experience-from-productionto-implementation begins at: 12 minutes, 30 seconds; ends at 13 minutes, 45 seconds]

Rana Abu Zeid Qubain: The implementation of the video is dependent on the in-class teacher. This teacher mixed the math with the art. The teachers are free to utilize the module in the way they see fit.

BLOSSOMS really has had a very good impact on the people involved, from the producers who made the BLOSSOMS modules to the in-class teachers and the students who used it. We created and distributed a questionnaire to get feedback from the producers. The producers felt that it was really a mind exploration for them, to look for new ideas for teaching, to introduce questions to enhance critical thinking. Having the same idea segmented into different sections to reach what they envisioned at the end was really a very interesting approach. They are currently using this approach in their standard classes as well.

Relating the concept to daily observation was a key point as well. The in-class teachers felt that the questions were very motivational for the students, leading to higher student involvement within the class, as you have seen in the three sample implementations. The in-class teachers reached a wider range of students in the class. They felt that having this interaction between the video and the in-class activity had made students that are not usually involved more engaged. The activities imparted a new aspect to their teaching.

Students find this to be a very enjoyable and interesting way of teaching. It recognizes their daily life applications. It raises their curiosity about different subjects. A number of them have asked when they are going to see more of the BLOSSOMS lessons taught in this way. I will show you a sample interview with one of the students.

[35-second video segment plays: <u>http://techtv.mit.edu/collections/linc/videos/7664-blossoms-experience-from-production-to-implementation</u> begins at: 15 minutes, 55 seconds; ends at 16 minutes, 20 seconds]

Young woman: I personally found the interactive class more interesting, since it motivated the whole classroom to watch the video that was being presented. The interactive class was about genuine concepts that we have dealt with before, yet we were never stimulated to think of it in such a different way. After this class, I was motivated to challenge myself in concepts that I had previously taken for granted. Thank you.

Rana Abu Zeid Qubain: Our ambition is to see the seed that we planted in LINC 2007 grow into a nice tree, similar to your foundation. We wish to have more teachers involved in the BLOSSOMS project and to create more modules. Currently, we have just started in Lebanon, and we are looking for more countries and more teachers to be involved in this project.

I would like to extend my special thanks for a very special couple Prof Larson and Liz Murray that made things really happen. Thank you.

Implementation of BLOSSOMS in Pakistan

Muhammad Kashif Farooq, Assistant Program Manager Punjab Information Technology Board Lahore, Pakistan

My name is Kashif Farooq, and I am with the Punjab Information Technology Board. We are planning to implement BLOSSOMS in about 4,000 schools in Punjab. In recent months, the Punjab government has provided IT infrastructure in these 4,000 schools to implement many initiatives like BLOSSOMS, Oracle ThinkQuest, and many others.

Before implementation, we arranged a workshop for the faculty of the different private and public schools to get feedback about the BLOSSOMS modules. In fact, Pakistan has a heterogeneous education system. There are two main education systems running side by side. One is the international education system, and the other is the local education system. There are some gaps between these two, so we have some implementation issues like localization, language controversy, curriculum alignments, implementation, assessment and resources.

Generally— and I quote from the literature— teachers want to implement innovations in keeping with the culture of school and not beyond this culture or beyond the examination system. Therefore, they have to change their mindset to adopt BLOSSOMS and the other initiatives. We arranged a workshop and invited many teachers from public and private institutions. More than 80 teachers from the public and private institutions attended, and some teachers participated virtually. We showed the BLOSSOMS modules to them and discussed many aspects.

We received very interesting feedback. Most of the faculty members believe that these modules are very conceptual in nature, and thus could have a valuable impact on the Pakistan education system. The issues concern localization. Some people believe the modules need some localization, and some deny that, saying that there is no need for localization to implement the Blossoms modules.

The mainstream, or the international education system such as O-level and A-level educators, are used to the many international experiences in education, so they believe that there is no localization required. The local education systems are offering the Class 10, called Matric, and Class 12, called the FSc system. They believe that some localization should be required. Localization examples include accents and other things. We can also include language. The local educators think localization is required to implement these video modules.

The other, bigger issue is the language barrier. In Pakistan, the medium of instruction has been in English, in higher education and partly in lower education. The Chief Minister of Punjab has announced that the next medium of instruction in the primary and the secondary level will also be in English. Students will improve day by day, but many people's response is that Urdu translation needs to be provided. About 50% of the responses express that there is not any need for Urdu translation for implementation of the modules. Some people believe that thes English language video modules will reinforce general English comprehension for higher-level studies, while the other percentage denies that. Each person has his own views.

The other big issue in discussion is alignment with the curriculum. Many people believe that no alignment of curriculum with the video modules is required. However, a few people feel that we should produce topics related to the curriculum because they don't want to go beyond that curriculum. Two opinions arise. One opinion is that the curriculum should be modified as per the video modules. The other is the reverse of that, suggesting that the video modules be tailored as per the curriculum. Once again, people have their own views. In the end, the majority said that we should not tailor the curriculum, and that the videos should be introduced at the end of the high school education, to enhance the concepts of the students. Then the innovations and the existing curriculum can jointly contribute to the betterment of concepts for higher education.

Another problem is the issue of implementation of the BLOSSOM modules in the current education system. The major problem is faculty acceptance. On this topic, considerable faculty response indicates a rejection of the implementation of BLOSSOMS. These people are conventional-minded, older faculty who don't want to change anything. However, a smaller ratio of people wants to change the existing system. These faculty members want to change their methodologies and accommodate innovations for the betterment of the education system.

Another benefit to the implementation of BLOSSOMS modules is that teaching skills may be improved because the very, very experienced video teachers demonstrate their experience in explaining the concepts and creating new ideas of teaching. Teachers can learn a lot with these video modules if they open their minds.

Another issue is that of enforcement. There are two approaches to the implementation of the BLOSSOMS modules in the existing system. One approach is to implement them by enforcement and the other is to implement them voluntarily. Better results are gained through voluntary implementation, but people are teaching in school faculties tightly bounded by regulations, discipline, many other curriculum outlines, and this and that. As a result, they want some type of enforcement to be required from the government side, the school administration and other corners to implement these video modules in the existing educational system.

Regarding the academic calendar, people in the teaching sector are very much concerned with that. They have to achieve the targets of teaching in time. As a result, the majority of the people said that they have no time to implement or adopt BLOSSOMS for use in their current academic calendar. However, a significant ratio said that they can accept the challenge, and they want to implement these video modules in their current academic calendar.

People believe that an evaluation or assessment of the effect of the BLOSSOMS modules on the students is necessary. There are two types of evaluation we can apply. One is an external evaluation by the examination boards, like the local examination boards or the international examination boards like O-levels and A-levels. This would be a little bit tough, because for this, the evaluation system should be modified to take into account the BLOSSOMS modules. An alternative is internal evaluation. In fact, faculty and students don't take internal evaluations seriously because their careers are based only on the final evaluation. The final evaluations are conducted by external agencies, so many faculty members and students have a very poor response regarding internal evaluations.

The other issue is the resource barrier for the institutes. In fact, Pakistan is a developing country, and its telecommunications infrastructure is not quite as good as other BLOSSOMS partners, such as Jordan. Jordan has a rich communications infrastructure. I collected this data from the e-Government to Connected Governance 2008 data from the United Nations. Pakistan is a little bit behind Jordan, and the U.S. is definitely the leader in the communications infrastructure. Pakistan has a little bit of a problem in connectivity and infrastructure. Similarly, it is a problem for in-home users.

This BLOSSOMS workshop IN PAKISTAN was very effective and provided us with many recommendations. Unanimously, the crowd there suggested that these BLOSSOMS modules can easily be implemented in intervals during which the students have spare time, such as between examinations, and before joining higher education. They can use this time for the BLOSSOMS modules. If the BLOSSOMS modules can be part of the entry test for medical, engineering and other higher education disciplines, then students, teachers, institutes— all the stakeholders— should implement BLOSSOMS by themselves, and not by enforcement.

In conclusion, it is a valid recommendation, and now the ball is in the court of the Punjab government. It is up to them to decide, and also up to the director of BLOSSOMS Pakistan. They will finalize the recommendations and the implementation model. Still, the feedback suggests the benefits of the implementation model that I have shown you today. Thank you.

Suggested Additions To Supplement the MIT Blossoms Learning Videos

Dr. Said Jahama General Manager of E-learning Arabia Amman, Jordan

My name is Said Jahama, and my presentation today is about possible additions that could be used within the MIT BLOSSOMS videos. It is about how to complement the videos and what more could we add to make the experience more engaging.

First I have a funny story that is related to this picture you see. Last week I was at KAUST, Saudi Arabia's King Abdullah University of Science and Technology, where I gave a similar presentation. For some reason or another, they use Macintosh for their presentations. My presentation files were on my PC. I wanted to use my PC, but they did not have an adapter for their data shows. As a result, I was only able to use an old power point presentation, and I had to improvise and revert back to my old habits of being a teacher. I had many more things that I wanted to present, but they were on my PC and could not be accessed. To be honest with you, I really failed miserably there. I think everybody has been in that situation at one time or another. After that, I had a decision to make because my career was on the line there: either go without the technology and try to do a mostly textual presentation and rely on your talents, or do a technological presentation (just rely on technology) and hope for the best. In short, I'm praying for the best here, hoping technology will work!

I think you are familiar with the vision of BLOSSOMS. "The vision of BLOSSOMS is to begin to develop a large, free repository of video modules created by gifted volunteer teachers from around the world, seeded initially by MIT faculty members and by partnering educators in Jordan and Pakistan." Let me just emphasize one thing: BLOSSOMS videos were never intended to replace standard education. They are just resources to be used by the teacher according to his will. The question is whether he or she wants to use it, and how much could it be utilized? I skip the rest of the goals as I believe you are also familiar with the goals.

Let's go to the real material here. [<u>http://techtv.mit.edu/collections/linc/videos/7641-suggested-additions-to-supplement-the-mit-blossoms-learning-videos</u> - starts at 3:30, ends at 3:45]. The original vision of BLOSSOMS was to have a video DVD where you have segment one, segment two, segment three, coming in sequence. After each segment, there would be a question and answer section. There are some activities that students can engage in. The video teachers could also customize some activities to use as they see fit, using a teacher's guide to show how best to do that. So this was the original vision.

We at eLearning Arabia envisioned something more that could be added to this. Here is example one. [http://techtv.mit.edu/collections/linc/videos/7641-suggested-additions-to-supplement-the-mit-blossoms-learning-videos - starts at 4:15, ends at 4:30].

So, if every teacher wanted to use a yardstick or a tree branch for this experiment, perhaps it would not be good for the environment. We tried to find something to save the environment. In other words, one benefit of the above is that we are "going green." We added our own simulation. Of course, students needed to see it once in the video, but now how much could they play with it? Perhaps the teacher also could do it once, but after that the simulation might help the students. After each exercise, after seeing each part, we envisioned ways that we could add a simulation that helps students see what is being illustrated. Perhaps it is envisioning three pieces of stick, and then trying to see if I can make a triangle out of it. It took me like five times to actually get it, by the way.

Now to the experiment, you can see here I cheated a bit. I flipped the numbers so that we could proceed not randomly, but instead try to pick numbers that are correct. I will show you the simulation here. [<u>http://techtv.mit.edu/collections/linc/videos/7641-suggested-additions-to-supplement-the-mit-blossoms-learning-videos ; starts at 5:15</u>, ends at 6:15]

You could pick six and 10, which I guess is not going to work. But that is the essence of the experiment. Does it make a triangle? No— bad luck! All right. Now let's reset. Let me cheat again. Is seven going to work? Seven and 21? Where is 21? This should work, is that right? Just barely, I guess. It forms a triangle. All right. And students could actually do this on their own. Actually, at KAUST I asked people. I respect their minds a lot and there were some smart people there. They said, how much is the percentage, actually? I did not do it as well as you did it, but they said, "It's 100%. It's going to happen all the time." I was really surprised to get that answer. I explained a bit, and then they said, "Yes, yes we understand."

Anyway, so that was one simulation. Of course, there is another tool there that says, "What if I tried 100 sticks?" So I'm saving 100 sticks, and hopefully 100 trees. We do random generation of "triangles" or "no triangles." So the students could see 13, 20, and 7, or 0, 6, and 3, or something like that. A green means you form the triangle, red means you did not form it. This is random, of course.

Here in the chart, we almost hit it on the spot actually: 24, 2, and 76. [continues to refer to video segment] I'm cheating a bit; it is actually 25%. But it takes them time to realize that. What I am saying is that this actually substantially enriches the experience of the student, provided they have a computer in class. It does not have to be everybody that has a computer, as long as the teacher could demonstrate with a computer in front of them.

Here is another example of a BLOSSOMS simulation.

http://techtv.mit.edu/collections/linc/videos/7641-suggested-additions-to-supplement-themit-blossoms-learning-videos begin at 7 mins., 20 seconds, ends at 10 mins., 30 seconds] This is great video for students to see and they should see it, which in this case uses an example of infectious disease. They should actually do it in class with the hats. But then, also, they could play with the simulation a little bit, just to add more flavor to the experience. Here we have a sample size of 30. We start it and we have to pick a patient. Let's pick at random; let's pick patient 3. We used the same color coding— green, black, blue, red. As you can see, it is progressing day by day: what happened the first day, what happened the second day, and so on. It reaches a stable state here and stays until day six.

Now you could generate reports here - this is what we added. There is a report, as you see, showing which patients are susceptible. There is a report with color-coding, showing how many patients we started with, and so on. These are additional tools that amend what has been happening in class. I think Dick told me that this video was shown at Harvard Medical School. It was for physicians, and they were excited about this experiment. They could see new things and experiment with how the disease evolved.

It does not really involve a lot of effort to conduct the experiment. The effort is to understand what lesson the teacher is trying to get across, to work with him, and to see how we could really devise a simulation that addresses what it is he's showing. That is why I do not believe in ready-made content. It has to be really done within the class, which is what is happening here. It is a bit costly, but for some lessons, I think it is useful.

Now the BLOSSOMS website contains these two videos along with the simulations I have shown you. Let's go to the DVD interface that we have developed at eLearning Arabia. You can see that these are the segments— segment one, two, three, four. Of course, somebody could say: "Well, perhaps I am really affecting the learning curve, or the learning path, because I am allowing the students to go from one to three." However, we could disable that. Then once a student had it correct, he could go to any segment that he wants.

So these are the segments. The students could see which segments they are looking at. And this is the video. This is the simulation - both are showing and also there is the text or the transcript. So if the student doesn't understand anything, or needs to know more, the transcript is there. All of these are just additional tools that help the whole experience.

Some of you may wonder, how does Dick sound in Arabic? Listen. He sounds terrific! [http://blossoms.mit.edu/video/larson/larson-watch-arabic-vo.html]

Last but not least, [As the picture suggests], if I have delivered some new ideas, I may sleep easier tonight. Or perhaps *you* slept well right now! It depends on the context. Thank you.

Disrupting Class: How Disruptive Innovation Will Change the Way the World Learns

Michael B. Horn Co-founder and Executive Director of Education Innosight Institute

It is a pleasure to be here. Thanks for welcoming me to the LINC community. I can already tell that it's a fascinating group of people from around the world who are really committed to changing education and asking tough questions. I appreciate being invited, and am sort of humbled by that, to be honest.

As Dick just mentioned, with Clayton Christensen I wrote this book called *Disrupting Class: How Disruptive Innovation Will Change the Way the World Learns*. In it, what we tried to ask was: what are the root causes of why our schools struggle? If we can understand those root causes, how might we help schools innovate to solve those struggles? When Clay entered academia just over two decades ago, the question he brought with him was: Why do successful organizations fail? It is an interesting question when you step back from it, because it is fairly obvious why poorly run organizations would fail, but why successful ones? With great managers, great employees, great processes, why would they fail? That is a lot less obvious, yet it is what we see consistently through the sweep of history. Certainly in business history, the organizations that were once on the top, a generation or two later seem to be invariably in the middle of the pack or at the bottom of the heap. Countries go through this as well. You can look at really any organization and see this.

As he studied the problem, he reached a really counterintuitive conclusion -- although it might not be so counterintuitive for people at MIT. He concluded that it was the principles of good management, taught at places like the Harvard Business School where Clay was on the faculty, which ultimately spelled every organization's demise. [It is not true at MIT. It's much better there!] Clay studied this further and came up with a phenomenon that he termed "disruptive innovation" to explain why successful organizations failed. He has developed a series of theories to help try to make innovation - which has seemed so unpredictable for so long - more and more predictable over time.

What I thought I would do today is step back from that book and consider one of the questions we were asking about the U.S. education system: How do we change it from a factory model into a much more student-centric model that understands where different students are and adjusts for their needs and differences? The question obviously is different in different parts of the world. Sometimes it is access. How do we actually just get education out there? Sometimes it's a shift as well. Sometimes it is a blend of those two things. I want to use the model to talk about both of these problems, and both of these very interesting questions and opportunities in today's world. What I will do now is walk through the model, apply it a little bit to education, walk through a couple more

models, apply them to education, and so forth. Hopefully you will bear with me through this walk down theory lane.

We will start out with the disruptive innovation model itself. (See slide #2) What I have done on the y-axis is plot performance. The x-axis measures time. This represents any marketplace, or field or sector. What we see in every field is that there are two trajectories. The first one is this relatively flat line. It is the pace of performance that customers can utilize or absorb over time. The reason it is relatively flat is because our lives, our basic lives, do not change that much from day to day. The jobs I had to get done yesterday are something like what I will have to do today, and something like what I will have to do tomorrow. Of course, there is a range. There are some people at the high end who are never satisfied, no matter how much performance you give them. There are some people at the low end who are satisfied with relatively little. We basically have these trajectories.

Then there is the second line, which is really interesting. It is the pace of technological progress. What it shows us is two things. First, most technologies, when they enter a marketplace, enter as not good enough for the majority of users in that marketplace. But technology changes much faster than do our lives. Technology improves much faster than our lives change. So what at one time is not good enough for the majority of users, over time packs in more and more functions and features and performance, to the point that it actually overshoots what most of us can absorb or use.

Now, an easy way to visualize this is just to think about the early personal computers in the 1980s. Some of you may have sat at these personal computers and you remember typing on them. Every once in a while you would have to stop and coax the stupid word processing program to catch up with your fingers because the basic Intel 286 chip inside those early machines was not even good enough for basic applications like word processing, right? But true to form, Intel continued to improve the microprocessor year over year. For the most part, especially now as they introduce multi-core Pentium processors, most of us are over-served by all the speed and functions that they give us. Now there are a few people at places like MIT that demand more performance, but for the most part, most of us are over-served by the best.

Sometimes these trajectories up this blue line are year-to-year, incremental improvements. Other times, they are giant breakthrough leaps forward. But as long as the purpose is to sustain that blue line - to allow the leading organizations to make better products and services in the ways that they are designed to make better products and services to serve even more demanding customers - they almost always figure out a way to get it done. We call these "sustaining innovations." What we notice is that the incumbents, the leading organizations at the beginning of that blue line, are almost always the leading organizations at the end because they are so motivated to figure this out to serve their demanding customers even better. What I have done is push that diagram into the back plane there. The products or services that are initially in these planes are complicated, expensive, very centralized and therefore, inaccessible and

inconvenient. As a result, they can only serve a few people. There are tons of people out there who cannot literally access these products. We call them non-consumers.

Occasionally we see another kind of innovation come along. We call this one a "disruptive innovation." (See slide #3) It is a horrible name for an interesting concept. It implies "breakthrough," or a lot of other things - in the English language at least - but we mean something very specific by it. We mean an innovation that is actually not as good as the existing technology, judged by the historical measures of performance. It therefore cannot plant itself among those people in the back plane, but comes out into this new plane and serves non-consumers with a product that is not as good, but brings along a new dimension of performance. It makes the product accessible. It is simpler to use. It is more affordable and more convenient. It allows many of these non-consumers now to have access. It gets better and better year over year and also starts to be able to do the complicated things. One by one, the customers come out to the new plane because they are delighted with a product or service that allows them to do something for less money, while also being simpler to use and more accessible.

Now I'll tell a quick story to demonstrate this point. It revolves around a story when Clay was entering academia in 1989 in Massachusetts. There was a company at the time that I am sure many of you know and remember, called Digital Equipment Corporation or DEC. We were talking about it over dinner last night. DEC was the leading company of its time. It built these products called minicomputers that were not particularly small—they were about the size of this podium here— and that did unbelievably demanding calculations and computations for very demanding corporate customers. DEC made a lot of money. Whenever you would read in the business press about why these guys were so good, it was not just that they had the best engineers working for them. It was also - the business press would say - that these guys just had the best management team in the world, just the best people leading the company. They made the right decisions year over year. But an interesting thing happened in 1989. Extremely rapidly within a sixmonth time period, the business just collapsed. It literally fell off a cliff in a pretty brief timeframe.

So you go back to the business press and say, "What happened?" They would say, "Those stupid managers"— even though the very same were people leading the company. Only if they had just seen the personal computer coming, they could have grabbed hold of it and changed the world. But they didn't. They did not really know what to do with it and therefore they have been consigned to the ashtray of history." The explanation— and this is generally our explanation— of why organizations fail: stupid management. So the question Clay brought with him to academia was, "Why did smart managers decide to become stupid?" It did not make any sense in this particular case because every single minicomputer business— Data General, Prime, and Wang collapsed in the same time period. While you would expect companies to collude on price occasionally, to collude to collapse was a bit of a stretch of the imagination. Yet that is exactly what happened. They all collapsed. So Clay dug back in and concluded that something else must have been going on. And indeed it was. In the 1980s, management was seeing two kinds of business plans come to them. The first kind said: you make these unbelievably demanding products for demanding customers and you can charge a quarter of a million dollars, getting 45% gross margins on them. We have been doing what those whiz kids at the Harvard Business School tell us to do and listening to our best customers. They have been telling us that if you will just build the next generation minicomputer, with more functions and features, then your customers will be delighted to pay you half a million dollars, with 60% gross margins. However, another group came in and said: you guys really don't get it, do you? If you'd just get up out of your seats and look outside the window, you would see this thing called the personal computer. I'm telling you, it's going to change the world. So management got up out of their seats, saw the personal computer and made a few of them. But they also saw a few other things. As we already talked about, the personal computer that existed at that time was a crummy device compared to the minicomputer. It could barely do word processing, let alone any of the demanding things that corporate customers needed done.

Then these companies would talk to their customers and say, "Would you buy a personal computer?" Their customers would say, "Not a chance. It can't do anything we need. Why would we pay for that?" Then management looked at the business plans of the personal computers, which promised \$2,000 and gross margins of 40% that would quickly collapse to 20%. So the decision that management faced was this: Should we build better products for our best customers, for even better profits, or should we build worse products, that our customers cannot use and will not buy, for profits that would kill our business model? What should we do? It is an innovator's dilemma because the very logical things — if you don't also come out to this new plane with a new model— are the things that will kill you in the long run. And of course, that is exactly what happened!

So the question is: how did companies like Apple and the personal computer companies do it? Well, in the case of the innovators at Apple, they had the great advantage that they had no customers when they got started. All they had to do was to identify just who might want to buy a personal computer. So they marketed the first personal computer as a toy to children. For these costumers, who could not afford a minicomputer, this was better than the alternative: nothing at all. They were delighted with this "crummy" device because it was plenty good enough for them and it got better and better and better. By 1989, it was good enough that it started sucking a lot of the volume out of the market. And thus the world was transformed. This was great news for most of the world because we now had affordable and accessible computing. It was not such great news for the leaders of DEC.

This story repeats itself in many fields. (See slide #4) What I have done here is to put up, in the blue column, companies whose stock we wish we had owned over the last couple of decades. They have been disruptive and they have disrupted the companies in the red, who in their own right were disruptive when they got their start. Looking at the top one, we see that the Detroit automakers have largely been disrupted by the Japanese— by Toyota and Honda. The question is: how did Toyota do it? They did not come in the beginning with the high-flying Lexuses. No, Toyota started with a crummy car in the 1960s called the Corona. It rusted quickly and was not very good. Yet with it, Toyota targeted non-consumers, the people who could not afford the gas-guzzling cars that

Detroit was sending down. The Corona was better than the alternative: nothing at all. Toyota went up-market from there -- from the Corona to the Tercel, to the Corolla, Camry, Avalon, 4runner, and then the Lexus. Toyota changed the world.

Incidentally, the managers at the Detroit automakers were not asleep at the switch. They saw these guys coming, and every once in a while, said, "You know, we really ought to go down to the low end there and compete with those buggers." So they would send down a Pinto or a Chevette. But when they compared the margins of selling one of those vehicles with the unmitigated blessing of being able to sell yet another Cadillac Escalade or a Ford Explorer, it just didn't make any sense. So they would retreat up-market and cede more ground. By the time they really got it, it was too late. However, today Toyota is being disrupted. This is an advertisement Hyundai is running right now: "Isn't it time someone did to Lexus what Lexus did to Mercedes?" (See Slide #5) They basically own the subcompact end of the market now and are coming up rather rapidly with more fancy automobiles. Underneath them are the Chinese with the Chery and the Indians with the Tata. You also see this phenomenon throughout department stores that are largely disrupted in the United States by discount retail companies like Kmart, Wal-Mart, and Target. Target has even gone up-market. In the U.S., we now call them "Tarjay"! Online retail is coming up underneath them. You can go on and on through a lot of these examples.

As we think about education, there are some obvious lessons of disruptive technology in terms of the Internet. The Internet has transformed many fields. As this is a different audience from the ones that I generally speak with, I don't have to set out much of the groundwork. I can just say that online learning is obviously a really interesting disruptive innovation that has great potential for a lot of applications. The question is: where would it get its start? You would look for non-consumption as the most promising opportunities to launch these innovations. When you step back and ask where these non-consumption areas might be, it turns out that there are several areas where online learning can start to make an impact. Here at LINC 2010, developing countries are first and foremost on a lot of people's minds, and rightfully so. As a solution to extend access, classic use of disruptive innovation is ready-made for this market.

I will share a quick story. I was on a panel a few weeks ago with people at the University of Phoenix, Career Education, and a couple of online providers of university courses. They were talking about what mobile device learning will be used for. They were saying that it is not really good enough to offer the full educational experience right now, but that maybe it will serve as a supplement. Yet I was thinking: if you weren't rooted where you are, you would probably say something very different. Imagine what your company could do with mobile learning and how it could run with it and develop from it. There is not just a market for higher education in developing countries, given that in developing countries, 70-plus million children do not even have primary schools. Three times that number do not even have secondary schools. There are huge areas of non-consumption that we need to do something about to make this world a better place. Given this fact, there are big areas of opportunity as well as challenges.

Adult lifelong learning is where online learning in the United States has gotten its big start and much of its growth. For people who do not have the time or capacity to go back to a full-time or night school, online learning, as you know, allows them to learn anytime, anyplace. In the U.S. it has been challenging to think through the K-12 market – to discover where these areas of non-consumption might be - because we have compulsory schooling here. This puts the U.S. at a decided disadvantage for innovating. However, there are pockets of non-consumption at the course level in high schools in the United States-- where there is a dropout crisis with 30% of students leaving schools, with nearly 50% in urban areas. This is a big area of non-consumption, and if you could put it in a different model, then you could really do some good for a lot of people.

These are just some of the other examples. (See Slide #7) I won't go through everything. I will highlight one that has been on my slide for a while, because I know it came up yesterday. A speaker from India was talking about the school bus going to remote areas with online learning. The U.S. is limited enough that the only way we can think about it is for the school bus commute. In rural places like Arkansas, they actually wire up school buses for the long, daily commute. Thus, at least the kids can be online, actually doing work and so forth. Of course, some are goofing off, but it's better than the alternative – doing nothing at all.

The question that I know a lot of people are grappling with is this: how do you shoot innovations that would be successful into these areas of non-consumption? Following this theory, the answer goes to the way we teach marketing at places like Harvard. Those practices actually doom a lot of products, services, and innovations to failure. The reason is that we tend to segment the market by customer demographics. We will have white males, ages 30 to 49, with and without kids. We'll segment by product category— car companies will do subcompact, SUV, luxury, and on and on. The problem with these segmentations is that from the perspective of the user or the customer, the world is not organized by any of these categories. I do not conform to the average demographic in my buying behavior, or in terms of people likely to buy certain products. I just have things arise in my life, jobs I have to get done. I "hire" different products or services to help me get those jobs done. The unit of analysis that you want to focus on is actually the job - and the circumstances surrounding the job - to understand how to get an innovation to take off, rather than analysis by these on-average statements that are much more high-level.

I will illustrate this with a silly story that took place in the mid-1990s at a fast-food restaurant in the United States. (See Slide #8) There is a fast-food company, but the name is not what it says on the slide. We just pulled off a silly image. They wanted to improve their sales of milkshakes. This company really knew its market, as companies tend to do. They knew the exact average demographic of the users most likely to buy milkshakes. They had done profiles of them, and on and on. When you walked into the restaurants, they had clearly segmented the world by product category because they had sections for snacks, main meals, and desserts. The milkshake was a line item among the desserts. They would do focus groups where they would call in the average demographic and say, "How might we improve sales in milkshakes? What would you do to the milkshake?"

They averaged together this customer feedback and tried to make improvements, but the sales did not budge at all.

In the mid-1990s, they brought in one of our colleagues. He had a very different question on his mind, which was: I wonder what job people will hire a milkshake to do? This is sort of a silly question, right? But he came there and sat in the back of the restaurant for 18 hours one day, taking copious notes. When did people buy milkshakes? What were they wearing? What else did they buy? Were they with people? Who were they, if so? Did they consume them in the restaurant? Did they take them back to their car? At the end of the day, he saw something really interesting: 80% of milkshakes were purchased in two times during the day. 50% of them were purchased in the early morning rush-hour commute, where people bought them and nothing else. They would never drink them inside the restaurant, but would walk with milkshake in hand back to the car.

So the next day he showed up and stood outside the restaurant. He confronted these people when they came out, milkshake in hand. He said, "Excuse me" – and in language that they would understand— "I've just got to know, what job did you just hire that milkshake to do?" They would look at him baffled. He would say, "Well, think about the last time you were in this circumstance. What else did you hire to do whatever you're trying to do now?" One person said, "Oh, come to think of it, I've got this long commute ahead of me - a 20- to 30-minute drive - and it's kind of boring. I'm not hungry now, but I know if I don't put something in my stomach, I'll be starving by 8:00 or 9:00. One time, I hired bagels, but take it from me, don't hire bagels because they're dry and tasteless, and you have to spread cream cheese or jam on them to make them taste good. If you do that, you start driving with your knees, and if the cell phones rings, you've got major problems. I hired donuts once, but they stuck up the steering wheel, made it all gooey and stuff. It was disgusting. Don't do that. I hired a banana once. The thing was gone in 30 seconds. I was starving by 8:00, and I was bored the entire commute. I hired a Snickers bar a few times, but I felt so guilty, I swore I would never do that one again. But when I hire the milkshake, let me tell you, it's just perfect. God gave us two hands; the left one is for the steering wheel. I've never known what to do with the other, but there's a cup holder right here. The milkshake is so thick and viscous that it lasts me easily the entire 20- to 30-minute commute. It takes forever to suck up that straw and it's just perfect. I don't know what's in it - if it's healthy or whatever - but it sinks to the bottom of my stomach and fills me up easily until 11:30!"

So it turns out that the milkshake does the job better than all the other products and services out there - which are not Burger King, McDonald's or Wendy's milkshakes, but actually the milkshakes, coffee, donuts, bagels, bananas, on and on. So the market is a lot bigger, and the share is a lot smaller. Understanding that and the circumstances would lead you to understand how you have to integrate to actually nail the job for the customers. This restaurant thought that they were integrated well. They had everything in the house, but actually - when they understood the job - they realized they were not integrated well at all. For the user experience, why not put the dispenser at the front of the line and give people prepaid swipe cards so they could dash in, gas up and get on the road. That would be much quicker for the rush-hour commute. You would swirl maybe
more fruit chunks into the milkshake, not because it makes it healthy— because they don't hire it to be healthy— but instead, because every once in awhile the customer would be driving along and gulp up a fruit chunk, keeping the commute more interesting. You would do things very differently once you understand the job. In the afternoon, the job was to have fathers and mothers placate their children, to make them feel like better parents. So you would design a very different product to do that job. It just points to something that Peter Drucker knew a long time before this, which was that the customer is rarely buying what the company thinks it is selling him.

I think this is relevant for education in a lot of respects. I will just talk about a couple of these respects quickly and then jump into what it might mean. To a large degree, particularly in higher education and particularly in other areas of the world, people hire education to get access to a better life. The fundamental job is the access to a better life. It is not the information by itself. That is a means to the end and to the ultimate job. Understanding this fact starts to help us understand how to design a product or service to meet those educational goals. The roles of accreditation, social needs and so forth start to become better understood. In the new book while discussing K-12 education in the United States, we talk about how kids really having two fundamental jobs. The first job is to make progress or feel successful every day. Schools, as they are currently designed, do not do that well at all. In fact, they make most children feel like failures and kick them out. The second job children need done is to have a place to have fun with friends. That social experience is fundamentally important. Most of those areas for success and fun with friends are extracurricular activities, and are actually consigned outside of the educational scope.

One of the really exciting things about online learning is the way you can embed success into the actual curriculum itself because you can have rapid assessment. Online learning is constantly tracking where the students are, giving them challenges just above their level in order to move them forward.

I also thought I would talk about the business model, or the organizational model today because it is related to this last concept. What actually is a business model to nail one of these educational jobs to be done? The first thing is to figure out that in every business model there is a value proposition. This is basically the job to be done. It is a product that helps customers do - more effectively, affordably, and conveniently - a job that they are actually trying to get done. To deliver on that job, to deliver on that value proposition, organizations use people, technologies, materials, money, and so forth. In a business model, processes develop as these resources interact with each other in different ways. Ways develop to address recurring problems successfully, over and over again, such that you can nail on that value proposition.

Processes are developed not to change. That is why a good process is developed to do really well what it does, not what it does not do well. Processes are, as a professor at MIT actually termed it, where culture is. Edgar Schein described well how this is really what culture is. These processes, unstated or stated, are just the way we do things. Then that leads into a revenue or profit formula. (See Slide #9) How much money do you need to

get to deliver sustainably, or to afford the processes and resources to deliver on that value proposition? Then these things start to work in reverse. The value proposition you are often delivering is not the one you thought you originally were going to set out to do, but it locks you into this business model.

To see why it is so hard to change, we can take the United States Congress as an example. If you are a congressman and you have an innovative idea to change a social program, you introduce a bill into our congress. However, it's not more than a couple of days before the senator from Texas will call you up and say, "Got to tell you, buddy, I'm going to filibuster this bill if you don't change this, and this, and this and this." Then you get a call from the labor unions. They say, "This isn't going to fly. I'm going to have all of the people who support us just absolutely vote no. But if you'll work with us and change the bill in this way and that way, then you know what? Maybe we'll let it go through." Then you get a call from the senator from California, and he says if you just would add a couple of pro-California policies in there, a little money for his district, then he will let it go through. You get all these processes and actors acting on the original idea. What comes out the other end is something that fits the organizational culture of the business or the organization, not something that you originally designed to actually solve whatever problem you were trying to solve.

It is much the same way in businesses. That is why it is so hard for business units – like those in Digital Equipment Corporation - to evolve. Of course, corporations themselves can evolve. We have seen examples of this where companies like IBM have set up autonomous divisions and freed them from the constraints of the existing business model, so that it could be the leader in the mainframes, as well as one of the early leaders in the personal computer. Target is another one of these examples. I think it is useful to think through these models, to think through how we nail the experiences and the set of constraints that we need to observe so that we can deliver what the users are actually trying to get done. I think - from what I understand of some of the LINC 2010 discussions - that hopefully this will be a useful model, as you think about the infrastructure needs, cultural constraints and other challenges that are present.

One other way to restate a lot of this disruptive innovation diagram is to think about the world in terms of concentric circles. (See Slide #11) I will speed through this, but I think it is better to leave on an uplifting note. In the beginning of any industry, people are out in the fringes. They are solving on their own these jobs, these problems that they are having locally. So in computing, when we had to do computing, we would whip out our slide rules and do it on the spot. The advent of the mainframe computer centralized an industry and made it very specific as to who could access computing, and so forth. It was very limited because of the price, location and complication involved in using a mainframe computer. The minicomputer allowed more people to be able to use computing. The personal computer brought it even further out. Notebooks, net books and so forth have brought it out further still. The mobile phone is really just a small computer in our hands now and this is bringing it out even further, and decentralizing the world more and more over time.

I think that is what we are seeing in education right now. The decentralization that follows centralization is only beginning in education right now, as we are picking off job by job. Originally, you saw it centralized in places like Harvard University. If you wanted a university education, you had to come to Cambridge, Massachusetts. Only a few people could do that. From a U.S. view — and I think you can draw the parallels in your own countries as well — the Land Grant Acts in the United States of the 1860s allowed state universities to come up and extend education to marginally more people. In our context, junior colleges and community colleges have extended access even further. Now you are getting the real explosion, online universities, which are extending access and decentralizing education so you can get it from anywhere, at any point, much, much more easily. We see lots of growth right now throughout the world.

In the U.S. nearly a third of students are now taking at least one course online in college. So that's about four million. Worldwide it is even bigger than that. Even in K-12 in the U.S where the system is so ossified, we now have roughly two million students taking some form of online courses during their K-12 experience. We project that by 2019, 50% of all high school courses will be online. So change is actually coming rather fast. It is predictably improving as well. You are getting innovative things that are making it less and less of a distance phenomenon, as we have typically thought of it, and snapping it into hybrid environments similar to the mobile classrooms and schools that you talked about yesterday.

The technology that is allowing us to communicate with one another over great distances is improving by leaps and bounds. It no longer feels like distance when I can talk to you over a telepresence, which I am sure is going to be commoditized to allow many more people to have unbelievable video access. Online learning has progressed well beyond simple text-based things online to the point that we now have video. You guys have been leaders in seeing that one. We are starting to see game-based and simulation-based learning explode as well. That does not work for everyone. But those people who learn best through those environments are now having opportunities to access them. We are just really at the beginning of this revolution in the ways we learn. We are going to have to make a lot of changes in the ways we think about it. But despite those challenges, I think that there are a lot of opportunities right now that leave me incredibly optimistic. It is exciting to be in this community, because I am just really excited to learn from you. Thank you very much.

What Are Students Learning, and From What Activity?

David E. Pritchard

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I am interested in figuring out how students learn, what they should be learning, and how we can use technology to increase the amount students learn by as much as possible. Let me start off by first quoting education researcher, Jill Larkin, who said education reform is a lot like farming. At the end of the season, you look at how big the harvest is, and then try to figure out what on earth you did to make it bigger or smaller than last year. Of course it might well be the weather, which you didn't have anything to do with. Education reform is like this because if you only measure at the beginning of the year and the end of the year, how do you know what course element caused the learning that happened?

To get some indication of what course element causes learning, we did some correlation studies, looking at the remedial physics course that I was teaching for the kids who hadn't done well enough to get a C in the fall. We looked at what correlates with their final exam in May being better than the one they took in December (this difference is what we define as learning). What activities did they do? It turned out that going to class didn't help much, statistically. The number at the bottom is a p value - the chance that the result that we obtained can be explained purely by chance. If p > 0.05, most people regard the result as "not statistically significant". The group problems helped one year, but not the other. But the Mastering Physics was the absolute killer. The more the kids did of this, the more their final exam grades improved. Mastering Physics is the commercial version of the program that my son and I developed that was initially called cybertutorlmit.edu. It's a Socratic tutor. I can't go into detail about it in the time that I have. But as you can see, its use correlates with a two standard deviation learning effect, which is huge. Most classes do about one standard deviation over the whole term.

We then started looking in even more detail at the log of all the student's interactions with this tutor. Let me emphasize a point of great educational potential: when you are doing online education, your system can generate a pile of data about learning like you've never had before. When I am sitting down at the end of the term assigning grades in a conventional course, I have my grade book: 12 homework assignments, four of them partly copied; three exams; and a couple of lab reports, definitely both copied. Based on those 100 bytes of information, I am trying to decide something about the learning of that student. When somebody finishes with Mastering Physics for a term, I have a quarter megabyte of data. I am overwhelmed. But Educational Data Mining is giving some novel insights into what's happening.

I have some other research that I don't have time to discuss here that really shows the importance of good habits on learning. Now I'll show you one about bad habits on learning. We started to look at "how long does it take students to finish the problems?" in the online environment. Time to do a task is a variable frequently studied by experimental psychologists with both human and pigeon subjects. We discovered a small percentage of students who could answer some questions requiring two or three analytic responses in 30 or 40 seconds! So we had a conundrum; "Okay, this problem took most of the kids ten minutes, and they made mistakes. How did these few answer it in less than a minute and not make any mistakes?" Well, of course, there are a lot of geniuses here at MIT, but a more likely explanation, we decided, was that they were copying their answer from somewhere. So this is the fraction of electronic homework that was copied. We grouped the students into a few groups on the basis of the overall percentage of their problems that they copied: less than ten percent here, and the students who copied 70 percent of their online homework way out here.

How did they do on the final? We found two different things. For the analytical problems on the final, we found this group of points here. These data are almost low enough error for me to publish if they were from my atomic physics lab! They are really outstanding from the point of view of education. If you know about p values, and I did not write it on here, but the p value here is 10 to the minus 15. So what you are seeing is not a statistical fluke.

On the other hand, on the conceptual questions that they learned in class (or from easy Mastering problems early in the assignment and in the term which they generally didn't copy), the learning was independent of how much they copied on the homework. This is a huge differential effect in learning. It strongly suggests that all our students can learn physics if they put their mind to it, and that when they don't do the homework, it really costs them. Homework copying is over three times better at predicting a poor final than is doing badly on the pretest, or the first midterm, or on the homework score. Doing the work trumps native ability!

That is the kind of detailed information and investigation that we can find from educational data mining.

Next we decided to look at "What does two sigma learning really mean?" We decided to look at what the students were learning by comparing two groups two sigma apart. This is the final exam histogram, comparing 60 students in this group one sigma above average, and 60 students in that group, one sigma below. We are basically asking, "What do A- students know or do that C students don't?"

Here is the quality of the analytic answers that they gave. i is "horrible," basically "no clue." ii is "Some inkling when you start off, and then you made some serious mistakes." iii is "This was a so-so attempt, but your mom would be happy." iv, "You got it pretty good," and v is "You did it right— your dad would be happy." The C students are spread all over this map, but maximized at "clueless." The A students are up here at "getting it done." There is a huge difference, when you look at the quality. Six times more A students can do the problem really well, and only a fifth as many are clueless. The

majority of the C students wouldn't even make their Mom happy even though we are passing those C students. The results are similar for the written plan. Again the A- students are qualitatively far superior to the C students. I won't go into that further.

Now let's look at the scores. We find that the C students receive exam scores that are 38% lower than the A's and only 19% below average, and only 9 points lower than average when the test is graded on the basis of 100 points total. These statistics strongly minimize the great qualitative gaps between the A – and C students. The bottom line of all this is that partial credit grading, which is what we do, rewards partial understanding (see slide #7). Take it or leave it. We've got to look at what our system really does before we can reform it. There is a pretty clear challenge here: are we content to pass kids who have less than one chance in six of demonstrating a fairly complete solution to the questions on the final?

Now I'd like to address a second issue that has always worried me. We decided to look at it carefully. That issue is, "What do seniors remember from freshman physics?" If it is going to do them any good in the world after graduation, they at least ought to know this material when they collect their diplomas, right? We got some seniors — we had to pay them— who were hanging around the week before graduation. They took basically an equivalent freshman physics final exam, and we looked at how they did. We also administered some other tests and surveys.

How do you judge the learning or forgetting when you have two tests? This is really a good way to study education. What you do is you look at the students on the basis of their first test— the pre-test, as it is called. Then you plot how much they changed from there to the second test. If they got a zero on the first test, they could get 100 percent on the second test, and they could learn 100 percent. If they got 80 percent on the first test, then they can only learn 20 percent. This line here represents getting 100 percent in the final, and therefore that you learned 100% of what you didn't know on the pretest. So any straight line that goes through the point zero gain at 100% pretest like this is what we call a pure learning curve or pure gain curve. It means that everybody learned a constant fraction of what they did not know on the pretest. That turns out to be a pretty good model in lots of cases. It isn't understood why. We published a paper suggesting that it is a result of pure memory learning, which didn't go down very well with those of us who have the modern constructivist view of learning, which is most of my education colleagues.

On the final retest, after over three years without review, we expect that the students are going to do worse, not better. To treat loss of knowledge, we can look at the analog to pure learning, which is pure loss. You're on this line if you forgot everything from the first test— if you were up here at 80. Now, you forgot 80 percent, so this means you are forgetting everything. So a curve that passes through zero at zero and has negative slope like this would be a pure loss curve.

With this in mind, we gave them a conceptual physics test, and we were blown away. They did a little tiny bit better than they did at the end of freshman year. Wow! Then we looked carefully, and we

found that actually there were two parts of the test. There was a part that was on basically math, mostly calculus and graphs. What we found there was that the graduating kids are up here. This is a fit to it. This is a pure learning, with a gain of 70 percent. At MIT they learned 70 percent of what they did not know when they walked in the door. A lot of them in fact got 100 percent on it. You can see that line there.

Then, at the end of the freshman year, we had data, too, on the same instrument. They had gained 35 percent. So they learned half of all they learned in math in first semester physics, or maybe some in the math course they were taking at the same time. Then they learned some more in the rest of their careers (probably mostly in second semester math and physics).

Well, that's the good news. Now I'll tell you the bad news. The remainder of the test is on physics concepts with some numerical physics calculations. We didn't get a pure loss or gain curve when we plotted it against either the pre- or the post- freshman test scores. To get a clear loss curve, we had to plot it against how much they learned in the freshman course. What they learned in the freshman course, they forgot half of. They forgot, in fact, 52 percent. So we are seeing that students forget 50 to 60 percent over the four years. This is true for the analytic problems on the final as well – we get about 60% loss.

What that means is that the forgetting process between freshman course and senior graduation turns the A's into D's. It is worse than the difference between A and C that I just showed you. The former A kids are now D's. They would not pass the course— or would not be allowed to go on— even though they had an A as freshmen. If they had a B before, they would get an F. That is how much the forgetting there is.

Our data are consistent with the adage, "Use it or forget it." Whether that implies that we should only teach, or mainly teach, what will be reused later, I am not so decided on. But I definitely think we ought to work more on habits than on facts, and we ought to work on procedures also. I'll ask everyone who's a parent here, did you work a lot to get your kid to memorize the multiplication table or the capital of the state? Or did you try much harder to get them to have decent habits, like starting the homework at a reasonable hour, or picking up their homework papers and putting them in a pile, so when they got up in the morning they could just grab that and go to school? That's where all the hassle was in our family, and I think that learning and thinking habits is where we should put a lot of effort in college education.

The steep loss of unreviewed learning, and the persistence or growth of what was reused impact the old question of what we should be teaching in introductory physics. This epiphany came after I'd been working in education for seven years and teaching for 37. I finally said, "Well, maybe our current final exam is not the end all be all measure of what we should be measuring. Maybe we should ask some people what they think we should teach." So I basically asked a lot of different experts, maybe 500 in total. "Given a change in the academic calendar, you have 20 percent more time to teach the

calculus-based introductory physics course to non-physics majors. The syllabus has not been expanded, so what learning will you seek to add or emphasize with this extra time?" [Introductory physics is taken mostly by non-physics majors, especially at MIT.] ""

This graph shows you the 12 choices the experts suggested grouped into 4 categories. It also shows you where the teachers— and I had several different groups of teachers— came down. I want to draw your attention to a couple of points here. The first one is that all teachers are in accord that we teach too much content, and the last thing we should do is add more topics. Secondly, the number two choice of all these different groups, and the teachers' top pick on average, was sense making. Sense-making involves questions like: when your computer has told you to make 21-inch cables for the suspension bridge, how can you be really sure that that is the right answer? Or do you just believe the whatever the computer says? Of course not. So you have to learn to think about scaling, and ratios, and common sense. You compare that bridge with the Verrazano-Narrows Bridge, which it is similar to, and scale from that. That is the kind of thing that we think is really important to teach the students.

After I'd determined what the teachers think, I said, "Well, why don't we ask the students what they want to learn – we don't necessarily know best?" So we did, offering them the same set of alternatives as we offered the teachers. What we found were some pretty big discrepancies. First we found a lot of things where the votes averaged to around the "by chance" reading of 10 percent, where the students and the teachers picked the same thing. But there were some really large discrepancies. Here are the teachers, on "wider content". There are the students. What the students wanted most was sexy new topics.

Second point. Here are the teachers on sense making. That was their top choice. Here are the students on sense making. We did not teach them to make sense of anything in high school. We taught them to get the answer and go on to the next problem. Why would you look over your answer on a timed test, or on homework that constitutes only a small fraction of your grade but a large fraction of your sleep budget? That's their attitude. However it turns out that the students really want to see the relationship of what they are learning to everyday life. Obviously that is not happening in the labs, because they don't think the labs are very good -- even though the labs are supposed to be a confrontation of what we are learning with the real world. So things are pretty badly off kilter here. Basically, the conclusion I come to at the end is that we experts want to teach the students to become experts, whereas the students want to learn why physics is interesting enough to warrant their investing the time to become experts. In these required courses, I think the mismatch between what they want to learn and what we want to teach contributes an awful lot to the general malaise characterized by, "Well, we're just taking a required course to get our graduation ticket punched, doing the problem sets week by week. We'll copy if we have to."

In the remaining part of the talk, I want to step back and talk about schools and the digital age. A lot of this comes out of a great book, *Rethinking Education in the Age of Technology*, by Collins and Halverson. Let's look at education from the point of view of preparing students for the world they are

going to live in. We teach just-in-case knowledge. We're going to teach you the capitals of all the states, just in case you need to know that. We're going to test you on it, too, so don't laugh! When are we going to do it? Well, ideally everyone goes to college to age 22. Schools go September to June, 8:00 a.m. to 3:00 p.m. – the summer is for forgetting. We group the kids by age. The instruction, especially in K-12, is done on paper, and the teacher's role is to be the subject expert and to be the source and gatekeeper of the information.

How does this compare with life in the digital world? Most of the factual knowledge we need is found "just in time". I don't look up the melting point of tungsten anymore in my textbook or handbook. I just type "melting point of tungsten," and bing, there it is on Google -- one of the top three entries. Usually I can see the number right there in one of the excerpts without opening any of them. Then "when do people learn?" Well, to keep up with this accelerating world, you have to learn on the job and for the next job – i.e. all the time. Learning happens on cell phones in the subway. Obviously, this world groups people by interest, by their attainment level and by their profession. The age matters only in second order. Finally, most new written work is done on computers.

If you look carefully at what schooling should accomplish in the digital age, you'll have to conclude that the contemporary school is truly inappropriate. We have to rethink the necessity of "just in case knowledge" in light of the ubiquity of online resources and networked experts in our students' future. The appropriate teacher should be a coach and a guide, instead of a sage on a stage -- as much as I enjoy that role, like most professors!

Let me go on. Here my thinking is pretty speculative, although I back it up with some data, but not enough. I think the first thing about college is that we want to guide students individually both online and in class. Full time personal tutors in real life are too expensive, but personal tutors online are great. That is really what Mastering Physics is: an online personal tutor for your homework problems. We should incorporate games, simulations, social software, and class— the whole nine yards. But we have to integrate it.

Why is integrating everything so important? The answer is: so you can assess everything each student does to find out where his or her mind is. Because when you want to teach a student, you want to be able to teach them what they don't know, in a way that they will be receptive to, at a level that they can comprehend without boredom. You cannot do that unless you know where their head is. That is what a personal tutor really does. The tutor asks a question and looks into the eyes of the person, watches them struggle with it, and decides what to ask next or what help to give. We have to be able to do that online, and we cannot do that now, because we don't have good enough assessments.

Largely, education now runs in what engineers call "open loop mode." At the end of the term we survey the students: "Did you like this class?" I mean, does that question tell you how much they learn? We have a lengthy college-wide course evaluation. There is one important question, "Did you learn anything useful in this course?" But our questions mainly ask about the old-fashioned formal

course components: "Was the textbook clear?" "Were the lectures clear?" "Did the teacher use the blackboard well?" "Did the teacher use the web resources well?" "Was the course well organized?" "Were the tests fair?" Statistical analysis tells that all you really have to ask is "Did you like the teacher?" Everything else correlates strongly with that.

Did you learn anything? In fact, most universities and colleges don't care much about whether their students learned anything. If they did they'd try to improve it. I am omitting the fact that a lot of individual faculty members care tremendously, which is one of the reasons I love MIT – but I'm talking about the institution. When was the last time that somebody from MIT watched my class, then came into my office, and said, "You know, Dave, I think you could do better teaching if you did the following"? It happened only once - when I was teaching 8.01 with Tom Greytak - and I've been here a long time. And it was at Tom's initiative – not MIT's. Our educational institution does not reward us for increasing the learning of our students. If I am a "good teacher," I am a good teacher because the students like me, not because they learned a lot. There is no measure of whether or how much they learned (except for the concept tests we give before and after).

Let me show you one small example of universal assessment. Say I try to figure out where my class is on a chapter-by-chapter basis by looking at their average grade on the homework. I put in the statistical error bars here. But the error is bigger than that, because on this chapter, they did great; they got 85 percent. But I don't know if that was because the related questions were too easy, or because the students were really skilled. The kind of data that I have now provides little guidance.

So what do I have to do to get useful detailed assessment? As an example, I can analyze the detailed data from the online homework using item response theory. That is what ETS uses to grade tests. It separates the skill of the students from the difficulty of the items, allowing a determination of student skill independent of which test items they actually do. We did this by comparing the Mastering Physics data from one of our classes with data from the entire system. Here is the result. Two points: you'll notice the errors are much smaller. And, there is a very consistent overall trend, not visible in the percentage correct graph. MIT students start 1.5 standard deviations above the national average, and then in about six weeks they decay to about half a standard deviation above the national average. So we see that our admissions committee selects people who are outstanding in knowledge when they come in the door, but not necessarily good at learning. Of course, the education system does not measure whether you are good at learning, so how can they tell?

Most of these points have error around a tenth of a standard deviation. That is about one point on a 100-point test. Now I may see that my students are a little weak on some topic, so I vary how I teach the material in that chapter next year. I can watch whether that point goes up or down. I can actually evaluate my teaching at least on the week-by-week basis, rather than on a whole semester basis. This example has given me as much information as if I gave a two-hour test every week. But of course, then I wouldn't have time to teach them very much. If you do integrated online education, you can get this

kind of detailed high signal-to-noise ratio measurement for free, just by analyzing the data that is already in the system.

The other thing that is very important about having an integrated online system is that it allows improvement of the content through data mining. Before I give you an example, let me put this in perspective. You are teaching a class. You teach something. You give the kids a problem, and 80 percent of them get it, but 20 percent do not. How important would something be if it could reduce the fraction of the kids who were unable to solve it to 10 percent instead of 20 percent? That would be a pretty fantastic gain, wouldn't it? If we could do this all the way through school, we'd only have half as many people dropping out at the bottom. Now I'll show you how to do that. It will be in a limited context, but I'll show you how to do that.

We do it by revising the content from feedback that we get by mining the data that is accumulated in the online system in the course of the students using it. We originally gave the new carefully edited problems in cybertutor.mit in 2001. Four percent of the students here just abandoned the problem. Twelve percent requested the solution. Students averaged 1.5 wrong answers per question, and requested 0.75 hints per question. Then we spent additional time improving each problem based on data on student performance – about 10 percent of the time it took us to write it originally. In 2002, we gave that class the improved problems, and look what happened. Only half as many abandoned the problem. A little less than half as many asked for the solution. The number of wrong answers per part went down 40 percent, almost a factor of two. The number of hints per part went up, because we added a few hints where they were clearly needed. And the students spent exactly the same amount of time on each question.

Frankly, I think the students budget their time pretty intelligently. Each student is going to spend a predetermined amount of time on physics. If that means at the end they are going to have to copy a lot, well, they copy a lot. We also know that the copiers don't start their work in a timely fashion. They don't even finish it on time either. But let me get back to this. The next year, Physics Tutor was a commercial product with a vastly improved interface and some editing of the problems. We did not have access to all of these data and could not analyze all the other bars. However, the number of kids who didn't finish went down further. This is an example of the power of analyzing and thinking about the data that you mine out of online systems.

Here is a way to incrementally improve our central course element - the sage on the stage and everybody there with notebooks. The actual result of this educational element is to transfer information from the professor's notebook to the student's notebook without passing through the minds of either one. That is how some people have characterized a lecture. They are actually pretty close. I mean, most of you are paying attention— which is not like a typical lecture at MIT, I hate to say. But if on Friday you had a test on this, research shows that you would remember about 10 percent of the new concepts I mentioned. Here's an example of what kind of product we should be creating to improve the learning. We start with a video, for example, of a lecturer with some demonstrations and whatever else he has,

and we have standard "start" and "stop" buttons. Then down on the left here, we have a streaming text of what is being said. Some stuff similar to this already exists in OCW.

Here is what we do differently. We have "Frequently Asked Questions" that are relevant to this lecture, at this point in the lecture. These questions are scrolling by, and students can pick ones of interest. Then we use techniques like those used by Google to re-rank all the "Frequently Asked Questions". Maybe we have a TA behind this. The students can ask new questions. The students can suggest URLs that helped them understand this. These "Frequently Asked Questions" and the helpful— supposedly— references are shown to other students, and we look at what helps the students understand. Where do they go? How long do they stay there? And if we reconfigure things so the FAQ's are assessment items, there's a very important fact that we know that Google does not. That is, "Could the student answer the question when they came back from the supposedly helpful resource?" In this way, we get the system to be more scalable, because every student is indirectly helping every other student. If you are in a country where you have one teacher for every three or four classes, this is the kind of stuff you have to do. Finally, in my suggested system, whatever the student highlights of all of this information, can simply be added to their notes. There is also a course roadmap, because giving students an overview is really one of the hardest things in any course.

I've talked about my zero based thinking here today, and emphasized universal assessment. I've talked about improving the content and how we might measure its effectiveness. I want to end by saying that I think we have to start using social network stuff much more to help students educate each other. I just hired a post-doc who had done a thesis using something called Galaxy Zoo. A grad student realized that it would basically take him forever to classify the 20 million galaxies in the Sloan Digital Sky Survey. Well, are these elliptical galaxies? Are they spiral galaxies like the one we live in? Are they barred spiral, with a little bar in the middle? There are about 12 basic kinds of galaxies. Actually, this post doc discovered a new kind of galaxies called green pea galaxies, using this Galaxy Zoo. People participating in Galaxy Zoo get a little bit of training, they come in, they try to classify these things, they have discussion groups, and basically the system ranks how helpful they are to other people, how long they've been there, and how good their answers are. So the people in this network function as ranked peers.

The idea that the students learn from each other is not new. My mother, in 1927, taught in a one-room schoolhouse in Vermont. I once asked, "Mom, how did you ever teach K-8 classes simultaneously?" She said, "You give the kids an assignment. If the second graders can't do it, they go ask the fourth graders." Duh. That ought to work. Even if you have a class filled up, and no teacher for it, that can work. All you have to do is get someone in there who can implement that idea. They do not have to be the subject expert. The Web and done self-learner can be the subject expert.

There is no reason you cannot have student groups produce the content, use the system to assess its appeal and judge its educational effect, help the student groups improve it, and educate tomorrow's

learners with attractive and effective free materials. From my point of view, that is the future of education in the digital age. Thank you for listening to the end.

Network-Enabled Open Education: Changing the Landscape of Learning Opportunity

Vijay Kumar Senior Associate Dean and Director, MIT Office of Educational Innovation and Technology

It is always difficult following someone like Dave Pritchard, who is a deep practitioner, who thinks about the problems and thinks about the solutions. I am going to go from that stark reality to wildly optimistic notions. First of all, I just want to say it is wonderful seeing you folks after the last two years. I was gushing to Dick and Liz earlier on how nice it was to meet so many old friends, and make new friends. All of us are in this common journey. It is really tremendous.

I am a futurist also, but of a different kind. Actually, my doctoral work was in this program called the Futures Studies Program, where we didn't talk about inventing the future or predicting the future, but about making future possibilities more real for others. That is sort of the middle space of futurism that people like me occupy. We look at the real problems that Dave presents and then ask, "Are there some wildly optimistic technological solutions that might make some of those problems go away, or at least mitigate them mildly?"

What I want to do today is actually give you some sense of the potential of another disruptive innovation that has been talked about by various people in the last few days—a disruptive innovation that I call network-enabled open education. I will try to illuminate the value proposition of this disruptive innovation. At the end, I hope to speak to something that both Michael and Dave touched on, which is the readiness, the cultural readiness, for us as individual instructors, institutions, organizations and nations to really take advantage of this disruptive innovation.

I am going to vehemently affirm several things that folks have said, from President Vest, Cathy Casserly, Andy Di Paolo and some others. There is going to be a vehement reaffirmation of some of these topics, perhaps illuminated by some examples. I will then discuss some things that are happening at MIT, and also give some examples, based on my work with India, where I have had the honor of serving on India's National Knowledge Commission as an adviser, thinking about open education resources and open distance education.

I am going to ask that you all think very generously about the definition of "open," not just as open content. Think about it as open content and open tools. Open education is not a new term. It has existed variously as "flexible education" and "university without walls." There have been different manifestations over time. I want to think of all these things when you think about "open"— open content, open tools, open knowledge, the enabling resources that actually make education open. When you think about the network— and this is something that really got highlighted by Andy yesterday— think about both the connectivity and the collectivity, as was pointed out. When we think about the network, think about wired, wireless, and mesh networks. The Kashmir example was pointed to yesterday, about the mesh networks being leveraged by buses to provide access to resources. Think also about the network of people, because one of the things that we find going on is that there is this whole exploding set of communities that are being formed. These communities are part of the network that is really making it possible for us to realize this potential. This is sometimes comforting, because then we shift from solving all the problems technologically to enabling technology that will allow communities to solve several of the problems themselves. You have seen this in Clayton's original book about "the long tail," and all the stuff that can happen around the long tail. I want you to think about the network as both the technical substrate as well as this whole human capacity that is created.

So is there a disruptive innovation movement? This is probably the most used slide for all of us who give presentations in open education. It is interesting. MIT launched OpenCourseWare, and what has been following over the last four or five years is this wonderful, gathering storm represented by all these institutions. So it's not just MIT OpenCourseWare, which is dynamite as it is, but the fact that there are upwards of 200plus institutions that are now part of this consortium. This is evidence that there is a significant open movement going on. The consortium is a very good representation. It epitomizes that movement. There are wonderful initiatives from all over the world. In fact, I have to keep updating the slide. Every time I go to another country and give a talk, another country pops up over here. This is a sign of the growing movement.

There is one initiative that I speak about because of my work in India. You will notice that there is something called NPTEL, which is the National Programme on Technology-Enabled Learning. Over the last six years, five Indian Institutes of Technology (IITs) and 2 other institutions have gotten together to create engineering courses for engineering institutions in India. All this is available through YouTube. Many, many countries, including India, are represented in this open education movement. So there is a tendency to make stuff that is newly created and to make it open and widely available. And this is not just for higher education. Yesterday we had several conversations, and I had to insert this slide around secondary education. So this phenomenon is not restricted to higher education. There are any number of growing repositories of resources available for K through 12, as we call it in this country, or secondary education elsewhere.

What is telling is that the resources are growing, institutions are participating, and initiatives are being created. From an institutional sense, you know that this is a significant movement when it is becoming part of the discourse for educational change institutionally and nationally. I have listed a whole bunch of organizations, some of whom I have worked directly with, like UNESCO, in developing their open suite. But the fact is that when people are talking about access and quality, when people are talking about participating in the growing knowledge economy—nations, institutions—for instance, a Commonwealth of Learning clearly identifies with openness. This is through a lot of pushing that Cathy Casserly and her colleagues did, looking at open educational access. This is becoming part of the strategy that institutions— colleges and universities as well as global institutions— are adopting to further their ambitions and their goals for advancing quality and access.

I mentioned India's National Knowledge Commission. This is actually work that I did supported by the Hewlett Foundation. You will see some very, very clear recommendations that now have been accepted by the National Knowledge Commission. They are part of the body of recommendations that the Indian Government has accepted which deal with open education resources and distance education. They have clearly identified this as a central strategy. At that time itself, we started thinking about networkenabled open education. To the point that Michael is making, one of the thrusts that you will see in those recommendations is to say, "Look, when we are talking about networkenabled open education, we are not talking about this as something supplemental to how real education happens. One of its goals is to see that what we have traditionally thought of as a second-class citizen, distance education, when it is represented as networkenabled open education, can become the central modality for delivering quality education everywhere. This is not an "also ran." It is how education can be developed.

With regard to a country like India, this is a country in a hurry, in a rush to grow— you know, there is a lot happening. When you think about the amount of demand there is for an educated workforce in every sector— transportation, laying roads, education, researching— there is no way in hell that you can multiply or replicate the traditional ways of delivering education to meet that demand. You could start a school, and I could give you numbers about the gap (about 50 million) between the number of children who are exiting the universal primary education model coming into secondary education and the kids who fall through the cracks because there aren't enough secondary schools. You can't build a school a day to meet that demand. When you talk about higher education, it becomes even more explosive.

Part of the Commission's recommendations was touched upon in Michael's message, and it is that we do not have to reinvent all parts of the wheel. You can really leverage this growing phenomenon of educational resources, and focus a lot of national energy on customization and localization and do all the long tail stuff. The point I am trying to make is that this has really become a central part of the kinds of investments India is also making in meeting its educational goals.

Now, this is 15 seconds of shameless self-promotion. I mean this movement is serious. The fact that it was becoming so big and so huge is what prompted my colleague, Toru Iiyoshi, who was at that time working in the Carnegie Foundation, to say, "Look, there is something happening over here. Many of these initiatives are sprouting. Can we invite all these players who are leading these initiatives to sit back and think about how this very significant movement can make a collective difference?" All these initiatives are taking off and all of it is represented in this anthology. Many of the authors, like Cathy Casserly, are present here. The book is organized in terms of open technology, open content, open knowledge. These are not orthogonal concepts, just an organizing framework. The book really invites the various players to answer these two questions around the educational value proposition, and what might be factors that would lead these disparate initiatives to collectively make a transformative difference to education. We actually asked our authors not to write case studies of their individual initiatives, but to step back and look at it collectively—which they have done. By the way, this book—in terms of walking the talk—is available openly online at the MIT Press site.

I used those two guiding questions as a framework to see what might be some elements of the new value proposition and what might be some readiness factors. When I talk about the value proposition, "charity begins at home." So we talk first about OpenCourseWare. You heard President Vest reflecting on the time when OpenCourseWare was launched, and all the statistics—the numbers, the millions, gazillions of hits, the accolades that were received. But I borrow a couple of poignant vignettes from the OpenCourseWare presentations which really speak to the transformative possibilities and even touch some of the issues of quality that have come up the last two days.

(See slide #12) You might have seen this before, about a student in Nigeria who looks at the course notes that are available in OCW and looks at the course outline and the questions. The entire set is present there. His comment is interesting, because he says that it helped him gain a deeper understanding of the material. This example shows that the resources that are available through OCW and other OpenCourseWare can actually be used as supplements, sometimes as a way to structure, to help students get that other perspective, and sometimes to help them understand deeply.

This is a different kind of a vignette, about a professor in Melbourne, Australia, who says, "You know, there is this very coherent presentation of this course." As you can sort of get from his comment, he is using it as a model. He is using this as a starting point for developing his own course. I introduced this slide yesterday after hearing the questions about quality. You can develop quality from scratch, but one thing about the open movement and materials like these in OpenCourseWare is that they are snapshots of real courses, and might I say, yield quality courses. They present good models. They can serve as benchmarks. They can be emulated.

Shigeru Miyagawa, a linguistics professor here at MIT who now chairs the OpenCourseWare Faculty Advisory, had, in the early days, a wonderful comment on the OpenCourseWare page. He said that we as academics know how to share our research, but what OpenCourseWare allows us is to share our pedagogy. How we share our pedagogy is through this very, very comprehensive representation of a course that is present as syllabus, outline, structure, the sequence of activities. These components serve as models of quality. There are other ways of getting quality from these resources, but I wanted to mention that this representation itself presents a starting point for how one might think about quality.

There are other things that we do which can speak to how OpenCourseWare might be used. Dave Pritchard pointed to some examples from the video, and I will touch upon that. Here is a very interesting example from one of our faculty members, Karen Willcox, who, to pick up Michael's point about "just in time," might introduce a refresher element just in time. When you want to do a refresher section— on, let's say, calculus in the middle of a fluid mechanics course in your third year --or you want to understand why you might be doing arcane triple integrals in your second year by pointing to something else three years down the road when you are doing transport phenomena— this is how these things might be relevant. So there are interesting ways in which to make the education experience richer, either by bringing in just in time, refresher materials for review, or to point out the relevance of the material that is covered now for the future. So these are the kinds of possibilities that these open education resources present.

When you think about the value proposition, again, I like to say— and I will try to illuminate this with some more examples— that the "access" case is pretty much clear. Suddenly you have this tremendously growing volume of educational resources of all

kinds, including full courses and learning objects. I am going to show laboratories, in case you thought it was only about accessing content. What it really does is increase the access vector, in terms of scale and quality, in tremendous ways.

I already warned Andy, when he quoted Sir John Daniel, that I was going to pick up on that quote, where John Daniel talks about how open education resources can really affect our traditional thinking about how access, quality and cost are related. Sir John has a wonderful way of talking about it. He talks about these three vectors: access, cost and quality. The way he presents this is that we always thought about this triangle as an immutable triangle, -- our traditional means implied that if you increase access, quality is going to suffer and if you increase quality, cost is going to get crazily high. What he points out, and what is being validated slowly but surely, is the fact that this iron triangle is indeed being rendered flexible because of network-enabled open education.

We can go into lots of philosophical discussion about this, but there has always been a very insidious connection between exclusiveness and quality—small institutions, small sizes, interpreted variously. Or you would have heard, "Oh, if you have 600 people in a class, quality is going to suffer." Maybe— through this intervention— not. Or others say, "If you bring in a lot of media-rich materials that will help different pathways to learning, the cost is going to go up." Perhaps it will not, if we actually engage the community in producing some of that, or in providing some of these experiences. The point that Sir John makes, that I again vehemently agree with, is that network-enabled education actually provides the opportunity to render that hitherto inflexible triangle flexible.

Yesterday we heard a lot about flexible learning. One of the things that it is doing, through all the examples that we heard about, is really shifting from teaching to learning. We used to think that was just an "eduspeak" buzzterm that educators use ---about "shifting from teaching to learning". But what you are really seeing is that in learning—flexible learning, just-in-time learning, anytime-anywhere learning — suddenly there is a very, very palpable shift from thinking about teaching to learning in all its modalities, all its localities. That speaks to the access and quality influence of open education.

There are other two areas that I have pointed out, in terms of the value proposition. It really allows us to intelligently blend physical, virtual, situated online experiences in interesting ways, and I will show you an example. The third aspect that Dave was pointing to was the opportunity to do continuous improvement of the materials and of the pedagogy, if you actually built overlays and engaged the community and networks on top of these available resources. There is a very good example. Carnegie Mellon launched their open learning initiative, which is a whole set of resources which actually use a closed-loop kind of model in order to change the experience, change the content, and change the delivery, based on the experiences that students are reporting. So it speaks to that kind of continuous improvement. Those opportunities are possible.

Boundarylessness is the other thing I wanted to point out. Typically, when we think about boundarylessness, we mean geographical boundaries. I am thinking about the possibilities that we are creating for boundarylessness in terms of the traditional boundaries that exist between disciplines, between research and teaching. We are able to bring open education resources to transcend those boundaries. A very favorite example of blended education that I point out from MIT is iLab. Jesus del Alamo, the inventor of the idea of iLabs, really says iLabs is about Internet-based, browser-based access, to real laboratories— not simulations and not virtual labs. So students in Singapore, in Sweden, in Africa, in China, in India are accessing labs, for instance, that are available here at MIT. They set the parameters and look at results. They actually conduct experiments. In fact, you see the network analyzer equipment over here. There is a "benign" nuclear plant over there. We have our own nuclear engineering students, as well as middle school students through an NSF grant, who have access to those labs. The thing about iLabs is not the fact that there are four or five or six labs at MIT which people all over the world are able to access, but the fact that the architecture allows labs anywhere to be set up and made available. You can see the implications for vocational education. We are making sure that when we talk about network-enabled online education, we are not just talking about access to content; we are talking about good end-to-end experiences.

I will give two very quick examples, and then we will move on. Dave mentioned this in his talk about using video (See slide #17). This is a technology that leads towards the vision that he was presenting. It comes out of research work that Professor Jim Glass in Computer Science does. What this allows us to do is to really search the transcripts that are available. It is an automatic transcription technology. It uses voice recognition and A.I. techniques. It is not only for automated transcription, but it allows you to search on particular keywords so that you can go to specific segments of the video. So if you have 21 hours of video-based lecture, let's say, from Professor Walter Lewin-and those of you who have seen him will agree that if not deserving of a teaching award, he is at least deserving of an Oscar- and you want to go to all the segments of the lecture that deal with angular momentum, or gravity - pick your topic - you can search the transcripts. The yellow-highlighted things that you see are to search the transcripts and get to those particular video segments. You can see the implications: I have missed a class and I want to go review the segments on a particular topic, so I can go back and review it. Take a topic like angular momentum. It starts in physics, but it might need to be covered in mechanical engineering. You can go to those segments. So you can start leveraging content across courses. That is the kind of boundarylessness that is enabled. If you overlay what Dave said on top of that, you see how you can start thinking about mapping concepts that need to be learned with particular educational content. You can harvest them and do the mapping. Those are some of the possibilities.

Because this is a very international audience, I am interested in showing this very exciting initiative that we are engaged in. We are working with the School of Architecture and Planning at MIT, and a group in India called the Indian Institute of Human Settlements. It is an urban planning institute that is being set up. They have really embraced openness in all its dimensions. They say, "Look, for scale, and for the kind of inclusiveness we want in our institutions"—and when I talk "inclusiveness" in India, we are talking about multiple languages and multiple states— "we really think openness is the answer, as in making our curriculum open, making sure things are translatable." So when we showed them the possibility of Spoken Lecture browser, they immediately jumped to this example. They had all these video lectures that were being transcribed, but they got very interested in the translation capabilities. You will see as this video goes

along that the transcription is being translated automatically to Hindi. You can actually search the segments in Hindi, and it will go back to the segments. This is, by the way, Professor Bish Sanyal, a colleague of ours in the School of Architecture and Planning. It will do a keyword search. So it is doing the same thing, the transcription of the lecture.

(See link on slide #18— <u>http://spokenmedia.mit.edu/demo/iihs/</u>)

That word "*niyojan*," by the way, means "planning." It goes to the segment that talks about planning, in real time. Imagine: this is happening. And we have engines. About four or six years ago, in one of the early LINC conferences, Dick invited Vijay Chandru, one of his colleagues, who showed the Simputer. It is a hand device, which has an engine to do text-to-voice translations in 13 Indian languages. Imagine the Spoken Lecture browser, combined with the text-to-voice translation in 13 languages, and suddenly you can start seeing the possibilities of network-enabled open education.

There is a lot to tell. I won't go through all that, in the interest of time. What I will leave you with is that there are wonderful things about finding resources in the network. How do you search them? How do you use recommenders that allow you to find related resources? These are the kinds of things that we are working on at MIT. If you look at a resource for a course, you search the Web, you search Wikipedia, or you search select repositories, and you get to a resource. But you also want to find what related resources are there for a topic, because people learn in different ways. Some people are visual learners. I used an example the day before yesterday: when my father taught me probability and statistics, I didn't understand a thing, but when my wife taught it, I got it. So I might want to go look at related resources on a particular topic. That is the recommender that you see. Here it's just hitting against our OCW site. When you find a particular resource, you might find related resources, which might provide alternate pathways. This is a topic that Professor Larson is passionate about—alternate pathways for people to learn, in a guided mode.

You can start thinking about the student experiences. You find all these resources. I plunked that. This was a resource that had to do with Nepal. As a student, I might say, "Well, where is Nepal?" I might pull up Google Earth and try to place that in context. I might say, "What has happened historically?" and use some feature like Timeline. So there all kinds of these things that provide contextually relevant education through the kinds of affordances that networks and open education resources provide. I just wanted to give you a glimpse of the student experience over here.

I will just touch on readiness, and leave it for discussion. When we talk about readiness, Michael already spoke to the culture and the context. The fear that we have is a fear of extensive abundant resources. Picking up from Coleridge's rhyme, there is "Water, water, everywhere, but not any drop to drink." Can we find relevant resources? Can we find relevant resources in time? Then if we find them, can we get them, because these resources are sometimes trapped in particular technology implementations? If not, they are bounded legally, so they are not accessible. Even if you can get them, and you find the relevant resource, using the recommenders, et cetera, can you get them? If you can get them, can you are teaching with? These are the problems we are working on at MIT. Actually, some of this is driven by Dave Pritchard. How do we make sure that we find

content that can be easily mapped to different concepts that we want physics students to learn? You saw a whole list of concepts over there.

The second dimension, cultural readiness, is a bit trickier. I will just make one statement: Many of our practices in education are trapped in a model of scarcity. If you look at our business models, our delivery models, our situated-learning models, they all assume that resources are limited, teachers are limited, contact hours are limited and lab equipment is limited. All our models of delivery and business models are premised on this model of scarcity. Now we have this overwhelming abundance, or growing abundance, of resources and communities. We are not just talking about resources that are suddenly widely available. Through social networks, you have a whole bunch of relationships, community, and people. The readiness challenge for us is — how do we productively leverage this abundance? What is it that we do as teachers that takes advantage of the fact that there is all this stuff available over there? Do we need to do all the translation? Can we leverage peer-to-peer communities to do a lot of the sense-making and understanding, so that we do not have to do it all ourselves and so that we can start thinking about how to shift the production function of education? That is the kind of readiness challenge we have, if we are to realize this wonderful potential.

I will stop there and say, "That's my story, and I'm sticking to it."

Science, Technology and Engineering Education In 21st Century Diplomacy and Development

Andrew Reynolds Deputy Science & Technology Adviser To the Secretary of State at the U.S. Department of State

Let me begin by joining others in saying how much I appreciate what Dick Larson and Liz are doing in this program. I know you all join me in that sentiment. It has been an amazing two and a half days, I must say, and I have learned a great deal.

I appreciate the opportunity to speak. I come with perhaps what you might call a 30,000-foot perspective this morning, from the view of Washington. The State Department and the Agency for International Development are working in the very medium and the initiative that you all have devoted your lives to making possible– which is the greater education for the greater good of the larger group of people that have been denied such education over time. I will take you through a number of slides pretty quickly, because there are too many, but let's start.

The first slide summarizes what I would like to cover today, not in any depth, but just to give you a snapshot. Project Horizon is a strategic planning exercise looking at the year 2025. We really have to look ahead of the headlights and not constantly in the rear-view mirror, or we are doomed to repeat mistakes. I will tell you, the world that we see in 2025 is not necessarily a pretty one. It gives the imperative to you even more, as educators, to continue in your hard work.

I want to say this about science and technology: It has been my experience that people collectively use the terminology S & T, science and technology, and they really take the engineer for granted. I think that is a mistake because in many developing countries, it is the engineer who must lead first, in helping to build infrastructure, in the form of schools, and provide lighting, and power and water. This infrastructure is critical for education, as well as the research bench, for better living, better health standards, and so forth.

The next slide offers a nice collection of definitions that I have extracted from the National Academy of Sciences, and National Academy of Engineering. I particularly like this quote from Theodore Von Karman, the brilliant Hungarian, aerospace engineer who came to the United States and is really the founding father of the Jet Propulsion Laboratory in California. Do not take the engineer for granted. Here, in this august institution, I think it is particularly fitting to make that case. I am the squeaky wheel in the State Department and in the A.I.D. for the engineering community. I constantly remind people that engineers are seminal to success.

This is just a small perspective of where we think we are going. The point of this slide is particularly important and is really the pivotal point of my presentation to you today. Never before has our international relations environment been informed so greatly by science and engineering and education. Never before have we been compelled to pay so much attention to these disciplines as seminal ingredients in our international relations

and our development. I can show you many examples in these slides where successive Secretaries of State, since we have opened our office in September of 2000, have seen the importance of science and technology.

To bring it to the present time, our current president delivered a speech at the National Academy of Sciences in April last year. The speech was pivotal to demonstrating that this administration had a significant world view, an appreciation for science and technology and engineering as never before seen. The appointments to the Cabinet, as well as other senior officials, including that of John Holdren, the science advisor to the President – whom many people in this room also know very well – demonstrate that world view across the board. More directly for our institution, Secretary Clinton has also expressed this sentiment. We move into our cosmos, our construct, our ecology, where we are doing everything possible to integrate development and diplomacy as a unified process in the United States government. Our joint strategic goals, illustrated in this slide, I am glad to say, are relatively bipartisan because they began back in the Albright Administration of the State Department and continued through to Colin Powell, Condi Rice and now, Secretary Clinton. So we have built continuity into this joint strategic planning, which is extremely important. I can tell you that bringing together the cultures of the State Department and the Agency for International Development is very difficult. They have two very different histories, and two very different cultures. But this slide points out the strategic goals that we work upon together and work through to demonstrate where our foreign policy and development policy must go.

As seen in the next slide, I have divided those six joint strategic goals into areas where science, engineering and technology can inform, empower and advance. The "hard power" category addresses national security, where science, engineering and technology mean so much, be it in arms control, be it in the export of dual-use technologies, or the policing of technology in the world. The "smart power" concept and the "soft power" concept probably are inspired, if by any single person, by Joe Nye at the Kennedy School, who has worked in and out of administrations for many years. What I am trying to do is show you how these strategic goals are informed and empowered by science, engineering and technology as a general proposition.

This advocacy is part of the reason our office is there in the State Department. Science and technology had become sub-critical in the 1990s, with too few people with scientific and engineering disciplines to really understand and inform how international relations, foreign policy, and development policy should be carried forward. Just as a metric, the Agency for International Development had 15,000 people in the year 1975. In the year 2000, they had 2,000 people. Most of those people were in Washington, just monitoring and administering contracts. What we are doing now is rebuilding A.I.D. at the same time as we are rebuilding the State Department's capacity to follow science and technology.

To continue, the "soft power" points, of course, are humanitarian assistance and promoting international understanding, both empowered by science, engineering and technology. Our consular affairs and management structures, too, are benefiting from advanced technologies and advanced scientific and engineering assets. We have the largest US government physical infrastructure around the world because of our embassies and our missions – in total an even larger number than the Defense Department, in some ways.

This next slide tells you about our mission as an office. I will not go over it except to say that we rebuild and build capacity in people, in terms of partnerships with the outside world, in like-minded ways. We also look to strategic planning, which I will focus upon later. This is a list of many reports in the past that have all pointed to the need to look strategically at the future through the S&T lens. The next slide summarizes Project Horizon, and it is one of the pivot points of my presentation, because it is forward-looking. It is the notion that in our environment at the State Department, and in many of your environments, our world is built on five, ten, and 15-minute intervals – the very short term. Our world is certainly five, ten and 15 minutes, and maybe five, ten and 15 hours most of the time. It is a 24-7 cycle because somewhere around the world, our embassies are working with their host countries. There may be a crisis, and we have to be on call, like doctors, in that sense. While you may have every ambition and hope to sit down in your day-to-day living in the State Department or in A.I.D. and concentrate on something that might take three or five years to realize, often you come through the door, and there is a fire on your desk. So you put the fire out.

In this world of fast cycles – 24-7, five, ten, and 15 minutes – it is also important to try to be "*contemplative*," to take a deep breath, and look at the future. We chose 2025 when we organized Project Horizon in the year 2006, as a milestone. The Defense Department was also looking at that milestone, as was our intelligence community, with the idea that we should think about the world at 2025, anticipate where we are going to some extent, and prepare for that day. The important thing about this exercise was, it was very interagency, with 15 agencies — civil agencies, the Defense Department and the intelligence community — in the room, as well as a select number of NGOs and business community and civil society representatives. It was all open and based on a set of possible scenarios.

The objective function of Horizon was, if this is the future we see at 2025, which I will describe briefly in a minute, how do we prepare for it? What are the critical assets that our U.S. government must develop to be ready? This was done through a very interesting survey of 200 notable people in this field of horizon scanning and strategic planning. The drivers identified in the survey and illustrated in this slide were all distilled into several major dimensions, which in essence framed this scenario-based exercise. The drivers presented a challenge to the nation, state power and influence. They addressed the gap in the global standard of living. They addressed economic competitiveness and threats, because in the end, the State Department and the Defense Department represent the national security community - we have to worry about the fate of the nation and threats to the nation.

This is probably as pivotal a slide as any that I will show you, in this context (see slide #12). These were the 15 major drivers, major factors, expected to characterize our world in 2025, based on these expert interviews. I highlight in red, for obvious reasons, two drivers, one for science and technology competition in the world and the other for advances in science and technology, including disruptive technology, which follows closely what Michael was using metaphorically in "disruptive education." Disruptive technologies are serious concerns for peaceful nations. In a world of ubiquity, where

science and engineering are, indeed, global now, there are also sinister players who would like to use technology against civil society. This is all part of our greater challenge. Those two points are really the most important to take away. Notice that everyone talks about these issues, these drivers, but to focus on your proposition, the greater education for the greater good for the largest number of people, this will all come into play.

The next slide summarizes the Horizon scenario set (see slide #13). We actually constructed 16 scenarios, but we could not game them all. It would have been impossible. So we selected five. The five are in what you might call an "electron cloud, that is created in a future but uncertain space. That is a metaphor I like to use. They are boundary scenarios. Maybe the world will be somewhere within the five, taken holistically, taken collectively. But I can tell you, as a general matter, that the dominant theme in all these scenarios is that with increasing population and pressure on natural resources and the environment, the global commons of the earth are under serious duress by 2025. That is an important point because that is part of the education process we have to undertake, as well.

In short, all these scenarios look to an assault on the global commons. And there is real concern that the international institutions governing those spaces, and the governance community, are not (and will not be) adequate to address those issues in a serious and significant way. Remember, this Horizon exercise was gamed with those five scenarios, in three different workshops, with three different populations, drawn from the 15 agencies, the NGOs and the business community. They mapped their exercises individually. Then we mapped them collectively to come up with these answers. Again, the overall objective of Horizon was, if this is the future we face, what government assets will be needed to be ready for that future? There are ten associated recommendations (They are there for you to read in slides #14 and #15).

The first recommendation calls for a quadrennial strategic review, akin to the Defense Quadrennial Review, which is done every four years. The whole-of- government really needs to conduct strategic planning in that way, on a regular cycle. We do not do that at present. We do strategic planning ad hoc, very ad hoc. As seen in these recommendations, we need ubiquitous and seamless information sharing, domain foresight, fusion groups, and capabilities for global health engagement. In the case of an H5N1 crisis, are we ready? Similarly, we need global hazards planning and response capabilities, such as those we practiced in Indonesia in 2004, and most recently in Haiti. Are we ready with the assets we need to bring to the point of need, for response and recovery?

For this audience, note the next recommendations: a human resources model for global affairs and a "Global Affairs Learning Consortium." Now doesn't that have a significant resonance to you, maybe? That was very government-specific. How do we, in the federal government, empower our own workforce and build a culture that looks to global affairs, and horizon scanning, and foresight? We do not have it. We do it in the strategic planning exercises, but they are ad hoc, as well. We assemble people for one exercise and then you move away and go back to your day job. Our advocacy, and mine particularly, is that we need a culture of committed civil servants, for example, who work

in this career path and are not worried about five-, ten- and 15-minute fires on the desk every day, who have the ability to think outside the box and to look into the crystal ball darkly. Thus arises the public-private partnership framework, the next recommendation, which, of course, is also very important.

The tenth and last recommendation is a real sweet spot for us. We have never used our science, technology, and engineering assets in a strategic sense. We are always very ad hoc. We have a meeting with Indonesia. We have a meeting with Brazil. We have agreements for cooperation, numerous agreements that we utilize for building greater S and T cooperation, education cooperation. But we do not use them as strategically as we might. That is what Project Horizon was telling us to do.

I am glad to say that there is continuity, a bipartisan nature to foreign affairs. Condoleezza Rice's advisory committee took the Horizon outcome, which was a general conclusion for federal government, and said, "How does it apply to the State Department and the AID?" First and foremost, we need to expand our workforce and bring more science and engineering expertise and literacy into our workforce. This is very important for us and for our mission.

The advisory committee also called for better knowledge management. There in the slide you see "Harness 21st-century technology and knowledge management." This continuity, I am pleased to say, has been picked up by the current administration. But just as an interlude, before we go into more detail about the Obama administration, here in the next slide are some of the issues that we address every day, that we think about in the context of horizon scanning, if you will. Many of them are familiar to you. I think there is a richness about this list. I like to have a discussion when I am doing this. If you have a question about any one of these, I would be happy to go somewhat deeper into them.

Notice that that the issues are represented for the short term, the one-, three-, five-year time frames. Then you move into the long term, and you begin to see how Horizon themes come forward. Look at demographics, the megacity issue. Think about the megacities in the world today. Most of them are in the developing world. The infrastructure is inadequate. In fact, there is no infrastructure in many cases. Many of them are located in seismically active areas. Haiti was a precursor to something that could be very much larger, for example, in Istanbul where you have very active faults. The world is always in upheaval. Remember, folks, we do not have any control over Mother Nature. So engineers and infrastructure are needed at the leading edge of a civil society that is growing and urbanizing as never before.

The issue of food, fiber and fuel competition is something we know well, as are alternative energy technologies. I speak to the "adaptation" issue with a capital A, because the climate is going to grind on, and it is going to change as it sees fit. We have huge economic momentum in the industrial system that we have created, so we must begin to pay attention to adaptation, while we try to substitute alternative energy sources and go for deeper conservation in much of what we have before us.

Then, of course, a topic I am sure of very great interest you, is this whole evolution to the next-generation Internet. I take those characterizations in the slide from John Kao's great

book, *Innovation Nation*, which Michael knows very well. We talked about this. There are multilateral organizations and mechanisms that are very much engaged in these and other issues. Just last week, I was attending the Commission on Science and Technology for Development under the United Nations Commission for Trade and Development in Geneva. We have two mandates in that commission. The first centers on traditional science and technology for development. In this case, we are working at present on the theme of distributed renewable energy technologies for developing countries. The second mandate is the follow-up to the World Summit on Information Society, to ensure that global access to the Internet is continuously facilitated by member countries and international organizations. Talking about the gap in broadband access is really the area of greatest concern, obviously. You know that better than I.

The next slide depicts the current foreign policy environment. Secretary Clinton laid out this architecture - these pillars - last summer. In the terminology—"multi-polar" versus "multi-partner world"— the emphasis is not polarity; the emphasis is partnership. That is a new, refreshing turn of phrase. Of course, we are seeing our attempts to engage Iran and North Korea and others falling short, in some cases. Nonetheless, it is a pillar of this administration's foreign policy and is really critical.

The next slide is also critical because it returns us back to the sweet spot of joint strategic planning. I will also outline the Quadrennial Development and Diplomacy Review for you.

Because global health and global response to natural hazards require that all forces, all assets of our national power, come together and work, we need to ensure that civilian and military efforts operate even more synergistically together for efforts in places like Afghanistan and Iraq. Of course, we always must say American values are integral to our specific policies.

This slide addresses the new Quadrennial Diplomacy and Development Review, which, in many ways, has roots from Project Horizon. This administration saw that as a good idea and embraced it last summer. A.I.D. and State Department senior management are going through an arduous process to consider this list of various questions. This is a "hard love" exercise, where you say: "What is good? Keep it. Improve it. What is bad? Get rid of it." So if we really mean what we say about this QDDR exercise, it will create a reform movement. We hope so. Its final process is moving to conclusion now. Policy gaps and organizational change are all cross-cutting themes in the exercise. This is very important because it is so current, and we have been waiting for it.

This leads us to the next slide about the National Security Strategy, in terms of the structure of the United States Government – and really, many governments – starting from executive leadership. The president has a national security strategy, which defines the broad parameters of our domestic and our foreign policy. The speech President Obama made at West Point last Saturday really gave us the first clear idea of what principles will be priorities in this current administration. I think the most important new thing, in my experience, is this: saying we cannot be a good advocate abroad unless we are strong at home. Therefore, the president's, and this administration's, domestic policy is to rebuild the infrastructure, to go to a less consuming, less polluting, more efficient

energy infrastructure in time, to start the process. Above all, it is a priority that we refurbish, strengthen and reform our education system. That is a centerpiece of our national security strategy, I am glad to say.

Another priority in the Obama National Security Strategy is engagement of our world through our diplomats and developers, support of international development, and rebuilding alliances and promoting human rights at home and abroad. This obviously stems from Secretary Clinton's speech, as well. We will see the new national security strategy most likely released this week, for all to see in its complete form, but the President gave us this very nice foreshadowing.

So now back to content of this slide because a year ago the President made this rather seminal speech in Cairo. I have talked to many of you about it here this week. The vision was there in this speech, but sometimes the follow-up in the action has been short of the mark. I would say that this is a difficult process, because the president set a vision, and then the machinery must go to work. This is not unlike what we were hearing this morning with your distinguished panel, about the discussion of an online freshman year versus a resident freshman year. And boy, there are economies in the administrative side that I really appreciate, such as the moat and the bridge analogy of the 70 universities in the area. But I just highlight a few of the important things that President Obama said in Cairo, particularly with the interest of the Muslim majority nations in mind, to reset the terms of engagement and to reach out the hand of cooperation and partnership between our many communities, including in education and business.

The President spoke about mutual interest. He spoke about educational exchange programs and scholarships, and a new corps of business volunteers. On science and technology, he spoke about envoys going out as special representatives for him and Secretary of State to enlist and understand other nations' needs. He spoke about priorities in science, technology and education. That process has gone rather well, I would say. We will come back to some of these issues later.

In the next slide I want you to see that a very important turning point after the President's speech has been a total embrace by our public diplomacy, and our department as a whole, of the fact that science and technology are now underutilized assets in this enterprise of international relations. Everyone feels very comfortable about science and technology cooperation, and we have always taken it for granted. But we have never really given it the champion viewpoint, and publicized it, and demonstrated how important it has been in normalizing relations with so many countries through thick and thin.

A new emphasis that speaks to these things is now at the center of our foreign policy and our development policy. Nationally, we are working in a people-to-people modality. It is just what you are doing here as this LINC networking community. It is meeting with counterparts. It can be facilitated electronically and online, and we are doing that, as well, but it is also about meeting people on their own soil, leveraging existing platforms, and ensuring that the content fits, culturally, with a diverse counterpart. Above all, it is about strengthening the institutions. Education, of course, is fundamental to this, as is networking and e-learning. I can tell you, social networking is now a major theme in the State Department and A.I.D. and we are mobilizing resources to do this better. We have a Secretary of State who speaks about social networking and empowerment of women. You remember, "It takes a village," in her mind. So we have, in essence, a real push to come into the 21st century in the State Department because many would still accuse us of being rather 19th-century in the way we do our business, particularly with regard to our computer systems. As you see in this slide, these are just a few of the virtual platforms that we will be stimulating. We have already established this, but we will go even further.

Of course, we have to put in truth in advertising: MIT and OpenCourseWare are right at the center of many of the things we do. We stood up in Iraq with a Virtual Science Library in 2006, when our scientists and engineers could not meet on a regular basis due to security problems on the ground. The Iraqi Virtual Science Library is a tremendous success. It opens access for Iraq scientists and engineers in universities and ministries to tens of millions of documents, research papers and current information, including OpenCourseWare. Those platforms are something we will be reinforcing more generally in the next phase of our outreach for science, technology and social networking, including with more Muslim and other countries.

The Secretary and her Undersecretary for Public Affairs, Judith McHale, are very much in tune with youth and women and empowerment of less fortunate communities. Why can't we use some of these good news stories to greater effect than we have in the past? We can do more of this and publicize it, particularly when we are working with counterparts in foreign countries who have become leaders in business and in universities, as educators. It is an important thing to speak to the public in foreign countries and say, "Your leadership is needed in science and engineering. This is a part of your culture as well."

This is the sampling of what we now call the "New Beginnings" initiative that the president launched in Cairo on June 4th, last year. There are some very significant ideas illustrated in the next slide. I have just taken a few. The science envoys - Bruce Alberts, Elias Zerhouni, and Ahmed Zewail - have already made trips to the Middle East and Indonesia. They are bringing back information from governments, universities, and other communities in those countries to help us understand where we could concentrate our collaboration in the next phase. We have just announced with Egypt a science year in 2011, I am glad to say, which will focus on education, and STEM particularly, with youth and in universities. The program will bring more scholarships, including greater connectivity to the GLORIAD, which some of you may know. That is a scientific ring for high-density data exchange.

Our office happened to lead the next initiative, illustrated here, in March 2008: the Geospatial Sciences for Sustainable Development in Africa. I like to count it under the new initiatives column, as well. We were out in front, using remote sensing, geospatial sciences and GIS for sustainable development issues, the analysis of issues, urbanization, food security, land use management, watershed, and the compelling issues that arise and are pointed to as flashpoints coming at us. We can get started now, and use imagery as deftly as possible, as quickly as possible, and do it regionally because information and communication technologies (ICTs) have empowered us to do so.

The Summit on Entrepreneurship referred to in the next slide has just occurred. The president actually delivered the keynote speech. It was, again, an outgrowth of the Cairo Initiative to bring the business community together in public and private partnerships on the entrepreneurship side. So we develop a continuum in our ecology, comprising basic science, applied technology, engineering and education, from the bench to the market. Within that is Partners for a New Beginning and eMentor Corps online. We are building a portable website on the State Department website for eMentor, so anyone can come in and look for a venture capital contact, financial manager, or a planner. That is the idea: using e-networking and e-government in a much more nimble way, and for the benefit of a larger audience. There is a technology and innovation fund that the President also spoke about. It is just being organized under our Overseas Private Investment Corporation.

Our mission is on the rise. The administration realizes that what we were saying for the last ten years has to be redoubled and strengthened. We need more scientists and engineers in our midst. At A.I.D.we need to push more scientific literacy and capacity– in the form of officers– to our missions and our embassies where we lost a great deal of critical mass in the last 25 years.

I have a few final thoughts, and I hope that leaves a few minutes for questions you may have. I took notes from the first couple of days. I think Cliff Missen really has something here, because the broadband divide will remain for a great deal of time. I noted the large investment of private capital in Africa. The fact that there are more mobile phones on that continent than anywhere else in the world is remarkable, but broadband access to empower education is another matter. I do not know if Cliff is here today, but I will tell you that his is really a sweet idea, and it is obviously at work. He has been very successful in Africa, and you saw from his map that he is working elsewhere.

I think Andy DiPaolo had a very nice turn of phrase there, as did the gentleman this morning. And then, Milton Chen— I really like his metaphor, "weapons of mass instruction." That is a good takeaway and turn of phrase. Then, of course, ending up with Dr. Vest, I think he said it all: "The uncommon education for the common man" as a driving motivation in his own life. Then this whole notion of why e-education matters, and how it can empower so quickly, because of the great devotion of people like you. Finally, of course, Dr. Vest ended up by saying, "Then came another great thought," LINC and BLOSSOMS.

In this context, and for me, Colin Powell's rule 13 stands out: "Perpetual optimism is a force multiplier." He had 13 rules -that is the one that keeps me going every day, and I hope you, too, as well. Thank you very much.

The MIT LINC 2010 Conference Parallel Presentations



The MIT Stratton Student Center

The MIT LINC 2010 Conference Parallel Presentations

Session #1:

The Internet and Education: Case Studies from Around the World



E-learning in Afghanistan¹

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Abstract

This paper looks at the promise of e-learning in higher education in Afghanistan viewed through the 2006 technological pedagogical content knowledge framework suggested by Mishra and Koehler and the findings of the 2009 meta-analysis and review of online learning studies prepared for the U.S. Department of Education. First, I will discuss briefly the Afghan socio-cultural context. Secondly, I will draw on three years of experience, from 2006-2008, on the development and implementation of the Afghan e-Quality Alliances to discuss the Washington State University strategies for building Afghan capacity and knowledge on information communication technologies, content, and pedagogy. I will discuss the use of free and open source software (FOSS) and open educational resources (OER) and initial attempts by Afghan instructors to create e-learning courses. Finally, I will suggest a way forward to improve the fulfillment of the promise of e-learning in Afghan higher education institutions and to develop policy that articulates a leadership role for Afghan institutions to reach secondary schools and adult learners, with the goal of bringing education to learners of all ages.

Qatra qatra daryaa mesha... Drop by drop, it becomes a river... Dari Proverb

1. Afghan Socio-cultural Context

Geography. Afghanistan is a land-locked country that shares borders with Tajikistan, Uzbekistan, and Turkmenistan (three countries that gained independence from the USSR in 1991); Iran; Pakistan; and China. Afghanistan consists of extremely rugged mountains that reach 24,500 feet, plains in the north and southwest, and sandy deserts along the southern border. This diverse geography explains the difficulty faced by government and development workers in building infrastructure, including telecommunications infrastructure and in building capacity.

Ethnicity and Language. The major ethnic groups in Afghanistan are the Pushtuns, Tajiks, Hazaras, and Uzbeks. As a result of the drawing of national boundaries by the colonial powers all of these ethnic groups are found in the border countries. In addition to ethnic diversity, the Afghans are diverse linguistically; speaking Dari, Pashto, Tajiki, Uzbaki, Turkic, and other languages. Although the Pushtuns make up the largest ethnic group, about 40%, more Afghans speak Dari, a language closely related to Persian/Farsi than Pashto. For teaching at the tertiary level, the language policy under consideration as of 2009 is to shift all teaching in English. In practice, most lectures are done primarily in Dari, with most of the textbooks in English. Language is an e-learning issue since most of the e-resources are in English. While there is material in Persian, geopolitics have prohibited those with U.S. government funding to negotiate resources made in Iran.

Power Struggles. Afghanistan has a long history of internal strife and external invasions and pressures, resulting in alternating fusion and fission (Dupree, 1973). The external invasions have contributed to Afghanistan's heritage including Buddhism followed by Islam. In 1979 a rebellion by the mujahideen, Islamic fighters, against the Marxist government led to an invasion by the Soviet Union. The mujahideens, with covert aid from the U.S., fought the Soviets and in 1989, the USSR pulled out. Power sharing among the mujahideens disintegrated in 1994 and they turned their guns on each other. Different parts of Afghanistan were governed by different warlords with support by different external interests. Disillusioned mujahideen fighters, mostly Pushtuns then formed the Taliban movement. In 1996, the Taliban seized control of Kabul. After September 11, 2001, the U.S. invaded Afghanistan as part of its war on terror. President Hamid Karzai became transitional president and has served as President since December 2001. Given the significant role of multilateral agencies in Afghanistan, many observers question whether Afghanistan is a sovereign country or is an instance of what Bothe and Fisher-Lescano (2002) refer to as global

¹ The author's views expressed in this paper do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

governance. The issue of sovereignty, along with the internal power struggles, has brought into question aid effectiveness and sustainability in higher education and higher education innovations, including e-learning.

Islam. The new Constitution, adopted in 2004, defines Afghanistan as an Islamic Republic and has been endorsed by the newly established government based on democratic processes of Loya Jirga (Grand Assembly) and results of two national elections. Thus, legislation is based on Islamic laws and values which clearly support women's education, but individual ideologies in the government has complicated the decision making process for higher education, particularly with regards to the education of women, as well as, use of ICTs for teaching and learning. Several articles of the Constitution make explicit the link between Islam and education including articles that indicated education is to be based on Islam.

Human Development Indicators. Afghanistan continues to rank at the bottom of the human development index. For under-5 mortality rate for all countries, Afghanistan is ranked number two from the lowest (UNICEF, 2009). Life expectancy at birth is 42.9 for males and 42.8 for females. Adult literacy rate is 43.1 percent for males and only 12.6 percent for females. Along with the 3 decades of war and insecurity, these human development indicators has meant low levels of capacity to deal with ICTs as users or as providers of technical support.

Higher Education. The World Bank (2005) reported that Afghanistan has made notable efforts to revive higher education. The World Bank also reported that 19 higher education institutions had reopened and enrollment had increased from 4,000 students in 2001 to 37,000 (17 percent of whom were women) in 2004; with the lowest university enrolment at 500. The World Bank report identified the key higher education issues as physical facilities, efficiency, quality, relevance, financing, governance and a shortage of qualified faculty members. Only about 50% of the instructors at Kabul University have a Masters degree. Teaching is based on curriculum developed in the seventies and is largely teacher focused. As of 2009 the draft higher education law was still under discussion. The choice between Dari, Pashto, or English as the language of instruction remains to be an issue. According to Ghani and Lockhart (2008) Kabul University students, more than anything else, wanted "to connect to globalization and take advantage of information and opportunity and that students in the Islamic Law School wanted to learn English and be computer literate" (p. 76).

Consider this: a typical 30-year old in 2009, was born in 1979 when the Russians invaded Afghanistan. He would have gone through secondary and tertiary schooling during the Mujahideen and Taliban period. She would not have been allowed to go to school during the Taliban period. The hypothetical 30-year old could be an instructor at the university. The knowledge of a 50-year old instructor would have been frozen in time because of lack of interaction with the outside world, among other things.

To summarize, the constraints to equal access in higher education: About 100,000 are estimated to want to go to postsecondary school within five years and about 1 million in ten years. Women who were banned from going to school and going to work by the Taliban now constitute about 30 percent of the student enrolment in higher education nation-wide. Constraints to educational quality in higher education include a constant refrain from university administrators, lecturers and students about outdated course catalogs, syllabus, course content and textbooks. For example, the Faculty of Engineering has continued to teach from a 1976 course curriculum. Moreover, most lecturers are locked in the traditional mode of lecturing which means that students are passive listeners. Constraints to electronic quality in higher education result from a lack of infrastructure. Although the power supply has improved, most of Afghanistan's 30 million people have no reliable access to electricity. More than 80 percent of the population live in rural areas and depend on traditional fuels for cooking and water heating, and kerosene for lighting. Absence of power also means that most higher education institutions cannot readily use ICTs, including the Internet. This lack of infrastructure hinders the implementation of a solution to the problem of outdated teaching and learning materials. As for Internet connectivity, the government, led by the MoCIT (see Figure 1) and, donor agencies, led by the NATO Science for Peace and Security (SPS) Programme (www.nato.int/science) are implementing plans to develop the national infrastructure to connect to the international gateways.



Figure 1. Map of Afghanistan and Optical Fiber Ring

Higher Education Policy. After the fall of the Taliban, the Government of the Islamic Republic of Afghanistan (GIRoA) followed a policy of centralization/reintegration/elimination with regard to the higher education institutions. The 2005 policy called for the strengthening of regional/provincial universities, including Nangarhar, Kandahar, Balkh, Herat and Polokhome.

ICT Policy. As early as November 2003, the GIRoA Ministry of Communications and Information Technology (MoCIT) set forth an ICT policy that emphasized the use of ICTs in educational efforts so that Afghanistan can "leapfrog" some stages of development, and be better prepared to enter the global economy of the 21st century. The GIRoA viewed ICTs as critical towards educational improvement where large segments of the Afghan population (including women) are educationally disadvantaged and live in rural areas. For this reason, the ICT policy stated: "GIRoA through the MoC, the Ministry of Education, Ministry of Higher Education (MoHE) and associated institutions will take steps to:

- 1. Develop ICTs curricula at both the secondary and tertiary levels, promote participation in related courses (such as computer science, multimedia, communications, and engineering) and develop teacher training and training-of trainers courses in ICTs-related subjects.
- 2. Invite prestigious foreign universities to collaborate with Afghan universities in establishing ICTs research and development programs. This will include initiating the highest level of academic education, including but not limited to Ph.D. programs, in ICTs in Afghanistan.
- 3. Create opportunities whereby students, in particular those in remote locations, can be exposed to technology. These would include Mobile Internet Units, i.e. buses equipped with computers and Internet access that visit schools; Networking Academies that give students and teachers the skills to design, build, and maintain computer networks; and tele-centres that would be operational in schools during and after class hours.
- 4. Support opportunities for distance education, including the establishment of centres that provide access to international online courses. Distance education expands resources available to both students and employees and can compensate for a lack of trained faculty and supervisors.
- 5. Establish partnerships with the private sector to develop and provide ICTs training for business personnel.
- 6. Coordinate public agencies in the training of civil servants in ICTs skills and applications."

Compared to the comprehensive vision of the MoC, the 2005 Strategic Development plan of the MoHE stated only the need to "explore and develop the possibilities of distance education within the country, connecting internationally and partnering with overseas institutions of higher education." With regards to distance learning, Kabul University's 2005 plan indicated:

The rapid development of online courses suggests that Kabul University can address the national need for a better-educated workforce by building the capacity to offer academic and training programs—whether belonging to Kabul University or any other university—throughout Afghanistan. The university will, therefore, work with national and international partners to create a network that can be used to offer a wide variety of online courses throughout the nation.

Afghan e-Quality Alliances. Within the context described above, in April 2005, the Chancellor at Kabul University expressed interest in the potential of what he called distance learning and what Washington State University (WSU) called e-learning; while the words were different both meant the potential for flexible access to content and instruction at any time, from any place. Partly to respond to his interest, USAID funded the Afghan e-Ouality Alliances Program to be implemented as a global development alliance with WSU as the lead implementing institution. The alliances are made up of leaders and stakeholders who work together towards a common objective, that of Afghans building capacity in higher education for sustainable nation building. Achievement of this long-term objective requires: equal access to quality education and e-education resources. Four interrelated results were envisioned: Improved capacity of the leadership and management of 19 higher education institutions to meet standards of excellence and quality assurance; Improved capacity of 5 Kabul-based and 4 regional higher education institutions to sustain services of an Afghans Next Generation e-Learning (ANGeL) Center for Teaching and Learning; Improved capacity (knowledge, attitude and skills) of lecturers to teach students by upgrading their curriculum, course syllabus, and online content in key academic areas; and, Strengthened capacity of Kabul University and the Civil Service Institute to build capacity in public policy and administration. The two key strategies are: Use of Global Development Alliances (GDA) to provide experts with relevant teaching or industry experience and peer to peer technical assistance and training opportunities to achieve shared objectives and the Use of ICT to provide access to up-to-date teaching and learning materials to be shared across 19 universities, to augment not to replace the lecturer, and to enable a variety of learning modes.

This paper will focus on the ANGeL Centers designed to strengthen teaching and learning at all levels and in all contexts at the university, particularly with the use of ICTs. The ANGeL Centers were planned to help lecturers to

broaden their understanding of the learning process and to adopt processes to improve student learning and faculty instruction; help students with critical thinking and study skills; and; support lecturers, students and members of the broader learning community as they invest in personal and professional development. ANGeL Centers were planned at Kabul University, Kabul Polytechnic University, Kabul Medical University, Balkh, Herat, Khost, Nangarhar and Kandahar regional universities. By 2009, except for Kandahar, all the other ANGel Centers have started to function.

2. Technology, Content and Pedagogy: Building early wins

Defining e-learning. Electronic resources, particularly Internet technologies, have blurred the distinctions between traditional learning and e-education, e-learning, online learning, distance education, and distance learning. Common among these terms are three key components present in every teaching and learning situation: (1) a teacher and a learner or learners, (2) a communications system or mode as a learning process, and (3) content to be taught or learned. A fourth component that is becoming ubiquitous is information and communication technologies.

The Afghan e-Quality Alliances uses e-learning or e-education interchangeably, defined as: e for effective teaching and learning where students learn from traditional face to face interaction, as well as global engagement; using both physical and digital content. This definition which is closest to blended e-learning assumes: (1) a mix of lecturers, tutors, facilitators, course coordinators or other students; (2) a teaching and learning pedagogy that involves presentation, practice, assessment, and review; along with a mix of learning tasks and interactive activities; (3) a mix of content; and (4) a mix of technologies CDs, cell phones, the computer, and the Internet. E-learning builds on the notion of Gilbert's connected education (2000) – not among refs.!) and will contribute to the goal of Afghan e-Quality Alliances: equal access to quality education and e-education resources.

This definition which is based on experience has been reaffirmed and validated by the U.S. Department of Education meta-analysis and review of online learning studies (Means et al., 2009). The analysis found that learning outcomes for students who engaged blended learning or a combination of online and face-to-face instruction exceeded those of students who received only face to face instruction or purely online instruction. The study also found that online learning appeared to be an effective option for undergraduates and graduate students as well as professionals.

The discussion that follows is structured around the technological pedagogical content knowledge framework (Mishra and Joehler, 2006). The framework suggested examining three main components of learning environments and their interrelatedness: content, pedagogy, and technology. In Afghanistan, content was needed to address outdated textbooks and teaching materials; training in pedagogy to address rote memorization; and technology to leapfrog access to content knowledge and pedagogical knowledge.



Figure 2. Technological Pedagogical Content Knowledge Framework (Mishra and Koehler, 2006)

Technology. For Internet connectivity, the MOC has the lead in building the national optical fiber backbone that follows the route of the national highway system. To connect the higher education institution to the international gateway, NATO-SPS initiated the Virtual Silk Highway (SILK) project in 2002 to provide affordable, high-speed Internet access via satellite to the academic communities in the Caucasus and Central Asian countries. The Kabul University in Afghanistan was included in 2006. The Caucasus and Central Asia sites are migrating to terrestrial
connectivity with support by the European Union, the new NATO-SPS project "SILK-Afghanistan" will extend the connectivity to initially seven provinces of Afghanistan. In the meantime, Afghan e-Quality Alliances has to pay for expensive bandwidth, about \$4500 for 1Mbps per month. In May 2009, the MoCIT announced that the cost would decrease to about \$400 for 1 Mbps per month upon completion of the Noori Fiber Tech Project.

FOSS. An early decision was to make use of free and open source software (FOSS), thus open office is used for basic computer functions. Software used for the learning management system is Chisimba, a Web 2.0 enabled, Free Software development framework for creating web and distributed applications. Written in PHP5 using the model-view-controller (MVC) architectural paradigm, implemented via the front controller to facilitate cross modular functionality, it has over 100 modules available. The Chisimba framework provides the functionality to create a variety of systems and platforms such as, Content Management System (CMS), Learning Management System (LMS), Collaboration Platform, Blog, Podcasting Solution, and Wiki and many others. The multilingual capabilities of the framework allow localization, and its help system allows for the presentation of basic textual help, or extended help via Flash or video in multiple languages. Chisimba, which is a Chichewa (Malawi) word for the framework used to build a traditional African house, is the product of a collaboration of the 12 African universities, under the leadership of the University of the Western Cape.

To get the instructors ready to create a course on the learning management system, training in the basic use of computers preceded the training in e-elearning. Initial training included basics of a computer, such as logging in, remembering to use the same spelling for logins and passwords, saving, copying and organizing files and images.

Content. Early on, as in the use of FOSS, the decision was made to make use of free and open source software (FOSS) and open educational resources (OER). Access to updated subject matter content was made through a digital library and online course content, especially open educational resources. The digital library, developed under the leadership of the University of Arizona, consisted of a digital catalogue of library holdings in Afghanistan and access to e-books, e-journals. For example, SpringerLink provided access to full-text database for more than 1,250 peer-reviewed journals and more than 10,000 books online, WorldCat (OCLC First Search) provided access to dozens of databases and more than 10 million full-text and full-image articles. Moreover, the University of Arizona Libraries (UAL), in partnership with the Afghanistan Centre at Kabul University (ACKU), collaborated on a digitization project "Preserving and Creating Access to Unique Afghan Records" to add to the digital resources.

Access to content for online courses was provided by the Digital Learning Commons and the MITE/NROC hippocampus. Digital Learning Commons has advanced placement courses that are equivalent to first and second year university level courses. To ensure a quality academic experience, the Digital Learning Commons vetted course content that employed: Course material and organization, student engagement, classroom management (Academic integrity and netiquette expectations regarding lesson activities, discussions, email communication and plagiarism and a protocol for dealing with inappropriate student behavior), student assessment, course evaluation and management (feedback), student support, mentor support, and ease in navigation.

The National Repository for Online Courses (NROC) based at the Monterey Institute of Technology and Education (MITE) provided access to the hippocampus courses. The focus of NROC is general education subjects, such as algebra, biology, and U.S. History. These courses were developed by NROC with course developers and evaluated using the NROC course development guidelines. NROC has contributed additional development resources to ensure that the content is editorially rigorous, complete from a curriculum perspective, and the technology is compatible with popular content management systems. All courses include presentational materials, problem sets, assessments, and all necessary teaching materials.

Access to educational e-resources has been beneficial with regards to addressing the problem of outdated textbooks. To appreciate e-resources, training included navigating the courses, using search engines, identifying and applying criteria to articles, and using bookmarks. Mindful that access to e-resources does not necessarily translate to improved use of the materials for teaching and learning, training for instructors included a module on pedagogy.

Pedagogy. Pedagogical knowledge was based on the following principles: (a) e-learning does not serve as a replacement for face to face instruction but as an enhancement of the face to face learning experience; (b) a range of learning experience included traditional didactic where content knowledge is transmitted by digital devices; active learning where the learner works with online drills, games, and simulations; and interactive where the learners learns from interacting with others through online discussion forums, collaborative projects, etc; and (c) a mix of synchronous activities, with instruction happening in real time or asynchronous, with a lag time between online stimulus and response.

Training about effective learning and education that uses electronic resources utilized a teaching and learning methodology adapted from experiential education theory. Using this four-step progressive/recursive design methodology, material covered during this course would be systematically presented (Step A), practiced (Step B), assessed (Step C) and reviewed (Step D). Starting at the top of the circle to the right, Step A represents the

introduction to new materials such as theory and skills. Progressing to Step B, participants will practice the application of the newly presented materials. Once applied, participants will assess their work in Step C, which will lead to a reflection or review of lessons learned in Step D that will inform and influence the next progressive iteration the learning cycle, with Step A.



Figure 3. Teaching and Learning Methodology

A full progression of this methodology was attempted each day of the training event. For example, the first day of this training focused on the fundamentals of eLearning, where materials were presented during the initial part of the day (Step A) and learning activities centered on the application of these materials were conducted during the latter part (Step B). Concluding the day, participants were asked to assess their understanding of the fundamentals of eLearning (Step C) and to identify questions and unresolved related issues for the next day's session (Step D). The second day built on the materials introduced and practiced during the first and were guided by the participants' assessment and reflection on the lessons learned form the first day. This training is considered progressive in that each step builds on the previous. This training is recursive in that the material presented in one day was reviewed and applied in a subsequent day.

Putting It All Together. To link technology, content, and pedagogy together, a special training program was designed. The learning outcomes were for the instructors to be able to:

- Explain distance learning/eLearning/e-Education/blended learning and why it might be useful for their institution; it was important to get past the notion of doing away with the instructor or face-face learning to the instructor being able to enhance face-to-face instruction with e-resources. To own the e-learning process, instructors had to explain why e-Learning might be useful for their institution, highlight the top five challenges that decision-makers must face in order for e-Learning to succeed at their institution in Afghanistan, give their definition of e-Learning considering the level of development in Afghanistan, and articulate what pedagogy (teaching and learning methodology) could be used to deliver e-Learning.
- 2. Search the web and the Afghanistan Digital Library for examples of course syllabus and course materials that are relevant to the courses that they are teaching; for the instructors searching the web was a new experience while evaluating sites using criteria that they would use for textbooks and journals was an old skill that could be transferred to the online environment. In addition to learning the mechanics of navigating an online course, this provided an opportunity to experience the look and feel of online courses.
- 3. Experience ANGeL as an eLearning management system, from the perspective of being a student; this required relating the key functions of Afghanistan Next Generation e-Learning (ANGeL) to the practices of good teaching and learning.
- 4. Design an eLearning course with learning outcomes, tasks, and assessments to be uploaded on ANGeL; the first task was to write a syllabus for their e-learning course, followed by creating learning outcomes, e-lectures for each learning outcomes with links to e-resources, creating learning tasks and activities, and creating learning assessments, and,
- 5. Upload an e-learning course on ANGeL, including setting-up a discussion forum and developing online tests.

To achieve the desired learning outcomes, learning tasks and activities were consistent with Bloom's taxonomy of educational objectives in the cognitive domain (knowledge, comprehension, application, analysis, synthesis and evaluation). In addition to the short e-lectures, students were expected to participate in the following tasks and activities: Read for knowledge and comprehension; reading materials are shown as links or can be downloaded from the file manager; Search the digital library and the Internet for additional information; Discuss, analyze and synthesize lessons and reading materials through online discussion forums and, eventually through forming

communities of practice for face-to-face interactions; Interact with others by email and face-to-face interviews; Create presentations to be presented live for feedback and assessment; and, Create an online course.

Feedback. Instructors who attended the training courses in July/August 2009 provided positive feedback about the potential benefits of e-learning. A prerequisite was for instructors to have taken classes on Open office courses in word processing, spreadsheets and doing presentations. Most of the instructors had limited experience using the Internet. So that the instructors could better explain e-learning, distance learning, and online learning to themselves, their deans and to the Ministry officials, the online discussion forum was introduced and proved valuable in capturing responses. The instructors enjoyed learning how to search and find material relevant to their subject areas. For example, medical faculty were pleased with Medline after they figured out how to navigate the site. Islamic law faculty instructors were pleasantly surprised about the number of articles on Islamic law found in Google, Google scholar, and Google books although they were disappointed about the paucity of materials in Dari or Pashto, to which encouragement was provided to create their own materials and contribute to the knowledge base. To a person, the Afghan instructors saw the benefit of the Internet as a place to update their subject matter knowledge and thus improve their course curricula and their students' learning. Some of the instructors noted that they could ask their students to do web searches, evaluate or rate the sites, and make recommendation for sites that could be useful for their courses. The instructors also saw the benefits of the online discussion forum as a way of managing frequently asked questions, expanding student participation to other universities and locations in Afghanistan and beyond, and co-teaching courses. The tools for making online quizzes and creating surveys were also well received.

One faculty member from Kabul Polytechnic University writes: It is very good, interesting, enjoyable and easy to use (for me). I am teaching my subjects (Environmental Geology, Practical General Geology, Engineering Geology and Hydrogeology, Sedimentology, Prospecting and Exploration of Solid Mines, Physical Geography and GIS) through this site. I started my teaching with the subjects of Environmental Geology for 35 students and General Geology for 42 students. Students were very pleased about using the Internet for learning, when they pass the exam they were excited because they had found the result in one second after finishing exam.

Instructors also had a chance to test drive the advanced placement courses provided by the Digital Learning Commons and the hippocampus provided by the Monterey Institute for Technology and Education's National Repository for Online Courses. The instructors noted how well these courses were done but expressed doubts about access for their students, considering the number of computers and the slow bandwidth. Finally, instructors learned to create their own courses. This required working with the technology and making decisions as to which modules (online discussion forum, blog, multiple choice test, etc) would be helpful. The instructors had to prepare a syllabus, write learning outcomes, decide which Internet resources would be useful, make links, add e-lectures, write learning tasks and activities and assessments,

The instructors recognized that challenges for successful roll-out of e-learning courses included limited access to computers for students and faculty members, poor and unreliable Internet connections, and limited student and faculty experience using the Internet for teaching and learning. The instructors said that they would continue to develop the e-learning courses that they started in class, stressing the importance of getting more practice and follow-up training on the use of wikis, rubrics, and other plug-ins.



Figure 4. Instructors getting help from their sons to navigate computer

3. Conclusion and Way Forward

Despite the contextual challenges, Afghan instructors from Kabul University, Kabul Polytechnic University, Kabul Medical University, Balkh University, Herat University, and Shaik Zayed University could appreciate the benefits of the Internet as a place to read information as well as a means for connection and collaboration. Without fully realizing it, the Afghan instructors who have participated in e-learning workshops have made initial steps toward using the Web 2.0 concept for teaching and learning.

To maintain the momentum to fulfill the promise of e-learning, a concerted effort for follow-up discussions with NATO about fast-tracking the provision of bandwidth and with content providers, such as Digital Learning Commons, Springerlink about continued provision of free access to open educational resources, and for several levels of follow-up training is crucial. Training should include how to make use of open educational resources as face-to-face enhancement, with an emphasis on the pedagogical aspects of the available content and on using components of the software technology for active and interactive learning. For example, the hippocampus course on Environmental Science has suggestions for discussion topics, as do other hippocampus courses. The instructor could compliment these courses by setting up an online discussion forum or blog, along with the corresponding points toward a grade to be awarded for student participation. Discussion forums could be set up not only for students at a particular university but could be opened up for other students inside and outside Afghanistan. Moreover, training for instructors should include how to put together content, pedagogy and technology by creating their own courses for use by the Afghan students. Additional training for instructors on moderating online discussion forums, grading e-portfolios, including blogs and wikis, and designing online tests could be provided. See table 1 for illustrative modules, learning outcomes, and learning activities. Furthermore, to support e-learning in higher education institutions in Afghanistan, training is needed on how to modify the online learning management software to suit the Afghan learners, how to manage the network and bandwidth, and how to assure information security within the network. Instructors who already see the benefits of e-learning could serve as e-learning ambassadors.

Finally, there are e-learning policy issues that need to be considered if the goal is to embed e-learning by making it integral to broader strategies for teaching and learning not only for higher education students but also for secondary and adult learners. The policy dialogue should include a debate on why an investment in e-learning will help education goals, what is the economic rationale for investing in e-learning, what are the strategies to develop and sustain physical infrastructure, and how to coordinate infrastructure efforts between external donors and several Government of Afghanistan Ministries, particularly the Ministry of Communications, the Ministry of Higher Education, and the Ministry of Education. Moreover, the e-learning policy should consider lessons learned from current initiatives to support the objective of building and ensuring quality in e-learning, develop formal and informal collaborative and cooperative arrangements between the higher education institutions inside and outside Afghanistan, plan a leadership role for higher education institutions in building e-learning programs for secondary and adult learners, and, support research initiatives to create a more systemic approach to e-elearning.

Table 1. Illustrat	ive Training Modules, Learning Outco	mes, and Learning Activities
TRAINING MODULES	LEARNING OUTCOMES	LEARNING ACTIVITIES THAT
	At the end of this training module,	DEMONSTRATE KNOWLEDGE OR
	participants (instructors) will be able to:	SKILLS
TECHNOLOGY	-Demonstrate knowledge about ICTs,	-Using the computer
	including the Internet	-Using open office or its equivalent
	-Demonstrate skills required to operate	-Using the Internet
	ICTs	-Using search engines
		-Using skype
		-Using video conferencing equipment
TECHNOLOGY	-Relate technology and content	-Using technology (Afghanistan digital
CONTENT		library, open educational resources) to
		access content through the Afghanistan
		digital library
		-Creating course content
CONTENT	-Demonstrate knowledge of subject	-Evaluating websites based on knowledge
	matter that is to be taught and learned	of subject area
		-Recommending websites
		-Constructing knowledge
PEDAGOGY CONTENT	-Arrange course elements for better	-Arranging course elements (learning
	teaching and learning	outcomes, learning tasks and activities,
		learning assessments) for better teaching
PEDAGOGY	-Demonstrate knowledge of processes	-Explaining learner centered, outcomes-
	and practices or methods of teaching	based, experiential, active and interactive
	and learning	learning
		-Writing learning outcomes
		-Developing learning tasks and activities
		for active and interactive learning
TECIDIOLOCY		-Designing assessments
DEDAGOGY	-Relate technology and pedagogy	-Searching the digital library and the
PEDAGOGY		A un station a blass
		-Annotating blogs
		-Designing online discussion activities
		-Moderating online discussion forums
		-Designing online group conaborative
		Rating and recommending websites
TECHNOLOGY	Relate technology pedagogy and	Creating courses for a learning
PEDAGOGY CONTENT	-Relate technology, pedagogy, and	-Sharing knowledge (blog wiki website)
TEDAGOGT CONTENT	content	-Bating websites books
		-Discussing analyzing recommending
		websites
		-Forming interacting with communities
		of practice or social networks
		-Editing and commenting on wikis, etc.
		-Participating in creation and completion
		of evaluation survey
		-Creating presentations for face to face
		feedback and assessment
		-Designing assessmentsonline tests, e-
		portfolios (documents, annotated blogs to
		share knowledge, presentations, essays,
		reflections)

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E-learning in a Nigerian Open University

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Abstract

The issue of e-learning in developing nations is beset with paradoxes. First- developing nations want to move with the trends in the provision of open and distance learning hence they are interested in e-learning. The use of e-learning however has its own challenges in terms of infrastructural provisions in form of electricity, broadband, computers and inter-connectivity. There are also the challenges of availability of personnel, the capacity and expertise in on-line teaching and tutoring, attitudinal dispositions of stake holders like students, tutors and even institutional providers themselves. These challenges facing e-learning in developing countries are ongoing and require the attention of all stakeholders. This paper, based on the development of e-learning in the only open university in Nigeria, discusses the process of establishing one, trying to situate it within the challenges mentioned above.

Introduction:

The emergence and proliferation of new information and communication technologies (ICT), had introduced an unstoppable revolution into education particularly in the areas of teaching and learning. The Internet and the web have further raised the revolutionary tempo especially through the enhancement of e-learning. For most open and distance learning providers, e-learning had added another dimension to the issue of access. While open and distance learning, ODL, itself is hailed by nations as bailing them out of the problem of providing access to education to the masses, e-learning is further extending the frontiers by further removing distance from education and helping individuals who can, to access education any where, any time, at their own pace and at any place. E-Learning or On-line education offers students excellent opportunities for individual communication with their study materials, study resources, and their tutors. With the asynchronous nature of on-line learning, learners can be in contact with their tutors and study materials and even colleagues on a 24/7 throughout the year. For the purpose of this paper, we would want to adopt Keegan's rather old but simple definition of on-line education which he said is "characterized by: the separation of teachers and learners which distinguishes it from faceto-face education, the influence of an educational organization which distinguishes it from selfstudy and private tutoring, the use of a computer network to present or distribute some educational content, the provision of two-way communication via a computer network so that students may benefit from communication with each other, teachers, and staff" (Keegan, 1988), linking it with the description of e-learning which Kaplan-Leiserson (2003) said, "... covers a wide set of applications and processes, such as Web-based learning, computer-based learning, virtual classrooms, and digital collaboration. It includes the delivery of content via Internet, intranet/extranet (LAN/WAN), audio and videotape, satellite broadcast, interactive TV, and CD-ROM" (Kaplan-Leiserson, 2003) It is important to bear this in mind because at the National Open University of Nigeria, e-learning activities started with the most basic, the use of audio tapes and progressed to the use of CD-ROM, interactive video and now, the university has a most standard e-learning laboratory using one of the best Learning Management Systems, LMS, available.

E-Learning at the National Open University of Nigeria

The National Open University of Nigeria, NOUN, sprang from the ashes of the defunct National Open University, which was abruptly closed down by a military government in April 1984, barely one year after its establishment. In the year 2000, after an international workshop co-hosted by the Commonwealth of Learning, COL, and the Nigerian Federal Government, the years 2001 – 2010 were declared a decade of open and distance learning in Nigeria.. Thereafter, a time-line was drawn for series of activities and implementation strategies. One of such strategies was the resuscitation of the defunct open university which now had to be re-named National Open University of Nigeria (NOUN). It was clear in the mind of the planners right from the beginning that e-learning or on-line learning would play a major role in the teaching and learning delivery system of the university. The following gives a step-by-step description of the e-learning activities of the university

Objectives:

The main objective of the NOUN e-learning efforts is to encourage staff and students of the university to adopt an innovatory approach to educational provisions and instructional deliveries and imbibe the culture of using technologies to support such provision and deliveries.

Specific objectives:

Some of the specific objectives are:

- 1) to sensitize staff and students of the university towards the use of *e-learning tools*
- 2) to develop capacity in e-learning and provide leadership in this aspect of ICT utilisation in Nigeria and within the West African sub-region
- 3) to raise general awareness of the academic community of e-learning tools
- 4) to provide systemic and continuous support for staff and students in the use of e-learning
- 5) to initiate a culture of innovation which will lead to experimentation in educational provisions
- 6) to include e-learning in the portfolio of teaching and learning tools at NOUN
- 7) to establish and disseminate good practice in this area of teaching and learning in Nigeria and within the West African sub-region
- 8) to provide, as part of the university's strategic plan, a sound infrastructure for the development and delivery of e-learning tools and services

We now describe in a systematic manner the various steps taken in establishing the elearning tools and services in NOUN. In doing so, we shall be taking cues from the DEC guidelines for online programmes in distance education*.

1. ORGANIZATIONAL STRUCTURE

In organizing an e-learning and on-line programmes, the National Open University of Nigeria followed strictly the 'Blue-Print' prepared for the university in 2002. The technology aspect of the blue print provided for two Directorates in the area of Technology viz the Directorate of ITSS and that of CNSS. While the former is charged with issues relating to hardware, the latter takes care of networking and software issues. This arrangement thus ensures that there are persons in charge of the university's on-line programmes to coordinate both the programmes and the human resources needed for the smooth operation of the programmes and the integration of the technology infrastructure. The two Directorates in-between them also provide technical persons to administer the technology as well as the LMS to be deployed and provide instructional design

support on the LMS. Further, the university's intention was to adopt a tripartite approach as she launches her on-line programmes. First is an in-house development of the e-learning and on-line programmes hence the staffing of the two Directorates ensured that there were staff recruited to develop e-content. These staff were trained to acquire the needed capacity and especially refocused on the in-house style of the university in the development of e-content. The second plan is to out-source part of the LMS development including the relevant e-content. This is because in ODL, teamwork is the predominant approach. Further, such out-sourcing may also help to improve quality assurance when inter-mixed with the in-house development. The university's iLMS is currently under development by experts to whom it is outsourced. It is going to be a truly African product with the tidbits of cultural influences on learning not included in commercial LMS available on the market. The staff of the two Directorates, as well as other academic staff of the university, the course material designers, and other relevant staff, are already liaising with the agency on regular basis to ensure a quality product. In developing her own iLMS through some notable experts, the university had suggested that the experts bear in mind the need to be as eclectic as possible so that in terms of technology to support both asynchronous and synchronous instruction, the consultants should try every imaginable and available tool (websites, wikis, blogs, Second Life, e-mail, Twitter, course management systems, video/audio podcasts, Facebook, threaded discussion lists, video/audio/text chat, video conferencing software, and lots more). Eclecticism here means that even the old and conventional practices are not discarded in the development of e-learning platforms in developing nations. The NOUN iLMS is to be designed to accommodate a platform like a graphical MOO, which contains a text chat pane on the left and a display pane on the right in which the facilitator can show just about anything online -- webpages, presentation slides, graphics, video etc. It has been argued that a social network tool like the "Facebook really is nearly ubiquitous in our current information environment. Any willing person really can use it, if they know of a purpose, see value, and are informed about their privacy options, and students use the facebook to learn, create learning circles and community of scholars without any costs implication for the university. It has also been found that most students spend long hours with the face book, and, if providers can integrate its use in instructional delivery, students may gain more and become more motivated in their learning. In fact, the university's iLMS was presented and test-run early December 2009. The third was to adopt some of the existing LMS, looking for those that are actually robust enough in terms of fulfilling all the criteria of a quality LMS. The last stage of organization here is the Help Desk. The university has a well developed and well staffed help desk, visitors' information and call centre, VICC, which services both off-line and on-line activities. It is planned to be a 24X7 Centre, with adequately trained staff for chat services for all categories of enquirers. With our ever growing student population majority of whom are still grappling and struggling to become computer literate, the VICC will fill the gap of tutoring stuents on the correct and approprioate use of and interaction with the iLMS. This is a major support service to all students as NOUN launces her iLMS. More on support services later.

PLANNING AND DEVELOPMENT OF ACADEMIC PROGRAMMES - COURSEWARE

Planning a suitable online courseware format

Selection of appropriate authoring tools and relevant hardware (Server, LMS platform, etc.); The online programme should emanate from/ or at least be a part of the perspective plan; Development of online programmes should go through three stages namely: Programme formulation, Instructional Design and Development of courseware, which is as follows:

The NOUN on-line programme is an integral part of the perspective plan of the university to develop a sound e-learning environment. It cannot be denied that e-learning is a dynamic effort and changes could come up at any stage of the development or even at the course of implantation and running. NOUN had thus planned for an up-to-date courseware format, while bearing in

mind the most appropriate authoring tools and most usable LMS platform. The A-Tutor is the currently most patronized by the university though attempts had been made to also introduce the MOODLE and as noted earlier the university is developing an in-house LMS known as iLMS. The following were the stages of concern to the university and due attention was paid to these during the development:

Programme formulation:

Need Assessment: As a new university, it was not difficulty doing the needs assessment. The university needs every aspect of the e-learning environment that will make the programme succeed

Defining Target Groups: The target group consists of all the students, the staff and of course the prospective students of the university. Knowing that this is going to be the first open university in the West African sub-region, a broad target group became mandatory. Further, bearing in mind that the open university's main aim is to provide access to virtually anybody who knocks at her doors thirsty of education, the university prepared for almost all levels of programmes beginning from certificate programmes, diploma, first degree and postgraduate programmes. This is not an easy thing to do in starting or creating an e-learning environment. To give it a distinct identification, the NOUN house-style was developed and adopted and all concerned were trained in the NOUN house-style. To test run the whole thing, the university decided to use first the A-Tutor with the hope of adding other viable and culturally robust LMS later, with the iLMS becoming a default platform.

Instructional Design:

The structure was formulated to be eclectic and this makes it easy to adopt a media-mix by which text, audio, video, multimodal, approaches have to be used. Course outlines were now developed for each course unit based on appropriate course delivery planned for the level/course. A carefully thought-out assessment procedure was in-built, taking into consideration the facilities available for such and other delivery strategies in the A-Tutor, and especially the iLMS to be used.

Courseware Development:

The university was particularly lucky in that she inherited a group of professional staff who had been charged with responsibilities of developing media-based materials for teaching and learning before the establishment of the open university. These staff were carefully screened and those with relevant skills were further trained to both take care and supervise others in the areas of Content Development, Content Editing, Format Editing, Language Editing, Development of Graphics, Illustrations, Animations, etc. These category of staff were also very helpful at the stage of finalising the E-content though other staff from the ICT directorates have to join at this stage too. Of course the ICT staff were responsible for uploading courseware on the LMS, and for pre-view and testing of access. The two directorates are also charged with responsibilities for periodic assessment of the entire programme to ensure constant revisions and material updating. In all, there was emphasis and focus on ensuring that the course content was appropriately pitched and the iLMS is culturally compliant.

Courseware developed were in self-learning format, having adequate hyperlinks pointing to relevant resources and as pointed out earlier, they were also in the form of a media mix comprising of text, audio, video animations, etc. Production of courseware was done both in-house while a few were out-sourced. With the assistance of a Canadian university many of the staff of the university were trained in developing e-content and those with advanced knowledge were charged with duties of continuous training of the staff since many of the university staff were new to both open-university system and the e-learning environment. The various entry and exit points approved by the university Senate were used as guides for example in defining the study input for each programme in terms of credit loadings etc.(see Table 1)

Level of	No of Credits	Duration		
Programme				
Certificate ;	18	6 months		
Proficiency				
Diploma	60	2/4years		
Access		9 months		
	30			
First Degree	120	4 /8years		
(Bachelors)				
Bachelors	90	3/6 years		
(Direct Entry)				
Postgraduate	36	9 months		
Diploma				
MBA/MPA	45	18/36 months		
MA/M.Sc	36/42	12/18months		
		(24/36		
		months)		
Ph. D	60	2 /4years		
	90	3/6years		

Table 1: Norms for offering programmes through distance mode at the National Open University of Nigeria based on credit system

In approving the credit loading, the Senate was very much conscious of having to ensure parity with the conventional universities since the issue of quality and societal acceptance comes in here. Further, learning from experiences in the area of study material production and distribution, the university ensured that Courseware was uploaded before the launch of programme and as soon as the launching was done, the Courseware had been available at all times for the students to access and use.(see able 2)

S/N	Schools	Printed		CD's		WEB		Braille	
		*	**	*	**	*	**	*	**
1	SASS	175	177	73	77	160	164	29	29

Table 2: Overall breakdown of Course materials Printed on CD and on the Web

2	SST	131	134	57	65	155	123	3	3
3	SBHRM	97	97	76	79	117	120	1	1
4	SLAW	24	24	13	13	27	27	-	-
5	SED	86	86	22	23	73	74	25	25
Total	5	513	518	241	257	492	508	61	61

Additional 5 in print, 16 in CDs and 16 on Web.

Overall summary of table (ii) above indicate that:

(i) 518 course materials are in print.

(ii) 257 course materials are on CDs.

(iii) 508 course materials are on the Web.

(iv) 61 course materials have been brailed.

3. DESIGN OF E-CONTENT

The design of the e-content was done in two ways. Some aspects were outsourced while others were developed internally by the university staff. E-content, as noted earlier, was mainly in the form of text, audio, video and animation. The number of credits was determined on basis of the outline and as approved by Senate. Provisions were made for interactions, chats, assessment and evaluation, and also online counseling. Each aspect of the content was based on principles of self learning.

4. STUDENT ADMISSION

To ensure success in the operation of the e-learning environment, the university decided to link the university –wide online admission processes to the e-learning platform. On-line admissions, registration, e-payment and all related matters were out-sourced to the E-transzact. Each student was provided a wallet into which all payments are made. There are various sub-heads in the wallet depicting the particular thing for which payment was made. This was made to be as userfriendly as possible and every student and prospective applicant can easily go in to apply and make needed payments. As soon as payments were made, receipts were immediately generated and codes assigned for future use by the student. As soon as a wallet is created/opened the student is assigned a pass-word which enables him/her to access the wallet in subsequent transactions and no one else can gain access to the wallet.

5. LEARNER SUPPORT SERVICES

The National Open University of Nigeria places much emphasis on learner support services and she has one of the most robust learner support for off-line students. In developing the e-learning environment, the university is aware that on-line students could even be more isolated and more bored learning on their own than off-line students. For this reason, a well-designed learner support was integrated into the on-line provisions. To adequately cater for interactivity and constant interaction, there are provisions for online chat rooms, e-mail facility, bulletin boards, video conferencing etc. accessible to both academic and non-teaching staff, registered and prospective students. As noted earlier, one of the first things provided is a Help Desk called the visitor information and call centre, VICC. This centre provides services to prospective students, the larger public and even staff in the areas of both academic and administrative support services to all. The centre, fully staffed with well-trained staff, provides information as well as referral to all callers. It should be re-emphasised here, however, that apart from instructional facilitators, every study centre has at least one student counsellor who provides services such as dissemination of information, self study tips, assistance with development of study skills and

habits, helping students to handle their assignments especially TMAs, helping with orientation, registration and course management strategies, counseling and tutoring services, vocational guidance etc. In addition, the study centres also provide multimedia support, library services both mortar and brick libraries as well as digital libraries for which each registered student is given an access code, evaluation of assignments, feedback, guidance of project work, organisation of seminars and conduct of paper and pencil as well as online examinations and other related services. The VICC as an arm of the learner support services, also provides information and referrals to all categories of callers. Such referrals could be for counseling, further information, or to other units and departments of the university which could provide the necessary help to the caller. To further help the work of the VICC and the learner support directorate, information on available support services are usually prominently displayed on the web for users to see and these are occasionally flashed to call attention of users to such available services.

Student counselors at the study centres, a number of instructional facilitators, technical staff at the ICT directorates and other staff are trained to handle chat and discussion forum online as well as to maintain, in a most confidential manner, online records pertaining to:

- Tutor- Counselors and Staff
- Students Registered
- Counseling Sessions
- Assignments Received, Evaluated and Returned Student Queries
- Administration and Finance
- Student feedback about the course, delivery, counselor/teacher, facilities, environments, etc.

Learner support services directorate as well as the VICC have their servicom charter, which provides a time frame policy for replying to the students' and other callers' queries within the stipulated time. Further, as part of learner support, the university had introduced on-line periodic webinars on contemporary or significant topics and self-help topics that are geared to helping on-line students on guides and strategies for learning, time management, preparing term papers, handling of TMAs etc. and, from time to time, information about such webinars are displayed on the website and e-mailed to all the concerned instructional facilitators, academic staff and students.

Though online support services are at their infancy in the university, significant progress had been made in the development of such services and it is hoped that all concerned will keep taking advantage of these services.

6. LEARNER ASSESSMENT AND EVALUATION

University examinations form part of the quality assurance of any given university in Nigeria both conventional and open university. In fact NOUN appreciates the fact that the sanctity of her examinations, the quality of the examinations, the organization and efforts made to ensure that leakages, mis-conduct etc are prevented will form part of the yard stick by society in accepting her programmes and certificates. The university thus creates a directorate of examination and assessment, DEA. First, the university Senate emphasises the use of TMAs as a form of formative assessment, providing regular feedback to each student through tutor comments on the TMAs submitted, thus helping the student to gauge his/her performance and progress in the courses registered for. Senate also directed that in addition to the TMAs, Formative assessment should be through online computer marked assignments. Individual and group projects, discussion forum, and webinars are clearly linked to the objectives and desired competencies / skills or expected learning outcomes of each course. Senate also directed that the turn-around

time for providing feedback on performance to the learners should not exceed two weeks and definitely before the end- of-semester examination commences. Formative assessment for all on-line courses should also be on-line. Senate also rules that this form of assessment should contribute 30% weightage in the overall assessment. Summative assessment is usually in form of end-of-semester examination which are usually conducted online in a proctored system. The university currently experiments with and uses MAPLES T.A for the e-examination. Staff of the university are studying and critiquing the software and had been identifying areas that need improvements to accommodate issues like setting and marking essay tests, providing for systematic coverage of the taxonomic spread and immediate generation of transcript. The MAPLE T.A is quite user friendly and examinees have no difficulties interacting with the platform. In a similar manner, the assessment aspect of the iLMS, the university in-house platform, is as friendly as MAPLE T.A. The iLMS too is grappling with the issue of assessing essay questions in addition to the other formats. It can however unlike the MAPLE T.A. immediately handle issuance of transcripts, provide for acceptance an processing of credits transfers and automatically merge TMA scores with end-of semester exam scores.

7. TECHNOLOGY INFRASTRUCUTRE AND USE.

The NOUN web site, <u>www.nou.edu.ng</u>, has become very familiar to all students including prospective students and the larger public. The website contains all the relevant information, about various courses, fee structure, rules, examination schedules and time-table, etc. Information had been provided for all prospective users about the technical requirements to join NOUN's online programme; and a reliable access to a LMS had been installed on the NOUN server. Every registered student is assigned an e-mail account and the mobile phone number of every student is available for mass SMS text messages. An in-built regular orientation, registration an examination registration procedure is available. A "Help" system is available, to help all users of the platform to become more familiar with technology use and any changes in the environment.

How far and how well?

The e-learning attempt by the National Open University of Nigeria is new to all stake-holders concerned – students and staff alike. Given the age of the university, we cannot yet boast of grandiose success. There is need however for us to take an in-depth look at the attempt to date and tease out what lessons had been learnt so far and what the prospects are likely to be. The university had graduated only one set of post graduate Diploma students. We cannot honestly say that any student has graduated using full e-learning methodologies. However it may be safe to state that in NOUN, a blended approach is being implemented whereby print materials are made available to learners supported with materials burnt on CD-ROMS as well as placed online, probably with a 60% - 40% ratio (see table 2). In that sense we can say the students that have graduated used some form of e-learning in their studies. Those students who had graduated however were not exposed to the iLMS which is original to the university and which is recently been gradually introduced.

Lessons learned:

The practical reality on the ground is that NOUN is applying e-learning as a new delivery method in an academic culture that is predominantly used to a face to face course delivery. The university had also gone ahead to develop an 'indigenous', home-grown platform which incorporates a judicious mix of technology, content, media, graphics and delivery, one that factors in cultural, socio-emotive, cognitive and even digital divides, since the university is quite conscious of the wide age gap differences, (16 - 75) of her students. This gap as is well known,

"encompasses such disparate groups as the unemployed, returning to work, new starters, over 55's - the 'lost generation' who have typically missed out on training and *educational* opportunities and will benefit greatly from a raised awareness of IT and new computer skills which will raise confidence for re-entry to the workplace and *a drop-in back into education*" (Walker, 2003) (italics mine)

In her attempt to make the programme fly, the university -planned and effected a staged roll-out, provided awareness at each opportunity at the various quarterly forums with students and course facilitators, at Faculty Boards, and in Senate meetings, and then, had intensified capacity building and in-house training for all staff. This step led to huge creation of interest in the e-learning efforts of the university and the lesson learned here should not be lost on the university, i.e. create internal awareness for your new programmes and train staff to use them. Talking specifically of the iLMS just been introduced, the following are obvious things learned.

It integrates school management with the Learning management system (LMS) which is not found in other systems; we learn from here that it is more beneficial so to do. Further, it has full support for equations and symbols, this is not too common and the workability in this regard had taught its own lesson. Further still, it has an easy content authoring interface which integrates easily with already prepared materials in MS Word or other word processing tools. It avoids scripting, a process which facujlty members had found very tedious and time consuming especially using MAPLE T.A.. Simplicity is thus a lesson learned here. The iLMS enhanced interactivity available in chats, forums and local mails, thus adding another dimension to collaborative learning. Also, it presents a school management system where learners are advised on course requirements at each level and also tracks the academic record of a student. Here, we learned that it could be advantageous to develop globally and yet think globally. Finally, it is learned that if and when an institution has a leadership that is technologically aware, ICTconscious and keeps abreast changing environment in his or her field, all other impediments to being on the frontline of technology could be overcome.

Having said all these, there are still vast areas for improvement. There is need to improve the aesthetics of the software generally. Also, the iLMS is massive, a student can easily get lost, and in fact facilitators too may require frequent training and retraining. Further, it has been observed that "end users become impatient with plug-ins, which are often rather unwieldy and take considerable time to download" - especially when this is linked on to a slow server and a non-robust band-with. For the iLMS, it takes such a long time for the web pages to display, and this issue needs serious attention. Another disadvantage is that It is clear that the university needs to commit huge investment in training the users. It could also not be denied that with a proportionate number of our students been over 55, elements of culture shock will continue to manifest until they are all 'domesticated' into the computer environment. Finally, there is still a perceived lack of balance between the 'push' and the 'pull', with the tilt in favour of the push so far. And, as Walker, (2003) put it, "With student centered learning designed for and from the users' perspective, there should be a balance of content 'pushed' to students associated with a 'pull' or demand for content". Students' awareness has to increase tremendously, Study Centres have to be adequately equipped with internet-ready computers and the band-with issue has to be tackled head-on if this balance is to be achieved soonest possible.

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A Student Affair: Globalizing and Mobilizing with Online Learning

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Abstract

While many countries, including so-called third world nations, have slowly been building their education systems, America—despite its policies, programs, and good intent—has paid mere lip service to the realization of its educational goals. Consequently, education in many states in America is witnessing a breakdown. Georgia is a case in point. To mobilize education, we need to reassess online universities as a viable and marketable study option for diverse populations in an ever-changing and globalizing economy.

What does a scheduled caste/scheduled tribe person from modern rural India have in common with a descendent/product of the feudal system in Europe? What do either of them have in common with the modern day public school student from a depressed neighborhood in the United States? Ostensibly, nothing. But just a brief google look into the three categories shows that money, or its lack, is what they all have in common. And lack of mobility. In other words, they all share the possibility of a bleak future.

Whatever the times, education is an important vehicle to rise above certain of life's inequities. While many countries, including so-called third world nations, have slowly been building their education systems, America—despite its policies, programs, and good intent—has paid mere lip service to the realization of its educational goals. Consequently, education in many states in America is witnessing a breakdown: the state of Georgia is a case in point.

Georgia, the United States and the International Stage

No such dire headline introduces the 2009 Adequate Yearly Progress (AYP) Report. Certainly, the report begins by setting forth five clear goals, the first of which is to increase the high school graduation rate, decrease drop out rate, and increase post-secondary enrollment rate. However, right next to this goal, a graph charts the steady improvement of Georgia's graduation rate: from 2003 to 2009, the high school graduation rates have steadily improved from 63.3 to 78.9 percent.



(Georgia Department of Education http://public.doe.k12.ga.us/DMGetDocument.aspx/AYP%20Board%20Presentation%202009%20FINAL.p df?p=6CC6799F8C1371F67F748FE12E14157BF05F6F31E416590B38A508EFF52256B8&Type=D)

Graduation rates are generally considered a significant marker of performance at school. They are consequently used to determine policy both for schools and for students. The Georgia reports for High School would have us believe that Georgians are moving from strength to strength. But nothing could be further from the truth. This is because there is a divide between figures reported by federal, state, and independent bodies.

High school graduation figures for 2005-06, for instance, published by all4ed.org, an advocacy organization, were as follows:



http://www.all4ed.org/files/Georgia_wc.pdf

The 2005-2006 report card shows a 16 percent gap between the Georgia rate of graduation from separate sources:



http://www.all4ed.org/files/Georgia_wc.pdf

The report on "Graduating America: Meeting the Challenge of Low Graduation-Rate High Schools," by the Jobs for the Future advocacy group and the Everyone Graduates Center at Johns Hopkins University (Balfanz, Almeida, Steinberg, et al, 2009), in fact, places Georgia among 17 states with the lowest graduation rates "that produce approximately 70 percent of the nation's dropouts."

James J. Heckman and Paul A. LaFontaine (2007) underscore and expand the issue of variance in graduation data to the national level. In their essay, "The American High School Graduation Rate: Trends and Levels," they assert that "Depending on the data sources, definitions, and methods used, the U.S.

graduation rate is estimated to be anywhere from 66 to 88 percent in recent years—an astonishingly wide range for such a basic statistic. The range of estimated minority rates is even greater—from 50 to 85 percent" (<u>http://ftp.iza.org/dp3216.pdf</u>).

Despite such disheartening high school graduation rates, the National Center for Education Statistics (2005) reports an increase in college enrollment of 18-24 year-olds over the last three decades; however, by and large, male enrollment decreased while female enrollment increased. "The enrollment rate for females increased from 20 percent in 1970 to 41 percent in 2003. The enrollment rates for males decreased between 1970 and 1980 (32 percent and 26 percent) and then increased to 34 percent in 2003. In 2003, 42 percent of White, 32 percent of Black, and 23 percent of Hispanic 18-to 24-year-olds were enrolled in college." (http://nces.ed.gov/programs/youthindicators/Indicators.asp?PubPageNumber=22)

Further, according to The National Center for Public Policy and Higher Education, in the state of Georgia, only about 28 percent of young Black males are enrolled in college, compared to 39 percent of White males (Georgia's 2008 Report Card).

But college enrollment rates, though important, must be balanced by graduation rates. Georgia's 2008 Report Card also shows that in comparison to the top rate of 65 percent, just 48 percent of entering Georgia freshmen complete their bachelor's degree in six years.

These low college graduation rates point the finger at a number of issues, one of which is the lack of preparation of high school students entering college. This in turn points the finger at the *in*accuracy and *un*dependability of the high school graduation data put out by the state department of education. And so we get caught in a merry go round, with little chance of getting off.

It is clear then that in the state of Georgia, high school graduation rates are low, and college graduation rates even lower. Even within these categories, the figures are divided along race and gender lines, with women performing higher than their male counterparts. Disturbingly, Georgia's 2008 Report Card also shows that it lags behind internationally (to its European counterparts and Australia and New Zealand, as well as Korea and Japan in some instances), in the categories of Participation (of ages 18-24 enrolled in college), Completion (of degrees) and Educational Level of Adult Population (ages 25-34 are lagging behind ages 35-64 in acquiring a college degree). What these figures project for the future of the people in terms of jobs, and the attendant quality of life (leave alone gender and race relations), is anyone's guess. A competitive world market and an increasingly aging America merely exacerbate the issue. Like a call from a person on the verge of committing suicide, these figures are a clarion cry for help which must not be ignored.

More importantly, what applies to Georgia, also applies to many other states or pockets of states in America. Indeed, nationally, "one-third of students—about 1.3 million each year—leave high school without a diploma" (www.all4ed.org). And only after we acknowledge that we are in trouble, can we proceed to putting systems in place that will encourage students to enroll in school/university, and graduate.

The Need of a Changing Population: Why it Matters

To begin, we need to assess what are some of the ways to motivate students to do so? Certainly, assessing our changing economy and our changing culture is one way to go. America is no longer an agrarian society, requiring certain school hours within a day or even a certain cycle of school year. Young people today are also not like their grandparents. They are much more culturally aware, and savvy beyond their parents and grandparents. Not to speak of, in a hurry to don the cloak of adulthood that has been glamorized by the media. In a culture that seeks to inculcate independence at an early age, including economic independence, it is then hard to lay down institutional rules and set teaching systems that contradict that same independence. Exacerbating this dilemma is the ever-increasing cost of higher education in the United States. Independent organizations and studies by the National Center for Education Statistics all show how many students rely on loans to finance their studies, and have to cope with substantial debt following their sojourn. Like high-end stores with high overheads, higher education institutions need to reconsider their strategy. If students are somewhat self-disciplined, goal-oriented, and not easily demoralized, but chafe at the regimentation of a regular school day, then online learning could be the answer for them.

For the last couple of decades, all levels of education at traditional institutions have been engaged in trying to utilize a certain amount of technology for learning by developing their online arms as well as by fostering global initiatives. But with the state of education at high alert, *all* means should and must be harnessed to bring more education to more students. Setting aside lofty rhetoric, we must mobilize education. With online learning already established as a powerful global communication tool, it is time to re-evaluate distance learning institutions to determine how they can serve as a viable and marketable study option for diverse populations in an ever-changing and globalizing economy.

But is online learning a viable option for all levels, including high school and college students?

In Fall 2008, the US Department of Education, NCES, conducted a study based on a Fast Response Survey System on the use of educational technology by public schools. Among other things, the First Look Report showed that: "Eighty-three percent of district respondents agreed with the statement 'teachers are interested in using technology in classroom instruction,' while 58% agreed that 'teachers are sufficiently trained to integrate technology into classroom instruction' . . . Forty two percent of respondents agreed that 'funding for educational technology is adequate,' and 83% agreed that 'funding for educational technology is being spent in the most appropriate ways.'" (http://nces.ed.gov/pubs2010/2010003.pdf).

While more technology options for disseminating knowledge, and assimilating it, at the high school level may be welcome, especially in conjunction with other andragogical approaches to education, I will focus my study on online learning for college students.

A. ROLE OF VIRTUAL UNIVERSITIES

While most recognize that to fit into a rapidly globalizing society, to get well-paying jobs at home and abroad, we must move out of our geographically-insular attitudes, many American students are lagging behind. Brick and mortar institutions have historically understood that to enhance understanding and forge constructive communication, it is imperative that we facilitate interaction between different cultures. Academics has traditionally answered this purpose. Among other measures, Study Abroad Programs have been a significant means of exposing students to new cultures. Now, many (big) colleges/universities are making participation a prerequisite for graduation. Inclusiveness is also evident in new curricula for existing and new courses/programs of study. Under the aegis of the Quality Enhancement Program (QEP), many traditional institutions are also forging partnerships, nationally and internationally, to share resources and provide a more rigorous and comprehensive educational experience to students.

Though Online colleges/universities have often been stigmatized for their brash newness and failure to maintain standards, these arguments must be reexamined against held stereotypes and prejudices. In line with President Obama's initiative for higher education, and to be competitive in this volatile economy, we must lift the stigma surrounding Online education in higher learning and accept it as a viable option for many students. By educating students from Beijing, to Delhi, to Ibadan, to Seattle—many of whom may not fit in a traditional classroom—Online education is already addressing many student needs. For example:

a) Cost effectiveness

With smaller campus facilities, and reduced faculty and maintenance costs, most distance learning institutions are able to pass on some of their savings to their students. Most of these institutions consequently charge tuition and fees that are significantly lower than those charged by traditional campus-based schools. Further, students also save transportation costs. Boarding and lodging that constitute a considerable portion of expenses for dorm-dwellers may also be reduced, or eliminated in many cases, by staying at home or living in a region with a lower cost of living.

b) Overcoming life constraints in a busy life cycle

Like everyone else, students have multiple commitments, which can crop up at inconvenient times. The option to participate in both real-time and asynchronous coursework at distance learning institutions allow students to fulfill these commitments without interrupting their studies, and potentially lead more complete and less stressful lives.

c) Dynamic, relevant and timely curricula

While the procedures and processes put in place for new curricula and course development serve a valuable purpose in brick and mortar institutions, they are also often needlessly time consuming and sometimes misused for personal and political gain. With less red tape required for approval times, Online institutions can offer a more versatile and timely course of study that is available when the student needs it.

d) Bridging time, space, and other boundaries via the Virtual Campus

Human beings have historically defined themselves on the basis of boundaries. Over a period of time, however, these boundaries have become more limiting and counter-productive. Reaching out to other individuals is essential to break barriers of ignorance. Online learning, via chat rooms, discussion boards, email, and multiple social networking tools (in addition to the online lectures and 24/7-available, user-friendly programs and services on the Web sites), allows students to reach out to individuals across regional and national borders, making knowledge more accessible, exchange of ideas more possible and human understanding more achievable.

e) Multiple teaching and learning styles

Students no longer come in certain race, gender and age packages. They also do not reflect a single life background or experience. Over time, these categories have become increasingly complex. Education must reflect and respond to this complexity. Online education, with its dynamic and versatile tools at hand (as outlined by the other points above) is successfully able to answer the diverse needs of diverse populations.

B. LIFELONG LEARNERS

Of all the categories of students that stand to benefit from these institutions, I want to focus particularly on lifelong learners. These may be students with some higher education background, or none at all. That is, they may include some students who were high school dropouts. They may also be in various stages of being considered adult or returning students. Over time, many institutions have tried to address the needs of these students through their Continuing Education Division/Department. A range of non-degreed programs and individual courses are commonly offered. Most recently, however, certificate courses have been included that are often tied to the degree programs offered by the corresponding departments. A student may then choose to take up an individual course, a series of courses to earn a Certificate, or even continue on and earn a degree at their own pace.

Students who enrolled in such courses, in the past, have often been stigmatized. While this attitude is much more evident in developing countries, America, too, could stand to make further improvements that make students of a non-traditional age group fit in more easily. After all, lifelong learners are so for many reasons: they may have missed an opportunity due to circumstance or personal decisions, need to enhance their resume for their job, gain professional development credit as a matter of course, or just possess a desire to learn.

Whatever the reason, these lifelong learners are a unique category. Their independence, needs, commitment and determination, and the life experience they bring to the table, require an equally unique system of delivery. Of course they also bring multiple commitments and limited study time, as well. A virtual campus often serves these students well, and offers them the freedom to which they are already accustomed in a busy life cycle. If universities are to truly serve their communities, then they must revisit their curricula, and their teaching methodology. Andragogical approaches to teaching/learning need to be consciously adopted.

As departments of education have sprouted everywhere, the emphasis has shifted a little more to methodology each day. Historically, pedagogy refers to teaching practices used by teachers for children. But as the student population shifts to adults, it is apparent that the role of the teacher and the purpose and goal and way of the learner shifts. It is therefore natural that additional, even different teaching methodologies be employed to teach these adult students.

Investing in new technologies, training all personnel, all leads to higher costs per student. Certainly, the issue is not merely theoretical and philosophical, but economic as well.

For those whom money is the only or at least chief signifier of the importance of things, let me be clear: the relation between education and economics is direct, certainly. According to the Georgia Department of Labor (April 18, 2010), Georgia's unemployment rate has risen to 10.6 percent, which is above the national average of 9.7 percent. Together with the need to create new jobs, we need to create individuals with qualifications to work these jobs. A poorly educated America will not be prepared to apply

for jobs right here on its own soil, leave alone overseas. And since, for most people, jobs are their only source of income, this will mean a poor lifestyle and resentment towards those who are perceived to have what Americans no longer have, or have enough of.

But at the end of the day, education is about more than the diploma. On the simplest level, it is about learning. And the question that needs to be asked, is: What is the role that technology can play in the process of learning? If technology can enhance how students comprehend an issue, if it can enhance understanding faster and more clearly than was possible before—that is, if it can help digest an issue, question it, develop it, and help arrive at a conclusion, then it has a purpose and a place in the world of education. If technology—by the use of mixed and multimedia, with or without interactive capabilities, can peak curiosity and imagination, then it is viable.

Partnerships with other institutions

The policy of No Child Left Behind, while theoretically not without meaning, has lead to inflation of data to get grants and privileges. It has also done a disservice to the very population that it needed to protect and nurture: the students. Deflecting attention from the uneducated and the under-educated. As the *US News and World Report* and other agencies publish their annual reports of institutional rankings, the competitive spirit of the Superbowl that is so uniquely American is palpable within the halls of academia. However, no game can be won without the implicit cooperation of the players within the team. And so the value and place of the spirit of cooperation must also be learned. No child, indeed, must be left behind. Regionally, nationally, globally. E-learning has made this possible. By using technology, not only can schools and colleges/universities reach out to a more diverse student population, they can also reach out and partner with each other. Undergraduate- and Graduate-degree granting institutions can partner with schools of their own level, as well as with junior colleges and high schools. By channeling the spirit of cooperation, schools and students can actually move towards the kind of enrollment and graduation figures that reflect lived social and economic reality. Mentorship programs—such as Big Brother, Big Sister—can serve as a module for putting together a high performing school with a low performing one. These partnerships can be a source for:

Academic Resources (teachers, lectures) Facility resources (Laboratories, libraries) Job preparation (Internships)

No Diploma Mills, Please: Criteria for Online Universities

Distance education has functioned and survived in the world for a long time. In many cases, the new technology serves the mere purpose of hastening the same old system of correspondence studies. For this reason, among others, the value of distance learning institutions has been questioned. However, even on this simplest level, this service should not be devalued: to the corresponding student, the pace at which he/she can pursue a program to its completion can be a powerful argument in favor of it.

As in other areas of life, people must behave themselves into learning new education strategies till these become natural and normal for them. Certainly, standards must be maintained. The criteria considered for Online universities must be the same as for traditional ones:

- Academic Rigor, with a competitive and challenging curricula;
- Qualified Faculty, who are academically and professionally respected;
- Academic Facility, that takes into account student diversity;
- Student Outreach, with strong institution-student interaction that begins before admission and continues beyond the degree; and,
- Department of Education/appropriate recognized US-accreditation, that approves and maintains the US government-held standards in education. (Indeed, in order to continue to enjoy recognition by the United States DOE, accreditation agencies must be ever more vigilant of their member institutions to ensure that academic standards are being met.)

It is important to state that online learning and self-paced study is not for everybody. The student who was happy to shirk responsibility may feel additionally encouraged to do so. Acknowledging and evaluating one's ability to recognize opportunity is an adult act. Sadly, chronological age does not always measure that ability. Further, as with all things, we need to acknowledge that, depending on the student and the teacher, e-learning can either remain a new tool for performing old tasks or it can evolve into a dynamic

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interactive tool that opens up new gateways to learning. With all the criteria listed above being met, at an affordable cost and at the student's convenience, Online universities can contribute much good—including, securing and saving the future of generations to come.

A Student Affair: Creating a Blueprint for Student Services at University of Atlanta

Because education on the simplest level implies content-based knowledge, an academic institution is most defined by the academics it offers. Certainly, all divisions and departments exist on campus as a kind of satellite, to play a supporting role for student success. However, in this age of online learning, these divisions too must alter and adapt themselves. My experience at the University of Atlanta, where, since March 2009, I was called upon to create the Division of Student Affairs with diverse student departments and services, and then adapt them to the needs of an entirely online student body, is a case in point.

Newly-accredited by the Distance Education and Training Council (DETC), University of Atlanta had a student population of a couple of hundred students, many of whom were academically inactive and not progressing; I had a difficult task ahead. Departments and services that are taken for granted in institutions of long-standing, their structures established—their functions known, and their value undoubted, all had to be re-envisioned not only to shape the needs of a new institution but especially to motivate and shape the needs of a student body largely spread across the world—primarily, Middle East and later Asia.

I began with very few resources, human and technological, and many questions: What should we do when the institution is new, with most of its students of adult age (typically between 20 and 50) and scattered around the world? What should we do when systems and structures we have taken for granted are yet to be articulated leave alone set in print or carried out? How should we create campus life, when there is no campus—as we know it? How should we connect with a student whose phone and internet connection is down—often, and who lives 10,000 miles, or more, away? How should we respond to the frustration of a student who is anxious to reach someone at a time when we are asleep? How should we connect to students who are culturally not conditioned to share their personal constraints, and we do not even have their body language to guide us? All these questions, and many more, needed answers that were often as unique as the students themselves. Consequently, the experience was frightening, challenging, and exhilarating, all at the same time.

First, given the new emphasis on product and manufacturing terminology, I needed to establish the intellectual/educational nature of the service on tap. Further, I needed to achieve a healthy balance between student/client/customer service and the educational product. Clearly, the old way of offering information would not be enough. Creating copy was of course essential; the value of the visual and tangible information for the student can not be underscored enough. It offers a place for the student to return frequently. However, when the demographic of the kind of students attending your institution is constantly changing, revisiting the information for content and clarity, and editing it to suit student needs, becomes a constant. Just as information often has to be altered, so must the services offered be altered to suit the needs of the changing student population.

This ability to listen and respond quickly to the needs of the student body as it tries to pursue academics, in many ways forms the new definition of campus life for students.

It was imperative that all Student Affairs staff that interacts with students have a good understanding of the student body. With all communication between divisions placed in a virtual student file, by the time the student was handed over, post-enrollment, the student affairs staff had a good handle on the background of the student. Studying this file gave the staff an insight into the students' pre-enrollment journey, and gave them a better handle on issues as they helped them get started.

How to welcome students to a virtual campus, and get started? There are many ways to do this: some effective for some students; others, not at all. The orientation needed to be more than the introduction of a physical place; it must be an introduction to the university's learning platform. Crafting a simple script (that underwent multiple incarnations), and a basic powerpoint presentation with visual images of different divisions, buildings, offices, academic functions, etc., was a starting point. I knew that Orientation must be made mandatory and a prerequisite to beginning any program of study. Though students are often anxious, even excited, to start, they are the first ones to be turned off when they meet with challenges and frustrations at not being able to perform simple tasks, like how to access an assignment, and then submit it.

It was inevitable that as we inaugurated our Live Orientation Tour, we were inundated with requests. Webinars were used to host multiple orientations at one time. As this is a synchronous activity, it had to be timed just right for students whose night was our day in the United States. Despite the emails and phone calls to coordinate the event, there were often frustrations as students failed to find a connection, or could not log in, or logged in late, or could hear but not speak, or speak but not hear, etc. Despite having IT personnel on call at all times, the orientation often had to be conducted via webinar, phone and Live Chat at the same time. People who arrived late had to be accommodated at other sessions. In the spirit of interaction, students were encouraged to ask questions. Inevitably, twenty minutes stretched to forty, sometimes sixty and up; the tours were endless. Clearly, a more permanent solution, a bigger budget and more staff were required. So, it seemed the logical next step would be to tape the orientation. That way students could watch the video, and return to view it as many times as they needed—much as they would a text book.

Once the orientation tour video was created, it was placed in the secure section of the Learn Center, together with the Student Handbook.

The Student Handbook was not just a document of rules and regulations to uphold moral/ethical academic standards and disciplinary codes for students, but also included new material on how to prepare for, and proceed, in an online program of study. This information was considered absolutely vital for the students, as many students enroll in an online program without any real understanding of what it actually entails, and how to create structure and discipline in their own lives. Watching the Orientation video and reading the Student Handbook, and returning the signed last page (to ensure compliance), were made prerequisites to beginning a program of study. Being ID and password protected, students would yet have access to this information at any time, anywhere in the world.

Getting feedback on initiatives is important, so two-three weeks after enrollment, seeing the video, etc, the students were sent an invitation link to an independent web site to fill out a survey on their orientation experience. The questions ranged from their satisfaction with their information, to the ease and accessibility of the programs, to their experience with individual staff who facilitated their progress. While many students chose not to participate in these surveys, those who did do so, consistently responded positively.

Working with the students daily allowed us to learn of their frustrations, sometimes unique to their part of the world. There were small issues, like: what does EST stand for? These and many other questions were addressed both for general audiences, as well as for the enrolled students in the secure Learn Center. These often gave birth to a new kind of FAQs. Other issues were bigger: For instance, I noticed how students could view all assignments for all courses in their degree program. While having a brief description of all academic courses is necessary, having detailed syllabi for every single class to be taken is overwhelming. This was clearly a glitch that needed to be smoothed. Working with IT in Uganda via webinar, we created a simple red and green light system: now students would be able to view all courses yet to be taken with a red light next to them. Each time they needed a course opened, they would send in an electronic request. If the request was valid, the red light would be turned green, and they would receive a message to that effect so they could then proceed with their course in the Learn Center.

As new services were added, students were informed of the same.

I ID Card Services

In order to offer full-time students around the world some of the privileges and benefits that students enjoy at brick and mortar campuses in the U.S., we were able to partner with International Student Exchange Cards (ISE Cards) to offer a more powerful and internationally recognized card. Working with Student Affairs staff, a student could upload all their data from anywhere in the world.

II. Subject-based Support Services

Early studies showed that students may be enrolled for months on end without progressing through a course, till they eventually withdrew. (These studies were later developed into formal withdrawal analysis reports, in the hope of addressing the reasons for lack of progress and withdrawal and move students towards success.) Despite being attracted to the more independent/self-paced asynchronous study, many students seemed unable to ultimately handle the same. Their sense of isolation was great and academically they seemed lost. I therefore hired multilingual Support Coordinators with strong academic credentials, technological and communication skills. While they could not, and did not, replace an instructor, they had to be able to think on their feet, without boiler plates for a response—a tool that fools nobody, and is often unsatisfactory and offputting to the recipient. By virtue of their academic credentials, they were in a strong position to comprehend issues and direct students to the appropriate area where they needed help. Every 10-15 days (limited because of few staff), they initiated student contact by phone, email, IM and Live Chat to see how they were doing, and encourage them to engage in academics, particularly lifelong learners who need motivation to commit time, energy and resources to online learning. They based their conversation on the activity, exchange or lack thereof recorded in the student's virtual file. They listened compassionately to all kinds of reasons/issues/problems students talked about, broke through barriers of isolation, and often were able to serve as real-life examples of what the students could achieve, and thus moved them towards starting or submitting assignments. While some students did not respond, many others responded positively, even forging a special relationship with their Support Specialist by communicating several times a day. There were challenges, of course. Staff in the U.S. was particularly handicapped by the time difference. However, as English is not the first language for most of the students, and they often can not understand the language, accent, information, etc., they prefer communication in writing. Staff in Pakistan, being in a different time zone, were better able to resolve the time difference issue. All staff followed telephonic dissemination of important information with an email, to help the student stay on track. They also kept detailed notes of every single communication with a student in the common internal web site (extranet/intranet), so that the next person had the information at hand for review. My goal was, despite limited resources, to create as personalized a service for the students as possible. We wanted to let the students know that someone cared for them.

III. Judicial Services

Judicial Service functions are a major part of Student Affairs duties. Staff recorded and troubleshooted every student grievance. Some were simple, others were not. Some major grievances that caused considerable friction were: promises made by admissions representatives during enrollment, grades not returned in time, lack of direct contact with instructors, transfer of credit concerns, the differences in the U.S. syllabus and what some claimed was followed in campus locations abroad, etc. Once again, it was imperative that the students feel heard. In order to satisfy the student, limit withdrawal, and increase retention rates, each issue had to be evaluated individually, with great attention and care. Communicating with appropriate division heads, creating direct connections for study center services abroad, encouraging direct contact with local offices for greater transparency, were some measures put in place. Because the students' frustration was often exacerbated by distance, it was imperative that they be in constant touch with their familiar Support Specialists, as we tried to resolve these issues.

IV. Bookstore Services

Because the university has an offsite bookstore manager in the United States, and with no offshore book vendors, Student Affairs staff collaborated to direct students as to how to order books as well, so that they could get started on their studies. High cost of books, lost or delayed delivery, high native country tariffs, were all issues that must be dealt with before a student could begin his/her course work. While we could assist with some issues, such as make special arrangements with Financial Affairs to pay for their books (in case the student did not have a credit card, for example) or with lost delivery, we were unable to intervene in cases where high country tariffs were applied.

Ebooks was the answer. But that brought its own challenges. A lot of prescribed books are not available in ebook form. So it was suggested that, in many cases, curriculum be revisited to find alternative ebook options. Meanwhile,, even when ebooks were available, students had access for 90-180 days, or so. For many students, unable to keep to their time schedules for course completion, this ended up becoming an additional source of frustration.

V. Library Services

Many students informed us of lack of local library facilities in the area where they lived. While we did have an e-brary, just like a brick and mortar library, it too can also be intimidating to navigate and use. Plus, students do not know how to use some of its features, such as creating their own bookshelf or an area for taking notes, etc. Student Affairs staff collaborated to show students how to do research on individual assignments using the ebrary. Student Affairs also worked on expanding the library.

VI. Online Tutor Services

As a lot of students lacked English skills, and often could not get past the basic language courses, it was imperative that students be provided with live and immediate help. I therefore engaged staff to maintain Live Chat sessions twice a week, and offer writing help to English 101 and English 102 students. For the benefit of most students, this service was to be offered from 10 am to 11 am on Mondays and Wednesdays. Students were often sent general topics and areas to be discussed, ahead of time. They were encouraged to come in with specific issues and assignments they were working on, so that the help they received was equally as specific and one-on-one. As in a regular classroom, shy students often remained silent but listening, as the tutor explained whatever point was under discussion. In other cases, interaction and collaboration among students was visible: even as some students with English as their second language struggled with expressing their concerns, other students stepped in to help them out.

VII. Social Media for Student Engagement and Retention Purposes

Peer-to-peer interaction is a vital component of any form of study. To address this need, and student grievances about their academic struggles, isolation, etc., I developed our presence on Twitter and Facebook; thus, increasing traffic manifold and also offering us an insight into what was going on with the students. Immediately, University of Atlanta had a presence and a face. Unlike other institutions' use of these utilities, I envisioned using them a little differently. Under the Discussions section, I had groups created for different disciplines and majors. This was to be an exclusively student area. Staff helped maintain the Discussions section by regular promotional contact with students (sometimes weekly, sometimes more often, based on individual, group and mass targeting). Students could "hang out" in these rooms and interact with others according to their majors, disciplines, geographic areas, etc. They could swap books, academic concerns, etc. Soon, we saw them logging in to hold academic discussions, or just say hi, helping each other understand the learning platform, or how to do assignments. From there it was an easy step to their exchange of personal information to pursue their "conversations" more privately. They openly asked each other for support, and looked for student mentors who had already gone through an experience so that they knew what it was about. Admissions was also enhanced by potential students being

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directed here to see for themselves the working campus and student body. Student Affairs staff also assisted in monitoring Discussions, and, depending on the issue, made contact with the students directly to offer help.

Strategic messages were also placed on the WALL section of Facebook to engage students. With a direct link to Twitter, we were able to reach a wider audience. For instance, in order to celebrate Women's History Month and International Women's Day, students were encouraged to record their experiences and nominate people from their local community.

By providing an academic support service creatively, we were also able to capture global cultural, linguistic and academic concerns.

VIII. Community Engagement

It is important to give back to the community you live in. With headquarters in Atlanta, I wanted to establish the University's link to the city. So I fought to have approved a full-tuition scholarship based on need and academics, for a minority student from Georgia who was enrolled in a Masters-level program.

By all accounts, many students depend on some kind of financial aid to go to college. In fact, lack of financing is one of the key reasons for students' inability to pursue their studies, and later, their withdrawal from studies. Despite the fact that the university's tuition was relatively low, by offering a scholarship, I hoped also to attract some committed students to the program.

I also set up a "Get Back to Work" Program, and personally volunteered my services to help unemployed Georgians who desired to return to work but who needed assistance putting together letters of application and resumes and interview skills.

Unfortunately, despite tremendous grunt work, with only local and web site publicity made available, these initiatives did not receive the notice they required to take off the ground.

IX. Miscellaneous

Some projects, like setting up Student Government and Alumni Services, did not come to pass—despite many valiant efforts behind the scenes. Setting up Counseling Services was particularly difficult in an online setup. Convincing people of the value of emotional health as almost a pre-requisite for academic health, and consequently, retention and the bottom line, is a process. Students' lack of response, and quite simply the fact that these projects, like democracy, take time to be assimilated before they can be realized, all are challenges I met.

As of March 2010, university enrollment was almost up to 900 students, half of whom belonged to Administrative Offices, and were strictly catered to by off-shore offices. Of the remaining students, though retention rates were high (with only four withdrawals for the month of February, for example; February Withdrawal Analysis, 2010), actual academic performance was low: 22.9% had completed their first course; 34.5% had started their first course, but not completed it; and, 42.6% had not yet started their first course (Student Progress Report, 2010).

The point here has not been to enumerate all the clever ways in which technology was or might have been used to connect with students. Rather, given extreme financial constraints and other resource challenges, how much was accomplished in a little over a year to serve the students and move them towards success.

A Collaborative Approach: Technology and Education

Online learning is a viable option. Technology must work hand in hand with education to not just serve the purpose of providing information faster, but more efficiently, and in a way that provokes intelligent thought, promotes meaningful exchange and leads to compassionate and creative function. Educational technology, in its meanest form, has shrunk the universe to fit the smallest of screens and has opened our eyes to the possibilities that exist beyond us. It offers time travel with a twist, and brings into intellectual juxtaposition old evils like the caste system in India and the feudal system in Europe, and the more modern public school system in the United States that is funded by tax dollars, and in catering to its own class perpetuates—in many ways—old and divisive ills. Like any boundless potential for knowledge, it can make learning more accessible, possible and even joyful. However, it is in dire need of captaincy and direction. To create a more level playing field, for jobs and economic security, education for all is the answer.

In his fascinating text of lectures on "The Aims of Education", delivered at the University of Chicago in 1950, T.S. Eliot began by wondering if 'education' could be defined. If so, how narrow or encompassing could that meaning be. Progressing beyond simple connotations of scholastic information, at one point he asserts "it [education] becomes 'culture, or development of powers, formation of character, as contrasted with the imparting of mere knowledge or skill" (in *To Criticize the Critic and Other Writings* 67-68). The essay acknowledges the added complexity of diversity in society and cleverly proceeds to discuss various definitions only to point out their limitations, as each requires further definitions of terms and contexts. But still, Eliot ends on a note that encourages people on their own journey, despite the elusiveness of meaning.

In that spirit, and despite the fact that with online learning we are encompassing an ever- more diverse society, and, undoubtedly, someone will parse the definition of terms I use here, it is my firm belief that education refers to more than academic knowledge that imparts a skill and prepares students for an occupation. It refers to an encompassing array of experiences and interactions—inside and outside the classroom—that build a functioning, responsible and contributing member of society. So though Academic Affairs remains the backbone of an institution of learning, with content-based knowledge its chief intent, Student Affairs must play an even more integral and directive role in the creation of campus life for students: upholding a strong social, emotional and mental life, with imagination enough to make academic success less onerous, and, certainly, more possible.

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Information and Communication Technology Innovation in Education: The Case of Turkey

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Abstract

Turkey has initiated a number of projects to improve the quality of education and to provide students with knowledge and skills needed for the job market through the integration of information and communication technology (ICT) into education during the last twenty-five years. This paper is an overview of those initiatives of ICT in education in Turkey. It is argued that more attention is needed to what teachers think about the innovation and how they may be more involved. Some of the lessons learned are also discussed.

Introduction

Turkey first introduced computers into secondary education in 1984 through the Ministry of National Education (MONE). Since then MONE has initiated a number of projects to improve the quality of education and to provide students with the knowledge and skills needed for the information-based economy job market by integrating information and communication technology (ICT) into education. Major steps in this endeavor include the Computer-Aided Education Project (1989-1991), Computer Experimental Schools and Computer Laboratory Schools Project (1993-1997), Basic Education Program (1999-2007), and Secondary Education Project (2006-2010). This paper describes what has been done in those projects regarding ICT provision and its integration into education. Some of the relevant research is also surveyed to identify the major issues in ICT innovation in education in Turkey. What teachers do and think about the innovation and what school characteristics are conducive to successful implementation are explored through a study the author conducted in Izmir of the Computer-Aided Education Project, additionally what lessons can be drawn from Turkey's experience are discussed.

ICT in Education Projects in Turkey

Computer Education Project (1984-1988)

Computers were first introduced into secondary education in 1984 with the establishment of the "Specialized Commission on Computer Education at Secondary Schools" by MONE. During this initial phase, the aim was "to spread computer literacy" and "[c]omputers were seen as one tool to compensate for the poor quality and persistent deficiencies of suitable teachers" [1]. Project activities included preparation of the curriculum; software design; training the teachers; and incentives for local hardware and components production. In the academic year 1985-86, 1,111 computers were provided for 101 high schools and 130 computers were provided for some vocational schools. A total of 2,400 computers were purchased for secondary and vocational schools between 1985-1987 [2]. During 1985-1990, 48 training programs were organized and 2,240 teachers trained in computer literacy and programming [1, p.107]. Some of the issues identified in this phase included the incompatibility of the software with the curriculum, inadequacy of training, inappropriate hardware and software, and unsuccessful teacher involvement [3].

Computer-Aided Education (CAE) Project (1989-1991)

The early stage, which focused on hardware and teachers' learning the Basic programming language, evolved into the pilot project of 1988-1989, supported by a loan from the World Bank. MONE invited private computer companies to develop courseware for 37 subjects as well as providing further training, and purchased 1,178 computers for 58 schools. Several universities were contracted to train 750 teachers in programming and computer literacy [3]. The issues identified included lack of appropriate courseware, inadequate pre-service and in-service teacher training, insufficient hardware, and maintenance problems.

CAE Advisory Council meetings organized by MONE in 1989 and 1990 brought together academicians, teachers, and other educators, and MONE officers to discuss issues related to the implementation model, teacher training, hardware and software, and planning of the investments. The main CAE project was initiated in 1990-1991 as part of the World Bank National Education Development Project. As part of a number of measures planned to strengthen the education infrastructure in Turkey, this project included a program for introducing computer literacy and computer-aided instruction in grade 10 of selected secondary schools. In 1990-1991 MONE placed approximately 6,500 computers in 396 secondary schools and trained 250 teacher trainers and 5,000 teachers. MONE commissioned the development of courseware in the national language for 141 secondary and vocational school topics [4, p.26].

MONE established the General Directorate of Computer Education and Services (BILGEM) in 1992 to coordinate the integration of IT in education and oversee the various projects. An assessment of the developments in the CAE field in a World Bank Country Study [1] indicated that "[c]omputer penetration in these schools remains extremely low; and computer:pupil ratios are discouragingly high." In 1991, there were a total of 9,068 computers in vocational and secondary schools with a computer:pupil ratio of 1:218. The study stated that "Turkey lags significantly behind comparator and OECD countries." The World Bank study identified two implementation obstacles. First, the available software had not been integrated with curriculum developments. Second, there was a severe shortage of suitably trained teachers. These obstacles prevented the use of hardware in the originally intended manner [1, p.107]. The study pointed to the "needs to accelerate diffusion of general informatics skills in the workforce" and recommended "[m]ore aggressive implementation of the Computer Assisted Education (CAE) program with greater emphasis on: (a) teacher training; (b) curriculum development; and (c) relevant software availability" [1, p.202].

Project on the Development of National Education (1990-1999)

Within the context of this project implemented with World Bank support, MONE conducted two projects with the purpose of expanding the use of computers and computer-assisted education [5]. In the Curriculum Laboratory Schools (CLS) project, 208 schools from seven regions were equipped as curriculum laboratories to test the new curricula and teaching materials. The equipment included PCs, laptops, printers, data projectors, fax machines, modems, scanners, TV sets, video cameras, overhead projectors, projectors, cameras, and materials for physics, chemistry, biology and life sciences. MONE provided in-service training to the school principals, teachers, and inspectors in order to facilitate effective usage of the resources. MONE stated that by establishing the CLS schools, providing the equipment needed and training the personnel, the CLS project had achieved its aims, although the evaluation of CLS had not been completed at that time.

The CLS project also included models for school performance evaluation and development. Performance Management Model for School introduced a new model for the evaluation process to "save the evaluation process from its centralist structure and enable the members of the school community to take place in this process." The Planned School Development Model was a management model that set up a strategic plan and established an understanding of a "sharing school" model. In 1999, school development studies in all the educational institutions were conducted in accordance with this model [6].

The Computer Experimental Schools (CES) project aimed to use 53 schools as an experimental platform, to test the new curricula and teaching materials, where information technology would be integrated with the teaching-learning process. The CES schools received computer hardware, software, teacher training and facility renovation, as well as a computer-mediated communication network linking. A computer laboratory in these schools contained 20 monitors, with one server, a printer, and a modem. Nearly half the number of schools also participated in the CLS project, which provided them with additional audio-visual equipment. Software consisted of network software; applications programs; educational software for science and technology, games, authoring systems for teachers; and instructional software for English, math, biology, physics, and chemistry [7]. The project trained 250 teachers with

140 formators (teacher trainers) in the use of computers and educational software. Eleven months after the implementation, the evaluators found that administrators, teachers and students were all enthusiastically and creatively using the equipment and software. Schware & Jaramillo [7] mention the absence of relevant software in the Turkish language and the inadequate level of difficulty of the courseware for some selective schools (Anatolian schools) and the problem of teacher workload for those who were trained to be formators as the major challenges faced by the CLS project. The wide geographic dispersion of the CES schools posed difficulties in providing enough support and follow-up to each individual school all the time. The CES project was evaluated by an international group of experts in 1996, and was found successful in integrating IT into learning and engaging community involvement in the initiative [8].

The National Education Development Project also included a Pre-service Teacher Education component, which was implemented between 1994 and 1999 by the Turkish Higher Education Council. This component designed new teacher education curricula in thirteen subject areas based on a student-centered and constructivist approach to student learning [9].

Basic Education Program

In 1995, the Turkish Government requested the World Bank's assistance in preparing a project to support universal basic education. In 1997, Parliament approved a new Basic Education Law which established the timetable for implementing universal eight-year basic education and provided major budget resources [8, p.5]. In 1998, the World Bank approved the first of two loans of USD300 million each to support implementation of the Basic Education Program.

Basic Education Program Phase I (1998-2003)

The original objectives of the project included the capacity expansion of basic education schools; training of teachers, school principals and inspectors; development of central and provincial implementation capacity to carry out the program; and creation of a mechanism to monitor and evaluate the outcomes of the program. In 2003 the project development objectives were amended to include improving basic education quality by providing ICT classrooms and educational materials to schools [8, p.3].

The project procured computer hardware/software and peripheral equipment for 22,854 rural schools, overhead projectors for 18,517 rural schools, and 6,255 data projectors for 2,802 basic education schools installed with ICT classrooms. The project also purchased 1,500 notebooks for master formators, primary education inspectors, and 130 notebooks for the inspectors.

The Basic Education Program trained 221,000 teachers in ICT literacy. 2,058 IT formators were trained in IT coordination; 250 formators received master IT formator training; 250 master formators received refresher courses. Additionally, 405 teachers were trained in active learning and special learning methods; 3,781 received training for candidate principals; and 150 MONE staff received English language training. 2,956 inspectors received training in active learning and teaching strategies and use of material; and 861 inspectors received training in active learning and special education methods [8, p.23].

The World Bank's overall assessment of the project was unsatisfactory. Enrollments in basic education increased by 1.5 million since the start of the Program, raising the gross enrollment ratio for eight-year basic education from 85.6 percent in 1997 to 96.6 percent in 2001 [10, p.2]. However, this was still low compared to other middle income countries, which on average were at around 100 percent. The World Bank also noted that in recent international assessments, such as TIMSS and PIRLS, Turkish students were still well behind most of their counterparts in student learning. Although the project had improved access to ICT, both access and educational use of the technologies was very limited when compared to OECD countries [10, p.12].

Major training activities were carried out under MONE's budget and the World Bank did not attempt to review the effectiveness of the training conducted by MONE. The World Bank identified the following deficiencies in the project in connection with the ICT objective: Insufficient software; IT courses focusing on basic computer skills; lack of training in how to integrate computers into subject teaching; lack of an IT policy paper and a strategy to integrate IT into the curriculum and teacher training; and the ICT impact study not completed [10, pp.8-9]. The lessons learned by World Bank included the need for the Bank and the borrower to agree on outcomes and monitorable performance measures for ICT investments [10, p.20].

Basic Education Program Phase II (2002-2007)

The objective of the second phase was to support implementation of the Basic Education Program by extending the actions supported under the first phase, by supporting the development of preschool education as an integral part of basic education, and expanding special needs education. Activities supported through the second phase were to concentrate on increasing coverage and improving quality of education particularly among the children of low-income families and children with special needs. The following outputs were achieved under the components related to ICT [10, p.26]:

- 3,000 schools were provided with 4,002 computer laboratories providing access to ICT to more than 2.4 million students. The laboratories included computers, servers, printers, scanners, multimedia projectors, interactive whiteboards, air conditioning units, appropriate furniture, etc. In school selection, preferences were given to schools without ICT equipment located in low income areas.
- 70 special need education schools were equipped by computer equipment in 44 provinces.
- 40 primary education classrooms within hospitals received computers and printers.
- A wide variety of materials, including educational software for various subjects, were supplied to the schools.
- ICT in-service training was provided to tutors (trainers or "formators") to provide teachers with basic computer skills and to assist them in using ICT to improve instruction, to inspectors to assist them provide pedagogical ICT support to schools, and to assist computer instructors in using the existing ICT classrooms to their full potential. About 550 ICT tutors were trained in the area of new technology and design. 600 ICT tutors were trained as master formators. Over 73,000 teachers were trained in the area of new curriculum in 80 provinces.
- An education portal was developed by MONE using other resources.

The World Bank's overall rating of the project's performance was at "Moderately Satisfactory" level due to some shortcomings, which included limited project impact on increasing basic education coverage, partial achievement of the project targets for selected outputs, and delays in implementation followed by postponed impact analysis. The World Bank report commented on the complexity of project design, stating that "implementing such a complex project with large scale civil works would require an implementation period longer than 3.5 years" and "the complexity of project design was not counterbalanced by a comprehensive set of mitigations and arrangements" [10, p.7]. The World Bank complained about the poor assessment of project risks. The Monitoring and Evaluation Component of the project financed studies on the impact of in-service teacher training on students' performance, the impact of education materials on learning achievements, and ICT integration study [10, p.28]. However, the studies designed to collect baseline information in the respective areas were conducted closer to the project completion, and follow-up studies were never implemented.

The outcomes of the project were assessed using a Beneficiary Survey and Stakeholder Workshops [10, p.12]. The beneficiary survey was conducted in Autumn 2007. In total, 1,825 interviews were conducted with headmasters, teachers, parents, and students from schools supported under the project in 12 provinces. On the national level, meetings and interviews were conducted with officials of key MONE Directorates involved in the project as well as officials from the State Planning Organization and project staff. The evaluation indicated that providing students and teachers with educational materials, providing access to ICT for students and assisting in developing basic computer literacy, and training teachers contributed, together with the other interventions, to increasing quality of education process and educational outputs [10, p.16]. Students and teachers reported greater opportunities for accessing ICT for computer lessons, as well as teaching and learning other subjects and performing extracurricular activities (i.e. developing web-sites). Computer labs were extensively used for improving students' computer literacy. There were positive examples of ICT use to support new curriculum, and students' independent learning [10, p.18]. All target groups reported that students used all educational materials provided under the project, especially computer equipment and materials for preschool education. The survey showed that students demonstrated improvements in knowledge and skills after they used the new educational materials. School visits and meetings with teachers demonstrated that most of the teachers' demands for formal training in ICT literacy, and support in using ICT for teaching were met locally, outside the project. Ongoing support to teachers in ICT use was provided by tutors trained under the project. Local communities also appreciated the ICT equipment installed in schools.

Secondary Education Project (2006-2010)

The Secondary Education Project was approved by the World Bank in March, 2005, for a loan of USD104 millions. The objective of the project originally was "to improve the quality, economic relevance, and equity of secondary education to support lifelong learning" [11, p.12]. The ICT part of the project had the aim of "[p]roviding information and communications technology training as a core competency for youth to function in a modern knowledge economy, improving instruction by using information and communications technology to expand access to learning opportunities, and supporting better management of learning and administrative processes, and assess the educational impact of the information and communications technology investments."

As a result of the increased "emphasis on foreign language teaching to improve the skills of Turkish citizens so that Turkey can compete more effectively in a global economy and be better prepared for EU accession," the original project development objective was revised in 2007. The current project objective is "to support the Government's reform of general secondary and vocational education by improving conditions for student learning, establishing a career guidance system and enhancing foreign language teaching" [10, p.3]. The ICT subcomponent is to finance ICT classrooms in 322 schools as well as training of teachers in these schools in order to improve the competency of students to function in a modern knowledge economy. It covers development of multi-media learning tools, consultant services, goods and materials to utilize ICT to improve instruction and access to on-line educational content [10, p.8]. As of October 2, 2009, there had been limited progress in implementation. Currently the closing date of the project is December 31, 2010 [12].

The ICT projects described above are parts of ongoing educational reforms in Turkey to improve educational attainment and quality as part of EU integration efforts. They include reforms in curriculum, assessment, teacher professional development and the expansion of ICT, all of which require a long-term effort to yield the expected outcomes. These efforts aim at realizing a vision of "Turkey, a country of information society, growing in stability, sharing more equitably, globally competitive and fully completed her coherence with the European Union" [13]. Through these projects, the use of ICT in schools has become widespread and curriculum improvement activities have been accelerated. Although important enhancements have been accomplished in the population's access to education and the education level of the labor force, the levels of access and quality have continued to remain low compared to the EU average and the education system is insufficient to meet the requirements of the labor market. The problem of quality in education still remains an important issue according to the Ninth Development Plan (2007-2013) [13, p.49]. Accordingly, increasing quality and coverage of basic and secondary education will continue to be official objectives of MONE, as reflected in the current national Five Year Development Plan. Turkey recognizes that "[i]n order to increase the quality of education there is the continual requirement to improve the physical infrastructure, equipment and qualifications of teachers, use of resources allocated for education more effectively and in harmony with the renewed curriculum programs and teaching methods [13, p.98].

Research on ICT in Education in Turkey

ICT in education initiatives taken in Turkey during the last 25 years can be characterized by a lack of sufficient research into the options for policies and strategies and the impact of the actions taken [13]. Evaluation has been the weakest element of the projects, and limited information has been produced about the extent of computers in teaching and learning, the factors affecting use of computers, the quality or inadequacies of courseware developed, or effectiveness of the in-service programs. Yet MONE has continued to initiate new projects with loans from the World Bank to invest more resources into hardware, software and training without fully understanding the impact and complexities of the previous initiatives. In other words, the initiatives appear to be interventions based on a simple conceptualization of a complex world. In several project documents, the initiatives are considered as reforms; however, there are almost no references to theories of educational change or innovations. Several international and national studies as well as theories of educational change point to the central role of teachers in the implementation of educational change in general and in the integration of information technology into teaching, in particular. According to Fullan: "Educational change depends on what teachers do and think—it's as simple and as complex as that" [15, p.117]. The problem faced in Turkey in trying to implement the ICT innovation in education has been that we have simply not known enough about what the 'teachers do and think' about the computer innovation(s) they have been introduced to [14].

Several academic studies during the last two decades have shown that the actual use of ICT in education in Turkey has been less effective than expected in all of the projects [e.g. 14, 16, 17]. Some studies have aimed at studying ICT initiatives as educational innovations and gaining further understanding of how school teachers in

Turkey perceive computer innovation in their schools [e.g. 14, 16, 17, 18, 19, 20]. These studies indicate that the chance of successful implementation of the ICT innovations depends on teachers' involvement in the change process.

Computer-Based Cognitive Tools for Learning and Teaching: The COG-TECH Projects

To explore how computers could be integrated into teacher education programs, an international collaboration initiative was developed by the COG-TECH (Cognitive Technologies for Problem Solving and Learning) Network, which aims to foster collaboration among the European and the Mediterranean countries in the field of information technologies in education. The initiative included three projects (MED-CAMPUS Project B-359 and C-359, 1993-1995, and INCO Project 973367, 1998-2001) coordinated by the author under the auspices of the European Commission. The main purpose of these projects was to train teacher educators in the teacher education institutions of the Mediterranean countries to use computers as effective pedagogical tools.

The main assumption of the training programs had been that the role of information technologies in education should be as a tool for learning rather than a vehicle for knowledge transmission. The training activities of the projects included international summer schools and national follow-up workshops that introduced the participants to a set of computer-based cognitive tools. One of the goals of the summer schools was to train some of the participants to a level sufficient for conducting similar training in their countries. Three summer schools and five workshops entitled "Computer-Based Cognitive Tools for Teaching and Learning" were organized between 1994 and 2001 in Turkey, and one workshop in Jordan. Altogether, 110 educators from 16 countries took part in the summer schools and 140 teachers were trained in the workshops. A workshop entitled "Information Technology Implementation in Schools" was organized to inform school administrators, computer coordinators, and ministry officials in Turkey about issues in information technology implementation in schools.

The content of the summer schools and workshops, as well as results of their evaluation, are described in two articles by the author [22, 23]. The impact analysis showed that the training activities had a significant impact on the teaching and practice of many educators by exposing them to new approaches and helping them acquire knowledge and skills needed for using computer and information technologies as effective teaching and learning tools. Changes in how technology is viewed in the teaching and learning process had been most significant.

Information Technology Innovation in Turkish Schools: An Investigation of Some Schools in zmir

As part of the MED-CAMPUS C-359 project, the author conducted a study in 1994-1995 to gain an understanding of how secondary school teachers perceived computer innovation during the Computer-Aided Education (CAE) project that was initiated in 1991. Drawing upon the work of Fullan [15], Huberman and Miles [24], and Grunbeg and Summers [25], a conceptual framework was developed for formulating research questions and guiding data collection [26]. The framework was organized around *relevance* (need for innovation, clarity, practicality, congruence, instrumentality, cost/benefit ratio), *readiness* (commitment, compatibility with culture, front-end training, materials, other change efforts, planning, coordination time, prior relevant experience, provision for debugging, skills, understanding), and *resources* (central administration support, in-service support, school administration support). The study sought to determine whether; the innovation was *relevant*, the teachers were *ready* for the innovation, and the *resources* were provided. For implementation, the following key factors were hypothesized in the conceptual framework: innovation characteristics, teacher factors, school characteristics, and external characteristics.

The research can be characterized as multiple case studies with *school* as the unit of analysis. The qualitative phase was guided by the results of a preceding quantitative phase, which involved a survey of 39 schools in _zmir. Data collection was done in 1994-1995 and the schools were revisited in 1996. The case studies were of three schools: two state schools which had participated in the CAE project, and one private school which had been involved in its own programs of ICT innovation. The first state school was a selective high school (*Anadolu Lisesi*) while the second one was a selective vocational school (*Anadolu Meslek Lisesi*). All three schools delivered instruction partly in English with the private school conducting most teaching in English. The within-case sample consisted of the school principal, the computer coordinator or school-based teacher trainer, and one or two teachers who had received some in-service training for using computers.

The study found that the extent of the implementation of ICT innovation in secondary schools in Izmir was rather limited five years after its initiation. Most of the use of computers in teaching was *teaching about computers*. *Learning with computers* was very limited and mostly took place in vocational schools. Although MONE had
provided the schools involved in the CAE project with computer laboratories and instructional software, and trained teachers, not all of the conditions supporting successful initiation were present at the state schools studied. The externally mandated innovation which had "no aims" was introduced into schools in which neither the teachers nor the students had time for an extra activity and the teachers were without adequate knowledge and skills. In the private school, where the innovation was internally developed, the conditions supporting successful initiation were present as a result of a longer initiation process supported with significant amounts of external funds.

Both the quantitative and the qualitative components of the study indicated that teachers' overall attitudes towards the use of computers in education were positive, but lack of self-confidence towards computers was common. Teachers' lack of knowledge and skills in using computers for instructional purposes was the most important obstacle in implementing computer use in teaching. Lack of time, lack of relevant software, insufficient training opportunities, insufficient expertise/guidance and help for instructional use, insufficient technical assistance, and insufficient number of computers available were the other important obstacles for implementing computer use in teaching. The survey results indicated that pedagogical/instructional aspects were not neglected in the in-service training teachers had received, in contrast to the findings of the IEA study [27]. A significant portion of the teachers in the survey sample had received more than 60 hours of training which was not considered sufficient. Interviews also showed that extensive training was necessary to reach a sufficient level of confidence and knowledge. In the survey results gender differences appeared in connection with training received and level of use. There were fewer females with higher levels of training. The majority of the non-users were also found to be female.

The qualitative component of the study pointed to additional factors which affected the implementation process. The university entrance examination and the resulting need to attend a preparatory school emerged as the most crucial factor in determining whether the innovation will be accepted or not. The results suggested a variety of themes that may be associated with success in the implementation phase. It was clear that the coordinator/teacher trainer had a key role in that process, probably more important than the principal. The stronger position of the private school in satisfying successful initiation conditions and the progress achieved during implementation with significant amounts of financial support indicated the need for larger investment in training and materials and for ongoing support.

Discussion

One of the lessons the World Bank drew from the Second Phase of the Basic Education Program is that "it is important to learn lessons, obtain evidence to evaluate performance and achievements from previous operations before asking the Government to commit resources for next operation" [10, p.41]. The ICT in education projects in Turkey have so far produced limited information and lessons that may be useful to consecutive projects. Various academic studies such as the COG-TECH study which had aimed at this can be examined to draw some lessons.

The COG-TECH study concluded that the initiation and implementation of ICT innovation in education needs better planning, more and better resources for the schools, and relevant and adequate upfront training, and is a much longer process than envisioned. Even in the context of the small COG-TECH projects, some confirmation of the proposed model for teacher training spanned a period stretching over seven years. It is interesting that the planner and lender of ICT projects in Turkey (i.e. MONE and the World Bank) envisioned projects of 3-4 years of duration that could have measurable impact.

The COG-TECH study also found that teachers' lack of knowledge and skills about using computers for instructional purposes was the most important obstacle for implementing computer use in teaching. These findings emphasized the importance of training for the teachers. Although MONE provided extensive in-service training, what was offered was not sufficient and not available in a form that can be useful to teachers. The World Bank's mention of "lack of training in how to integrate computers into subject teaching; lack of an IT policy paper and a strategy to integrate IT into the curriculum and teacher training" [10] in 2008 shows that the progress has been inadequate. The COG-TECH study's observation, that interaction among teachers may be as important as training, and that time for informal as well as more structured arrangements such as workshops must be provided for, needs to be considered in planning in-service training.

The COG-TECH projects had developed and implemented a model for training teacher educators and practicing teachers in using ICT as teaching and learning tools in 1994, and trained several MONE members; however, no direct influence has been reported on the in-service training programs MONE offered. Turkey was able to develop a new teacher education curricula based on a student-centered and constructivist approach to student learning only in 1999, 15 years after the first introduction of computers into education as part of the National Education Development Project funded by the World Bank. It is in a way sad that the retirement of large number of teachers

recruited in the 1960-1980 period, "gives an unparalleled opportunity" for the educational system in Turkey to benefit from "newly qualified teachers" who "will be trained by teacher educators who have ushered in the reform" [9]. This may be admitting that the most important aspect of the ICT innovation has not received enough attention until very recently, causing waste of not only material resources but a whole generation of human resources as well.

The COG-TECH study found gender differences appeared in connection with training received and level of use. There were fewer females with higher levels of training. The majority of non-users were also found to be female. These findings should be considered carefully for developing policies which might prevent further extension of existing social inequalities and negative effects of limited role models on students.

The multiple-choice university entrance examination and the resulting need to attend a preparatory school define a framework which may be the most crucial factor in determining whether an innovation will be accepted or not. This framework may undermine the current educational system especially in the state schools as most teachers' main professional concern is oriented towards supplementing their salaries with private lessons to prepare students for the entrance examination. Within the current system, ICT has only a limited potential for supporting knowledge acquisition and problem-solving in connection with preparing for the university entrance examination to the extent it can provide this support more effectively and efficiently compared to the other existing means. Aspirations for a student-centered and constructivist approach to student learning are in sharp contradiction with the reality of the test-driven education of today.

The results of the COG-TECH study suggested a variety of themes that may be associated with success in the implementation phase. The stronger position of the private school in satisfying successful initiation conditions and the progress achieved during implementation with significant amounts of financial support indicate the need for larger investment in training and materials and for ongoing support. At the same time, building a capacity for innovation by creating a culture of "cooperative interaction" in the school may be equally important. The apparently more limited understanding of the innovation observed in the state schools may be related to the lack of interaction with MONE. It may also be related to the more "hierarchical," "top-down" organization of the state schools compared to the "cooperative interaction" culture of the private school. This "cooperative interaction" culture seems necessary for creating a capacity for change in a school. The implementation of an innovation requires a change process that cannot be prescribed and must be worked out step by step by the community involved with it. A "bottom-up mechanism" which allows the teachers to shape the direction of the innovation appears to be an essential part in such a process. Development of such cooperative interaction cultures in schools may also be important for alleviating the disbelief in the continuity of innovation that emerged in the state schools.

The projects conducted by MONE with the guidance and support of the World Bank appear to be interventions based on simple conceptualizations of a complex change process, although over the decades those conceptualizations have evolved. The early conceptualizations gave a prominent place to hardware and assumed simple causal relations between some obstacles and the use of hardware: "Second, there was a severe shortage of suitably trained teachers. These obstacles prevented the use of hardware in the originally intended manner" [1, p.107]. Although later projects were seen as "complex project[s] with large scale civil works" [10] and the initiatives are referred to as *reforms* in several project documents, there are hardly any references to *educational change*. The projects emphasize objectives and outputs (typically in terms of equipment provided to the schools and number of teachers trained), but fall short of specifying a process or providing a description of educational change model(s) assumed. There are no references in project documents to the theories of educational change or innovations, as exemplified in UNESCO's ICT Planning Guide [28]. One or more educational change models based on several decades of research should provide guidance particularly in managing change and innovation.

The COG-TECH study found that teachers and schools had limited interaction and negotiation with MONE concerning the innovation beyond MONE's request for teacher participation in training and establishment of computer laboratories. In general the projects have lacked systematic dialogue and consultation with teachers, which is "fundamental to the process" [29]. The teachers were not involved in policy formulation, which has prevented the development of a sense of ownership of the innovation initiatives that is essential to successful implementation. Even recent major projects such as The Second Phase of the Basic Education Program fell short of involving the teachers as the planned Stakeholder workshop was not conducted [10, p.34]. One of the lessons the World Bank took from this project was: "It is essential that Bank teams not only carry out dialogue on policy aspects of the education sector, but also pay close attention to the political, social and institutional aspects of education reforms and have consultations with a broad range of stakeholders to improve the relevance and design of projects" [10, p.41]. It is not clear from this statement to what extent teachers' involvement in policy formulation is recommended for future projects. Grossman et al. [9] have found in their study of the Pre-service Teacher Education reform in Turkey that even participation in the implementation of a reform was insufficient to offset concerns about the top-

down nature of the reform effort in the teacher education community. Aligned with recommendations of organizations such as OECD, recent academic research on ICT in education in Turkey has focused on developing better national information on teachers. Such research is considered "important not only for improving the knowledge base for teacher policy, but also as a way of introducing new information and ideas to schools and ensuring that teachers engage more actively with new knowledge" [29]. We may hope that such research will also point to how teachers may go beyond the passive adopter role to become active participants in defining and developing innovations.

We cannot claim that our comprehension of the complex dynamics of educational change is deep enough. Fullan [30, p.ix] notes that our understanding of the "change forces" has gone beyond key concepts such as vision, strategic planning, and strong leadership, which have "contributed to superficial thinking". New ways of thinking provided by complexity and evolutionary theories are offering "liberating and inspiring possibilities for individuals at all levels of the system to understand better and to act much effectively" in this era of "chaos and disillusionment" [30, p.12]. The capability of learning is crucial to coping with the changing world. In order to survive as an institution, the school must become a learning organization and a member of the community of learners, which includes state and local authorities as well as parents [30, p.61]. As Egan [32, p.32], points out, "The problem is not with the school necessarily but with the way we conceive what the school is supposed to do." ICT innovation has offered Turkey as well as other countries an opportunity to reconsider what education is supposed to do. The further realization of ICT innovation's expected impact and its sustainability will depend on continuing efforts for enhanced partnerships between schools and universities, and other factors, some of which may be identified through research and reflecting on our collaborative activities.

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First E-learning Degree in Egypt Sees the Light: Case Study

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Abstract

Alexandria University created the first e-degree online in Egypt by the Faculty of Science, a master degree in Neurobiology. The project launched in December 2008 with the support of the AUF (the Agency of French-speaking Universities). The study started in October 2009. This paper shares the experience of the pioneer program in the country with an emphasis on the major role played by the AUF. We will discuss the efforts employed, the challenges faced, implementation and continuous improvements to be made in the future.

1. Establishing an e-learning degree in Egypt

In this section, we will introduce the Neurobiology program, the support it benefits from, and the challenges faced, then we will see the opportunities of other Egyptian institutions to create similar programs. As the only two e-learning degrees offered in Egypt were created by the AUF support, the next section will be dedicated to the areas of support it offers to e-learning programs. As to the third section, it will analyze the quality of e-programs as well as the support offered, with focus on developing countries. To conclude, general ideas and improvements will be suggested.

Each section will be accompanied with statistics output from two surveys, SurveyI, filled by peers from different e-learning programs in Middle East & North Africa, Sub-Saharan Africa and Europe. Eighteen participants shared their experience with the students from same target countries and the same supporting agency, the AUF. The other one, SurveyII, was exclusive to staff members from Egyptian universities.

1.1. The idea, how it arose

"Neurobiology" is an academic master degree offered by the Faculty of Science, Alexandria University in collaboration with Bordeaux II University (3 semesters of online courses and 1 semester of practical work in local laboratory or relevant institution) targeting all French-speaking countries. In the first year, 42 applicants from 19 countries applied, and 15 students were finally admitted. The second started in January 2010 is a professional master degree in "Enterprise Management" offered by the Faculty of Commerce, Alexandria University in collaboration with Poitiers University targeting all French-speaking applicants from MENA region, 372 applicants from 35 countries applied and 20 students were finally admitted [1].

The two programs were created as response to the call of proposals offered by the AUF that officially started its support in December 2008.

Neurobiology team is composed of academic advisors, course creators, tutors,

academic coordinator from each university and administrative coordinator. Most of team members are Egyptians; there are few members from Algeria, Morocco and France. Most of the team had training on how to use the educational platform and how to transform their course into an electronic course. As agreed in this program, most of the course creators assume tutoring tasks; they also took training in online tutoring.

1.2. Challenges of developing an online degree

Course creators had difficulties transitioning their courses from teaching to learning approach and from electronic format to electronic learning.

Among the most challenging phases of the program's development was obtaining the authorization of the Ministry of Higher Education, and explaining the principles of elearning program to the superiors. The regulatory and statutory guidelines had to be redone several times as the procedures were not easily understood and technical terms concerning e-learning programs were not clear enough for the superiors. The two programs, as several programs in other countries (44% of the participants in SurveyI), are still not well integrated in the certifying institutions and depend on individuals.

One of the other challenges faced by the Egyptian programs was the misperception of a project held in a developing country and supported by a developed country. The superiors believe that a project supported from an organization in a European country should be profitable or economically feasible.

Egyptian Universities receive a great number of students from several African and Asian countries each year who are interested in various disciplines, and a lower number of students from Western countries who come to study specific courses on language, history or culture. In fact, African and Asian countries send students to Egypt to educate greater number of students with lower fees if compared to tuition fees of a university in a Western country. Egyptian universities set higher tuition fees for international students than for local students being in this situation "A house of expertise".

1.3. E-learning tuition fees and program costs

To set tuition fees for the Neurobiology program, rates of different services offered by the personnel were calculated with only 15% for the treasury of the university and the certifying faculty instead of 52% as in in-class master degrees, without any addition of taxation or benefits. Then total costs were divided into a number of 15, 20, 25 and 30 students. This made an e-learning degree offered in Egypt to international students much less expensive than in-class programs.

In a meeting organized by Alexandria University with the ambassadors of African countries "Alexandria University at the service of Africa", the Nigerian ambassador in his speech expressed some resentment toward the actual regulations adopted by Egyptian institutions vis-à-vis students from African countries. He addressed two main subjects, one of them is that African students are charged higher tuition fees than Egyptian students while as he and as ambassadors of other countries believe, they are supposed to get a reduction being citizens of less developing countries.

It would be appropriate to mention that the AUF played a remarkable role during the signature of the agreement with Alexandria University, and convinced the "superiors" while discussing the tuition fees that this is the time to have a more powerful role in helping sister less developing African countries.

Therefore, the two e-learning programs are considered among the pioneer programs that aim to contribute efficiently in developing African countries through "south-south cooperation".

1.4. Opportunities to develop other e-learning programs in Egypt

Participants in SurveyII were asked to select the reasons for which an Egyptian institution should develop an e-learning program. Egyptian staff members believe that it is mainly a solution for limited availability of classrooms, students who cannot afford displacement from other cities or others countries, and professional applicants. Lower significance was assigned to considering e-degrees a good solution for female international students, from Gulf Area for example. For cultural reasons many Arab families are not comfortable with letting their daughters spend several years abroad to get a degree. Other reasons were mentioned like problems or international crisis as HIN1, or difficulties of getting visa for Egypt.

We may believe that e-learning may be a partial remedy for the other issue faced by international students in Egyptian universities and addressed in "Alexandria University at the service of Africa" meeting, that is the rigid bureaucracy of the security check followed to offer international students a legitimate status. The administrative procedure is lengthy and may end by declining some students after being admitted in the university, spending about one semester of courses and paying non-refundable one-year tuition fees.

Although e-learning seems a good solution for different current problems in Egypt, the fact that there are only two e-learning degrees offered, indicates that there is a problem adopting this solution.

Participants in SurveyII were also asked about the current difficulties of establishing an e-learning program in their Egyptian institutions and whether they know about the two online master degrees offered by Alexandria University, about 75% do not.

46.15% believe that e-learning is underestimated among potential students. 38.46% think that developing or designing an e-learning platform is difficult. 30.76% are suspicious about the possibility of verifying certificates and/or ID of distant students, and 25% think that cultural exchange may be restrained. Other reasons mentioned with lower percentages are that their courses cannot be offered online, tuition fees will be reduced, and IT skills are poor.

91.6% of the participants of the same survey mentioned that if the difficulties of establishing an e-learning program in Egypt will be solved they will be glad to work on a similar program as project manager, course designer, tutor or academic advisor.

Egyptian staff members who attended training in e-learning technologies offered by the AUF, do not think about the difficulties expressed by the participants of SurveyII, as they knew how they are overcame by the support of the AUF. They even enthusiastically ask about the opportunity of their institution to develop such programs. Unfortunately, their enthusiasm fades quickly when they realize that this support is currently offered to Egyptian institutions only by the AUF and hence courses must be offered in French language.

Participants in SurveyI, that are supported by the AUF, were asked whether that they would have chosen a language other than French if they had the choice, knowing that all participants in this survey are from French speaking countries. About 24% of the participants answered yes, the origin of these participants' institutions programs are from MENA Region, Sub-Saharan Africa and Europe. Only one French institution

was among this slice, it does not receive enough number of applications because of the specialty not because of the language, while the other institutions from MENA and Sub-Saharan Africa that answered "yes" are located in countries where French is not the sole or not the first official language.

In SurveyII, participants were asked what teaching language they would choose if they were offering e-learning degree. None of the participants chose French, 69, 2% chose English, 23.07% chose Arabic, 7.69% said that it could be offered in a combination of languages.

Egypt is currently offering e-programs that the majority of Egyptian cannot benefit from. This is the same reason that makes French-speakers from other Egyptian institutions reluctant about applying for the AUF call of proposals, without neglecting that, the public is still suspicious about 'e-learning'.

The two programs assume a great responsibility in increasing the Egyptian public confidence in 'e-learning'. Yet, there still be the main obstacle regarding the absence of other institution offering competent support as the AUF in other popular teaching languages.

2. Overview on AUF support offered to e-learning programs

The AUF or the Agency of French-Speaking Universities is the main operator of French language in institutions. The head office is located in Canada, Montréal. It is financed mainly by France (more than 75%); remaining amount is offered by Quebec, Belgium and Switzerland. It works with partnership of institutions that have chosen French as teaching and/or research language. The agency was born in 1961 and passed through different development and expansion phases. Currently, it works with 434 agents in all continents, following 71 institutions that are adhered to nine bureaus managed directly by the AUF [2]. They share experience, encourage scientific collaboration, support research and training future actors of the development.

The AUF agency publishes, on its official website each year, a call for proposals for creating e-learning programs, offering support in different areas.

In SurveyI, participants were asked to assign a degree of significance for every support area. It should be noted that Northern countries do not get support in all areas as the Southern countries. The AUF supports e-programs in the following areas:

2.1. Educational platform free hosting

AUF server hosts the educational platform for free for the first 4 years. The value of importance assigned to this area of support, as expected, was inversely proportional with the welfare of the region. Therefore it was as low as 0.5/4 for the European Institutions, and as high as 2.85/4 for the Sub-Saharan African institutions.

2.2. Training of the academic and administrative staff

It consists of training:

- course creators: they take training on using the educational platform "Moodle" and adapting the course for electronic learning,
- tutors: they are trained on online tutoring and take tutors certification, and
- administrative coordinator, it consists of problem based training.

This area of support got as shown in figure 1 the highest degree of importance by the institutions of Sub-Saharan Africa and lower by MENA. All institutions of MENA region assigned a "4" also; expect two institutions that they did not get support yet in this area during the preparation for their program.

2.3. Partial payment for e-course creation

AUF offers an incentive pay for the course creator and in return the institutions make 25% of the course available for free access on its website.

The AUF expects that such programs get another support and another payment from the university that signed the collaboration agreement. To be realistic, if a public institution from a developing country is asked to contribute with money, the agreement will more likely fail. Sharing with workforce and brains is what universities from these countries offer with pride.

2.4. Support of the AUF experts

Experts' support means getting support in different levels:

- technical, while supplying the platform with courses and customizing the parameters to meet the needs of the learning program;
- consultancy,
 - on cost analysis and budget preparation that are essential to set the tuition fees,
 - on authorship and copyrights during courses preparation,
 - on the compliance of activities and assignments to e-learning environment, and
 - on diverse backend issues that arise as result of implementation of the key service of e-learning, which is tutoring.

2.5. Call for application on the AUF website & scholarship for students

AUF enlists the online degrees in its yearly call for applications. French-speaking applicants from different countries look always for programs offered by the AUF. In SurveyI, institutions from MENA region and Sub-Saharan Africa assigned the highest value in the scale of importance "4", and the total value assigned by European institutions, is as high as 3.5.

One of the most important reasons that make students from Southern French-speaking countries look for programs published on the AUF website is the scholarship offered. Participants in SurveyI from Europe, MENA and Sub-Saharan Africa assigned almost equal value to the high significance of scholarships offered by the AUF.

2.6. AUF local campuses serving as students' bureau

Local campus is usually an office in a well-known university in French speaking countries, located in the capital or the second most "important" city in the country. This office receives the application submitted by all the applicants to all e-programs supported by the AUF. The fees are also collected via this bureau, another strong support area that was assigned a high value of importance by the participants in SurveyI.

2.7. AUF local campuses serving as free cyber café

All applicants accepted in any of AUF supported programs either benefiting from scholarship or not profit from free access to computer and internet in AUF local campuses. This area of support was assigned a high value of importance by participants, from Europe, MENA and Sub-Saharan Africa that is 3.25, 3.8 and 3.85 respectively.

2.8. AUF local campuses serving as test center

AUF office in Paris organizes exams in all local campuses for students of different programs.

Again, another area of support that is judged strong by survey participants, yet Sub-Saharan Africa institutions were relatively the least interested in this support area. As most students subscribed in these programs are from West Africa, the curve inversion is simply due to geographical position of each of these institutions. Transportation from African to European country requires flight and accommodation. Boundaries between some African countries are as the boundary between Boston and Cambridge, a "bridge".



Figure 1: Index of importance assigned by institutions from Europe, MENA and Sub-Saharan Africa to the different areas of support offered by the AUF to e-learning programs in French speaking countries

3. Analysis of e-program implementation

As any program, project or production process there should be a continuous improvement to the system that arises mainly from change in demand, outputs and results of the system implementation.

3.1. Choosing the field of study and launching an E-program

According to SurveyI, the main reason for choosing the specialty of the program (multiple choices allowed) is being a discipline very much in demand in target countries (62%). Among the other reasons indicated were being:

• the same specialty of a team enthusiastic about the idea (37.5%),

- the same specialty of the project investigator (31.25%),
- absent in the country of the project investigator (31.25%),
- absent in the target countries (31.25%), and
- the same specialty of a group experienced in e-learning technologies (25%).

Participants in SurveyI were asked what could have motivated the project investigator to create an e-learning degree in his institution; their answers are summarized in the following graph. They also added as another reason, which is helping students get degree without leaving their jobs or their countries.



Figure 2: Index of importance assigned by institutions from Europe, MENA and Sub-Saharan Africa to the different reasons that motivated the project investigator to create an e-learning program

To profit from the true power of e-learning and overseas outreach, we should use technology integration in learning as tool not as objective. Moreover, the specialty of an e-learning program could be or should be the specialty that is well present and deeply rooted in the country of the certifying institution and in need in target countries.

3.2. Certification and accreditation

As mentioned earlier, the local digital campuses of the AUF serve as students' bureau, they check the students ID and certification. Yet, this procedure is not 100% reliable, and some institutions express concern about certificates issued from some countries that gained reputation in selling fake certificates and fear that students may get

through them the "authentic" certificate they never had. Moreover, examiners in many occasions are not able to determine the equivalency of a certificate issued from a university from Southern countries.

Talk about authentication and accreditation leads us to address another subject concerning weighing of online programs.

About 50% of the participants in SurveyI agree that 'e-learning' is still underestimated in their countries in Sub-Saharan Africa (28.5%), MENA (71.4%) and Europe (75%).

Two questions were asked in SurveyI to check institutions' perceptions in these terms. The first question was about whether the joint degree (Northern – Southern institutions) gives more value to the program. About 82.5% answered yes as expected. However, the statistics of answers to the other question seemed contradictory. "*Do the learners express more interest in courses offered or tutored by teachers from the North?*". 29.5% answered "no" and about 17.5% "don't think so". These two groups said that joint degree gives more value yet they think or find that learners do not show more interest in courses offered by teachers from the 'North'. To interpret these answers, those two questions were re-asked to several students of Neurobiology program. Almost all students had the same answers:

"A teacher to be qualified does not have to be from Northern country". "A diploma or certificate to be of more value and accreditation according to the recruiters it is strongly recommended to be issued by an institution from Northern country".

3.3. E-program tuitions fees

Participants in SurveyI were asked whether tuition fees cover well their program.

The answers to this question were quite diversified. About 33.3% answered yes. As expected, none of this slice is a European institution. About 50% answered no, the third of which mentioned that other resources help. About 11% answered that they still do not know, newly launched programs. One of the participants thinks it depends on the number of students received each year.

According to the survey, a percentage of students varying between less than 10% and 25% cannot benefit from the AUF scholarship and afford paying the remaining amount.

In several occasions, AUF experts like to mention that a European institution, thanks to the high quality education offered, it gained a great reputation that made it double the program tuitions fees two times, and according to their call for application on the AUF website the difference between e-learning fees and in-class fees is shrinking. [3]

3.4. Tutors recruitment & Tutoring Quality

The current method adopted to recruit tutors is to publish a call for tutors with the call for application of the students, encouraging the tutors from Southern countries to apply. Few institutions do not publish a call for tutors and make the course creator accomplish the tutoring tasks.

Having the course creators accomplish the tutors tasks might be a good choice if, according to the program specialty and objectives, the tutors will answer course specific questions. In other programs or courses, it is recommended to hire tutors who are only "acquainted" with the discipline but not expert in order not to guide the students thinking, or better call them here "learners".

Participants in the survey were asked to choose the best method to recruit tutors: call for application or having an online tutors' directory accessible to recruiters. 24% support the current method adopted by the AUF, call for applications. Only 6% suggest the option of having the course creators as tutors. As to the 70%, they think that tutors' directory would be the best choice. Actually, there is no online tutors' directory.

In order to improve the quality of tutoring service, AUF is currently developing a program for tutors' certification. First level of this program was completed; the second and third levels are under development.

In spite of the high quality of the content of this training, there is a missing key element, which is learning how to evaluate individual work, and teamwork online.

The tutors are told what they should do but not how to. Tutors in several occasions miss the target of making students work together, and teamwork evaluation is not always as expected. This, in turn, has a strong negative effect on the learners' performance.

3.5. E-program targeting professionals

Online degrees mostly target professionals; it helps them get a degree without leaving work. Some tutored sessions are offered at the students' working hours, so they have to connect from work. Should presence and absence in tutored sessions be graded? The answer to this question remains unanswered.

Also in the call for application, the applicants are asked whether they need the local campus support as free cyber café. Many answer "yes". From the experience of the Neurobiology program, it turned out that students are not able to profit from this, for two main reasons. First, the local campuses in all French-speaking countries are located in one city only except in few countries [4], where most residents of these cities have a relatively good internet connection at their place. As to the other underestimated cities that suffer from low bandwidth and expensive internet connection, in addition to frequent power outage, they are distant from the local campus. Secondly, local campus are open only from 9am to 5pm, 5 days a week (either from Monday to Friday or Sunday to Thursday) when most, if not all, students are at work.

4. Conclusion

Technology integration in education has demonstrated a great capacity in outreach, north-south and south-south collaboration, as well as evolution of teaching and learning methodology that Egypt as well as several developing countries had never known.

The Egyptian e-program serves a model of how a developing country could actively use new technology not as end user but as service provider and hence contribute in the development of developing countries. To optimize the efficiency of this service, some components are still needed in the infrastructure and some improvements to the already installed system should be integrated, such as:

• Development programs and organizations that allocate funds for education in developing countries should consider creating a competent supporting organization as the AUF, in other popular teaching language.

- Large companies can cofinance e-learning programs and allow students to do their practical work and research in their enterprise. Competent e-learning programs adopt the slogan of "Train more, cost less with no quality compromises".
- Choosing best discipline for specific target countries should not depend only on the view of a group of individuals, it can be made by the help of international and national development organizations and through local surveys.
- Supporting e-learning may start with creating local digital campuses in main cities or capitals but expansions should be considered in a mid and long terms plan through self-sufficiency fund. Local campuses are important even if the program outreach is national.
- It is important to develop an online tutors' directory at the disposal of the recruiters that will encourage tutors to boost their career and improve their qualifications and performance, especially if this directory contains a recommendations section.
- There should be one comprehensive and authenticated anti-fake certificate online platform accessible to virtual universities. This platform should also offer services for learning and work experience validation accessible to virtual universities and potential e-program students or candidates. All universities should include their certification and credit hours systems whether they are "accredited" or not.
- Soft drinks dispensers, ATMs and telephone booth are good inspiration for creating connected computer "booths" or "cabinets" that may be available for students 24/7 in different towns of developing countries.
- Online learners should be privileged by having access to international journals of science and have more access permission to virtual libraries and virtual conferences. They can also have a student discount card for their online environment.
- E-learning programs with the current methodological learning process, confirm that it is not about distance learning anymore, no more borders, students from different countries join in the same place, teamwork and collaboration between students are encouraged. Through their ideas and projects for their country, they share their dreams and synergize their efforts to suggest new approaches and programs to develop their countries. An online directory of projects submitted by students will help avoid redundancy and encourage innovation but also will work on protecting those projects and innovative ideas through clear agreement between students, mentors and certifying universities, which partially share the copyrights of researches presented by the students.

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The MIT LINC 2010 Conference Parallel Presentations

Session #2:

Technology-Enabled Education and the Lifelong Learner



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Abstract: The role of Romanian universities has become crucial in (re)negotiating a new relationship with life-long learners and in bridging the gap of social, age and educational disadvantage. This gap places young graduates at the top of IT skills and life-learners at the bottom of the same scale when both categories attempt to find work. In this way, Romania is a model for the potential of long distance learning in emerging countries, esepcially those of Eastern Europe. Particularly in emerging countries such as Romania, universities are called to respond to ever new challenges; they must bring not only new forms of technology-enabled education to learners of all ages, but they must also make sure these devices reach out and contribute to social cohesion and bonding. This is all the more difficult to achieve as it comes along with a new paradigm in education, characterized by flowing (interchangeable) roles, shared resources, virtual facilities, and asyncronous teaching/ learning processes. In the first part, this paper depicts the status of adult education prior and post fall of communism (1989), and then describes the context in which distance education programs were established. Moreover, it describes, some of the integrated efforts that a young Romanian university (Lucian Blaga University of Sibiu) is making to reach out to all categories of learners, as well as the extent to which we accomplish these goals. The paper argues that, in a learning context, the Internet becomes a tool for innovation, shaping notions such as borders, space, time or mobility. In particular: distance education generates new social patterns of bonding by creating a shared memory of recent learning experiences; eases the accommodation at a distance to the future job; facilitates the social and professional integration of new life-learners; enhances new community strategies; facilitates the intra-national mobilization of learners: produces new networked life styles; and enhances the capacity to make decisions and act over disadvantages and borders in real time, giving rise to new forms of national socialization and community solidarities.

The Online Life-Learner: Rethinking the Social Role of Universities in Distance Education

Most European countries have made significant progress in defining unified and overarching strategies for lifelong learning and in setting it as a national policy priority. Such a strategy would mean that in achieving lifelong learning, a long term view would envision a coherent set of priorities, as well as the resources needed for different capacities to address flexible learning pathways and effective transition points between systems, levels of education, and training. In the case of Romania, this has been very difficult to achieve in this educational area: as the country emerged from a communist period, there has been a 20 year span of trying to catch up with the more advanced Western and Central European countries.

The Impact of Government on Educational & Career Choices

Whereas in Western countries educational and career choices are only minimally influenced by government policy, the government of the former East European communist countries intruded upon individual career choices to a large extent, in what was to be called "the governmental regimentation of access to the highest school track". (according to Pinquart et al. (2004)).

Idelological objectives.

Before the fall of communism (that is prior to 1989), adult education (AE), as part of life long learning (LLL), was a mass phenomenon; it had strongly ideological connotations. It was not considered necessary as a second chance, since there were to be no unemployed or illiterate people (Sava 1998). Under communism, enforced school attendance meant that illiteracy was practically eradicated and this held true even for the Roma population (a population now having the highest illiteracy and dropout rates). In Romania, during the socialist regime prior to 1989, the plan for industrialization identified the working class as the ruling force; it required a rigid outline that nominated the number of workers needed in each sector of the work environment. The educational focus was on expanding the working class, and the slots open in the educational system reflected this strategy. In other words, the profiles and number of career specializations were regulated by a centralized governmental plan outlining the need and availability of job opportunities.

Mandatory, Free Eduction

In the Romania of the 1970s and 1980s, education was mandatory up to the 10th grade and free of charge for the entire length of study. However, the number of high school graduates accepted into colleges or universities was severely restricted. According to the U.S. Library of Congress Study of Romania (Bachman, 1989), only 8% of the high school graduates were permitted to enroll into the highest educational track. The very same statistics (8%) apply to their East German peers, whereas in West Germany 23% of late adolescents were accepted into colleges (Pinquart et al., 2004). In the Soviet Union in the 1950s, roughly 80% of the children finishing secondary school enrolled in an institute of higher education; in the late 1970s, the figure was not more than 18% (Heller, 1988).

Occupational Choices

During communism, unemployment in Romania was kept to a minimum and every high school or college graduate was to be guaranteed a job. As a result, the central government allocated slots based on predicted demand for given occupations. As a result of this restricted opportunity for admissions, competition became very intense at an early age, so much so that career choice and decisions were pushed to the age of 16, or sometimes even as early as 14 (Bachman, 1989). With this early age in career decision making, it is not surprising that the family came to have a strong influence on career orientation and students' educational trajectory was determined mostly by concerns about job assignments, geographical location, and anticipated working assignments and conditions. Upon completion of one's educational program, an individual could not apply for a job of his or her choice; rather, the individual was assigned a job through a yearly state-coordinated distribution system. The Ministry of Education would organize long summer

sessions of graduate distribution, according to specializations and fields of study; this practically forced the graduates to work in geographical regions far away from their families or birthplace. The range of career choices was restricted and reduced by the undesirability of some of their assignments and had a very limited field of action in the socialist Romania (Ioanid, 2000; Ludusan, 2003). However, there were a few advantages to the system: First, a departure from the "common gender stereotypes of career choice" (Whitmarsh & Ritter, 2007). These were the times when higher numbers of college admission slots and greater opportunities for large city assignments made engineering an especially attractive field of studies in the 1980s. They were also the times when many female students took advantage of the educational slots available in electronics. construction, heavy machinery, or metallurgic engineering. Second, free access to health care and education, welcomed by all citizens. And third, a guaranteed employment and pension system, by means of which the Communist system offered the undisputed advantage of protection security. Ironically, this protection security – which was in fact the only instrumental freedom familiar to Romanian citizens - was fractured by the overturn of the Communist regime.

Curriculum

Prior to 1989, the university curricular content placed a strong emphasis on theoretical knowledge and focused more on transmission and reproduction of a large quantity of knowledge while minimizing the value of practical applications within the educational experience. The highly specialized college curriculum carried the informational load of a combined bachelor's- and master's-levels education (Ludusan, 2003), which sufficiently equipped graduates with theoretical knowledge. However, the educational system failed to offer the experiential tools needed for the practical integration of that knowledge. With such a lack of practical experience, graduates faced a great disadvantage when they attempted to "translate" these studies to Western educational standards and practices. With the downfall of the Communist regime and the abrupt opening of opportunities to work and study abroad, the necessity to establish an international curriculum of university studies emerged with unprecedented power (Ludusan, 2003). These events also propelled a new paradigm shift in learning, one passing from reproductive to problem-solving education and formative evaluation.

TheNewEra

This was basically the heritage that all educational policies have been trying, since the1990s, to change in view of preparing graduates for the tough(er) and, by all measures, different emerging labor market. In this context, adult education and continuing professional education have known the greatest expansion and significant development., This development is due in part to the emerging new requirements in the labor market and different connotations of job profiles. It is fostered and brought along by the principles of an aspiring democratic society in which learners of all ages had to take an active part. AE has thus taken the active role of filling the gaps of education for the unemployed, for excluded groups, in the context of persistent illiteracy and increase of low income, and for the at-risk population(s). More recently, Romanian higher education institutions has become more involved within European and international projects in the field of technology-enhanced learning aiming at institutional development. As a result, it has been possible to do a lot of catching up. Since Romania's adherence to the European Union in January 2007, more active steps have been taken towards shifting the responsibility for education and learning away from government and to the individual, as well as toward a focusing uponon the development of individual capabilities and the capacity to learn.

Opportunity

The shift from former education institutions and processes, toward diverse learning opportunities that are more process and outcome oriented, has been gradual, constant and accelerating. Although occasionally slowed down by financial scarcity, the shift is real. In Romania, AE now represents a real second chance for people who left formal education too soon, for people who need to change jobs, for those who need to overcome problems caused by social change, those who are required to identify their own needs and goals, for those who set out to learn and be ready for continuous self improvement. The government funding for LL goes mostly to professional re-qualification and reconversion; it is being monitored by the Ministry of Labour and Social Care and the many public institutions or non-governmental organizations which develop training for new jobs. There are non-governmental organizations playing a leading role in continuing professional training because they are more flexible providers, often with international support. The need for introducing new technologies and modern equipment, the appearance of the first generations benefiting fully from modern educational programs, as well as the expansion of science-based fields, has led a now huge gap between the young graduates with top IT skills and life-learners belonging to older learning groups at a visible disadvantage in their competition for jobs. An example will serve to hightlight this.

ResultingGroups

According to an EC Report, between 2000-2006 in Romania the annual growth rate of graduates in mathematics, sciences and technologies was 5.5%, that is 1,1 percentage points above the European average rate. (Preliminary report of the European Commission in 2008 regarding education and training progress.). For example, in 2003/2004, this annual growth rate represented 24.4% of the total number of Romanian graduates, which ranked Romania higher than other recently adhered EU member states such as Hungary, Poland, Latvia, Estonia, Slovenia, and even well above the EU average rate, 24.1% (Eurostat 2005). At the other end of the spectrum, the participation rate of adults aged between 25 and 64 in education and vocational training is at a low level, stationary at the level of the year 2007 (1.3%). Participation in qualification-requalification training courses is low, about 4.8% (according to AMIGO, NIS 2008), with significant variations between rural and urban areas. This rate of adult participation in education and lifelong learning is still far from the European goal which stipulates an increase of at least 12.5% by 2010 from the total population aged betwee 25- 64. According to the Report on the Progress Towards Lisbon Objectives in Education and Training, Commission of the European Communities (EC Report 2008), the highest participation rates are registered with the Scandinavian Countries and the UK (well over 20%), whereas in Bulgaria, Greece and Romania these rates are around 2%, four times below the EU average.

This huge gap between learners belonging to different age groups and having different computer skills has become more visible in the last decade and has produced imbalances in the labor market for those who did not stand a fair chance to get work. Added to all this, is the fact that the expansion of higher education in Romania in the recent years has complicated the picture because it has produced an increase in the number of graduates entering the workplace; this is accompanied by a growing concern about the mismatches between the slightly increasing demands for qualified labor and the rapidly growing number of higher education graduates (World Bank Country Report 2008).

Increasing Use of Learning Technologies in Romania

All this has happened at a time when Romanian higher education, as a result of the new learning technologies and up-to-date ICT infrastructure, has benefited from considerable know-how transfer and higher funding resources. These benefits have increased substantially not only because of funds received from various national Romanian Government programs but also, exponentially, from the simultaneous expansion of many e-learning modern programs (Istrate 2007). Consequently, all the higher education institutions have set-up Distance Education Departments, and indeed some of them Technology Enhanced Education units, which are all operational and which deal with the implementation of the new teaching methodologies within the traditional education activities. Initially, these distance education programs were centered more on correspondence education rather than on using modern information and communication technologies. However, with time they have become ever more modernized and competitive in the European space of learning and teaching; they are effective in diminishing the existing gap between the young students and older life-learners in terms of curricula, methods of teaching, learning flexibility and outcome (Nistor et al 2005). One such example is the Open Distance Learning Department of Lucian Blaga University of Sibiu which was established in 1998.

The Open Distance Learning Department at Lucian Blaga

The department offers various distance courses (either initial, continuous or post higher education) and allows for 18 authorized specializations to function via distance education in 10 territorial centers. The distance education programs have, comparing to the regular studies program, the same curriculum, the same specialization, equivalent diplomas and all the rights of the graduates assured by law. Throughout Romania, the improvement of school infrastructure and the connection of educational institutions to Internet have been the goals of two major-impact programs since the 1990s: SEI (Sistemul Educational Informatizat – Education IT-based System) and RoEduNet (extending the Romanian educational information network). Beside these programs, initiatives and projects aiming to support the innovation in education have been jointly undertaken by various institutions and individuals (Istrate 2004). At our university, technically, the distance study program is operated by the MySeLF Application which is a projected electronic platform in the e-Learning 2.0. system and which provides specific resources, individual learning tutoring, bidirectional communication and self-assessment facilities. The

MySeLF e-Learning platform consists of integrated modules which allow for the use of the open meetings application for videoconferences and is assisted by the Multimedia Educational System, which consists of the Internet DIDIFR-TV channel system and TV by request. The new ICT tools used are: CDROM, e-books, websites, virtual laboratory and libraries and users are assisted online by video tutorials round the clock. Formative assessment methods and final examination are used; periodically, student feedback contribute to statistics on the impact of e-learning in distance education on web products consumers provided by two of the most highly specialized platforms for standings and statistics on Romanian sites: www.trafic.ro and www.best-top.ro.

Distance Education in A Historical Context

Notably, distance eductional itself is not new to Europe. Distance education has been part of the European educational scene for about 150 years. It started in 1840 in Great Britain, and between 1890 and 1920 private distance education was introduced on a regular basis in Germany, France, Italy, The Netherlands, Sweden, Belgium, Spain, Switzerland, Denmark, Norway, and Finland (Karow 1980). Long distance education came to a full recognition as a value adding HE system in the second half of the last century through the establishment of Open University, (UK), Centre National d'Enseignement à Distance (France), and FemUniversitat, in Germany. With well over 180,000 students, Open University is the largest in the UK, issuing 3 million diplomas and educating full-time employees, disabled people and convicts. In Eastern Europe, the course of history meant that distance education had to be introduced through state initiatives. It had to somehow take account of all missing lifelong learning issues which concern all components and levels of education and training and includes non formal and informal education contexts alike. This accounts for the lateness, occasional slowness and difficulty in its implementation throughout Romania: early education, education in family, education through mass media, education for democratic citizenship, training in enterprises, initiation into ICT and developing language skills. Following the Soviet Union model – a model known for its extensive use of distance education for postsecondary studies in conventional universities, teacher training and polytechnic colleges as well as in a number of specialized distance teaching universities - correspondence tuition in Romanian distance education has been combined with face-to-face sessions in a "consultation model" so as to enhance teaching and learning (Morcov, 2006).

The Present Romania Efforts

It is this distance education model we are discussing here from a social point of view, a model specifically designed to serve certain groups and meet specific educational criteria. From the outset, our Romanian universities have targeted certain largely adult groups as the main beneficiaries of distance education: those who were mainly adult groups of high school graduates who could not have access to HE during communism because of the severe restrictions on the number of places in entrance examinations, people who were technically left out of the system and who were in the 25-55 age group. To this, another target group was also encompassed, represented by persons willing to pursue HE but who were prevented from doing so because of lack of geographical accessibility.

Much has been said about the disadvantages of learning in distance education programs in relation to traditional campus settings, particularly in terms of classroom learning, lack of face-to-face interaction, geographical remoteness and quality of program. Initially, our university conceived distance education in the form of correspondence education. However, the slowness of the teaching and learning processes, as well as the lack of any computer skills, particularly attributed to older generations of learners, made it necessary in the late 1990s to add another component to the system so as to account for the age group discrepancies. This has meant that the face-to-face teaching had to be maintained somehow and students were to be assisted in the education process as much as in regular programs. Despite all controversies, distance learning's advantage of allowing students in remote areas to attain to educational opportunities they could not have otherwise had, has proved to be an impressive advantage. Therefore, besides online courses and assistance, our university teaching faculty travel periodically to distance education centers, making in person efforts to fill the gaps of knowledge, offer tutorials and contribute to strengthening the relations between actors involved in a process of learning (trust, commonly respected rules on competition/co-operation, relational attitudes, common language, etc). Such a learning process which traverses a lengthy socialization process is, in principle, only possible within the framework of physical proximity (Crevoisier 2008).

Changing Student Perspections & Academic Reponses

However, the times have changed and for the new majority of students, young or old, higher education is no longer as central to their lives as it once was for previous generations of students. Students' now expectations are for a different, newly established relationship with the college than students have historically had: today's students seek convenience, service, quality and low cost. In fact, current desires for distance education are for a stripped-down version of higher education minus the plethora of electives and student activities, a more adult-oriented, for-profit educational and territorial variant. This has led to the placing of the online life-learner in a learning context in which, from a social point of view, the Internet has become a tool for innovation, one that also reshapes notions such as borders, space, time and mobility.

On the general level of the development of society and the economy, we are witnessing nowadays an extraordinary growth regarding the mobility of information, knowledge, individuals and capital. At present, there is a phenomenal development of new information technologies, a drop in transport costs, easier movement of persons, and progressive integration of higher education within corporations, as well as considerable growth in intangible activities within the composition of a product and its consumption. All these factors have been leading to a growth and multiplicity of knowledge which can be mobilized fast and over greater distances but becomes efficient if the needs and expectations of the recipients have been properly identified. The decisive factor in online learning is therefore no longer the fact that learning and economic activities match regional training and structures, but rather the local capacity to formulate learning demands and entrepreneurial projects as well as the ability to mobilize knowledge and competencies at medium and long distance. This is effectively accomplished by distance education and, since its establishment, it has generated ever new social patterns of bonding in a shared memory of recent learning experiences, enhanced by the on-line learner's ease of accommodation at a distance to the future job.

These strategies have proven worthwhile, all the more so as debates and inter institutional consultations are currently being held to overcome the general decrease of Romania's population. As higher education represents a terminal segment in education and training, it also has been our university's mission to therefore absorb, through DE, an important pool of adult population so as to contribute to the diversification of the student body. The prospect of decrease in the population of Romania (by 11% by the year 2030) according to EU forecasts) will have a strong impact on the development and use of course areas. The population of Romania will constantly grow older by 2050, and the employed retired ratio will grow worse to more than twice the current level. In 2005, the dependency rate for people aged over 65 was 21% in Romania, partly as a consequence of fluctuations in retirement policies. The rate, which is defined as the ratio between the category of over 65 and the category of employees aged 16–64 will be 51% in 2050. This means (according to National report 2008) that the number of people aged over 65 will represent almost 30% of the total population in the same year, compared to the current level of 15%. The total population of Romania will gradually decrease to 17.1 million in 2050. Under these conditions, it has become clearer that the university's current educational concerns should be socially and strategically geared towards the development of a national integrated and coherent strategy for lifelong learning/adult education, assumed by all stakeholders and social partners. As distance education facilitates the social and professional integration of new life-learners, enhances new community strategies and facilitates the intra-national mobilization of learners, we seem to have thus moved from the concept of socially static externalities to one that is relational, evolutionary, and more compatible with our territorial approaches. Likewise, as individuals and competencies move around and interact with others at varying distances, when we take a social perspective, the processes of interaction and learning can be perceived as a collective, shared activity within territorial education which is capable of producing new networked life styles and different forms of national socialization and family solidarities. This enhances our graduates' capacity to take decisions and act over borders and disadvantages in real time.

According to the National Institute of Statistics (INS), in the academic year 2006-2007, the country's long distance education students numbered 177, 204, which is about 43, 000 students more than in the previous year and 18 times more than in 1999, when this education system started to be fully implemented in Romania. More data shows that our university's distance education has produced a huge regional impact, as Sibiu is situated in the Central Region of the country (Transylvania), which covers 34 100 square km, represents 14,3 % of the whole Romanian territory and occupies the 5th place among the 8 existing development regions of Romania. The region's population is 2,5 mil people, out of which cca 60% are located in the urban area. The age population structure indicates 15,7% inhabitants aged between 0-15, 66% in the 15 -59 group, and 18,3% over 60. Since 1998, our university has trained well over 30,000 distance education graduates and two-thirds have reportedly found jobs in the first two years following graduation. Most of the faculties in the Long Distance centers are of Economics,

Agricultural Sciences, Food Industry and Environmental Protection, Law, Journalism, Engineering and Sciences and they train future engineers, accountants, tourist services managers, financing experts, food processing engineers, public administration officers and gas technicians and experts. The regional potential is exploited through the Branch College of Gas Exploitation and Management at Medias which operates and trains specialists for the area rich in natural gas resources and gas delivery companies. There are also Long Distance MA studies programs available for the graduates who wish to specialize further in their studies or attain to the Ph.D level. The program has thus reached and activated a significant proportion of adult, underserved, distant, and other nontraditional student populations in the Transylvanian region. In other words, we have tipped the scale in the occasional relative balance that existed between the highly trained graduates from our traditional study programs, on the one hand, and, on the other, the less favored generations with scanter chances to succeed these days on a tough(er) national and European labor market facing migratory flows of foreign workforce.

Long Distance websites: <u>http://didu.ulbsibiu.ro/</u> <u>http://didu.ulbsibiu.ro/aplicatie/prezentare/index.html</u>

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Leadership Vacuum in the application of ICTs in Lifelong Learning in Africa

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Abstract

This paper discusses the leadership vacuum in the application of Information and Communications Technologies ICTs in lifelong learning in Africa South of the Sahara. It identifies challenges and constraints that counter the application of emerging technologies such as the internet and the cell phone in continuing education in order to widen access and participation in lifelong learning. The paper further discusses factors affecting access and availability of ICT technologies and their impact in promoting and sustaining lifelong learning and suggests how these technologies can be harnessed through organised leadership to provide sustainable learning experiences.

Key words: Leadership, ICTs, access, sustainability, open and lifelong learning.

The Leadership vacuum in the application of ICTs in lifelong learning

In this paper, the term, Communications Technology is widely used to cover a range of technologies, (TV, radio, multimedia, internet, fixed and mobile telephone networks, cable television, internet connectivity through electrical wiring systems and many more. ICTs have been used separately or in combination to deliver content synchronously or asynchronously to support interactive communication between learners and their teachers particularly in open and distance learning delivery mode. The integration of digital and electronic communication devices such as the video, audio, data and text is being used in Africa, particularly in the urban areas to create rich interaction between learners and their teachers or for business purposes in the world of commerce However, the use of ICTs in lifelong learning is greatly influenced by access and availability of technology, affordability, and possession of requisite literacy skills. Physical access, where learners have access to computer hardware and telephones, radio and television technologies and the skills required to enable one to use these technologies effectively, particularly computer technology and the internet remain some of the major challenges in Africa. Secondly skilled capacity and socio-cultural factors, such as gender, race and age; lack of relevant content that addresses the local and macro- economic environment; lack of legal and regulatory frameworks that facilitate the integration of ICTs in daily lives of people have a negative impact in the application of ICTs in continuing education in Africa.

Lack of ICTs infrastructure, and high costs, and the failure by many governments in Africa to integrate ICTs in the economy at the micro-level makes theses technologies out of reach as teaching and learning tools for the majority many of whom live in the rural areas.

Despite these challenges, the lightening pace at which the world is changing today dictates that practising professionals engage in a process of lifelong learning. This demand has been created by what Perdue (2003:615) calls, 'explosion of information; the changing nature of knowledge. Provision of lifelong learning, to cater for out of school youth and adults in Africa is inevitable. Staff development for people using ICTS for lifelong learning is essential to equip the to develop and deliver academic programmes of good quality. Capacity building for lifelong learning is further justified by the rapid pace of the technological change that now requires educational systems to prepare their citizens for employment by training them for several careers, in a variety of learning environments (Pacey & Keough, 2003). This requires the integration of information technologies (ICT) with the world of work. Where available, computer technology has been used effectively for teaching and online registration of new and incoming students.

Fear of the unknown is another factor that affects the use of ICTs in teaching and learning in Africa. Even where technology is available, the introduction of ICT taught academic programmes is quietly resisted by academicians in institutions of higher learning for fear of being replaced by technology. Very often, open and distance learning practitioners experience subtle resistance from academicians who ask, 'what will happen to me if I convert my course to WebCT to be provided online'? This fear militates against the provision of continuing and lifelong learning particularly in dual mode institutions because those outside university walls cannot access tertiary education, in an extramural context. National governments and educational institutions have a duty to educate their people about the value of ICTs in expanding educational opportunity to those who cannot go to conventional institutions due to long distances or other socio-economic factors.

ICT Policy Guidelines and Lifelong Learning

Lack of policy guidelines in the application of ICTs perpetuates the disconnect between physical access to computers and on- the -ground connectivity thus limiting the use of technology as a resource for lifelong learning and socio-economic development in general. As a result, there is too little if any systematic learning offered through ICTs. In order to create a more equitable global society that is connected and is learning and communicating regularly, certain barriers to the access to ICT technologies require immediate attention by leadership in Africa. Except in a few major urban cities, connectivity to ICTs remains one of the major barriers to accesses to ICT for learning purposes. Lack of technology in Africa has meant that performing various administrative activities such as providing information on course prerequisites, grading criteria and tips on how to study are done physically by bringing students together in a study centre at very high costs borne mostly by the learners. Providing these services through ICTs would reduce time wasted and costs incurred by distance learners when they go to designated but geographically distant study centres to register or access learning materials for their courses in various academic programmes.

Africa's participation in e-commerce, has been minimal, leading to minimal or no benefits from the ICT trade. Africa has been more of a consumer of the both hardware

and software and not an equal trading partner of the multinationals corporations that own and sell ICT technologies. The only engagement in this trade has been in form of small businesses which are limited mainly to the mobile phone technology which is available to limited numbers in the rural areas who live near small urban centres where they can walk to charge their cell phones. To redress this situation, some African governments have already embarked on policy initiatives in order to enhance access to ICTs. The Botswana National ICT Policy, Maitlamo, (2005) undertakes to provide public radio and TV broadcasts including community radio; provide all Batswana with easy and affordable access to the internet at home and through Community Access Centres and via mobile internet units; and train communities in the use of ICTs to enable them to participate in Micro, Small and medium, business enterprises (MSMEs) by 2016. This ICT policy also underpins the need to provide easy access to valuable information on health, jobs, and education; increase the number of computers at home; and increase ICT related education to children, the vouth and adults by connecting schools and libraries with ICT and reach rural communities by providing internet access centres and training in rural villages. Although there is a modern telecommunications network infrastructure around the main transportation corridors circling the country, to support e-Readiness and e-Potential in Botswana, smaller and remote communities who stand to benefit from lifelong learning are not well served, as yet.

The Botswana government underscores the ICTs potential in teaching and learning, by encouraging curriculum developers to include ICT skills in the school curriculum so that there can be a bottom up skills development in the acquisition of ICT skills. To support these initiatives, the government has resourced education centres for teachers to use when they go for in-service training (INSET) (Boitshwarelo, (2009:10). However, there is a serious shortage of ICT facilities, particularly the internet in the school environment. This shortage could be due to government policy guidelines that require the ministry of education to provide ICT infrastructure at centralised places such as the education centre for use by teachers during in-service activities. Given the irregular access to the ICT facilities in the education centres, and in schools, it is therefore difficult to roll out an ICT training strategy using this approach, in Botswana. To redress the situation, Boitshwarelo (2009:13), advocates for a deliberate government policy that supports teachers acquisition of ICT skills, capacity building and the existence of an ICT-supported learning environment.

If internet facilities were available in all primary schools, in-service primary school teachers studying via the distance mode would be able to search the internet for educational resources, receive updates to the modules, submit their assignments, receive online tutorial assistance, receive feedback on their assignments and make enquiries to administration about their progress (Wright, 2008). Secondly, the programme staff would also use the internet to communicate and conduct their administration duties more efficiently, while audio conferencing and video conferencing would be used to connect learners with their tutors and allow tutorials to be conducted. Wright (2008) recommends the provision of facsimile machines to all schools that have landline based phones, to facilitate faster communication and enable distance learners to send their assignments by fax and retain a copy as evidence. This would make record keeping easier because students can track their assignments by the dates they were sent, where these are misplaced or cannot be traced by providing

institutions. Facsimile machines would reduce the trips distance learners have to make to post offices to post their assignments to colleges for marking.

Limited access to ICT infrastructure, lack of adequate ICT skills, time constraints in the workplace due to competing teaching workload, all interfere with the application and use of ICTs. These sentiments are voiced by Mead-Richardson,(2009) in her paper examining the application of ICTs for training lecturers in colleges of vocational and technical education so that they can offer some of the technical courses through the distance delivery mode. In his study to establish Relative levels of eLearning readiness, applications and trainee requirements in Botswana's Private Sector, Nleya (2009:9) found that, 'there is low confidence in the use of computers in the areas such as finding documents, using folders to organise emails, use of multiple documents, use of graphics, Photoshop, electronic discussion, searching on the web, discussion lists, chat, video/computer-conferencing, smart classrooms, updating training materials, and the use of computer labs for computer based training'. From this study it can be argued that although private sector employees in large companies in Botswana have access to computers, their employees are at the point of initial awareness according to diffusion of innovations process thus indicating very low levels of eLearning application in the private sector. This is in-spite of the fact that 70% of the companies reported that they encourage their employees to acquire computer literacy skills. This low competency skills in eLearning can be attributed to lack of eLearning action plans in Botswana and other developing countries. Such plans are necessary to inform the establishment of partnerships between the public and the private sector in order to encourage technology transfer and improvement of entrepreneurial skills so as to achieve systemic change (Nleya 2009:11).

As cited by Gakuu et.al. (2009) the Kenya National ICT Policy of 2006 emphasizes the need to integrate ICTs in education so as to improve access, learning and administration. However the study cites various factors that hinder the use of ICTs namely: lack of skills and interest in schools particularly among school managers who are the drivers of change in educational institutions; limited or lack of access to computing equipment and the internet; lack of skills among teachers; including lack of time to prepare ICT teaching materials due to overloaded school curriculum. This study concluded that although national policy documents on ICTs exist, they have not been fully implemented due to lack of action plans at the school level while connectivity to facilitate access and use of ICTs for learning and teaching is still at its infancy. The study also found a big divide in access between urban and rural institutions with urban areas being better equipped than institutions in the rural areas. The study suggests that the ministry of education develop an ICT policy that requires integration of ICT instruction in the school curriculum. This study notes that, little has been done to integrate ICTs into teaching and learning, mainly due to lack of policies and action plans at school and the national level.

In 2009, the Kenya government gazetted the Kenya Communications (Amendment Act of 2009 to among other things, facilitate the development of information and communications (ICTs) through various media such as broadcasting, multimedia, telecommunications and postal services including electronic commerce (Gakuu, et. al 2009). To strengthen the use of media as a tool for stimulating socio-economic development, the Kenya government has launched the East African Marine Systems (Teams), which is a high capacity fibre optic cable to connect Kenya and East Africa

with the rest of the world at a high speed. When fully operational, this initiative will no doubt stimulate economic development in Kenya by enabling both rural and urban communities to participate in e-education, e-commerce and e-agriculture.

ICTs and Millennium Development Goals (MDGs)

The application of ICTs in lifelong learning in Africa must be viewed in a wider global context. At the turn of the century, Commonwealth governments identified eight UN Millenium Development Goals (MDGs) (Daniel 2004) to be realised by 2015. Achieving these goals requires the development of the necessary skills to enable people to create their own human capacities. The first MDG champions the eradication of extreme poverty and hunger. This is only possible through the exploitation of ICT capabilities to facilitate sharing of information on agricultural developments at the grass root level, in order to improve farming, production and storage techniques. The radio and the mobile phone technology has been very effective in facilitating communication among rural communities. The second and third, MDGs (to promote universal primary education and reduce gender disparities) requires training of massive numbers of teachers, a feat that cannot be achieved through the conventional education systems. The fourth, fifth and sixth MDGs advocate the improvement of health by reducing mortality rates of children and that of women at child birth and the reversal of the spread of HIV/AIDS. Achieving these goals requires training of health personnel and provision of primary health information to all, through delivery modes such as open and distance learning (ODL)

Through the use of ICTs, ODL can be harnessed to provide lifelong learning and subsequently facilitate the achievement of the MDGs as it is an appropriate vehicle for training and development of staff through partnerships at the local, regional and international levels. Some of the setbacks in the realisation of MDGs through ODL is lack of policy guidelines and partnerships to provide educational opportunity through Lifelong learning. Towards this goal, the Commonwealth of learning, COL is providing leadership by working with collaborating governments to develop national and institutional ODL policies and design appropriate learning materials in order to scale up opportunities in lifelong learning by 2015.

These initiatives need buy in from collaborating governments and institutions. In this regard, COL notes with regret that the Centre for Distance Education for the Southern Africa region (SADC-CDE), which was one of the first initiatives in this direction has had little impact on the region due to lack of buy-in from the institutional partners that it was intended to work with (Commonwealth of Learning,2009-2012:50). However the COL has undertaken to promote lifelong learning and livelihoods in rural communities by forging links with universities, research institutes, and key actors in ICT and media to create and make vital information accessible to farmers, through the development and use of ICT supported training programmes.

Capacity Building

Given the current need to address poverty reduction; provide access and participation towards equity of opportunity and the internal competitiveness among public and private institutions, including limited funding from national governments, tertiary education institutions in Africa such as the University of Nairobi in Kenya have embarked in continuing and lifelong learning not just to provide access but also to generate funds, by providing open and distance education programmes through ICTs and short courses. Tertiary institutions such as the University of Nairobi, Open University of Tanzania and the Zimbabwe Open University have introduced diploma and Masters in open and distance education programmes via ICTs as part of capacity building in the development and packaging of instructional materials for lifelong learning. Drawing from the industry, public and private sector these institutions offer short courses through various delivery modes. These courses are meant to equip participants with audio/video development skills, so that they can in turn develop, record and disseminate multimedia learning materials packed into DVDs and VDC for lifelong learning. The University, has also set up a Web Learning Management System called the Web Education Software Electronic Learning Environment (WEDUSOFT ELE) to support ODL teaching and learning strategies at the University (University of Nairobi, 2009). This web based eLearning medium is mainly meant to train academicians to support students by converting courses from face to face delivery to web based delivery and adapting and integrating technologies to improve the delivery of

The emergence of the World Space Radio using a digital satellite signal, (Afristar and Asiastar), interest in radio as a medium of instruction has been revived in Kenya to exploit the potential of radio for educational purposes (Odera 2006). With its digital satellite signal and portable receivers, the Kenya government has provided leadership and support in exploiting the World Space Satellite Radio, to transmit radio broadcasts to in-service teacher trainees and to supplement primary education lessons in all primary schools. Although radio broadcasts cannot take the place of a teacher, the world space radio has played a significant role in supporting distance learners and by so doing helped to widening access to educational opportunity and lifelong. After school hours, the World Space Radio is used to deliver audio-drama, entertainment and educational content to adults and other professional. Radio lessons are supported by printed materials..

The acute shortage of trained teachers in Ghana and generally in sub-saharan Africa cannot be addressed through conventional methods only (Sampong, 2009). Through in-service open and distance education delivery mode, (mainly print supported by face to face tutorial sessions), Ghana is augmenting pre-service teacher training programmes offered in 40 colleges of education in the production of qualified teachers as a measure to phase out untrained teachers from primary school teachers. The aim is to upgrade teachers without withdrawing them from the schools and by so doing enable teachers to integrate theory with practice, create career paths for promotion and new avenues for acquiring further qualifications through lifelong learning

Another top player in the provision of lifelong learning via ICTs is the African Virtual University (AVU). The AVU strengthens technology driven teaching and learning by working with partner institutions in the development of learning materials; training staff from partner institutions in delivery and technology; governance and funding to promote accountability transparency and good governance of distance education programmes; and training of personnel in professional development aspects Dzimbo, 2004). In addition the AVU helps partner institutions in:

- Formulating and implementing human resource development strategies and policies;
- Putting in place guidelines for identifying, recruitment, training and retention of ICT staff through staff performance management and assessment systems;
- Selecting and using technology (ICTs) and infrastructure that is affordable, accessible and conveniently located within the reach of trainees to facilitate capacity building;
- Creating resource pools of local trainers/facilitators;
- Developing infrastructure that facilitates regular formal and informal staff development meetings;
- Developing a comprehensive plan for assessing human capacity for addressing short, medium and long term skills development requirements;

• Developing staff capacity in costing, budgeting and financial management Staff development in ICTs involves identifying strategies that enhance human resource development and operational capabilities to improve performance the institution. This requires effective design, implementation, coordination, management and evaluation of programmes, taking into account the available human, financial, physical, technical and related infrastructure.

Mobile phone Technology and Lifelong learning

Access to ICTs for educational or business purposes remains one of the major obstacles in Africa where global inequalities in terms of accessing ICT tools with an estimated mere 21 million of its 816 million citizens having the privilege of having access to the mobile telephone (Gakuu, et.al 2009). Majority of those with mobile telephones are based in the North of Africa or South Africa. Secondly lack of education, training and skills development in ICTs reduce peoples power to utilize fully, ICTs such as the computers. Technophobia is another challenge that many adults encounter in their endeavour to embrace new technologies. In some instances, lack of role models and career advice, inadequate intuitional support lack of encouragement and mentoring, including lack of peer support and support networks, could be hindrances towards embracing of ICTs for some adults. To combat these fears particularly among women, Omamo, (2009) suggests the existence of initiatives that encourage potential users to develop self esteem, self confidence and self reliance.

Mobile phone technology, particularly the Short Messaging System (SMS) is used to communicate important administrative issues, such as academic instructional messages, interactive quiz questions with feedback, submission of answers to paper based assignments and 30-second lectures on important concepts in the study materials (Fresen and Henrikz, 2009:14). As cited by Fodzar and Kumar (2007:4), mobile phone technology is used at the Indira Gandhi Open University (IGNOU) to provide distance learners with more interactive, more bustle, more contact and more regular communication with tutors and among themselves. IGNOU has found mobile phone technology useful for supporting distance learners who are mainly adults combining learning with full time jobs, family and other communication between learners and their teachers and between learners themselves and combat factors such as lack of time, poor guidance, lack of support from tutors including difficulties in contacting tutors, not getting study materials on time and not getting

timely feedback on assignments, and time management issues. Other issues cited by distance learner for lagging behind in their studies include lack of interaction with other learners, lack of time to job and family responsibilities. Some of these learning problems can be combated through the creation of learning communities or self-study groups and as a result enable students to interact, socialize and develop feelings of connectedness with themselves and the distance education institution.

The University of Makerere, Uganda, uses the SMS to communicate with distance learners Kanjumbula, (2006). This was made possible by a broadcast software from a local company, which has capacity to send instant messages to the mobile phone and email contact of a student. Through this SMS software, the University is able to send vital information relating to course delivery structure by specifying which units are to be covered, timetables, feedback from tutors, fees updates and about new stock of textbooks. This study found that distance learners are happy with SMS communication as it is more regular than general correspondence and keeps them connected to the University. However issues of costs come in where some students could argue they cannot afford to stay long hours on the mobile phone due to high costs of airtime. Kanjumbula argues for a dedicated line with mobile phone providers, to combat commercial rates for students and reduce costs incurred by the University announcing programme activities through the radio and newspapers.

In Botswana, the mobile phone technology, though relatively expensive, can be applied to connect distance learners with their tutors if transmission costs for educational purposes were to be subsidised. Mobile phones could be used to communicate attendance to tutorials, submit grades to students, and contact learners about class activities such as change of dates for tutorials. As cited by Wright (2008), Aderinoye, Ojokheta and Olojede (2007) argue that in Nigeria, mobile phones are used to teach literacy to about 9.3 million nomads, as they move from place to place with their herds of animals. In Kenya, doctors use cell phones to diagnose diseases for patients living in remote areas. Another alternative would be to install toll free telephone lines at colleges of education to facilitate communication between distance learners and their tutors. Institutions such as the University of South Africa, UNISA run toll free telephone lines for their distance to enable them to get tutorial assistance, counselling and library services.

These technologies can be utilized further to provide training to participants about how to run small businesses. As reported by Bakesha, et.al (2009), rural women in Uganda, have utilized information provided on a CD-ROM, face to face distributed groups and home to home networking to improve their entrepreneurship businesses skills. As a result of this blended learning experience, communities of learning and practice emerged in form of new groups (formal and informal) were formed to enable the women to enhance their businesses. In this initiative, the first group of learners acted as role models and later mentors of new group members.

Another initiative involves e-Schooling for the youth and young adults which combines formal education with entrepreneurial skills through the use of ICTs in situated and distributed community centres in both rural and urban areas (Kinyanjui, 2004). By embracing ICTs, Kinyanjui urges African governments, in collaboration with NEPAD and the African Union and the African Council for Distance Education, to develop national strategies that are embraced by all stakeholders so as to create

ICT capacity in the design and management of educational programmes that are delivered via ICT technology. One of the solutions to provide access could be through satellite technology and continental backbone infrastructure to link major cities and hubs at the continental level.

Target Groups

Apart from teacher education which has benefited from the application of ICTs in Africa South of the Sahara, there are other target groups that can be reached. Wolf as cited by Munyua (2009:2), postulates that approximately, 10% of boys and 40% of girls in developing countries aged between six and eleven never enrol in school particularly in areas where factors such as unemployment and mothers' education is lower, and where the girl child is more likely to have household and childcare responsibilities including engaging in income generating activities as her contribution to the family income. Another target group that could benefit from ODL and lifelong learning initiatives in Africa, includes people in a self-employed who are involved in Micro Small Enterprises (MSEs) such as hair saloons, selling of second hand cloths, running small scale home based catering services, and Jua kali (hot sun) welding and car repair activities who own and use the mobile phone extensively (Munyua (2009). Mobile phone enables these entrepreneurs to network and share information by communicating anywhere, any time. These traders are also able to integrate their businesses and family life and as a result, improve their business performance without compromising their life activities. Yet very few of these entrepreneurs are trained in how to run a business and this is where the use of ICTs and the mobile phone would make a contribution.

The use of ICTs such as computer assisted learning is out of reach for learners based in the rural areas. At the University of Pretoria, in South Africa, online internet-based learning was found inappropriate since not every distance learner has access to a computer (Fresen and Hendrikz (2009). In order to diversify the delivery mode from print based materials, CD_ROM for learners taking the Advanced Course in Education, (ACE) containing enrichment learning materials and not compulsory reading so as not to disadvantage learners who have no access to computer networks. The materials in the CD-ROM included "e-library" in form of library articles, generic academic support such as time management and study skills, coping with stress. The CD-Rom materials are accessible only to about 25% of students who have access to computers. This project also uses cell phone technology since because 99% of the learners have access to cell phones. Through this push technology approach, many students have tried to get access to computer ether at the schools or at internet cafes, so that they can read materials on the CD-ROM.

In Nigeria, mobile technology in form of e-health is used to provide mobile health care (Ikhu-Omoregbe, 2008), through the provision information required for health promotion, provide medical education, facilitate biomedical research. Health practitioners have found the application of mobile technology in form of PDAs, cell phones and laptops useful in the provision of health care. E-health can facilitate exchange of records, transfer of prescription information, including classification of diseases and storage and exchange of medical images, and as a result lead to a more

efficient, timely exchange of medical information among medical care providers reducing errors that are likely to occur through paper work communication in a typical hospital particularly in the developing countries of sub-saharan Africa.

Conclusion

In conclusion, I would like to argue that if Africa is to realise the full potential in the use of ICTs in lifelong learning, there is need for a committed leadership at the regional and national level, that makes ICT technologies available and accessible to all in Africa. Setting up ICT policies alone without implementation guidelines will not assist. There is need for guidelines deliberately developed that outline how ICTs technologies are going to be tapped. Secondly, there is need for research at the grassroot level to establish why ICTs are only available to those who live in urban areas and how these technologies can be accessed in the rural areas where the largest population in Africa lives. Thirdly, governments in Africa need to create visible partnerships with non-governmental organisations and the private sector, particularly the multinational corporations so that the latter can subsidise technology to make it accessible and available for lifelong learning. Finally lack of literacy skills remains the main threat in the use of ICTs by the majority in Africa. This hindrance needs immediate attention.

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Social and Economic Challenges to Lifelong Learning in Nigeria

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Abstract

Education is a right for all in any nation. Education gives access to other basic human rights. Learning is an activity carried out by human beings and is a continuous process. The philosophy behind lifelong learning is that it is never too soon or too late for learning. Lifelong learning is attitudinal that is acquiring a mindset that one can and should be open to new ideas, decisions and skills. But lifelong learning in Nigeria is besieged by social and economic challenges. Some Nigerians feel they are too old to learn or that they have learnt enough in school and this attitude hinders the creation of a national culture of lifelong learners. The Nigerian educational system is deficient in providing a process that encourages lifelong learning.

1.1 Introduction

Education is a basic right and a key which gives access to other basic human rights such as health, housing, work and participation among others, while also making it possible to accomplish global, regional and local agendas for development (UNESCO). Education, therefore, has value to individuals which brings possibilities to people's lives. It brings about economic well being, enhances health, encourages self-reliance and entrepreneurship, and helps families build better lives and lift their children out of poverty.

Learning is part of human nature because learning is a continuous process. Naturally learning is thought of as something acquired in school but learning can take place in different places. Mazur (2008) avers that learning is acquiring knowledge or developing the ability to perform new behaviours. It is common to think of learning as something that takes place in school but much of human learning occurs outside the classroom and people continue to learn all through life. Children are taught basic academic subjects which they learn in school but they learn a great deal outside the classroom continuously. Mazur (2008) states that learning continues throughout our lives and affects almost everything we do. Adults learn new knowledge and skills throughout their lives. If older adults remain healthy, their learning ability generally does not decline with age. Learning, therefore, is for life.

2.1 Lifelong Learning

There are different meanings of lifelong education and lifelong learning. But according to Knapper and Cropley (2000),

The single crucial element in the notion of lifelong education is to be found in the word 'lifelong'. It embraces a set of guidelines for developing educational practice (education) in order to foster learning throughout life ('lifelong'). Lifelong education thus defines a number of organizational, administrative, methodological and procedural measures which accept the importance of promoting lifelong learning.

Continuing, they feel the basic idea behind the term 'lifelong learning' is that deliberate focused learning does and should occur throughout a person's lifetime. Lifelong learning is based on the philosophy that it is never too soon or too late for learning. Lifelong learning is the development of a mindset that one can and should be open to new ideas, decisions, skills or behaviours. Lifelong learning provides learning opportunities for people of all ages and in different contexts such as work place, at home and through leisure activities which are not formal like school and higher education. Lifelong education is a form of pedagogy achieved through distance learning or e-learning, continuing education or correspondence courses. Lifelong education includes postgraduate programmes, people who want to improve their qualifications, update their skills or retrain for a new line of work. Lifelong education is important because of acceleration of scientific and technological progress. The knowledge and skills acquired in primary, secondary and university education may not be sufficient for a professional career that will last many years. Lifelong learning faces the challenge of meeting the expanding educational needs and expectations of larger numbers of students from different background. New occupations and careers and the rapid transformation of others requires new knowledge and skills to perform them. The explosion in knowledge and technology also calls for lifelong learning. The change to an information society, economic restructuring, organizational reform and changes in the workplace and career patterns call for lifelong learning. Lifelong learning is advocated because of the cost of education in the formal system and the need to teach and learn effectively within constrained resources. Lifelong learning is for social inclusion, employability, active citizenship and personal fulfillment. Lifelong learning enables individuals to update and complement their knowledge, competences and skills throughout life. According to Fischer () the objective of lifelong learning is to fundamentally rethink learning, teaching and education for the information age in attempting to change mindset. It involves and engages learners of all ages in acquiring and applying knowledge and skills in the context of authentic, self-directed problems and it exploits the possibilities offered by new media. Druker, 1994 opines that creativity and innovation are considered essential capabilities for working smarter in knowledge societies. Thus an important challenge is how these capacities can be learned and practiced. An implicit assumption made is that self-directed and lifelong learning can influence the creativity and innovation potential of individuals, groups, organizations and countries (Dohmen, 1999).

2.2 Distance Education

Distance education has made major changes on how educators and students think about teaching and learning. Distance education now provides educational opportunity to population that could not be reached before by allowing students to learn in more convenient times. In distance education, people extend the period of their education from a few years of schooling to a lifelong learning process.

Distance education requires the use of methods of instruction that uses different communications technologies in teaching learners in different places. These communications technologies are not readily available in Nigeria because of their cost, maintenance and provision of other facilities such as electricity to go with them. Many Nigerians who would have benefited from distance education do not because they are illiterates in the use of computers and internet. Synchronous and asynchronous distance learning methods are difficult to use in Nigeria because there are no several telecommunications media linked together so that learners can benefit from the strengths of each one. Communications technologies are not efficient, not widely available and so no elementary or secondary school offers distance education programme.

In Open University programme, students receive instruction entirely at a distance. This method of education is valuable in developing countries because large number of students can be reached with few teachers. It also provides a cost-effective way of using limited academic resources. According to Kwache (2007) in Nigeria, if open and distance education is well supported by e-learning technology, it will provide accessibility, flexibility and collaborative work to both the urban and rural populace of Nigeria and Africa in general who might not have the privilege to attend conventional universities. But this type of education is not readily available in Nigeria because of the cost, man-power to man the technology for learning.

2.3 National Open University of Nigeria

Governments in Nigeria has consistently relied on education as a tool for national and personal development. Alhaji Shehu Shagari saw the ever growing demand for education by Nigerians which cannot be met by the traditional means of face-to-face classroom instructional delivery. Open and distance education was seen as a way out. The National Assembly then promulgated an Act to establish the National Open University of Nigeria (NOUN) in July, 1983. In 1984, it was closed down by the Federal Military Government that overthrew the civilian government of Alhaji Shehu Shagari. After many years of closure, there was still the need to provide education for all in the

country. The National Open University of Nigeria is meant to provide functional, cost effective, flexible learning for all who seek knowledge. Some of the major objectives of the National Open University of Nigeria are to ensure equity, access and equality of opportunities in education generally but specifically in university education; enhance Education For All and lifelong learning; entrench global learning culture and reduce cost, inconveniences and hassles to education and its delivery. Equal opportunity entails meeting the individual where he or she is and attending to his or her needs from there. The university helps individuals to achieve what they thought was not achievable before. Equal opportunity means that when you apply to NOUN, no matter your credentials the university is prepared to meet you there. The university also helps you gradually through courses, certificate and diploma programmes to get you up to the point of matriculation where and when you can actually begin your degree programmes."

The National Open University of Nigeria concerns itself with preparing professional in various disciplines through the distance learning mode. It offers courses leading to the acquisition of certificates, diplomas to post graduate diplomas and degrees. It is designed to cater for the continuous educational development of professionals such as teachers, accountants, bankers, lawyers, doctors, engineers, politicians, self-employed, businessmen and businesswomen. The major difference between the conventional universities and NOUN is the mode of instruction. At NOUN, instruction is through the open and distance learning method. This means that the students are provided with a set of course materials to study and they are examined when they have completed them.

It is a more flexible approach to learning. Flexibility is the cornerstone of NOUN. It is flexible in terms of time and timing, programmes and programming, and all these without compromising quality. A student can learn in any place and at any time convenient to him/her. If a student misses a particular schedule, she/he can repeat the lectures to himself/herself over and over again at other periods. The students work and schedule of duties do not suffer because they are in the university. Studentship does not disrupt whatever else the student wants to do - paid employment, family life, or raising a home etc. rather it enhances them. A student can also engage in normal activities in his/her community, in the church or mosque and in the society without hindrances. These flexibilities require from the students more self organization, more self discipline and more dedication to work and studies.

At the National Open University of Nigeria, there is a way for everyone who has a will to obtain university education. NOUN is established to complement the public and private universities. It provides university education in a non-conventional way because there is no continuous face-to-face lectures as in the case of conventional universities. The students are allowed to carry on their full-time employment and carry their academic load in small bits as their capacity allows. But the student has to understand clearly that Open and Distance learning requires more reading on his/her own, able to study independently, able to utilize at a higher level the various learning to learn strategies and to be more self motivated than the students who are in conventional universities (Getting to know your University).

The distance learning in the Open University is meant to appeal to anyone who wants to work and learn at the same time. Distance learning in the NOUN is composite and comprehensive. It includes personal contacts and a combination of resources such as

- Regular contacts with tutor;
- Availability of course materials in print (study materials, textbooks, work-books etc).
- Course material on CR-ROM;
- Computer conferencing facilities;
- Audio and video cassettes;
- Networking opportunities with your classmates and peers.
- Websites for courses
- Television instruction using Nigerian Television Authority (NTA) Educational Unit, State and Private broadcasting stations;
- Radio broadcasts using the Federal Radio Corporation of Nigeria (FRCN), state and private broadcasting units;
- Feedback regularly on tutor marked assignments and

- Periodic face-to-face contact sessions using tutorial facilities.

2.4 Objectives and Expected Outcomes of the National Open University of Nigeria

The National Open University aims at ensuring equity and equality of opportunities in education generally but specifically in university education; providing a wider access to education generally but specifically university education in Nigeria; enhancing education for all and lifelong learning; providing educational resources through intensive use of information and communication technologies ,to reduce cost, inconveniences and hassles of education delivery. It is also expected that the Open University will raise the literacy level of Nigeria; substantially increase access to university education; widen the catchments scope of beneficiaries of university education thus reaching the hitherto unreachable and ensuring that nobody interested in, and capable of having university education is left out; enhance and facilitate workplace training and professional development; meet the yearnings of Nigerians from university education and reduce pressure on university place in the conventional university.

2.5 Study Centers

Study Centers are the main center of student learning activities at the National Open University of Nigeria and where the Federal Government of Nigeria presence is articulated. There are 29 study centers spread across the breath of the country. The expectation is that all the state capitals will have a study centre of NOUN. The plan is to eventually establish a Study Centre in each Local Government of the federation.

2.6 Student Enrolment

Students admitted to the university is about 26,923 from its past two previous admission exercise (2004 - 2006). A breakdown of the figure is as follows:

Total	26,923
Law	2,673
Education	2,937
Science and Technology	7,413
Continuing Education and Workplace Training	1,530
Business and Human Resource Management	6,726
Arts and Social Sciences	5,644

In 2007, the intake was about 20,000

2.7 Staffing

At the headquarters, the staff strength is about 600 comprising of management, academic, technologist, administrative and other support staff. The university has also taken over the former National Educational Technology Centre (NETC) Kaduna as the Kaduna campus of NOUN. It has about 53 staff who together with the facilities located at the site are being reformed, modernized and upgraded to perform the original and many other added functions of the centre. In addition the university has staff at the various Study Centres. Each Study Centre staff include one study centre manager, administrative officers, account officers, many instructional facilitators and at least two student counselors. The main function of the instructional and tutorial facilitators is the conduct of regular tutorial meetings and facilitation of instruction at the various Study Centres. They also assist with professional workshops, course development and design. They are also responsible for tutor marked assignments and assist with the conduct of examinations. Instructional Tutorial facilitators form an important segment of learner support services.

2.8 Fees

The National Open University of Nigeria does not charge tuition fees. The fees are meant to cover costs for courseware development, production and delivery. The intrinsic nature and value of each course determines what is charged. The courses are not charged uniformly. An undergraduate course has a fee that is lower than that charged for a postgraduate course. A one credit unit course is less costly than a two credit unit course.

Production of course materials, learning aids and other student support materials acquired or developed in-house are being centrally undertaken at the REPROAQ centre and delivered in various formats and through various channels to the study centers for onward distribution to the students. The choice of format and/or delivery channel is based on students' preferred learning styles and the facilities that can be accessed in the various locations.

The different delivery formats for NOUN include printed materials, audio tapes, CD ROMs and on-line multimedia interactive and non-interactive presentations. The different delivery channels for NOUN include physical transportation of hard copy materials (printed materials, audio and video tapes, CD ROMs by courier companies, NIPOST and in-house transport division), electronic transmission of materials in multimedia (voice, data, graphics, video), over fixed line (telephone or leased lines), terrestrial and VSAT wireless communication systems, television and radio broadcast of educational programmes.

Reprodaq headquarters is located in Lagos state but not fully operational yet. It is expected to be the central hub for the production, storage and distribution of learning materials in multiple media format. It will be an aggregation of educational resources for sharing and distribution purposes – Reprodaq will offer academic services, content authority, central multimedia content reposition/ Data Base, E-learning/ Web based learning solutions, learning management systems, user interface, communication tools (mail, chat, forums, instant messaging), secure internet access, access to the National Virtual library, data collection, display and analysis; directory services; testing and certification; network management. Also production and editing facilities will be installed at the Reprodaq headquarters to produce, convert and edit multimedia content for multi-channel delivery. Delivery platforms will include – line audio and video uniast, Multicast and Broadcast; video and audio on-demand; text and graphics; CD-ROMs; audio and video tapes and printed materials.

2.9 Course Development

Course development is an integral part of instructional design within the open and distance learning system. All the courses in the programme have been designed and developed in line with an approved curriculum to meet the educational needs of the target group. The course content is written by experts in the various areas to achieve specific objectives. The development of these materials is based on the course description prescribed for each course. Each study material consists of identified topics that make up the course outline. Study units are developed and written addressing these topics. Exercises which students can attempt to evaluate themselves are given. There are also tutor marked assignments which students will complete and submit for assessment. The study materials are passed through several editing processes to ensure quality both in content and language.

2.10 Social and Economic Challenges

Nigeria educational policy does not show a deep understanding of the complex and emerging needs of the 21st century work force. It has also not integrated the 21st century learning tools in the instructional process across all levels. The Nigerian education system in preparing its students to become effective and good citizens should provide infrastructure and reflect on the practices available in schools. In Nigeria, there is need for strong, autonomous, responsive and inclusive universities to provide research-based education and gargets for learning in order to meet the many challenges of a globalised world bedded with technological change. An out-of-school (market/mechanic village schools) programme in South Eastern States of Nigeria for Basic and Post Basic Education Curriculum Modules was prepared by Skills For Life's Seasons Educational and Health Center (SLSEHC), Awka funded by Education Trust Fund (ETF) under the boy child education intervention in South Eastern States of Nigeria and restructuring based on Nigerian Educational Research Development Center (NERDC) and UNICEF curricula.

The Executive Secretary of the Education Trust Fund, Mustapha Jaji, stated that the ETF Boy Child Education is a means of enhancing access to quality education and re-entry into relevant knowledge process, specially designed for the Boy-Child from the South East geopolitical zone who at one time or the other left or dropped out of the formal school system. This programme is a continuing programme for boys who could not complete their formal education. They are now made to learn in their communities as market and mechanic boys. The essence of this programme is to achieve the goal of Education For All (EFA) by the year 2015 as well as enhanced and improved livelihood. This is a sort of lifelong learning for children at secondary school level who did not have the opportunity

to get secondary education or to complete secondary education. They are taught the basic literacy and numeracy to help them become functional in the society.

Lifelong learning can only be facilitated by technology because teachers and educators need a research-based and funded learning. Research in itself is not done in isolation in a particular university. There is the need in Nigeria to collaborate with other teachers or educators or lecturers across the globe as it is a known fact that globalization play a key role in research. There is need for sustainable technologies to sustain research. Professional and senior citizens who wish to continue with lifelong learning can do so with the aid of technology as they cannot afford to revisit their universities and enroll in classroom lectures and examinations. E-learning then becomes a mode of learning for professionals who desire to upgrade on their job. Research and Development (R&D), an avenue of encouraging new innovations in technology and industrial designs in a form of collaboration between experts in industries and professors in the universities as a result of lifelong learning is facilitated by emerging technologies. Technology, therefore, provides a stable medium of harnessing human talent in life learning.

There are a number of social and economic challenges facing Nigeria as a nation which hinder the attainment of the objectives of lifelong learning. The educational system in Nigeria emphasizes the acquisition of certificates so learning is thought of as something that takes place in school but much of human learning occurs outside the classroom and people continue to learn throughout their lives. There is also high unemployment rate in Nigeria and high crime rates. The government also pays heavily for early retirement pensions because older people do not have the opportunity to learn to adapt to the many changes that affect their lives. Tax revenue is reduced because with early retirement taxes are not paid while healthcare cost becomes higher. Despite these social and economic challenges to lifelong learning in Nigeria, she has come a long way to start a distance learning university named the National Open University of Nigeria (NOUN) and a few distance learning institutions. She has established and sustained internet connectivity in all the universities. There is also the establishment of forms of collaboration among educators and teachers in home universities and abroad.

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Using Virtual Classroom Technology to Promote Equal Opportunities for Post-Graduate Women Engineering Students

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Abstract

The traditional role of a university is to provide learning opportunities, mainly for students from 18-25 years of age, and to offer an education relevant to meeting life's challenges. Beyond that, post-graduate studies serve as the first stage in continuous, lifelong adult education. More attention should be paid not only to enhancing the educational curriculum, but also to improving the manner in which it is being taught and the means of its delivery. In the engineering sciences curriculum, where the learning material is subject to frequent, significant changes, this poses an especially acute problem. These constant changes cause differences in the levels of "starting knowledge" not only between young and adult students, but also between mature men and women students, due to the disparity in martial and parental status, educational aspirations, etc. [1]. Many potential women graduate students feel that, as a result of their having left their university studies to fulfill traditional family obligations, they later find themselves at a disadvantage in comparison with men graduate students.

This work offers a practical means for surmounting the gender bias in "starting knowledge" for many graduate engineering courses and possibly other courses, as well. We propose the use of modern learning technologies (such as E-learning) and changes in the existing methodology of some courses to reflect gender demands in E-learning [2].

We explore an approach based on dividing the learning materials into two modules. **Module 1** brings all the students up to the same level of "starting knowledge"; it is totally interactive, done by means of fully virtual lessons (including conversational audio, live video, animation) with online tests, practice exercises and final examinations.

Module 2 combines frontal classroom lectures and online chats, forums, bulletin boards and polls.

Submission of a research project is required at the end of the course to complete the course requirements.

An analysis of some course statistics demonstrates that mature women students, in particular, prefer and do better in courses designed according to the approach proposed above. Our proposed method is universal and may be implemented in any compatible E-learning course.

1. Why is female post-graduate engineering education so important? Some facts.

In light of the position held by Science, Technology, Engineering and Mathematics (STEM) in the development of modern society, the governments of many nations support efforts to stimulate educational progress in all STEM fields. However, when comparing the number of Bachelor's students by scientific fields (Figure 1), one can see that the number of women students in the Engineering Sciences (ES) is approximately 75% less than that of their male counterparts. An analogous disproportion also appears in the number of Master's and Doctoral students (Table 1).

Clearly, this suggests the need for more rigorous evaluation of the factors leading to this situation. It is crucial to note, however, that Bachelor's students are a more homogenous group than their postgraduate equivalents in regard to gender and other characteristics, such as: age, work experience, motivation, family status, etc. For example, Figure 2 illustrates the difference between male and female ES Master's students (with and without working experience) who have chosen to resume their graduate education after several years of absence.



Figure.1 Distribution of Bachelor's Degree Students in Israel bv Field [3]

Table 1. Distribution of Students by Faculty and Degree at the Ben-Gurion
University of the Negev

07-2008

School of		Health		Engineerir	ıg	Natural		Humanitie	es &		1
Manageme	ent	Sciences		Sciences		Sciences		Social			
								Sciences			
Female	Male	Female	Male	Female	Male	Female	Male	Female	7 _1_		
49.9	50.1	70.8	29.2	19.8	81.2	43.0	57.0	65.1	200	Bachelor's	
45.6	54.4	78.7	22.3	20.3	79.7	35.7	64.3	65.4	2-2	Master's	
40.2	52.8	56.9	43.1	17.9	72.1	62.0	38.0	60.0	· 003	Ph.D.	
	•		•			•	•	•			
49.4	50.6	73.6	26.4	25.0	75.0	40.9	59.1	64.2	35.8	Bachelor's	2005
49.7	50.3	75.5	24.5	23.8	76.2	32.8	67.2	70.9	29.1	Master's	-20
48.5	51.5	59.1	40.9	26.5	73.5	37.0	63.0	59.4	40.6	Ph.D.	06
											N

54.9	45.1	74.6	25.4	26.0	74.0	44.0	56.0	62.2	37.1	Bachelor's	
51.7	48.3	80.2	19.8	25.6	74.4	36.4	63.6	70.1	28.9	Master's	
48.9	51.1	60.2	39.8	28.5	71.5	41.0	59.0	63.1	36.9	Ph.D.	



Figure 2. Percentage of ES Master's Degree Applicants following a 3-5 Year Hiatus in Their Higher Education

Many women, who were unemployed during their 3-5 year educational hiatus, plan to use their future Master's degree to attain prerequisite, entry-level job qualifications. However, most men who apply for Master's studies after a 3-5 year educational hiatus were working during that period and do so t further their careers. Thus, it appears those traditional, 'stay-at-home' wives and mothers, or those

holds part-time jobs, are already at a major disadvantage with regard to their male counterparts. In fact, the ES labor market continues to raise its standards and demands, providing even less flexible employment conditions, placing more obstacles in the path of potential women ES graduate students and preventing their number from growing significantly.

Obviously, to raise the number of women graduate students, one has to resolve this complex problem. Our solution includes an important component--the use of modern educational technologies, particularly E-learning.

2. A brief background on existing E-learning systems

Over the past 5 years, E-learning strategies have been incorporated into most of the public higher education programs in the West: more than 75% in the USA universities and 69% in European public universities. It is crucial to emphasize that: "E-learning is a learning process in which learners can communicate with their instructors, and their peers, access the learning material, over Internet or other computer networks"[4].

There are many types of E-learning environments: synchronous and asynchronous, Learning Management Systems (LMS), Content Management Systems (CMS), etc. Commonly, universities use LMS. There are many LMS vendors, such as WebCT, Blackboard, HighLearn, etc.

LMS has various distinct elements:

- 1. Interaction tools (E-mail, chats, video conferencing, white-boards, etc.).
- 2. Content delivery (Web-based).
- 3. Student management (student tracking, assignment control, auto-grading, etc.).
- 4. Multi-language support.

5. Synchronous and asynchronous "built-in" modules.

Note that very few studies correlate gender and E-learning, especially with regard to graduate studies via LMS. This paper considers utilizing the outstanding capabilities of LMS and to satisfy gender-related demands on E-learning.

3. Gender-related demands on E-learning

In light of prior research [5-11] and to attain the most effective use of LMS, we propose a set of gender-user based demands for E-learning.

1. The Students' Ages

Many researchers state that, in 30-40 year old students who use some kind E-learning environment, the gender difference in Internet usage is about 18% [5], while this difference is only about 2% amongst younger students.

2. The Chosen Discipline

Some recent studies show [6] that disciplines offering E-learning courses motivate more men and women to participate. In disciplines such as computer programming, software usage, etc.), there is only a small gap in gender motivation. One crucial factor, however, is the level of prior knowledge. Student groups with the same previous professional experience show no gender difference when choosing courses.

3. Communication Styles

Communication style is fully gender-dependent. In [8], it was found that there are distinct gendered communication styles in homogeneous male and female groups or in groups having a majority of one gender. Most frequently, the prevailing gender in a specific group determines the preferred communication style. The male communication style in chats, forums and other collaboration tools is more aggressive and competitive, with put-downs, frequent postings and self-promotion. The female style is characterized by 2 aspects: support and attention [9]. Another research showed that the level of anonymity in mailing lists influences the communication style. In [10], it was shown that communication between students who are strangers is more gendered than in groups where people know each other. All of this must be taken into account for the effective application of the LMS.

4. Learning Strategies

There, as yet, are no comprehensive and concrete analyses based on the importance of gender in learning styles. It appears, however, that women seem to prefer cooperating to working alone, unlike men [12]. One study finds that 44% of women students, compared to 24% of men students, opted for group work and interaction.

group work and interaction.

Our preliminary analysis of gender demands from E-learning indicates their complexity. But even at this point in our study, we understand that any course exploiting a learning environment, such as LMS, to entice women students to register, has to be founded on blended scenarios include of fully virtual and face-to-face modules and collaboration tools. (More detailed analysis of this topic is yet to be done.)

4. Using virtual classroom technology to promote equal opportunities for ES post-graduate women students

Is this work, therefore, we propose the following graduate course design, applying LMS methodology and dividing the course materials into 2 modules:

<u>Module 1</u> – brings all the students up to the same level of "starting knowledge", which is very important for mature working-women students.

<u>Module 2</u> – provides a mixed-initiative dialog, which combines frontal classroom lectures and online forums, chats, bulletin boards and polls.

To illustrate our novel approach, we analyze the outcomes of an LMS course "Using MATLAB software for engineers". For the last 4 years, this has been a required course for students of all degrees

at the Ben-Gurion University of the Negev Faculty of Engineering Sciences. This course was designed in High Learn LMS by Britannica Knowledge System, Ltd.

It is a special course, because the learning material bears no direct connection to previous knowledge in mathematics, physics, etc. It may pose some difficulty to mature post-graduate students.

As describe above, Module 1 of the course allows all the students to reach the same level of "starting knowledge". This is accomplished by means of fully virtual lessons, provided by a (didactic and professional) specialist in this field (Figure 3).



A Lesson Fragment. Figure 3.

Each lesson includes conversational audio, video, 3D graphics, live animations, etc. After each subject is taught, there are relevant assignments (Figure 4) and on-line quizzes. At this stage of learning, there is only one frontal, introductory lecture.

Module 2 of the course, besides the traditional frontal- lectures, offers participation in classroom discussions and the preparation of a research project, to be done, perhaps, in small teams or study groups with a balanced male-female ratio (in compliance with the gender demands above in 3.4).

5. Results

To evaluate the effectiveness of our proposed method, we compare the results of teaching said course in two different groups of students:

<u>First Group(FG)</u>-Bachelor's students, instructed using the customary methodology, including once-aweek lectures with the course curriculum presented via Power Point presentations, .doc files, all displayed using the same HighLearn system. Some of the assignments were preferred to be completed online and others to be done as laboratory work in the classroom. The exchanging of FAQs, discussions on solving homework problems, etc., was all carried out in online forums. The final exam and course summation was held in the classroom. <u>The Second Group(SG)</u>-Master's students, for whom an integrated course was designed according to our suggested method.

The male-female ratio in the FG group was 69%-31% and in the SG group it was 65%-35%.

Age, employment status and parental status were not taken into account. In both cases, the statistics were compiled using HighLearn System Management reports, such as: "Viewed Items report", "Assignment Status report", "Activity report", etc.

Table 2. Percentage of Logins Per Group

This Table shows that the amount of logins to the Course Library tree is almost identical for men and women from the First Group. Moreover, according to the "Activity report", all of these logins occurred during the first weeks of the course and did not reoccur.

On the contrary, analysis of the Second Group attests to the fact that the existence of the audio/video components replaced the need for actual attendance at frontal lectures. As a result, students are motivated to review the course material many times. This positive aspect encourages more students register for such a course.

Let us examine how these outcomes relate to the grading of assignments.

	Assignment 1	Assignment 2	Exam		Research Project
Women- FG	60.3	65.5	68.3		-
Men- FG	59.7	60.5	68.7		-
Women- SG	68.7	69.4			76
Men- SG	64.1	68.1			72
	First	Group		Second Gro	սթ
Men	49.5	70		46.8%	
Women	50.59	70		53.2%	

Table 3. Grades vs. Assignments

In this tally, we see that women, on average, tend to get better grades on their assignments than men do. However, on the final exam, men tend to show slightly better marks. This may occur due to the fact that men are generally over-confident, leaving the completion of their assignments to the last minute, thus lowering their scores. In contrast, women generally tend to complete all their assignments on time. In addition, in accordance with studies mentioned above, we deduce that women will score higher than men in the research project, since such a project requires high-level team work and communication skills.

The outcomes of the exemplary course above do, indeed, indicate the veracity of our approach; the SG women in the course produced better research projects, than the weaker exam results attained by the FG women. We also discovered, by means of taking online polls, that 70% of these women students exhibited higher satisfaction with our adapted LMS course format than with the traditional one. This may be explained by a myriad of factors. Firstly, the presence of fully online virtual lessons allows mature women students with families and work commitments to make progress in their studies without having to actually come to the Campus and to review the material at their convenience.

6. Conclusions

This work is only a first step in researching the connection between gender considerations and modern learning environments. We have shown that the proposed approach, of dividing courses into two modules: 1) bringing all the students to the same level of "starting knowledge" and 2) combining frontal presentations and face-to-face meetings with online access, increases the likelihood that graduate students, and especially mature women graduate students will choose such a course over the traditionally-formatted ones. The results of this investigation provide a method for equalizing education opportunities. This responds not only to the question: "Which students of the engineering sciences are most successful as end-user E-learners?", but also facilitates the effective transfer of necessary knowledge to all the course-participants, whatever their gender, age, socio-economic standing, previous work experience, etc., may be.

We further suggest that our modular course format, being universal in nature, may be compatible and implemented to a great benefit in E-learning courses on all levels of higher educations in all the other

disciplines, as well. We recommend that it be adopted by schools of continuous adult education, toward the more effective promotion of lifelong learning. Again, we consider this work to be merely the starting shot, setting off extended future research, which should include in depth psychological, pedagogical and social studies on gender issues, E-learning techniques and equalization in higher education.

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Constructing a Learning City

The Role and Reformations of Higher Education Institutions

——A Case Study of Tsinghua University

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Abstract

In the learning city construction, the traditional higher education institutions are taking prmations toward two directions: those to do with providing lifelong learning opportunities those to do with cultivating lifelong learners. As a top university located in the culture and cation center of China, Tsinghua University has taken on a multi-dimensional role in the cess of eliminating regional education unbalance and promoting lifelong learning. This ess I take Tsinghua University as an example to analyze the roles and responses of higher cation institutions in the learning city. Particular emphasis will be placed on the following be aspects: (1) the conceptions and significances of learning city construction; (2) the policy kground and the practical models of learning city construction in China; (3) the challenges reformations of higher education institutions under the background of learning city struction-a case study of Tsinghua University. Based on the above discussions, this paper v o demonstrate the implementation and effects of Ma'anshan learning city pilot project iated by Tsinghua University, which can also be seen as a vivid snapshot of successful peration models between universities and cities jointly construct a learning city project.

1. Introduction

In the late sixties of 20 century, the notions of learning society gained considerable rency and was regarded as a new form of social ideality in a number of countries. A learnir iety is made up of different kinds of learning organizations, such as learning individuals, ning families, learning communities, and learning cities. As for the concept of learning city 'erent scholars take different views on it. In this essay, the author defines it as a city that resses individual fulfillment as well as social cohesion through promoting lifelong learning the citizens.

It was not until 1990s that the concept of learning city had risen up into a widely rnational movement with the endeavors of the international organizations, such as UNESC CD, and EU. In the process of constructing a learning city, the higher education institutions ving on their excellent faculties, rich learning resources and advanced technologies should ke a distinctive contribution. To fulfill this historic mission, the traditional higher education itutions need adopting series reformations and innovations under the guidance of lifelong ning.

2. Learning city: Conceptions and significances

The meanings and characters of the concept

The concept of learning city has a history extending as far as the late1960s. During this iod of time, lifelong learning thoughts were revived by the advocacy of three international anizations (UNESCO, OECD, and EU) and have become a fundamental goal of social and itical policies. Lifelong learning has multi-modalities, whether it is called as "lifelong cation", "recurrent education", "adult education" or "permanent education" the core idea is

the same, that is providing education opportunities for all the people across their whole life n the cradle to the grave.

The learning city is closely related with the idea of lifelong learning. It is an operationa cept which integrates lifelong learning into the city strategic plan and transforms the lifelon ning ideas into concrete initiatives and action plans. The learning city encompasses varied ning organizations, such as learning families, learning communities, learning villages and ning towns. It is also a necessary part of a learning society which provides suitable ironments for varied learning activities and makes lifelong learning into realities.

Thus, the concept of learning city has transcended the geographical scope. It is more the gion with modern architectures, advanced technologies and developed economies. They ar numities where lifelong learning has been established as the principle, where varied cation providers (formal and informal) are organized in a systemic and comprehensive way where learning activities can happen at any time in any places.

Although different cities have formed different learning city patterns appropriate to the ticular needs of their own localities, learning cities have a number of common characters the them significantly differ from the traditional cities. As a learning city, it is

Regarding lifelong learning as an organizational principle and a strategic city
1;

✓ Promoting citizen's harmonious development (knowledge, skill, attitude, etc.)
1 as enhancing the social cohesion and economic development of the city;

 \checkmark Providing continuum learning opportunities for all the citizens, from early ldhood education to the elder education;

 \checkmark Integrating all kinds of learning resources from formal education (K-12) secto nformal education sectors, into a learning network;

2.2 The significances of the learning city construction

From the sociological perspective, cities are always regarded as the main strengths velling social reformations and developments Therefore, the construction of the learning cit

n important tool to realize lifelong learning conceptions and a breakthrough to establish a ning society. Meanwhile, cities are also the most appropriate forms to carry out lifelong ning activities because of their core status in population, politics, economy, culture and cation. Besides, constructing a learning city has other significances. It can be divided into e levels:

> Individual level. The learning city will greatly enhance personal fulfillment, tivate more adaptable, creative individuals through development of a learning culture.

Economic level. The learning city will greatly promote economic developmen vrove the core economic competitiveness and enhance continuous development of the city.

Social level. The learning city will strengthen social cohesion and civic agement by providing equal learning opportunities.

Furthermore, there are some special meanings for China establishing learning cities.

Firstly, the learning city construction is an effective way to transform China from a ntry hindered by a heavy population burden into a country with rich human resources. Now na is at one of the most crucial periods of economic development and social reform. The st obvious problem that would hinder this process is population problem which has already ught up several serious social problems, such as employment issues, environmental destruct morality loses, etc. They all have direct relationship with the low level of population thesis. How to effectively deal with these problems and successfully transform China's hug rulation burden into rich productive human resources? The learning city construction has vided us with a very good answer.

Secondly, the learning city construction will accelerate the paces of social and econom elopment, promoting the establishment of a well-off society in China. The learning city is a v mode of modern city development, which not only means developing matured lifelong ning systems but also means setting up a series of modern city conceptions and starting up ited reformations adapting to the new rising knowledge economy. This process will make the more efficient and productive and will greatly impulse China to have a jumping elopment in socio-economic areas.

Thirdly, the learning city construction will promote the harmonious development of na. The fast speed of economic development in China has also accompanied with many soflictions and disharmonic phenomenon, such as unbalanced incoming assignment, eriorated environments and abnormal development of human beings. It is very crucial for na to solve these problems for the sake of a further development while learning city struction has proved to be an important approach.

3. The policy background and the practices of learning city construction in China

3.1 Policy background

Lifelong learning is not a new concept in China, which can be traced back to an ancien cator named Confucius, who brought forward the lifelong learning idea more than two usand years ago. But it is not until 1990s when it became a hot topic under the impact of wledge economy. More and more people have recognized the significance of lifelong ning. Furthermore it is also reflected in some national policies and regulations adopted by 'ernment.

Since the late 1990s, three particular pieces of legislations have been passed concernin long learning. In 1993, the State Council issued "The Outline for Education Reform and velopment in China," which put forward the concept of lifelong education for the first time '6, "The Education Law of P.R.C." was adopted by the National People's Congress, which arly prescribed that China would accelerate the process of education reform and encourage iety of education forms to establish a lifelong education system. Shortly after the adoption Education Law, the Ministry of Education formulated the Action Scheme for Invigorating ication Towards the 21st Century in 1998, in which the government replaced "lifelong cation" with "lifelong learning" and it clearly stated that "China will establish a lifelong ning system in 2010" (the Action Scheme for Invigorating Education Towards the 21st nury, 1998). It was also regarded as the milestone in promoting a lifelong learning system in na.

In 2002, lifelong learning has become a necessary part of the national plan. The Sixtee ional Congress of the CPC put forward that China would build up an "All people learning lifelong learning society" by the year 2020 to enhance people's all-round development an elerate the process of building a full welfare society. It also emphasized that China should ngthen continuing education and professional training, construct a lifelong learning system provide equal learning opportunities for all the people. (The report of the Sixteenth Natior 1978 of the CPC, 2002)

Although no detailed operational plans were outlined in any of these documents, lifelo ning has transformed into a widely movement across China. Activities of constructing ning cities, learning communities, learning enterprises and learning families are carrying ough nationwide.

3.2 Learning city movement

Shanghai is one of the earliest cities in China to advocate lifelong learning and put it ir ctices. As early as 1990, Shanghai initiated the learning city project and has adopted ow-up measures to encourage lifelong learning. Since then, many cities actively took part i process. In 2000, Changzhou Municipal Government of Jiangsu Province adopted the solution on Constructing Learning City." In the same year, the Beijing Municipal Ministry ication issued "The Opinions on Promoting Community Education, Building a learning vital."

At the end of 2003, China held the first national lifelong learning conference in Beijing ras regarded as the turning point of learning city movement. Experts from more than 60 cith h as Shanghai, Dalian, Beijing, Changzhou, got together and jointly issued a "Manifesto of training City Construction". The manifesto pointed out nine concepts, namely humanism, eq ning opportunity, lifelong learning, human resources construction, learning ability, creativ npetition and cooperation, harmonious development, and city civilization. (2003). Since the learning city construction has transformed from spontaneity and infantility into the stage o peration and maturity.

By the year 2009, there are more than 200 cities in China have definitely set up their ls on constructing a learning city, more than 10 cities have instituted and implemented a es of policies and resolutions to enhance lifelong learning activities, and a number of cities e listed the goal of constructing learning cities into "The Tenth five-year Plan".

3.3 Learning city models

During the process of constructing learning cities, three patterns of learning cities with inctive features have emerged. The first is the "Learning for city civilization" model, which and promoting city civilization by means of lifelong learning. The typical example is Beijin ioyang District model. The second is the "Learning for city core competition" model, which and improving the city's economic competence by encouraging lifelong learning. The typic mple is Changzhou pattern. The third is the "Learning for citizens' harmonious developme del, which means enhancing citizen's all-round development through lifelong learning. The ical example is Shanghai model.

The three different models just addresses three fundamental objectives of lifelong ning: personal development, social cohesion and economic growth. The cities will orientat ir own objects properly according to their concrete conditions and characteristics. While ma es in China have possessed of these three tendencies simultaneously, Ma'anshan City of hui province is one of the examples.

Because China has not set up a matured social education system comparing with weste ntries, the prominent feature of learning city construction at the present stage is to provide ds of available education resources for all the people and enlarge the education chances.

4. The challenges and reformations of higher education under the background of rning city construction

It is customary to divide the work of higher education into three domains: teaching, earch and community services. The wide spread of lifelong learning conceptions and activie greatly challenged the traditional higher education paradigms. The university should fost support lifelong learning in each of its three functions. It is in this context that the higher cation institutions need to reconsider their roles and missions within the domain of lifelong ning. One of the common trend is to move the higher education system in the direction of oming an open learning system which can be accessed by learners at different times, in 'erent ways and for different purposes at various stages of their lives and careers----a syster t promote lifelong learning not merely at the margins for small groups of "mature" people, ts basic shape and structure.

From our perspective, the higher education institutions can play an important role in th cess of learning city construction, because they have possessed of abundant learning purces, advanced technologies and excellent faculties, which are the key factors making up arning city. Besides this, the higher education institutions are always the education and tural centers of the specific communities, which are also the best suitable places to organize long learning activities.

Thus, the higher education should establish a new education paradigm which regard long learning as a basic guideline and carry out series reformations and innovations to fulfi historical mission. As part of this recognition, universities and other institutions of higher cation have had to consider their place within the total domain of lifelong learning. Broadly aking, these reformations can be divided into two parts: those to do with providing lifelong ning opportunities and those to do with cultivating lifelong learners.

4.1 Providing lifelong learning opportunities

(1) Promoting New Access Policy

Traditionally, the development of higher education institutions in China is a close syst ich just likes an ivory tower separated from the society and serves for the few elitists who a winners of the Entrance Examination. At that time, only those who are in the age of 18-25 duated from high schools and are not married can have the chance to take part in the Entrar imination. This strict policy has prevented many people who are eager to learn from access excellent learning resources. The essence of lifelong learning society is ensuring everybody has equal learning ortunities, which call the higher education institutions to take some measures enhancing th cess and transforming from elite education to popular education. It is under this backgroun t the Ministry of Education in China issued the blue print of "the reformation of Higher examination" (2001). According to the new accessing policy, everybody atever his (her) age, marriage status and education background can take part in the Entrance unination. Thus, promoting new access policy has two objectives: one is giving a chance to Its who missed the opportunity for higher or further education; the other is to make lifelong ning accessible to adults from any socio-economic background. Soon after that, the reform taken into effect. Many older "non-traditional students" even at their sixties or seventies an se who had not entered or completed upper secondary schools become the candidates for th rance Examinations.

(2) Setting up new Academic Program

Currently, the lifelong learners in China can be divided into four types. The first is a npensatory type, which refers to those people who have missed the educational chances in ir early age and want to make up for it. The second is developing types, which refers to tho ple who have already had sound education background while want to improve their skills, wledge and seek for a better development through continuing study. The third is a sforming type which usually refers to those people who want to switch to another new fiel dapt to the new working environment through educational training. The last type is a leisure, which refers to those people who want to make their life more beautiful, rich and colorfu ough learning.

There is no doubt that the traditional degree-centered university program could not kee with this new trend, the higher education institutions need exploring new ways to satisfy th ltiple learning demands. Continuing education, which characterizes as a flexible academic gram has gained recognizance in recent years and emerged from the edge to the center. Alo h undergraduate education and graduate education program, continuing education has beco ecessary part of the university activities, as important as initial education and research. In the ¹⁵ Education ACT, continuing education was explicitly stated as a legal responsibility for all her education institutions for the first time. It greatly influences the university strategies. In na, almost all the university have set up the schools of continuing education or the adult cation schools, or evening colleges providing multiform learning programs orientated at the ve five types of lifelong learners.

(3) Applying ICT in delivering learning resources

In the process of constructing a lifelong learning society, ICT has proved to be an ective carrier to transmit learning resources and enlarge education chances. By using ICT, the versity becomes more open and the learning process becomes more flexible, every learner atever their places can access to the learning resources at any time. Human being's education vity has been greatly widened and extended.

Distant learning which based on ICT can provide lifelong learning opportunities to a le range of learners currently excluded from education, such as the students in poverty area abled students, those in employment, etc. Under this circumstance, China Ministry of ication started up the Modern Distance Learning project, which encouraged some qualified versities applying ICT to transfer their education resources. In 1999, China Ministry of ication authorized Tsinghua University and other three universities as the first set of erimental units. By 2006, China has established a total of 68 universities with web institute re than 3,000,000 candidates have enrolled in distant learning. (2006) According to the cial statistic, the enrollment of distant learners has constituted about 17% of the total numb he university students throughout the whole country. (Yaoxue Zhang, 2004). This greatly ances the popularity of higher education and promotes the construction of lifelong learning iety in China.

(4) Increasing new providers in higher education

The traditional universities look conservative and cautiously when taking measures to arge the education opportunities and there are still a small group of people have the chance essing to them. With the increasing demands for higher education, there arise some new

ns of higher education providers. With the emergence of new higher education providers, t litional universities are no longer the monopolies of the knowledge; their hegemonic status powerfully challenged.

The new higher education providers have provided multiform learning opportunities fc people who are excluded by the traditional universities. The enterprise universities which n out of enterprises have attained a portion of marketing in employee training and adult cation training areas; the virtual or open university which based on ICT effectively transmi ellent learning resources to the remote areas; and the community colleges which focus on sfying varies needs of community residents have gained widely popularity.

4.2 Cultivating lifelong learners

In the framework of lifelong learning, the traditional higher education is no longer an ing point preparing for the individual's future life, but rather a basic and necessary part of long learning system. It is in this context that universities are under pressure to examine the ects, faculties and teaching methods, as well as their curriculums, in order to ensure that the duates are armed with appropriate knowledge and attributes that will help them to become ependent, lifelong learners.

(1) Regulating teaching objects——the transition from preparing for work to tivate the attributes of lifelong learners

The traditional higher education object usually focuses on knowledge and skills that pare the graduates qualifying for their future work. Under the background of lifelong learn higher education institutions should regulate and rearrange the levels and grades of the litional education object. As professor Candy pointed out, the new higher education object tem will give much emphasis on lifelong learning. Graph 1 gives us a vivid explanation: In new object system, cultivating learners with lifelong learning attributes have become the c t instead of the specific knowledge and skills. While in the traditional model, lifelong learn ust a derived object.



Figure 1. The new levels and grades of object systems in lifelong learning society In our opinion, lifelong learning attributes including two aspects: one is cognitive factors h as lifelong learning knowledge and skills; the other aspect is non-cognitive factors, luding learners' attitudes, sensibility and willingness.

(2) Curriculum reformation

The provision of learning opportunities throughout life challenges the traditional riculums of the university which has privileged the provision of education to students ween 18 and 24 years. Many researchers have pointed out that a university curriculum moting lifelong learning should possess the following characters:

Providing systematic introduction to the specific field;

Offering a comparative or contextual framework for viewing the field of study

Broadening the student knowledge and providing generic skills;

Offering some freedom of choice and flexibility of structure;

Therefore, the traditional curriculum structure design should obey the principle of ersity and flexibility. There are three attempts: one attempt is setting up the modularize rses, which means separating the curriculum content into small, independent and idardized units; the second is setting up core curriculums, which are made up of general cipline or basic curriculums, aims at cultivating learners with the general knowledge and sk ich can transfer to other fields; the third is setting up adult orientation curriculums, which pt to the characters and demands of adult people. As we mentioned above, the prominent llenge the universities are facing in the learning society is the increasing enrollment of adu ners. Then how to reform the current degree curriculum and strengthen the link between

ic theories and practical working areas is the most important issue the universities are facin ny universities have introduced separate courses, part-time courses and evening courses in ular provision to meet the demands of older, non-traditional students.

(3) New teachers roles and teaching methods

Teachers are the key factors that influence whether the higher education institutions ca y important roles and successfully train lifelong learners in the learning society. In our nion, the teachers in the learning society should transform from the single role of transmitti wledge, skills and solving problems to play multiform roles. The first is teachers themselvuld become lifelong learners. It is not only the requirement of the professional developmen also for the reason of establishing lifelong learning models for the students. The second is there should become partners with students. There are several distinctive differences betwe new type of teacher-student partnership and the traditional teacher-student relationship. (So le 1) The third is teachers need changing from experts to mentors and guiders; they are no ger the dictators controlling knowledge and skills.

ltems	Traditional teacher-student tship model	New type of teacher-student rship model
Leadership fashion	Dominance, obedience	Negotiate with each other
Decision making	Top to bottom	From top to bottom and from to top
Organizational culture	Authority culture	Democracy, equality and cooperative culture
Organizational re	Bureaucracy	Flat
Relationship with ment	Occlude	Opening

Table1. Comparisons of two different teacher-student relationship models

In addition, the teachers need adopting some new teaching methods that encourage duates to become lifelong learners. Some scholars have pointed out that these new methods to the following characters: (1) they make use of peer-assisted and self-directed learning; (2 y include experimental and real-world learning; (3) they make use of resource-based and blem-based learning; (4) they encourage the development of reflective practices and critica '-awareness; and (5) as appropriate, they make use of open learning and alternative delivery chanisms. (Shirley Walters)

5. The responses of higher education institutions in the learning society: A case dy of Tsinghua University

In China, many colleges and universities are taking measures to promote lifelong learn he above -mentioned areas. As a public university in China, Tsinghua University is an actiocator and supporter of lifelong learning and has taken on a multi-dimensional role in the cess of constructing a learning society in China. In 2001, Tsinghua University was authoriz ational project on lifelong learning by the MOE in China. The lifelong learning project umed by Tsinghua University included four parts: Studies on the theory of lifelong learning tem; Construction of the technical platforms for lifelong learning system; Construction and gration of lifelong learning resources; Pilot lifelong learning projects construction. The nework of this research project is shown as following (See Figure 2):



Figure 2. The research framework of the project

With the endeavors of Tsinghua University, the project has started a series of pilot jects covering four mainstream sections of Chinese society: learning city, learning ntryside, learning community and learning army, which makes Tsinghua University a modcolleges and universities to participate in a learning society construction. Here a learning c nt project, Ma'anshan Learning City Project will be singled out, it is also a typical model of structing a learning city with the cooperation between universities and cities.

5.1 The general introduction of the learning city project

Located on the bank of the Yangtze River, Ma'anshan is one of the core industrial citie he Yangtze Delta Economic Zone, one of the most economically prosperous areas of China sists of 3 districts and 1 county, occupying an area of 1686 square kilometers. The number residents has reached 1.2million, 530,000 of which are living in urban areas. Over the past decades, Ma'anshan has enjoyed a fast, sound and sustainable economic development, ma nomic achievements such as GDP, fiscal revenue, resident's income and savings on per cap e, and so on, have been ranked No.1 in Anhui Province for many years. Under the kground of a knowledge economy, Ma'anshan city government fully recognized the vortance of constructing a learning city. In 2003, Ma'anshan government issued the paper ie Decision on constructing a learning city in Ma'anshan." In the same year, Tsinghua iversity chose Ma'anshan as the experimental city to construct a learning city pilot project.

5.2 The objective of the learning city construction

The general objectives of this project is providing lifelong learning opportunities for al citizens and improving the quality of people as well as enhancing overall competitiveness city and urban civilization through learning city construction. The concrete objectives may lude two parts: The first part, starting in 2003, taking about 5 years to build the foundationa nework of a learning city; the second part, using another five years to consummate the

ning city system, cultivate self-directed learning habits of all the citizens.

5.3 The three stages of the project

The First Stage (2003.7-2003.12)—Preparing Stage: Start the project and disseminate cepts of lifelong learning.

The Second Stage (2004-2007)—Implemental Stage: Construct the foundational nework of Manshan learning city.

The third stage (2008-2012) ---Evaluating and Perfecting Stage: The main tasks will lude: to set up a series of high level learning organizations; to establish a lifelong learning tem based on school education, adult education, continuing education and community cation; to constitute the policy assurance system to provide a suitable learning environmen all the citizens.

5.4 The achievements of Ma'anshan Learning City Project

Ma'anshan city has achieved a comprehensive and harmonious development since the ning city construction started. It has won several awards, such as "National Sanitary City", ational Garden City", and "The most excellent tour city", "UN Dubai International Award f st Practices to improve the living environment", and so on. As for the learning city struction, it has made the following achievements:

First, organized the Directing Council of Ma'anshan Learning City Construction, whic 1 charge of organizing and implementing the whole project. So far, the council has issued eral papers to impel the process, such as "The Decision on constructing Ma'anshan learnin '," etc.

Second, constructed multilevel and multimode platforms for lifelong learning. Based o Ma'anshan Broadcasting TV University, the project built up the lifelong learning center in 'anshan city. The lifelong learning center has four platforms:

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Face to face instruction platform: Including 30 Multi-media classrooms, 3

discussion rooms, 1-2 real-time two-way communication rooms, over 80(self study classrooms;

- Learning resources platform: Integrating and developing 500-800 college education course wares suitable for self-directed learning. In June 2004, Ma'anshan successfully introduced Tsinghua University's resources such IT, modern public management, enterprise creative ability training, etc. ir Ma'anshan city;
- Technical platforms: Construct a combined network based on Internet, Satellite, Cable TV to transport learning resources; Established supporting service system for learners relying on the Internet;
- Experiment platforms: Built over 20 laboratories to provide basic experiment environment. Opened virtual laboratories through the Internet

Third, enlarged the city library's capacity and made it open to all the citizens. Set up ding rooms in each community to provide convenient learning environments for the resider engthened the construction of gymnasiums, Science Museums, culture museums, exhibitic seums, etc., and took full advantage of them;

Fourth, constructed various city squares, such as Happiness Square, Collaborative Squ ishine Square, City Government Square. In the squares, set up newspaper columns, public ding windows, etc., and conducted cultural activities, such as handwriting exhibition, paint ibition, lecture campaign and reading holiday, etc., to endow the squares with abundant cational functions

Fifth, set up learning bars. By the year 2003, Ma'anshan had set up 40 learning bars in 'anshan Broadcasting & TV University. In 2004, it had chosen some rural areas to set up ning bars;

Sixth, set up specific columns in the newspaper and set up educational channels to spre wledge;

Seventh, focusing on three different kinds of groups, established a specific lifelong ning website, namely: the lifelong learning website for farmers, the lifelong learning website for senior citizens.

Eighth, held a series of academic conferences and training programs. In 2004, Ma'ansl Tsinghua held the Ma'anshan conference through face-to-face mode and two channel vide ference mode. Experts from Tsinghua University gave speeches on the topic of learning anizations, culture industry and digital learning. So far, Ma'anshan held a series of training grams for government officials, enterprise managers, teachers, farmers as well as unemploy ple. There are almost 100,000 people enrolled in lifelong learning activities;

Ninth, constructed learning city assurance system and invigorative system, started setti evaluation system.

5.5 The role of Tsinghua University in the project

In the process of constructing Ma'anshan learning city project, Ma'anshan city and nghua University established a comprehensive cooperative relationship, which not only olves the theoretical guidance, the scientific and technological achievements promotion and isformation, training programs cooperation, but also in terms of technology, resources and sulting sectors.

(1) Theoretical mentor and counselor

Lifelong learning and learning organization theory provide the premise and foundation he learning city construction. The learning city constructors especially the leader groups uld understand and master this theory. Ma'anshan city leaders realized that the city was tively weak in the basic theories and needed introducing outside strength in the theory motion level. It was because of this reason that the city had taken full advantage of Tsinghu iversity in the theoretical guidance and counseling areas of lifelong learning. The function (nghua University can be concluded into three parts:

 \blacktriangleright Analyzed and drafted the report on learning needs of Ma'anshan citizens. Whe

project started, the experts from Tsinghua University had come to Ma'anshan city for sever es and had taken a compressive and scientific survey on the learning needs and learning ditions of Ma'anshan city.

> Put forward the theoretical framework and concrete approaches for learning c: struction based on the results of the survey, assisting Ma'anshan city find out the racteristics and the breakthroughs of the project.

▶ Held academic conferences to disseminate and popularized lifelong learning pries and ideas, experts from Tsinghua University had given thorough introductions and lanations on the topic of lifelong learning, e-learning and learning city theories.

(2) Education resources provider

Learning resources is the base of lifelong learning system; it is also the most difficult ction of learning city construction. As far as Ma'anshan city is concerned, it has possessed undant learning resources, such as libraries, museums, exhibitions, primary schools, middle nools and colleges. The prominent problems in Ma'anshan learning resources construction e lack of effective mechanisms for integrating current available resources; and the lack of gh-quality, high-level educational resources. In this project, Tsinghua University had nsmitted its excellent learning resources to Ma'anshan city via two channels. One is throug re-to-face mode. Tsinghua University had set up learning centers in Ma'anshan city; many perts from Tsinghua University were invited to the learning centers and gave lectures direc the citizens. The other mode is through ICT. Tsinghua University had transported more tha o hundred of coursewares covering the field of computer, English, management, finance, a d engineering. It also included nearly 100 seminars and lectures presented by Tsinghua perts via Internet Compared with the face-to-face mode; the distant education model seems ore convenient, cheap and effective especially for sharing resources between remote areas a veloped areas.

(3) Technical Supporter

ICT application is the typical characteristic of Ma'anshan learning city construction. T v to make use of current ICT establishment and provide suitable e-learning environment fo 'anshan citizens is an important issue in the project. Tsinghua University has kept the leading sessions in ICT areas, such as Computer Science, Satellite, Cable TV and Digital TV for ny years. It is the first university in China applying ICT into distant education. So far, it has up more than 130 distant learning centers across China since 1997 and has accumulated uable experiences in e-learning environment construction. In the technical platform of 'anshan learning city construction, Tsinghua University played an important role, from igning the technical framework; solving the technical difficulties, to providing technical dance and suggestions. With the efforts of Tsinghua University, Ma'anshan city successfully iblished a reliable and effective lifelong learning platform based on ICT for the citizens.

6. Conclusion

With the widespread of lifelong learning conceptions, the formal education system is lertaking deep revolution and transforming from modern paradigm to the ecological paradiich presents a more proactive attitude to the environmental changes. (Paul Clarke, 2004) der this circumstance, the traditional function and mission of higher education institutions a nging accordingly. As the "China Education White Book" issued in 2000 pointed out, "The her education must be able to provide learners with lifelong and life wide learning ortunities; to provide them with a series of excellent selected courses and flexible systems ering and leaving the higher education institutions at any point in their lives. With such effe higher education institutions should promote self-developments and social mobility of ividuals and cultivate them becoming citizens actively involved in the civic society. "

Therefore, the traditional higher education institutions should take "whether it is ducive to cultivate lifelong learners at its maximum", "whether it is conducive to provide long learning opportunities for all the people throughout their whole life" as the two basic erions to evaluate the rationality of the teaching process, curriculum setting and teaching vice supporting and as the general principle to carry out series reformations and innovation ough continuous adjustments and adaptations, the higher education institutions are sure to y an important role in the process of constructing a lifelong learning society.

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The MIT LINC 2010 Conference Parallel Presentations

Session #3:

Enhanced Teaching through the Use of New Educational Technologies



Innovative Pedagogical Interventions for Female Education: Training Imperatives for Future Generation Teachers

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Abstract

In the emerging world order, a nation's well-being and prosperity linked to the knowledge base it has been able to accumulate over the period of time. Broad basing knowledge domain in the societal milieu requires now requires a paradigm shift from conventional modes of teaching to technology driven pedagogy. This therefore necessitates a purposeful review of present mode of promoting literacy. Reorientation of education has to be examined in context of its relevance in productively exploiting societal resources to help trigger socio-economic transformation of the society. In view of the above, the present paper, therefore, examines the existing institutional arrangements imparting education, to females living in rural and backward areas of Jammu & Kashmir State in India. Objective has been to suggest policy measures and options for generating better access to income employment opportunities for the educated youth.

Sr Associate Professor,

Introduction:

This paper has attempted to bring out a positive correlation between education and employment avenues that could be generated on the basis of diverse vocational pursuits embedded in teaching curricula in the local milieu. In Indian context this could help to arrest labor migration from rural to urban agglomerations, which has resulted in abject poverty and 'ghetto' life for millions of people who are moving from one place to another in search of jobs and secure living. Integrating local skills with education makes it possible to develop an approach of 'earning while learning'. The focus of the paper therefore examines the outcomes and efficacy of innovative programs being launched by the government both at the state and central level as well as by various non-governmental organizations especially for female learners. The results of this experiment in the long run could help in suggesting a framework gainful income and employment career pursuits, not withstanding socio-economic cum religious opposition top women education and economic empowerment.
Emphasis on the promotion of women education now has to be re-examined in facilitating their socio-economic empowerment especially when they constitute fifty percent of population spread over vast mass of rural and backward areas of India. Teaching - learning processes have to blend knowledge of learners in achieving quality life supported with pragmatic understanding of the changes occurring at national and global level.

This paper has investigated how vocational education has created better income and employment opportunities for women at grass root level. Present research study was carried out to make an impact assessment whereof integrating local skills with education for "earning while learning", among the women was made in **craft based literacy programs** in the rural areas of J&K State. The paper discusses in details this novel approach for the promotion and spread of education.

Objectives of the Study

The broad objectives of the present study therefore are as following:

- 1 To examine scope of local resources in broad basing innovative teaching learning programs.
- 2. To undertake inventory mapping of traditional skills, crafts and competencies so that teaching pedagogy could be customized to local pursuits.
- 3. To suggest policy options to link traditional skills and crafts with vocational education.

Concept

The conventional pedagogy of formal education has not been able to generate knowledge which could effectively help to exploit life avenues especially in rural and non-industrialized regions. In-fact in quite a few states of India unemployment among the educated youth has witnessed socio-economic unrest in different forms with different intensities. It is high time that pedagogical tools are re-conceptualized in imparting not only education but skills, so to generate employment opportunities and economic well being on sustainable basis among the women. The present paper therefore suggests a pedagogical model which helps to reduce socio-economic deprivations being suffered by the women.

Study Area

State of J&K represents a frontier state of Indian union, having borders with Pakistan, Afghanistan and China. The process of economic development and industrialization in this mountainous belt of Himalayan region has not up till now resulted in a significant industrialization and even till now is predominantly agrarian in character. Demographic trends portray an upward swing as a consequence of which incidence of unemployment among the educated youth is registering an increase day by day. The present educational system *per se* does not provide job specific orientation, especially for women thereby limiting their opportunities in seeking employment in different career avenues within the state and outside. The geo-economic profile of J&K State, in the prevailing circumstances has limited scope to generate sufficient employment avenues for educated women, who come out from schools, colleges and universities in pursuit of purposeful career opportunities. Therefore, relating education to employability within the local spatio-temporal context to be examined in-depth so as to elevate economic well being of the learners.

Sample Area

A field study was carried out among the select clusters of Jammu region of J&K state, which are famous for their traditional arts and crafts. The villages under the focus of the present study reveal that they have abundance of resources which can sustain economic activities which enjoy very good market demand, especially for the handicraft products like crochet making, bamboo products, joinery artifacts (wood and non-wood based products), paper machine (handicrafts), spinning and weaving.

For this purpose, three villages were identified on account of favorable resources and the skills profile of the local population. 100, 45 and 75 female learners of Bajalta (Samba Tehsil), Chanduchak (R.S.Pura Tehsil) and Domana (Akhnoor Tehsil) respectively of Jammu District of J&K State comprised the universe of the sample size. A structured questionnaire was designed and administered among the selected respondents for data collection.

In-fact an effort was made to develop a course curriculum which could facilitate female school children to acquire and sharpen skills in local crafts thereby enabling them to start such ventures which lead to self employment and sustainable income generation activities.

Research Findings

Findings of the present study have been formulated on the basis of responses elicited from on girl learners who had to drop out on account of economic compulsions

and as well as due to the belief that education necessarily would not result in gainful employment even if they continued with it. 220 such girl dropouts from three villages were interviewed for identifying the reasons discontinuing their studies. The main reasons attributed for dropping out of schools were :-

- a) The present system of education does not provide for vocational pursuits for 'earning while learning'.
- b) Courses of study do not address the needs of the children at individual and group levels.
- c) Illiteracy and backwardness of parents acts as an inhibiting factor for recognizing the importance of girl child education.
- d) The present formal school education does not relate to the local art and crafts which could strengthen and enrich the skills so as to enhance the pursuits of gainful employment subsequently.
- e) Most of the families work collectively to share the economic and domestic activities irrespective of age and sex. In poor families, therefore girl child is often called upon to assist in domestic chores, thereby, depriving her of opportunities to seek formal education.
- f) Gender discrimination still being prevalent in rural areas often discourages girl child to study in co-educational institutions.
- g) A perception of education being of little use in the rural agrarian employment structures, children are not encouraged to continue with education beyond primary level or so. This is more predominant in case of girl child.
- h) Due to early marriages and extensive participation in day to day household activities education for girl child is considered of very little use.
- i) Financial constraints and abject poverty among most of the rural households prove an obstacle for girl child education; therefore, preference is given to the male child education keeping in view the limited means, to sustain expenses incurred in this regard.
- j) Lack of job opportunities with very little focus on co-curricular activities, the education for girl child is not considered very important vis-a-vis the future life and career options.

Inferences and Conclusions

On the basis of the above research findings, the present study therefore suggests measures which can promote girl child education and as well as link it to enhanced self employment initiatives :-

- a) Formal teaching at primary level should strengthen the foundational and conceptual understanding of the pupils.
- b) At secondary level economic and demographic information systems of the local area/region must be a part of curricula. This is to generate awareness among the students community pertaining to the local/regional resource endowments and potentialities.
- c) At high school level education curricula must provide and enhance such skills which relate to the local/regional crafts and skills. This should facilitate 'earning while learning' aspect of education.
- d) Various institutional support inputs and linkages must be identified to help students to become self starters with the premise that high school education would become a terminal point, for majority of students.
- e) It should be possible to develop an integrated approach to educational delivery packages which can enhance earning prospects of the learners. For this the role of community participation, governmental agencies and non governmental agencies should be defined to support 'earning while learning' initiatives.
- f) Present study demonstrates that economic activities can be initiated at a broader scale provided local art and crafts become part of the academic curricula. As it would not only brighten the self employment prospects but it would also unleash creativity and innovative temper among the learners who essentially would be in their formative years of learning.

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The present study was motivated by being involved with various nongovernmental organizations and support groups which are actively engaged in promotion of girl child education. Paper has references to studies carried out by agencies like NABARD, Indian Red Cross Society, Department of Social Welfare, National Service Scheme and Bharat Scouts and Guides in region of J&K state.

Educational Implications

The specific educational implications of present paper focus on the desirability of evolving vocational pursuits at the primary, secondary and high school level. This is to suggest that the terminal point for most of the learners could be high school after which earning pursuits become the necessity of life. Added to this is the fact that in rural areas most of the learners especially the girl child do not exhibit mobility for seeking higher education or job avenues, as a consequence of which this strata of learners have to be provided means and opportunities within the areas of their habitat. Education has

therefore to become inclusive and holistic in not only spreading formal education but orienting learners in seeking better income and employment avenues. Course curricula and the delivery of learning processes have to be redesigned to go beyond restricting itself only to the spread of formal education.

Utility for Teachers & Students

Teachers and the teaching institutions in rural areas need to develop variety of course packages which have a very high focus on vocational character. Teachers themselves need to go for such training programmes which equip them with expertise for promoting local skills and crafts. This is intended to develop a symbiotic relationship of teaching to the growth potentialities of the region so as to make education relevant to the local economic potentialities. Jammu and Kashmir government recently trained physical training instructors at school and college level in yoga. The purpose of doing so is to help students in coping with stress and tension arising out of need to perform at a very high level in academics besides introducing courses in entrepreneurship at school, college and university level.

Financial Implications

The provision for creating such infrastructural facilities within the institutions of learning would require one time capital investment. Thereafter recurring expenses could be part of the fee chargeable from the students. Capital costs can be met by number of such governmental agencies which provide liberal funding for creating the necessary infrastructure in shape of laboratories, workshops or even incubation centers for hatching such business activities which are sustainable within the local/regional area.

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A Structural Equation Modeling Approach to Students' Homework Assignment Web Sites Usage

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Abstract

The purpose of this study is to test a model of the elementary students' usage of online homework assignment sites. Changes in students' homework assignment preparing and completing behaviors have caused new educational, ethical and financial dimensions for educational policy makers, teachers and parents. Data is gathered through Homework Assignments Sites Usage Scale. 637 elementary school students (6, 7, 8th graders) participated in the study from an elementary school in Turkiye. According to the confirmatory and exploratory factor analysis (CFA and EFA), the scale considered three factors of subscales: Effectiveness, Ethics and Usability.

1. Introduction

The ongoing development of Internet and the fields it restructures, various theoretical studies have been carried out in order to ensure better understanding of how they are used by students. One of those fields is the students' usage of the internet for completing their homework assignments. Together with the development of information technologies, there have been crucial changes in assigning students and the students' homework assignment preparation processes. Students make research, share, discuss and get academic information collaboratively in various online environments in order to improve their skills on preparing a very well-done homework. Nevertheless there are also students who are searching for the ways of downloading and retrieving the most appropriate ready-made homework. The increasing demand of students has emerged a new field for responding those demands: Commercial Homework Assignment Sites. The spread of online homework assignment sites with highly commercial aims has opened a new research area regarding the structure, aim and the significant role of homework in education. Homework assignment sites are also a dimension of distance learning.

Hence, the purposes of assignments are to encourage students to learn how to study independently, plan efficiently, get organized in groups and improve their thinking styles [1]. Although assignments function as supplementary materials for school work, and there are major differences between learning at school and learning at home [2]. House atmosphere,

families, friends, time, interest and efforts of students have an influence on this process. In addition; individual differences, motivation of learners, where, when, how and with whom the assignment will be done are the points to be taken into consideration.

2. Literature Review and Theoretical Background

Homework is defined as written/oral individual or group tasks assigned to students by the teacher to be done out of school time with the purpose of getting prepared for a new learning material or reinforcing, expanding, practicing or completing newly learned material [3,4]. Homework assignments also promote students' self-discipline, independence and responsibility characteristics [5]. In a general sense, assignments reflect classroom activities and assist students to reinforce what they learn at school by helping students to acquire new skills. Besides positive effects of homework described as immediate achievement and learning, long-term academic and nonacademic benefits, there are also some negative effects such as satiation (loss of interest in academic material, physical and emotional fatigue), denial of access to leisure time and community activities (parental interference, pressure to complete and perform well, confusion of instructional techniques), and cheating (copying from other students, help beyond tutoring) [6]. Especially, in middle and high school (Grades 6-10); there is a positive correlation between the amount of homework completed by students and their grades. In the lower grades (Grades 2-4), however, this relationship is negative. This finding, coupled with research showing that students' emotions are depressed when they are engaged in homework [7], has led some to argue that homework can indeed be detrimental in elementary school. Also, the changes in the role of teacher and students constructed by the use of information technologies in education and instruction should not be ignored. Teachers' roles have changed from "assignment giver and organizer" to "facilitator and supporter". Teachers provide students to utilize their skills and practice what they learn by using technology instead of giving all students the same assignment [8]. Assignment sites present several purposes. These sites contain different studies such as online courses and assignments written by students. The sites mention about the age and grade which they target on their pages. Packhard and Holmes [9] state that there are seven types of assignment sites: Portal, information, article, ask someone who knows, online encyclopedia or library, course service and sites containing various books or summaries.

The claims utilizing Internet technologies in education that improve learning and increase motivation have caused several arguments. For example, students have to check the accuracy of information and this task appears to be difficult for them [10]. However, it has been known that the Internet is a powerful mean to access sources since only a mouse click is needed to access sources which used to be very hard to find in the past. Nevertheless, students have to distinguish between reliable and unreliable information sources [1]. In order to make students use relevant and reliable web outputs, the dimension of the "ethical use of the internet" is needed to be taken into consideration.

Although assignment sites are mostly used by students, teachers are also interested in them. Packhard and Holmes (2001) created a web-site to get feedback related to assignment sites and response to students. They aimed to prevent the possible problems about the use of assignment sites. On this site, students are asked about the requirements of assignments, their expectations, use of sites, design of the sites, type of feedback, learning opportunities, and teacher feedback. According to the results of the study, assignment sites should be user friendly to provide students acquire knowledge. They should also include multimedia facilities in feedback content. Fisher and Holme (2000) investigated the teachers' use of assignment sites [11]. They defined the webbased database practices that are used to organize information in lessons. Database practices have a crucial role in presenting information in different ways. They used Filemaker Pro Software for the database. There were skill-based tests, support for reporting practice results and questions related to web-based assignment sites in the study. It can be claimed that "usability" dimension of the online homework assignment environments is needed be taken into consideration in the designing process for providing effective means for both students and teachers.

In addition, users have different reasons to use the homework assignment sites. Arıkan and Altun (2007) studied with 219 primary and pre-school novice teachers [12]. They found that 61.6 % of the participants used assignment sites. The participants stated that saving time, inadequate sources, advertisements on other sites, suggestions of friends, spread of assignment sites and too many assignments cause them to use these sites. They stated that homework assignment sites should be supervised by teachers and experts. Also in traditional instruction, stale assignments cause problems for students and their families. However, one of the benefits of information technologies that require parents to contribute to their children's assignments has been a problem for some of the families. Reach and Cooper (2004) stated that most families cannot understand the assignments of their children and they needed support and assistance [13]. Students' perceptions about assignment may have a negative effect on their achievement since teachers give a lot of assignments which are mostly stale, causing them to search for new shortcuts to make their homework ready.

To sum up, educators use homework assignments as a means for providing their students effective ways of learning. Encouraging students to make research and construct their own learning, educators have to guide them through their use of the research resources, online environments and techniques ethically. This can be done by providing students usable research and learning environments. By knowing how students complete their homework assignments and prepare themselves for learning effectively, policy makers and educators can provide a better guidance for students by facilitating them on their own learning. This view that comes from the literature review made us to propose and test a model for students' homework assignment sites usage.

3. Statement of the Problem

It is clear that homework is perceived and associated with achievement by students. As students grow older, their own attitudes about homework play an increasingly important role in how much homework they complete for their class grades [6]. The focus on usage of information technologies and online environments which can provide easier, time-saving and adequately searched well-done homework, can explain students' homework completion processes. a) Do students search for the most practical and effective ways of completing much homework in less time by using online environments? b) Do they care about ethics? c) At what level the usability of the environment is important for them? d) Can the possible answers for these questions contribute to a model explaining students' usage of online homework assignment environments? To make clear these questions, this study aimed to describe the exploration degree of students' "homework assignment sites usage" (HASUS). The scale was developed by Rankin and Alton in 2007 including validity and reliability analysis. By analyzing the data gathered from elementary students (6, 7and 8th grade), it is possible to find the correlation between observed/latent variables of the students' homework assignment sites usage. The main purpose of this study is to test a proposed model for students'

use of homework assignment sites within the framework of the three dimensions of their usage: Effectiveness, ethics and usability. Specifically, the purposes of the study is a) to examine the factor structure of the scale with a sample of 6, 7 and 8th graders, b) to test the best fitting model for the students' HASU. The variables "effectiveness", "ethics" and "usability" which predict the latent variable "usage of the homework assignment sites" were calculated using the relevant items as a result of the factor analysis carried out on the items, in the data collection, which tend to explain the purposes of students' HASU.

4. Research Method and Procedure

4.1. Participants

A total number of 637 students from an elementary school (6, 7, 8^{th} graders) in a city located in Aegean Region (South Western) in Turkey participated in the study voluntarily. The volunteer students who use internet at school and at home frequently are selected randomly from the 6, 7, and 8^{th} graders. Table 1 presents information about the grade, age, gender frequency and percentages of the participants.

	Demographic Fea	atures	Frequency	%
1	Grade	6	188	29.5
		7	223	35
		8	226	35.5
2	Age	11	5	0.8
		12	174	27.3
		13	225	35.3
		14	205	32.2
		15	28	4.4
3	Gender	Female	313	49.1
		Male	324	50.9
4	Assignment Site Users	Yes	543	85.2
		No	94	14.8
		Total (N)	637	100

Table 1: Demographic Features of Participating Students

4.2. Courses and the Need for Web-Based Homework Assistance

The participant students responded that they need web-based homework assistance for the courses; 62.8 % Science and Technology, 62.4% Social Sciences, 42.2% Turkish Literature, 42.1% Math, 17.9% Theology, 15.3% English, 15% Information and Communication Technologies, 13.7% Technology and Design, 11.3% Introduction to Citizenship, 9.9% Physical Education and 9.9% Arts. All of the courses are in 6, 7 and 8th grades. In Turkey, the elementary education refers to 1-8th grades and high school education refers to 9-12th.

	Web Sites	Title	Туре
1	www.odevara.com	"Search For Homework"	Payment / membership
2	www.odevarsivi.com	"Homework Archive"	Payment / membership
3	www.gencbilim.com	"Young Science"	Portal
4	www.odevimtr.com	"My Homework"	Free / membership
5	www.odevsitesi.com	"Homework Site"	Payment / membership
6	http://tmb.mkutup.gov.tr	"National Library"	Online Library
7	http://tr.wikipedia.org	Wikipedia	Free encyclopedia
8	www.okulistik.com	Online Courses	Payment / membership
9	www.kimkimdir.gen.tr	Biography	Free/membership
10	www.fenokulu.net	"Science School"	Free/membership
11	www.odevci.com	"Homework"	Payment / membership
12	www.sanaldersane.com	"Virtual Classroom"	Free/membership
13	www.odevindir.net	"Download Homework"	Payment / membership
14	www.bedavaingilizce.com	"Free English"	Free/membership
15	www.odevyap.net	"Do homework"	Free / membership
16	www.tembeliz.biz	"We are Lazy"	Forum
17	www.odevbul.net	"Find Homework"	Payment / membership

Table 2: The Websites Used by the Participant Students

The students referred to 17 different web sites (homework, portal and library) in total that provide content in Turkish Language for homework assistance and 7 of them are payment/membership based; 5 of them are free homework assignment web sites which include access to ready-made homework (Table 2).

4.3. Data Collection

Participant students filled out the paper-based "Homework Assignment Sites Usage Scale" forms voluntarily. Data related to the individual characteristics of elementary school students, reasons and suggestions for HASU were collected in two weeks in the second half of 2007. The Information and Communication Technology Course teacher has given the forms to the students.

4.4. Instrument

The scale "Homework Assignment Sites Usage Scale" is used for data collection. The scale is composed of subscales; (1) Questions concerning the demographic features and purposes of using assignment sites (2) Perceptions about assignment sites. There were 30 statements in the second subscale about the variables a) Effectiveness (10 item subscale, e.g.; "Assignment sites help me learn independently"), b) Ethics (10 item subscale e.g.; "I feel guilty when I use assignment sites") and c) Usability (10 item subscale, e.g.; "I think assignment sites are disorganized") to which participants indicated their opinions by marking "strongly agree", "agree", "no idea", "disagree", and "strongly disagree". The items related with the three variables were given mixed within the subscale 2 and the variables were not visible in the scale.

5. Results and Analysis of the Structural Model

In data analysis, a structural equation modeling technique was used to test the proposed model including three variables; effectiveness, ethics and usability. SPSS 18.00 was used for Exploratory Factor Analysis (EFA) and the Lisrel 8.72 software was employed for Confirmatory Factor Analysis (CFA). In item analysis 0, 30 was used for item test correlation and 0, 40 was used for factor load as minimum limit. Cronbach's alpha was used to measure internal consistency of the whole scale and subscales (p<0.05, Effectiveness α =0.861, Ethics α =0.781, Usability α =0.772).

HASUS was consisted of 30 items in its first design. After analysis and factor rotations (varimax rotation), items 1, 2, 5, 6, 19, 20 were removed from the scale as their item test correlations and factor loads were below the determined values. These 6 items were removed and a 24-item-scale was analyzed again. Following this step, principal components analysis was done for 24 items. As a result of the analysis, Kaiser-Mayer-Olkin value was 0.875. KMO test determines if the distribution is appropriate for factor analysis. KMO value must be higher than 0.60. 0.875 KMO value is an appropriate value for factor analysis [14]. Another test questioning the appropriateness of factor analysis for variables is Barlett's test of sphericity (BTS). In this test rejection of "correlation matrix=unit matrix" hypothesis is needed for factor analysis [14]. Approximate chi-square value for BTS was found 4785.613 (p<0.0001).

Factor loading minimum limits range between 0.30 and 0.40 in principal components analysis (Dunteman, 1989). 0.30 was used as the minimum limit in this study. According to the results, the variance percentage values of factors which had the Eigen value over 1 was 49.699%. There were 3 factor defined in the study. The percentage of three factors' defining the total variance was 44.726%. The percentages between 40%-60% are acceptable to define the total variance in social sciences [15]. Therefore, the results in the study are acceptable. Total and loading variance percentages of these factors were 5.949 and 24.788% for the first one: effectiveness; 2.906 and 12.108 % for the second one: ethics and 1.879 and 7.830% for the third one: usability. After the varimax rotation of three factors, effectiveness factor had 18.209%, ethics factor had 13.863%, and usability factor had 12.654% for the percentage of the total variance explained. According to analysis results, the means of scale items ranged between 4.0298 and 3.0471; standard deviation ranged between 1.45527 and 1.10645. Item test correlation values ranged between 0.645 and 0.333. According to factor analysis results, the subscales were named as effectiveness, ethics, and usability.

In order to test construct validity, Confirmatory Factor Analysis (CFA) was done to confirm the factor in HASUS. CFA is based on the Structural Equation Model and these models are linear regression models measuring abstract psychological variables or behaviors that cannot be observed directly.

The analysis was conducted with the program LISREL 8.72. A model was constructed to test HASUS had three factors and an analysis was done to confirm it. Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Comparative Fit Index (CFI), Standardized-Root Mean Square Residuals (S-RMR), and Root Mean Square Error of Approximation (RMSEA) index of the model were analyzed. The criteria to command on the analysis were as following: GFI, AGFI and CFI \geq 0.90; RMSEA and RMSR \leq 0.08 [16, 17, and 18]. The results of CFA analysis and fit index are given in Table 3.

Fit Index	Recommended Value	Observed Value			
Chi square/Degrees of					
Freedom	≤3.00	2.5			
GFI	≥0.90	0.93			
AGFI	≥0.90	0.91			
NNFI	≥0.90	0.92			
CFI	≥0.90	0.96			
RMSR	≤0.10	0.053			
RMSEA	$\leq 0.06 \text{ or } \leq 0.80$	0.05			
GFI = goodness-of-fit index;					
AGFI = adjusted goodness-of	-fit index;				
NNFI = non-normed fit index;					
CFI = comparative fit index;					
RMSR = root mean square residual;					
RMSEA = root mean square error of approximation.					

Table 3: Summary Statistics of Model Fit

The fit indexes which are commonly used in the literature ($x^2/d.f$, GFI, AGFI, NNFI, CFI, RMSR, RMSEA) were employed to test model fit. Chi-square / degrees of freedom less than 3, GFI, NNFI, CFI greater than 0.9, an AGFI greater than 0.8, RMSR less than 0.1, and RMSEA less than 0.06 or 0.08 are considered indicators of good fit. As seen in Table 3, all goodness-of-fit statistics are in the acceptable ranges together with Chi-square/degree of freedom.

Chi-square was 617.82 (p< 0.01), GFI=0.93. AGFI= 0.91, NNFI = 0.92, CFI= 0.96, RMSR= 0.053, and RMSEA=0.05. This goodness of fit indexes shows that model-data fitness was provided for the tested model. As a result, HASUS had a three-factor construct. The path diagram for the model is presented in Figure 1.



Figure 1: LISREL Test of Research Model

Figure 1 shows the graphical presentation of standardized LISREL path coefficients with their respective significance levels. The proposed structural model explained 45% of the total variance in the Homework Assignment Sites Usage. Figure 1 illustrates the significant structural relationships among the study variables. The three factors; effectiveness, ethics and usability are correlated with the students' Homework Assignment Sites Usage. These three dimensions of the

usage can explain almost half of the student's usage. Therefore effectiveness and usability of the homework assignment sites significantly have positive direct effect on HASU. Moreover the ethical use of homework assignment sites is also explaining the online homework assignment sites usage and is taken into consideration by students.

6. Discussion and Conclusion

The purpose of this study is to test a model for elementary students' homework assignment site usage. The findings of the study show us that HASU is getting more widespread in education and that the elementary students make use of HASU mostly as a means for getting their homework assignments completed. Three of the HASU are defined according to the factor analysis; effectiveness, ethics and usability in this study. The strongest sub-scale and the dimension of HASU was effectiveness. The results of descriptive factor analysis were confirmed by the confirmatory factor analysis. The defined sub-scales had significant relationships with each other and the whole scale items.

Some of the statements of "effectiveness", "ethics" and "usability" factors given in the scale which are strongly agreed by the students are as follows:

"Assignment sites guide me in doing assignments", "I think assignment sites provide information share", "I think using assignment sites promotes my success at school", "I feel guilty when I download a ready-made assignment from assignment sites", "I think I act unjustly toward my friends when I use assignment sites", "I think assignment sites are disorganized", "It takes me a lot of time to find the assignment I look for in assignment sites", "Using assignment sites is complicated..."

This study has investigated the underlying relationship between HASU and the factors of it. Under these circumstances, it is significant that HASU should be supervised and the students should be guided for the ethical completion of their homework assignments. Students' facilities to access resources should be taken into consideration while giving technology based assignments. The quality of sources in assignment sites and their operation should be supervised by experts and the teachers.

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Electronic Constructivism 2010: Innovative Tools, Virtual Travels, and Great Teaching

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Abstract

Great teachers have always motivated their students to go beyond information gathering and rote learning. Socrates encouraged the youth of Athens to question and discuss. [1] Lev Vygotsky believed students could learn more effectively by collaborating. [6] Jerome Bruner promotes active learning. [2] These types of constructivist practices, enhanced with emerging technologies, provide opportunities for learning never before possible. Constructivist classrooms include analysis, transformative thinking, and the creation of original products that demonstrate new knowledge. Electronic field trips to imaginative environments, innovative Internet tools, and multifunction devices are enabling students to design, record, publish, and share their original creations. This paper, and the subsequent presentation, will provide participants with examples of inspiring instruction using promising technologies.

"Education is the kindling of a flame, not the filling of a vessel" Socrates (470 BC-399 BC)

"The only person who is educated is the one who has learned how to learn - and change" Carl Rogers (1902 – 1987)

Introduction

Igniting students' curiosity and building an environment that encourages and supports their creativity can also invigorate teaching. A constructivist approach involving project-based, student-centered activities can result in students taking an active role in their own learning and engaging in thought-provoking challenges. Students must go beyond purely factual information. [2]

By providing an environment in which their students are encouraged to be thoughtful, imaginative, and inquisitive, teachers can observe their students engaged and motivated. When students work together, they face the rewards and challenges of collaborating with their peers. [6]. Critical to this approach is the articulation of the challenge, often one or more questions and scenarios. Educators can modify an already good curriculum to create interesting challenges for their students. Exciting results occur when existing technologies and Web 2.0 applications are integral aspects of information gathering, data analysis, and presentation possibilities. Anecdotal evidence indicates that student retention increases and standardized test results improve. More experience with virtual worlds, combined with formal research, is needed to authenticate these findings.

Virtual worlds

The development of 3D immersive worlds has offered a promising convergence of constructivist teaching in an imaginative and open-ended setting offering opportunities for interaction never before possible. Specifically, students become increasingly engaged in virtual environments when their avatars are invited to participate in scenarios recreating reality in a way not possible in real life. Interactions with historical figures come alive and historical events can be played out in real time. Collaborations with students around the world can take place in an environment where their avatars can interact as if they were in the same location. Virtual field trips can propel

avatars into situations and settings more realistic than any classroom. These adventures take place more authentically in virtual worlds than anywhere else.

The phenomenon of walking and flying within virtual environments, taking on personas, and connecting with other avatars, can be exhilarating. The excitement about the learning that occurs, is evident to the educators using MUVEs in their classrooms. Informal observations indicate that students are motivated, creative, and engaged. The type of observation and research needed to quantify learning in this way is in transition. The River City project, at Harvard University, has been developing methods of gathering and reporting data in virtual worlds, and reporting thoughtful reflection on student learning within MUVEs. [4]

Creative designers using innovative, new technologies are opening up opportunities for additional, more sophisticated 3D environments in the future. It is imperative that educators put aside any misconceptions about MUVEs and explore the most promising methods of using them to support learning. They can then share their observations and suggestions with others, building interest and support among their colleagues.



Figure 1. River City MUVE

One of the most successful efforts to involve students in virtual worlds is Global Kids, an organization with a mission "to educate and inspire urban youth to become successful students and global and community leaders by engaging them in socially dynamic, content-rich learning experiences." Global Kids has designed a variety of projects that engage students in worthwhile efforts to promote global understanding. "Virtual worlds can provide an assortment of learning opportunities, from identity formation to social networking, entrepreneurial skills, and financial literacy," says Barry Joseph, the director of Global Kids' Online Leadership Program. "Global Kids has responded by developing programs that formalize this informal learning to support youth leadership development around social and global issues." What's great about the Global Kids projects is that they mix virtual-world technologies with real-world challenges, engaging young students in socially responsible efforts that can have a real impact on the world they live in at the same time that they improve their chances for a promising future. "We have to think of ways to use games not just to escape reality but to re-engage with reality," writes MIT professor Henry Jenkins. Global Kids is "talking about real things that touch real people." [5]



Figure 2. Global kids in teen second life

Websites that provide resources for innovative teachers

Other technologies, including powerful website resources and handheld devices, can also contribute to a constructivist environment. Student access to websites such as the Library of Congress (www.loc.gov) archives can enable them to gather information quickly, analyze it, and create original work that includes authentic information, photographs, and videos.

With Gapminder, (www.gapminder.org) a multi-dimensional database, students can chart their data with color, shape, and movement, creating a lively, informative demonstration that can prompt rich discussions and further studies. Tracking the path of a hurricane on their cell phone can inform students of news happening as they watch. Traveling through the towns mentioned in The Grapes of Wrath or visiting the locations in Shakespearian plays can be accomplished with Google Lit Trips and used for history and English classes. (www.googlelittrips.com)



Figure 3. Gapminder, a multi-dimensional graphing tool

The real power, however, is generated by the type of questioning teachers provide, and the tasks they ask their students to accomplish. Teachers should include more than questions that can be answered with the factual information students find. When students participate in virtual worlds, Web-based field trips, and sophisticated data gathering, they can report factual information but then go beyond reporting and begin to create hypotheses, their own imaginative worlds, or Google earth based field trip.



Figure 4. Google Lit Trips

Recent Findings about an Emerging Field

Beginning in 2000, Dr. Christopher Dede has been the Principal Investigator of the River City project, funded by the National Science Foundation. Ongoing and extensive data collection combined with extensive efforts to observe students using the immersive environment, have resulted in nine years of reporting out on the learning that takes place. Students navigate through a 19th Century village where people are becoming ill. They take extensive notes and use 21st century skills and the scientific method to observe, gather facts, and create a hypothesis. Dede considers MUVEs to be the "next generation interface" for a generation of students used to multi tasking, instant communication, "ubiquitous computing" and augmented realities. Dede explains,

Students typically are already engaged in a 24/7 world of information-seeking and gathering. Moreover, they are often engaged in virtual communities for creating and sharing knowledge. However, the information and knowledge with which they interact is generally not related to their academic material. The challenge for educators is to engage students' considerable media skills in activities that are related to academic fields and disciplines and that make learning academic content and skills interesting and relevant. [3] [4]

"The biggest challenge educators will face will not be the technical skills, according to Dede - it will be 'learning a new pedagogy and unlearning the pedagogy of assimilation' – 'teaching by telling and learning by listening'." [3][4] This new pedagogy will involve teachers learning to promote interaction and exploration in a way that will still accomplish their curriculum goals and objectives – a challenging task. [7][8]

Asking Good Questions

Years ago, students were asked in grade school to "write a report about George Washington." In the past, they went to the encyclopedia and turned to the "W" volume. On 3_5 cards, they copied down information about Washington's background, his involvement in the Revolutionary War, and his ultimate legacy as our first president. On lined paper, they transferred their notes into sentences, using their very best handwriting. They convincingly articulated the facts in their own words, and their penmanship was legible. They were given a good grade. There was no analysis, however, no collaboration with other classmates who basically went through exactly the same process they went through, and unless they read the papers in front of the class, no one heard their words except for the teacher.

Imagine, though, how different the experience would have been if the assignment were: "Compare President George Washington's foreign policy to President Barack Obama's foreign policy. Create a conversation that the two might have had if they could communicate across the centuries using email, or another current technology." This type of question would involve a definition of terms. What IS a "foreign policy"? It would require research on the part of the student. George Washington's foreign policy is summarized in his farewell address, which can easily be found on the Internet. Discussion would be necessary to compare Obama's policies with Washington's. For the culminating project, students would need to compare and contrast their findings then construct a dialog the two might have had. Demonstrating it in the form of a podcast, digital movie, animation, or other technology would be the original product, the outcome of the activity. The process the students went through would be where the most learning took place. [7]

Conclusion

Virtual worlds are enabling educators and their students to venture into realistic and imaginative online environments never before possible. When teachers, as skilled moderators and facilitators, guide their students through these adventures, then challenge them to create their own artifacts and environments, true constructivist learning can take place. As safe, educationally sound MUVEs grow in number, the possibilities for active involvement and creative thought also proliferate. Based on the paradigm shift in education, where student centered learning replaces traditional rote learning, virtual worlds provide an exciting new range of online and face-to-face applications for innovative curricula.

Other powerful Internet based resources are enabling students to find authentic resources, analyze data, and present original and effective presentations.

What is always critical are the methods teachers use to engage and challenge their students. Enticing students with exciting online adventures, then extending the experiences with challenges to create original products, are ways to bring constructivist methods to the classroom, strongly supported by the most useful technologies.

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Biographical Sketch

Maureen Brown Yoder is a Professor in the Technology in Education program at Lesley University, Cambridge, MA. Dr. Yoder teaches "Emerging Technologies", a course incorporating the newest and most innovative technologies, using a constructivist and project based approach. In 1997, she was appointed the Program Director of the Online Masters Degree Program in Technology in Education.

Dr. Yoder is passionate about using inquiry-based teaching, and assists educators as they create thought provoking questions, direct students to rich Internet resources, and facilitate transformative thinking - in both online and traditional classroom environments. She has written and presented extensively on WebQuests, online resources, and "Electronic Constructivism," a term she coined. She inspires teachers to use a variety of constructivist approaches to inspire and motivate their students.

Dr. Yoder has conducted workshops on these topics nationally and internationally, most recently in Spain, South Africa and Argentina. She began her career as an elementary school classroom teacher then taught middle and high school technology classes before becoming a university professor. She received her doctorate at Boston University in Educational Media and Technology.



Figure 5. The author and her avatar

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ABSTRACT

Meaningful learning happens when students start to believe and gain interest to what they are doing, and then demonstrate skills and exhibit personalities that can be positive or negative. Through careful planning and conceptualizing ideas, students gain values, and connect with the project or concept. And since e-learning is also a classroom activity or included in a formal or informal education, meaningful learning could transpire. However, the process of how students experience it remains the focus of this study.

The study interviewed 15 students who are using e-learning as a form of instruction in college and students who are enrolled in distant learning education. They believed that as IT students, e-learning is part of the curriculum and the current trend in instruction, and through it they experienced meaningful learning. Pre-service teachers believed that classroom interaction among classmates and teachers can bring more meaningful learning although, they also believe that they can experience meaningful learning through e-learning if used more often and in a longer period. On the other hand, distant education engineering students have problems experiencing meaningful learning due to limited interaction with their instructor and colleagues. Although, they learned from the courseware and through communicating via virtual classroom and video conferencing, they also believed that if given more time, with deep immersion and chance to have personal interactions with other students and having a well-trained instructor for on-line courses and suitable media and instructional method, meaningful learning could occur.

1. Introduction

Nowadays technology is very useful in teaching and learning in the classroom. Most kids born in developed nations during the late eighties up to the present times are computer literate while an average number of students in developing countries are also computer savvy. Although the traditional methods of teaching are still useful, computers and other information and communication technologies are now the pen and paper, blackboard and chalk, and visual aide of the past.

Technologies are not only convenient to use but it can also be fun and stimulating to the minds of our young generation. Some technologies are easy to use and can be bought in an all-around computer shop. On the other hand, some are also expensive, and one needs to be trained before you can manipulate or operate it. As time passes by, all these technologies will be replaced by better, faster, more convenient and state-of-the-art technologies.

E-learning comes with these technologies. Virtual learning, computer aided learning, internet or web-based research and programs are common denominators of e-learning. They all refer to educational processes that utilize information and communications technology to mediate asynchronous as well as synchronous learning and teaching activities.

The question on how students learn through all these technologies has been proven by so many studies. Learning through e-learning definitely occurs. To some degree, it makes learning fun and interesting. With this kind of innovation, students yearn to learn but how about meaningful learning through e-learning.

Meaningful learning happens when students start to believe and gain interest to what they are doing, and then demonstrate skills and exhibit personalities that can be positive or negative. Through careful planning and conceptualizing ideas, students gain values, and connect with the project or concept. And since e-learning is also a classroom activity or included in a formal or informal education, meaningful learning could transpire. However, the process of how students experience it remains the focus of this study.

2. Research Design

This research is based on the learning experiences of 5 IT students, 5 Engineering distant learners, and 5 pre-service teachers of Manuel S. Enverga University Foundation. The grounded theory method of Strauss and Corbin (1990) was used. With grounded theory, a semi-structured, open-ended, ethnographic, in-depth conversational interview is more useful. Data gathering took place from September to November of school year 2009-2010.

Strauss and Corbin (1990) describe grounded theory as a process of linking sequences of action and interaction as they pertain to the management of, control over, or response to a phenomenon. Furthermore, the authors say that "process" is a way of giving life to data by taking snapshots of action and interactions and linking them to form a sequence or series.

According to Strauss and Corbin (1990), the purpose of grounded theory method is:

To build theory that is faithful to and illuminates the area under study. Researcher working to this tradition also hopes that their theories will ultimately be related to their within their respective disciplines in a cumulative fashion, and that the theory's implications will have useful application (p.24)

Strauss and Corbin (1990) stress that researchers using Grounded Theory method must be able to reach a certain level of skill and ease to be able to provide an effective and useful research. The following conditions must be met:

(1)	One must study, not merely read, through the procedures as described in the various
	books and be prepared to follow them (Glaser, 1978)
(2)	The procedure must be followed in doing research. It is only in practicing the

- *procedure must be followed in doing research.* It is only in practicing the procedure through continued research that one gains sufficient understanding of how they work, and the skill and experience that enables one to continue using the techniques with success.
- (3) A certain amount of openness and flexibility are necessary in order to be able to adapt the procedures to different phenomenon and research situations (p.26).

3. Research Questions

The initial research questions in this study emerged from the researcher's inquisitiveness about the learning experiences of students from MSEUF in e-learning. These questions greatly helped this research in the extraction of varied experiences of participants which are associated to meaningful learning. These questions were: (a) What were your expectations before using e-learning in school?, (b) How were you able to learn and understand all the topics given by the instructor through e-learning? (c) When did you start experiencing learning and understanding? (d) What other experiences can you provide that makes e-learning important to you and your classmates?

Interviews were focused on the process of selection and generation of artifacts for their portfolio, and other learning experiences that were significant to the study. The in-depth conversational interview was carried out in a non-formal and candid manner which lasted for about twenty to thirty minutes per student. The students were continually and repeatedly asked what they did, when it happened, why they did it, how they did it and with what consequence did it occur. Some students were interviewed twice to confirm or clarify some facts that they revealed during the preliminary interview. These approaches were very useful during the open coding which gave way in coding initial categories and sub-categories.

An open coding was employed while constantly asking questions like:

What is [the category]?, When does [the category] occur?, Where does [the category] occur?, Why does [the category] occur?, How does [the category occur]?, With what consequence does [the category] occur or is understood?

Through these questions, coding transcripts are broken into sentences and fractured into shorter lines. Analysis was done line-by-line or sentence-by-sentence through constant comparison method. Ideas which emerged were coded or categorized. Furthermore, the categories were compared and grouped to reveal the core categories. Thus, this is where axial coding begins. After which, selective coding gave way to the development of a storyline. And finally, the writing of the theory from the extant data analysis concluded the study's main objective.

4. Research Setting

Manuel S. Enverga University Foundation, a private non-sectarian educational foundation, was conceived and nurtured in the mind, heart, and will of Dr. Manuel S. Enverga (1909-1981), as founder and first president, during the difficult years of reconstruction following the end of World War II (Villariba, et al, 1997). At present, the university has a three-fold function, namely: instruction, research, and community service; offering responsive programs supportive of national development, goals and standards of global excellence. The institution offers over 90 degree and non-degree programs in the tertiary and graduate levels, and is manned by a fully competent teaching force consisting of faculty members with Master's and Doctor's degrees, as well as highly skilled nonteaching human resources.

5. Research Participants

The research participants were 15 students of Manuel S. Enverga University Foundation who have undergone elearning in their respective courses. They are 5 IT students, 5 preservice teachers and 5 engineering distant learners. The study was conducted from September to November of school year 2009-2010.

Emerged Procedural Framework

An evolving procedural framework for the generation process of the theory for "experiencing meaningful learning through e-learning" was produced.

Figure 1 describes the evolved grounded theoretical framework as regards to the systematic process of the grounded theory by Strauss and Corbin (1990).



Figure 1. Evolved Procedural Framework for the Generation of the Emerged Framework of Experiencing Meaningful Learning through E-learning

6. Methodology

I. Open Coding

Open sampling can be carried out through: (a) looking at the data purposefully; (b) doing it systematically; and (c) data emerging unexpectedly (Strauss and Corbin, 1990). This comes from having an open and questioning mind, and always being alert for significant data. Always asking oneself: What is this? What does it mean?

Moreover, open coding employs the strategy of constantly asking questions (who, what, when, where, how much, and why), breaking transcript into sentences and cutting or fracturing these into shorter lines. Analysis is done line-by-line or sentence-by-sentence through constant comparison method. This process is very important because categories also become the basis of theoretical sampling. Besides, this process gave way to where the researcher must focus on, and gave ideas of where one must look to find instances of the phenomenon. After which, concepts which emerged were coded.

WHAT	WHEN	WHERE	WHY	HOW	CONSEQUENCE
To learn web designing	During class	Computer laboratory	I was excited to learn	Doing time management, dividing time between learning and having fun	Transforming
Getting interested	During class	Classroom and computer lab	I was interested to learn	Ability to figure out what would happen after completing the database	Gaining interest and Connecting
Valuing computer education and the ethics	All the time	Anywhere	Because it will eventually make me a better person	Believing the computer ethics changed my outlook in life (personality)	Transforming
Believing on what Im doing	All the time	Anywhere	Because I know its the only way that can help me learn	Through self study	Believing
Interested to learn through the web	During class	Computer lab	Because I become excited for what it would bring	By being true to myself and lobe every bit of learning thru the web	Gaining interest and Connecting
Interested to learn through the web	During class	Computer lab	Learning was easy through e-learning	I found it less taxing	Gaining Interest
Learning competencies	During class	Computer lab	Because it is a requirement	By sharing and collaborating with my classmates	Interacting with classmates and becoming skillful
Learning competencies	During class	Computer lab	Because it was fun learning the applications	By sharing and collaborating with my classmates	Becoming skillful with classmates

Table 1	illustrates	the Extract	Concepts	of Field	Notes
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II. Axial Coding

According to Strauss and Corbin (1990) axial coding puts the data together and develops connections between a category and its sub-categories. In axial coding:

The focus is on specifying a category in terms of conditions that give rise to it; the context in which it is embedded; the action/interactional strategies by which it is handled, managed, carried out; and the consequences of those strategies. These specifying features of a category give it precision, thus we refer to them as subcategories (p. 97).

Borgatti (2005) stresses axial coding is the process of relating codes to each other. He further simplifies it as emphasizing casual relationship. And fit things into basic frame of generic relationships. Strauss and Corbin (1990) agree with the latter and added that relationships must be verified in terms of paradigm.

During axial coding, the Paradigm Model of Strauss and Corbin (1990) was utilized to create a systematical comparison to all categories that emerged from the documents. The features of the paradigm model is explained again in Table 2.

Element	Description
Phenomenon	This is what in schema theory might be called the name of the schema or frame. It is the concept that
	holds the bits together. In grounded theory it is sometimes the outcome of interest, or it can be the
	subject.
Causal	These are the events or variables that lead to the occurrence or development of the phenomenon. It is a
Condition	set of causes and their properties.
Context	Hard to distinguish from the causal conditions. It is the specific locations (values) of background
	variables. A set of conditions influencing the action/strategy. Researchers often make a quaint distinction
	between active variables (causes) and background variables (context). It has more to do with what the
	researcher finds interesting (causes) and less interesting (context) than with distinctions out in nature.
Intervening conditions	Similar to context. If we like, we can identify context with moderating variables and intervening
	conditions with <i>mediating</i> variables. But it is not clear that grounded theorists clearly distinguish
	between these two.
Consequences	These are the consequences of the action strategies, intended and unintended.

Table 2. Elements	of Axial	Coding
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Table 3 illustrates the extract from axial coding of core categories with their corresponding properties.

Causal Conditions	Valuing computer education and the ethics	Believing on what Im doing	Getting interested
Phenomenon	1	Meaningful Learning through E-learn	ing
Properties	Product	Perception	Process
Context	Because it will eventually make me a better person	Because I know its the only way that can help me learn	I was interested to learn
Strategies	Believing the computer ethics changed my outlook in life (personality)	Through self study	Ability to figure out what would happen after completing the database
Intervening Conditions	Pursuing what I believe and what it can make me.	Doing what I know is best	Always keen to learn more and having fun while doing it
Consequences	Transforming	Believing	Gaining interest and Connecting

Table 3. Extract from Axial	Coding of Core	<i>Categories</i>
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III. Selective Coding

The principal objective of selective coding is to explain the story line (Strauss & Corbin, 1990), to integrate the categories, and to build the initial theoretical framework. Basically, a story line is either generated or made explicit from the descriptive narrative about the central phenomenon of the study. When analyzed, the core category emerged from the story line. The paradigm model from the axial coding was exploited to allow the researcher to think in a systematic manner, ask questions back and forth, generate propositions, and constantly compare variables.

Developing the Storyline

In this study, the main story line was:

Abou experiencing meaningful learning of students during the e-learning process.

Students from the College of Computer Studies began to believe and gain interest to the curriculum upon completing their first grading period on their first year in college. They experienced meaningful learning because they can connect through all the projects and activities, have fun learning all sorts of courseware, and share it with others as well as gaining ethical values that would guide them through out their curricular years.

Students from the College of Education would rather spend more time in the outside world or experiencing the traditional classroom learning than doing virtual learning. On the other hand, some of them would like to experience more e-learning if given more time or allowed to have access to virtual learning more often than the classroom setting. They said that it's easy to do research using the web and it is also exciting to learn new stuff on an introduced courseware or through the internet. They believe that if they can learn more virtually they can connect with it and gain values through sharing their experiences to peers as well as their future students.

Lastly, the students enrolled in distant education believed that e-learning is part of the program and express that it made them value education and the motivation to finish a bachelors degree even while working abroad. On the contrary, they also express that having more time doing the entire task given by their professors will make them improve their outputs. In addition to this, a well-trained and empathetic instructor that will provide them with problem-based learning and learning-by-doing activities, and a skillfully integrated medium/media that will entice them to have more meaningful experiences.

7. Results and Discussion

The study interviewed students who are using e-learning as a form of instruction in college and students who are enrolled in distant learning education. They believed that as IT students, e-learning is part of the curriculum and the current trend in instruction, and through it they experienced meaningful learning. Pre-service teachers believed that classroom interaction among classmates and teachers can bring more meaningful learning although, they also believe that they can experience meaningful learning through e-learning if used more often and in a longer period. On the other hand, distant education engineering students have problems experiencing meaningful learning due to limited interaction with their instructor and colleagues. Although, they learned from the courseware and through communicating via virtual classroom and video conferencing, they also believed that if given more time, with deep immersion and chance to have personal interactions with other students and having a well-trained instructor for on-line courses and suitable media and instructional method, meaningful learning could occur.



Figure 2 shows the emerged integrative construct of the theory of meaningful learning of Information Technology students of MSEUF through e-learning.



Figure 3. The emerged integrative construct of the theory of meaningful learning of preservice teachers of MSEUF through elearning



Figure 4. The emerged integrative construct of the theory of meaningful learning of Engineering Distant learners of MSEUF through e-learning



Figure 5. The emerged integrative construct of the theory of meaningful learning of students during e-learning in MSEUF.

8. A Grounded Typology of MSEUF students with Regards to How They Experienced Meaningful Learning through E-Learning

The aim of this study is that all concepts are grounded, and as such they are not proven, they are only **suggested**. The end theories are set of hypotheses, not of **findings**, and that the enormous effort that makes up the process of generating theory cannot be shown in a single publication (Glaser, 1978).

Meaningful learning through e-learning for IT students could mean for them as believing and gaining interest to the design of courseware. Through careful and skillful planning and conceptualizing, IT students gain values upon finishing an IT and multimedia project, and connecting and transforming themselves after each course. On the other hand, meaningful learning through e-learning for pre-service teachers could mean employing it in longer periods and more often than traditional classroom settings. They started believing and gaining interest to the design of courseware only after one year of using it as a form of learning context, and through collaborating with peers, they gain values, and started connecting and transforming themselves after supporting e-learning. Finally, meaningful learning to engineering students enrolled in on-line or distant education could mean to them as having a well-trained and empathetic instructor that will provide them with problem-based learning and learning-by-doing activities, and a skillfully integrated medium/media that will entice them to experience meaningful learning.

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Online Degree for Teachers in the Brazilian Amazon: a Case Study

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Abstract

The Faculty of Education, University of Brasilia, implemented an online undergraduate degree program for classroom teachers who have not yet completed their studies. There are 1501 classroom teachers in the Brazilian state of Acre, bordering Peru and Bolivia, who have completed only high school. However, a new directive from the Ministry of Education makes it mandatory to have a degree in education to be a classroom teacher. A mixed program combining online work with face-to-face meetings was implemented to address this need. As part of their course work teachers have to complete a section of a Reflective Diary in each semester. As the undergraduate program is completed, each teacher delivers the complete version of the diary outlining the difficulties they encountered, the strategies used to overcome them, and how the program impacted their classroom teaching. The first group with a total of 810 teachers will graduate in March 2010. The dropout rate was very low, at 5.5%. A collaborative learning strategy was used to create learning communities and to bridge the various schools, regions and ethnic groups allowing participants to feel integrated despite distance, cultural diversity, language, religion. To conduct this research we collected data from project documents and teachers' diaries.

1. Introduction

A Teacher is not the one who always teaches, but also the one who is open to learn on the spot, anytime, anywhere. (Rosa, 1994, p. 199)

A reflective diary is a powerful tool for teacher professional development. This tool can facilitate teachers' reflection about their practice in the classroom. When reflection is not part of teachers work, classroom activities can become repetitive and unmotivating (Schon, 2000). In this paper we discuss teachers reflective processes using the Reflective Diary as the unit of analysis. The teachers we study are those enrolled in an online undergraduate degree in education called PEDEaD (**Pe**dagogia em Educação a **D**istancia). They use this tool in a continuous basis to improve their school practices. The Reflective Diary is also a requisite of the PEDEaD Program and is developed each semester by the teachers. At the end of the program teachers present their final version of their diary to an Evaluation Committee as a final requisite to complete the program. In the diary teachers describe their experiences and write their reflections about what they are learning in the PEDEaD program and about their practices in the classroom, establishing a link between theory and practice in their process of professional development.

The PEDEaD program involves three types of docents: **university professors** who elaborate the textbooks and the curriculum material (these are professors of the Faculty of Education –

University of Brasilia and professors of the University of Acre) who teach a post graduate certificate in distance education (Especialização em Educação a Distancia, **ESPEaD**) for the 54 **instructors** who then teach the 1501 **classroom teachers** enrolled in the online undergraduate program in Education, **PEDEaD**.

2. The online undergraduate program in Education PEDEaD

In 2006 the Secretary of Education, State of Acre, contacted the Faculty of Education, University of Brasília, to help them to comply with the new act of the federal Ministry of Education requiring that all teachers should complete their undergraduate degree in Education. A positive response of the Faculty of Education led to the creation of the online undergraduate program PEDEaD and the online post-graduate certificate ESPEaD which were launched in the first semester of 2007. There are 1501 classroom teachers in the State of Acre who have not completed an undergraduate degree. Of these, a first group with a total of 810 teachers will graduate in March, 2010. The second group of 691 teachers will complete the program in March 2011.

The PEDEaD program was offered in the mixed mode, combining weekly face-to-face meetings with online work in the Moodle online platform. The program is run by a General Coordination and an Intermediate Coordination. The General Coordination has an Office at the Faculty of Education, University of Brasília, and consists of the Director and Vice Director of the Faculty of Education, an Assistant Professor in charge of the online pedagogy, and four staff members. The Intermediate Coordination is based in the capital of the State of Acre, Rio Branco, and consists of four members supported by the staff of the Secretary of Education. These two units work close together to manage the entire PEDEaD and ESPEaD Programs.

The two programs, the ESPEaD and the PEDEaD are being offered in a concurrent format. The two programs led to the formation of a vast network of teacher professional development in the State of Acre that involves two universities (University of Brasilia and University of Acre) and schools in 20 of the 22 two cities of the state of Acre.

The foundation and structure of the PEDEaD program has its origin in a course developed by the Faculty of Education - UnB, in partnership with the Secretary of Education of the Federal District in 2001 called Pedagogy for Acting Classroom Teachers in the Elementary Grades (Pedagogia para professor em exercício no inicio de escolarização – PIE). The PIE program was a successful experience and led to the graduation of two thousand school teachers and sixty instructors enrolled in a post graduate certificate in teacher education. The PEDEaD was then modeled in the PIE program. In the offering of the PEDEaD program the same curriculum structure developed in the PIE Program was used, consisting of six integrating themes: 1. The Brazilian Educational Reality; 2. Culture and Work in Brazil; 3. Education and the Social Context; 4. The School as a Social Institution; 5. Curriculum and Cultural Diversity; 6. Teacher and Student Work in a Relation of Construction. These six themes were organized into six modules, each containing either five or six textbooks. Each textbook was then subdivided into three sections. With small revisions and alterations, almost all textbooks were used in the PEDEaD program. Alterations and additions were done considering the peculiarities of the State of Acre, i.e., a textbook on Native Education was introduced and other revisions were also done (O Projeto Básico, Universidade de Brasília, 2007).

As the original PIE program offered in 2001was one of professional development for

classroom teachers, the challenge faced by the professors at the Faculty of Education was to develop an evaluation process that should be an integral part of teachers learning process, stemming from the continuous reflection that each make about his/her practice in the classroom (Batista, 2003). In this case the evaluation could be the starting point of a new organization of the pedagogical work, more oriented towards teacher reflection and with a better foundation in the relation theory and practice. One of the biggest challenges was the decision to eliminate the final exam and to adopt an evaluation model centered in the elaboration of activities of specific content and in the construction of a portfolio where teachers could express, in a processual format, the development of their learning process throughout the course. This decision required a long and strenuous debate among participants involved in the PIE Program and also included educational evaluation consultants (Villas Boas, 2005).

The Faculty of Education decided to utilize an evaluation process for the PEDEaD Program similar to the one offered in the Federal District, the PIE, but refining and revising the model previously used. The experience with the use of portfolios in the PIE Program made it clear that it was necessary to do a better analysis of what should be the content of the Reflective Diary. Besides incorporating pictures, testimonies, narratives, and information, it was also necessary to build a synthesis that could express a deeper reflection of the classroom teacher about his/her own professional development process. Based on this assumption it was then decided that the diary should be written by the classroom teacher as a component of the evaluation process and the elaboration of a final version would incorporate and summarize all reflexions made and recorded by teacher along the six semesters of the entire program.

Differently of the PIE program, that did not used the computer as a complementary tool, in the PEDEaD program teachers use the computer to access an online platform as the main tool to support the learning process. In this case, most of the activities are done in the platform and available to the instructors and colleagues as well. The instructors have access to the assignments – as they have to grade them – but other teachers can also access and read the activities of their peers.

A PEDEaD teacher in the classroom

To enroll and to remain as a member of the PEDaD program the classroom teacher has to be active in the school, teaching grade 1-5 students. This teaching is incorporated as a regular workload equal to the classroom internship in schools required for regular students in the face-to-face undergraduate degree of education in the Faculty of Education, University of Brasilia. Besides, s/he needs to have Internet access to logon to the online platform and perform the weekly tasks for each of the sections of the textbooks. In addition to the weekly online tasks the teacher has a four hour face-to-face meeting with colleagues and the instructor to review the activities of the week.

Teachers are required to complete the diary each semester and defend the final version of it at the end of the program. The final version of the diary contains the reflexions each teacher develops along his/her own path to professional development in the sixth and final semester of the program.

A bachelor's degree in Education requires completion of 3200 credit hours distributed as follows: 1920 hours for the modules activities (reading the textbooks and developing the

activities online and face-to-face), and 1280 hours of classroom internship in schools. Evaluation of the online and face-to-face activities is structured in the following format: individual and collaborative activities online represent 50% of the grade. The face-to-face activities in the regular weekly meeting represent 30% of the grade and 20% is for the elaboration of the diary.

3. **Challenges to implementing the program**

The implementation of the PEDEaD program faced many challenges that impacted the program to a significant degree, i.e., distant location of communities associated with difficulties of access, as many schools can be regularly accessed only in the dry season, while access in the rain season is by boat or plane only; technical problems to access the Internet; and teacher training needed to use the online platform. Next, these issues are discussed.

The State of Acre is located in the core of the Amazon region, bordering Peru and Bolivia to the east. To the west it borders the Brazilian state of Amazon. All rivers in the state flow to the Amazon basin and the region is very hot, humid, and rainy. The entire state is covered by the Amazon forest, and many of the native people who live close to towns are also enrolled in the regular school system. There are few roads and many cannot be accessed in the rain season. The presence of the forest and the seasonal rain seems to be omnipotent and local people have to adjust to this reality. The importance of the forest in the lives of the local people is such that while the word citizenship is used to express the rights and obligations of a citizen to his country or region, a new word "florestania", that can be translated as "forestship", has been created in the state of Acre to express the rights and obligations of the forest.

All these environmental conditions difficult transportation and communication: often teachers and children have to change from a motor vehicle to a boat to get to school, and this makes the trip much longer and difficult. The same happens with the communication lines, the telephone and the Internet, that can be interrupted during the rain season.

Boats, ships and ferries are most common types of transportation

The technical problems we faced in the beginning of the PEDEaD program seemed to be insurmountable. Small towns did not have access to the Internet and when there was access, it was irregular and often it was not functioning making it impossible to do the regular weekly activities in the online platform. The only reliable service was the one owned by Brazilian Army as there are satellites over the sky of the region monitoring the borders and the forest. The PEDEaD team had several meetings with Army officers who helped us to broadcast several videoconferences to distant locations. In 2008, the second year of the project, many of the towns installed Internet services. But it was costly and still not totally reliable.

While in 2008 the Internet became available to all cities and towns involved in the project, access was mainly through school labs and government telecenters. Most schools and telecenters are closed in the evening and for teachers this was the best moment to work in their PEDEaD activities. It was by the end of 2008 that many teachers began to purchase their own computers and have access from home. Today we estimate that 80% of them have computers at home and Internet access.
Besides difficulties to access a computer and to the Internet, many teachers also had difficulties in learning how to use the computer. Many mentioned the fear they had to turn on the computer and do something wrong that would damage the machine. The PEDEaD program organized several training sessions in the different towns. While these training sessions were helpful, it was, however, in their homes that most teachers were trained. In fact, teachers' sons and daughters were in many cases those who first learned how to manage the home computer and the Internet and then taught their parents.

4. The Reflective Diary: What teachers say about professional development in the PEDEaD Program

In the "Teacher Manual of the PEDEaD Program", the Reflective Diary is defined as the space for classroom teachers to express themselves regarding their learning process in the program and to help them to develop the ability to reflect critically about the their own professional development (Universidade de Brasília, 2007 a.). This new proposal reverses the old evaluation paradigm, when the student is evaluated about something that s/he has or has not learned. In the diary is the teacher who defines and writes about what was learned, or not learned. This method implies in a reciprocal evaluation: the teacher says what and how the PEDEaD program helped in the process of learning and the Coordination of the program then incorporates changes and modifications in the program. At the same time, the teacher is evaluated by the instructor. In this way the diary is an open space where a pedagogical relationship of a different evaluation nature takes place as it is not only centered in questions and answers.

This evaluation model was defined and implemented at the beginning of the project. Teachers should keep a written record of their journey into carrying out the activities of the PEDEaD program. There was not a model to be followed but only suggestions made for possible ways. The Coordination of the PEDEaD program identified, already in the first semester, through the reading of the teacher diaries, the need for an additional course to improve writing skills. A course called "Production of Written Text" was developed and offered for those in need. This course was not part of the regular program workload and enrollment was voluntary

Online programs seem to be more demanding than face-to-face ones as participation is through the written word, with the messages and tasks posted in the platform, as opposed to the face-to-face learning when the spoken word is the main communication mode. Therefore, reading instructors and peer comments and messages, and writing and posting one's own contribution to the online platform becomes a routine task in the relation instructor-teacher.

Evaluation is perhaps one of the most complex tasks in the educational process. There are so many issues to take into consideration in this process as we try to understand whether the actions we carried out reached the stated objectives. As one teacher stated:

Today I understand that the time has come to reflect and to change, and to help school children think by themselves and to develop their own way to build knowledge. Enough already to try to make children just receptors of knowledge and information! We should let kids find their best way to learn because what may be easy for me may not be for the children. I also think that the word innovation should be part of the vocabulary of all educators so that they facilitate the emergence of new ways of thinking about how children learning processes can be

evaluated. Teacher 1

It seems that the need to control and to measure the extension of the knowledge built in the process of learning, that is, to evaluate, take us back to complex situations as is the case with this mixed mode program. The two programs, the ESPEaD and the PEDEaD, were offered in a concurrent format aimed at both instructors and teachers. To better situate this complexity, next we discuss five aspects of the PEDEaD program that are affecting the final outcomes: I. cultural diversity of the participants; II. curricular organization of the program; III. mixed mode nature of the program, offered in face-to-face meetings combined with online work; IV. teacher practices in the classroom; V. the relation between the undergraduate degree in education (PEDEaD) and the post-certificate graduate program (ESPEaD).

I. Cultural diversity. This first aspect has to do with the fact that the professional development program carried out by the Faculty of Education and the Secretary of Education, State of Acre, takes place in educational and culturally diverse spaces and using new types of resources. Many of the locations where the course was offered are very small communities. Some of the teachers came from rural areas, of precarious life habitat and poor learning conditions.

In order to undertake undergraduate studies I had to go through hardships and challenges that began in 1991, when my family moved from the small town of Tupan, in the State of São Paulo, to the State of Acre. I was nine years old and we moved to the town of Porto Acre. I was then in the third year of Elementary Education. My parents registered me in the local school. It was a very difficult period, to adapt to this new place, given the cultural differences, to their daily habits, and to the accent of the teacher and school children. Teacher 2

Another teacher commented about the same difficult he had with the local accent and how he learned to deal with the situation.

I should mention that I found a lot of barriers in the new town as the majority of people in the village came from the State of Paraná, in southern Brazil, and had a different accent, a bit as if they came from rural areas. However when I began to teach I taught them to pronounce words in the correct form, as I knew that changes do not happen in one day or a week, but in years. Studying one of our textbooks "Education and Maternal Language II", I began to better comprehend the spoken language of some of my school children as the majority of them came from rural areas and had a distinctive way of speaking. I confess that in the beginning I tried to correct them, but then I realized that when a child speaks a word wrongly you just need to repeat the same word with the right pronunciation and the child learns better this way rather than trying to correct and making the kid feel embarrassed in front of the others. Teacher 3

The use of the computer network linking the 20 towns in the state facilitated intercultural communication in a more consistent and regular way, allowing teachers to break the barriers imposed by geographical isolation.

II. Curricular organization. The second aspect relates to the curricular organization of the

program into modules. Each module contains five or six thematic textbooks produced by the professors of the Faculty of Education. Each textbook is then divided into three sections. Each semester is divided into weeks and in each week one or two sections of the textbook is taught. For a teacher to be successful s/he has to be well organized to deal with the specific themes discussed in the textbooks. Each week the teacher has to complete the online activities, responding to messages and interacting with the instructor and peers.

The program requires a great deal of organization, development, evaluation and self-evaluation, so that we experience the autonomy that is expected from us in the school where s/he teaches. It is a learning process mediated by technologies through which we are being prepared to teach with more competence by learning via a method of online autonomous learning, under the orientation of the instructor in the face-to-face meetings, when we review all the didactic material for the week, i.e., textbooks, additional readings, videos, and other learning materials of a very good quality. Teacher 4.

In this way the evaluation of the teacher in relation to his/her development and learning of the specific content is accomplished along the entire process, in each section, each textbook, and each module. The work posted by teachers is then read and evaluated by the instructor, besides being shared by all online peers, allowing for increased peer-to-peer communication and sharing. Teachers will then apply what they have learned with their kids in the classroom. As one teacher mentioned, the teaching strategies learned in the program were tested in the classroom:

Through the texts we read, the group discussions, the research we do, I have developed new knowledge and have also developed new research interests which related to my daily practices in the classroom. When I learned something new I would then apply that knowledge in my classroom and watch how the kids would react. There are very interesting teaching strategies presented in the textbooks and we have applied some in our own classes. Teacher 5

III. The mixed mode format combining face-to-face meetings with online work. While the online activities are the locus of the PEDEaD program, the face-to-face meetings are also an important component in teachers learning process. In the weekly face-to-face meetings teachers can establish a more relaxed interaction with peers and deal some of the difficulties they face in the program. Some teachers were discouraged because of the pressure and amount of work but were encouraged by their peers to persist and to overcome the problems they were experiencing. For many the help they found in the face-to-face meetings was fundamental to issues such as how to use the computer and to navigate online or how to deal with many of the demands they were facing.

"In the beginning my difficulties were enormous. I almost quit when I found out I had to use a computer. I did not know even how to turn on the machine, much less how to use it, how to work with the mouse. I was afraid to use the online platform and do something wrong. But my instructor was very patient with me and taught me everything, step-by-step." Teacher 6 Another one mentioned how the help she got from her peers was important in moments of hardship and distress:

"First I thank God, then my colleagues, because without them I would have quit. When I was not able to do some of the online activities there was always someone who would come to me and say: and then my colleague? Why haven't you done the activity yet? Let's go to my place and there we can work and I will give you a hand." Teacher 7

If the PEDEaD program were to be offered entirely online, without face-to-face meetings, many teachers would not have stayed and likely would have quit. The reason for the permanence of many teachers was the help and support they received in the face-to-face meetings. When teachers go to the weekly meeting they already have worked in the online activities and can bring to the meetings the difficulties and problems they encountered. The instructor then helps the teacher in need and discusses the problems and doubts s/he brings to the meetings. In this context, teacher evaluation takes place in a process-oriented format, in each meeting. One teacher mentioned how the help she had was important in achieving her objectives:

"I have learned that I am my own guide in this process and for this reason I have to dedicate myself entirely to the program, learning how to have an investigative mind and to sharpen my curiosity, fighting for not ever loose the desire to learn always, overcoming roadblocks and following the path to my objectives. I always found support from my instructors and colleagues, both online as well as in my meetings with them." Teacher 8

IV. Teacher practices in the classroom. In order to enroll in the PEDEaD program participants have to be teaching elementary grades. In this way there is a professional development network that includes undergraduate education through the teacher in the classroom and graduate education through the instructors and the professors of the Faculty of Education. The result of this integration is that a significant part of the activities done in the program have a direct impact in each of the three levels of education: elementary, undergraduate, and graduate. And it is important to mention that the network reaches elementary school children of almost all cities of the State of Acre, covering 20 of the 22 cities in the state. The work teachers do in the classroom is followed by the instructor and evaluated, not only by the instructor but also by the school team where s/ he teaches. This network helps teachers to improve their practices in the classroom and foster their commitment to their students, as mentioned by one of the teachers:

"Now I have an even bigger commitment with education, not to let this knowledge I have built through this program be forgiven. My role then is to mediate the learning of my students and to facilitate the emergence of reflexive and critical thinking in the classroom, leading them to comprehend their social role, as I comprehend mine, and to let them know about their rights and obligations as citizens." Teacher 9

The importance of the PEDEaD program in teachers practice can be noticed in this quote from another teacher.

I am more and more surprised about my own praxis, I have never had so many strategies to apply in my classroom. Now we are completing another module in the program and I have the conviction that the trend is to improve, it will depend of my efforts, of my capacity to act as a professional of quality. I will never forget that the future of my kids is in my hands. Teacher 10

V. The relation between the undergraduate and the graduate programs (PEDEaD and ESPEaD). The instructor has two main tasks in the PEDEaD program: he teaches his group of PEDEaD teachers both in face-to-face meetings as well as in the online platform, while he is also enrolled in the post graduate program of the Faculty of Education. In the beginning of each semester, instructors meet with their professors for one week of face-to-face meetings. Professors from the University of Brasilia fly to Rio Branco, the capital of the State of Acre where the meeting takes place. In the meetings professors present the content of their textbooks and propose and discuss with the instructors pedagogical processes to be developed along the semester. A significant part of these meetings were initially dedicated to training on how to use the online platform. Once this was learned, other types of usage were also done such as Web videoconferences, sites to place pictures, tools for chat, Wikis, and many others.

5. Conclusions

The Reflective Diary has been an important tool for teacher professional development in the State of Acre. Both instructors taking the ESPEaD graduate program and teachers taking the PEDEaD program benefited from the regular practice of writing their thoughts and reflections with a critical view of their own experience in teaching. As one teacher stated:

"I remember that some years ago when we studied History, we would study only the past. Today we still study the past, however with a view of the future with a critical vision. When we study the present we try to understand the reason for some facts or things. When I am studying I also like to figure out how they happened as they did and the entire process that led to this fact or thing." Teacher 11

And another teacher stated the ways he improved teachings of mathematics:

"When I reflect about my work I can see that I have improved my way of teaching mathematics. Now I can contribute much more with the learning of my children and I help them to consider the various ways to come up with a solution to a problem. The math games we learned with our instructor are very interesting and the kids of my class loved to do them in the classroom and learned much more this way." Teacher 12

Teachers diaries, as conceived in this program, is a tool to facilitate the reflection-in-action, used by teachers in elementary series to develop a continuous analysis of classroom activities, keeping a logbook of their reflexions, oriented by the instructor. Instructors also write their reflexion-in-action notes, producing their diaries, oriented by faculty members of the Faculty of

Education.

This educational process mediated by communication technology can facilitate the emergence of multiple dimensions and aspects that have to do with human sociability in today's world. As per the multiple practices that are used in education to transmit and build knowledge and to access information, it is above all necessary to work for the development of a human being who is capable to establish relations of humanity, be it online or face-to-face.

The background scenario for this network is literacy in its broadest sense. Therefore we want to support the development of a teacher that can learn how to learn and to have the initiative and will to constantly improve his/her own practice, feeling comfortable to express him/herself with the written word. And at the same time this teacher will be able to make use of Web resources, beyond the written word, with images, sound and other multimedia resources to improve teaching.

The sections I wrote in my diary describe some experiences in my learning process and reflexions about the PEDEaD program. I talk about the textbooks I read, the group discussions I had, the research and searches I did to find solutions for the problems I had in the classroom, allowing me to see many options and identify the different possibilities. We elaborated proposals for classroom activities and we would then apply those activities in the school to find out whether they were really good teaching strategies. Teacher 13

The design of this program has been based on the creation of a network to support teacher professional development with the support of professors and instructors to reach the teacher in the classroom. This was made possible because of the delivery mode chosen, a combination of online networking and face-to-face meetings to support the work of classroom teachers.

There is still much to learn from this experience, particularly from the network that has been set up for professional development of classroom teachers. Given the richness of the information available in teachers' diaries, in the messages posted in the online platform, and in videotapes made in the face-to-face sessions, there are many items still to be explored and studied.

The concept of reflection-in-action has been made more relevant in the program through the requisite of the Reflective Diary, a tool used both to evaluate teachers practices and the program itself. In the diary a teacher describes his/her experiences, difficulties, and successes, and through a continuous interaction of the items raised in the diary with the instructor and peers they have shown that teaching can always be improved through self-reflection and reflection-in-action about their classroom activities with their children.

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The MIT LINC 2010 Conference Parallel Presentations

Session #4:

A Look at E-Learning Architecture, Course Design, Information Gathering Strategies and Other Requirements of the Online Learning Experience



Enhancing E-Learning Architectures A Case Study

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Abstract

This paper discusses the design of an e-learning architecture at Princess Sumaya University for Technology. The approach is to start with a simple design suitable for e-learning startups, and then enhance it at three levels. The objective is to improve e-learning systems and their level of services while preserving flexibility, scalability and optimization of available resources. The approach followed makes it easy for other institutions to implement the design at its level of choice according to its requirements and needs.

Keywords: e-learning, architecture, web services, YouTube, load balancing, learning outcomes

1. Introduction

E-Learning is just-in-time education integrated with high velocity value chains. It is the delivery of individualized, comprehensive, dynamic learning content in real time, in order to aid the development of knowledge communities and link learners and practitioners with experts [1].

It has become a common supplement to traditional face-to-face education widely used worldwide and Princess Sumaya University for Technology (PSUT) [2] is no exception.

With the usage of e-learning systems over several years now, practitioners have come to expect several benefits and services of them, some of these include:

- Providing access to a range of multimedia resources [1].
- Higher levels of service, faster delivery time at reduced costs and risk [3].
- Generic design which is also scalable.

Unfortunately many of these benefits are currently absent at the current e-learning system at PSUT, and this is what arises the need for redesigning.

2. Environment

Before discussing the design of the e-learning system at PSUT, we must first realize the environment which we should comply with. PSUT is a university specialized in information and communication technologies (ICT) education which means that it has a community of practitioners (educators and learners) who are computer literate and can easily deal with different software tools used to prepare learning content and then study it, but this feature should not be taken into account to make sure that the design can be easily adapted by other institutions where computer literacy could be of high variance, keeping in mind the fact that PSUT is continuously developing new degree programs which are very likely to attract different backgrounds, in addition to a rapid growth in the number of people interacting with the system.

PSUT already has a local network in place connecting all departments together including student computer labs and instructors' individual machines. Internally there is a Computer Center which takes care of administering and maintaining both the local network and servers hosted locally for different purposes.

A locally-hosted online course offering registration and grading system is available and accessible through the internet with user credentials for each user such as students, instructors and administration.

Looking broader, the university is connected to the internet via a leased line and we will consider this as a scarce resource that has to be used economically especially when considering its relatively low bandwidth and the fact that it is shared among all beneficiaries.

3. Initial Design

This initial design is borrowed and adapted from Blackboard on Sun Reference Architecture Optimizing eLearning White Paper [3] with some modifications and generalizations. The architecture consists of the application, database, and storage tiers. Figure 1 shows a logical representation of the small campus configuration that is designed to support a user community of 1,000 to 10,000 active users when using the appropriate hardware.



Figure 1: Logical representation of the small campus configuration

4. Design Enhancements

This section discusses enhancements to the design explained. Each enhancement is about an existing problem of concern.

4.1. Using Web Services

The current architecture does not provide any integration or communication between the online registration system and the e-learning system. As a result, actions within the registration system such as courses for a semester and students' enrollment into courses and unenrollment from them is not reflected onto the e-learning system, but is done manually by the students themselves.

This has caused several problems:

- Students are exchanging their e-learning accounts. This has affected statistics of students' activities on the system, and severely degraded the informative value of analysis performed on this data.
- Students have been enrolling themselves into the wrong courses due to similarities in courses' names.
- Graders have been grading assignments of students who had dropped the course but are still enrolled into it on the e-learning system.
- Course grades are being moved manually from the e-learning system to the registration system, which is highly prone to error, not to mention the redundant time and effort needed.

To integrate the e-learning system with the registration system, it is being suggested to develop a web service especially for this purpose. A web service is a software system designed to support interoperable machine-to-machine interaction over a network. It has an interface described in a machine-processable format (specifically WSDL). Other systems interact with the web service in a manner prescribed by its description using SOAP messages, typically conveyed using HTTP with an XML serialization in conjunction with other Web-related standards [4].

Web Services are based upon three technologies: Web Services Description Language (WSDL), Universal Description Discovery and Integration (UDDI), and the Simple Object Access Protocol (SOAP). XML is used to tag the data, SOAP is used to transfer the data, WSDL is used for describing the services available, and UDDI is used for listing what services are available [5].

This web service is to be scheduled to run periodically to synchronize data between the registration and the e-learning systems.

Since the data on the registration system is very sensitive, the web service must be secured with reliable techniques such as those recommended by the National Institute of Standards and Technology [6].

Having the environment of PSUT as discussed earlier, this web service can be developed and hosted internally with minimal extra cost. When this web service is in place, it will additionally act as a prototype for expanding the e-learning system with the introduction of new services to be added and integrated easily and flexibly, especially that the web service and all its underlying technologies comply with the World Wide Web Consortium (W3C) standards [7].

Figure 2 shows the integration of the registration database with the e-learning system.



Figure 2: Integrating registration with e-learning over web services

4.2 YouTube Data API

Many agree that video content has become an essential component of e-learning systems, but its big size makes it the highest bandwidth consumer. Meanwhile, bandwidth at PSUT is a shared scarce resource and therefore its usage must be optimized, therefore the YouTube Data API can be utilized.

The YouTube Data API allows a program to perform many of the operations available on the YouTube website. It is possible to search for videos, retrieve standard feeds, and see related content. A program can also authenticate as a user to upload videos, modify user playlists, and more [8].

Using the YouTube Data API, a program can be developed to automatically upload videos from the storage server onto YouTube and return the video link. This uploader will be scheduled to run at internet usage off-peak times. Now there are two copies of educational videos, one on the local storage server and another on YouTube.

Additionally, and similar to content delivery networks (CDN), a virtual-CDN (V-CDN) implemented in software can be used. The role of the V-CDN is to detect the origin of video requests; if the request is originated from the university LAN it will be directed to read videos from the local storage server, otherwise it will be redirected to read videos from YouTube. This way, two students –one on the LAN and the other over the internet– could be watching the same video material at the same time, but each student is obtaining it from a different source.

This will add video content to the e-learning system at PSUT while carefully using bandwidth, and still maintain statistics of user activity since all requests arrive at the local server first before being redirected to the appropriate source. And since the videos will be available to the public, this will encourage tutors to produce high quality material and benefit from feedback, with an opportunity to contribute to education, research, and the community at a global level in addition to promoting the university.

Figure 3 shows an e-learning system enhanced with the YouTube Data API and the V-CDN.



Figure 3: Enhancing e-learning with the YouTube Data API

4.3 Internet Connection and Server Replication with Load Balancing

The problem with the current design is that it suffers from the bottle neck effect; all external requests come over the single connection to the internet, and all requests (both external and internal) are handled by a single application server. But what if the internet connection fails? Or if the application is overloaded with requests and therefore takes a long time to respond, or totally fails?

It is a common practice to replicate resources for the purpose of backup, reliability, and improved performance. It is suggested to connect the application tier with at least two internet links from different internet service providers. This will result in reducing the average response time because the work load is apportioned among the two links while the bandwidth is doubled. And in case one of the links fails, the e-learning system will still be accessible over the other.

When the design is adopted by a university with a larger number of students (more than 10,000 students), replication will be needed at some or all tiers (application, database and/or storage). With server replication a load balancing mechanism is needed. Server replication with load balancing will also enhance performance and availability.

Figure 4 shows an architecture utilizing resource duplication and load balancing.



Figure 4: Enhancing e-learning with resource duplication and balance loading

5. Lessons Learned

Enhancing e-learning systems as discussed is very beneficial. Integrating e-learning with registration over web services has made many operations easier and more accurate while preserving security, and has promoted the value of statistical analysis since it now relies on real student activities. This modular and low coupled design will support expansion and scalability, and act as a prototype for future integrations with other systems regardless of their implementations, since web services are by design platform, database, and language independent.

Taking the precautions to assure availability and improve performance has increased the reliability of students on the e-learning system and their interaction with it. It has improved their academic performance because the learning materials are always available and infinitely repeatable. The continuous interaction of students with the e-learning system has clearly furbished their learning behavior and enriched it with openness to many different learning resources available online.

Within the OCW Mirror Site Program, Massachusetts Institute of Technology (MIT) has provided PSUT with a copy of the MIT OpenCourseWare website hosted locally. Educators are using it as a reference for teaching and sometimes incorporating it in their materials, and students are making use of it to enhance their learning and for individual study of topics of their interest. As a result, students are being offered better education, and they are enhancing and broadening their knowledge.

The publishing of educational videos to the public domain on YouTube -or its alternatives- not only has optimized bandwidth consumption, but also encouraged tutors to produce higher quality materials taking into consideration a wider spectrum of audience with various backgrounds, and taking advantage of feedback provided

online. This level of demand for quality along with the students' new learning behavior has had the following affects on learning outcomes:

- It has moved the teaching approach from bare knowledge transfer to encouraging analysis, critical thinking, problem solving, and creativity.
- Students have developed a deeper understanding of the domains under study.
- In addition to knowledge, students are acquiring abilities and attitudes.
- Students have improved their networking skills and their realization of the importance of teamwork.

In the same method for uploading videos to YouTube, Google Docs will be utilized to provide web-based documents, spreadsheets, and presentations, offering accompanying condensed versions of video materials in some of these formats, in addition to independent educational documents.

Although assuring availability and optimizing bandwidth consumption may not be an important issue in countries where the internet infrastructure is mature and does not suffer from frequent disconnection nor from the bandwidth problem, saving costs remains a common desire. Since the discussed design and its enhancements build on existing resources with low costs to a certain level, it will strongly assist in introducing e-learning at institutions with limited budgets including high schools worldwide.

6. Conclusion and Future Work

This paper has discussed a redesign of the e-learning architecture at Princess Sumaya University for Technology (PSUT) initially designed for it, and then enhanced for better service and possible adaptability at other institutions.

Future work will include mobile learning support, assessment in e-learning, security, and further integration with other university departments.

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Exploring Information Gathering Process in Networked Environments

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Abstract

In this research, the steps under the process of information gathering are analyzed in the context of information literacy which is one of the most important skills required for students. Information gathering process in networked environments is modeled in this research by using qualitative methods. Case study is used with purposeful sampled three people who are studying for their graduate level education. Information gathering process which is starting with "reading and saving task" and ending with "evaluation" is modeled in a circular form. People can benefit from this model while developing instruction or training to support the learning of tasks (or steps), and also developing diagnostic tools and assessment forms in order to determine whether individuals have mastered and/or what to-be-learnt steps of information gathering processes are.

Keywords: Information literacy, information gathering, think-aloud.

1. Introduction

Information literacy is one of the essential skills for student on the way of becoming a lifelong learner. An information literate person is the one who can both benefit from library services and tools in the traditional sense and effectively use the sets of information presented on the internet and information searching tools [1]. Students are expected to navigate, comprehend and collect the specific data from networked environments by having the skill of information gathering and its sub-skills of accessing to accurate and reliable information. The transition from one-dimensional concept to multi-dimensional one [6], extended the available sources from physical to networked environments. Consequently, a bulk of texts has been transformed into hypertexts with links and connected these resources creating a new environment: networked information.

Information searching /seeking /gathering are used interchangeably in the literature referring to the information search and collection process in a broader context. While the former two correspond to searching, the latter can be thought as a combination of searching and collecting processes. In this study, the concept is used referring to "information gathering" (IG) in particular. Kellar, Watters, and Shepherd (2007) defined this process as the process of collecting information from many sources and may take a day to several days [10]. Since there is not a single correct answer at the end of this process, students cannot decide when the process of information gathering ends. In the meantime, many pages to review and too much time to spend make this process more complex. Writing a research paper for a biography, searching different car models before getting a new car, making plans for the upcoming summer vacation...etc. can be given as examples for understanding of the process of information gathering [10]

The search with the keywords of both "information gathering" and "searching" in the current literature reveal that studies on information gathering was explored participants' IG processes while using either the libraries [4, 8, 14], or the internet [5, 9, 10]. Emphasizing the fact that most research had been conducted 5-10 years ago, Kellar et al. (2007) have pointed out that the ways of accessing information varied in recent years; and information gathering skills have been redefined, especially with the use of web 2.0. tools (bookmarking, RSS ... etc..), web services and development of semantic search. Library searching skills compared to Internet is also considered as different in terms of the complexity of the tools and resources used in searches [10].

Brand-Gruwel, Wopereis, and Ywonne (2005) modeled the complex skill of information problem solving in their research [2] by starting out Eisenberg's Big6TM. They classified information problem solving as a complex skill and adapted the process to the regulation component in Big6TM. The sub-skills they revealed are as follows: defining the information problem, selecting information sources, searching and finding information, information processing, editing and presentation of information. This last component is a

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structure that plays role at each stage. Then they analyzed the tasks by classifying these skills in subcategories.

Some researchers emphasize the need for research focusing on the *role of micro-level factors in this process* [e.g., 12]. Examining the cognitive process or related skills alone could be too broad to develop interventional models. When the process and required cognitive skills are modeled at the micro level with the understanding of the nature of tasks, researchers will easily infer the skills and sub-skills expected from individuals.

In the light of these studies and arguments articulated above, it has been aimed to answer the following questions consecutively: "how information literate individuals collect information", "how can we model their process". The findings of this study would guide instructional designers to develop instruction or training to support the learning of tasks (or steps). Moreover, diagnostic tools and assessment forms can also be developed accordingly. Therefore, the primary goal of this study is to explore the procedural patterns in information gathering process from experts' point of view and to provide a working model of information gathering to be used in designing instruction.

2. Method

2.1. Research Design

This research is a qualitative study designed for revealing the information gathering processes of individuals in networked environments. Qualitative research contains deep, rich description and is more concerned with process than specifying outcomes or products [3].

In this research "case study" which is one of the research design methods is used. According to Yin (1984), case study is a kind of research method in which the focus is on the actual phenomenon within its real-life context, boundaries between phenomenon and its context are not clearly evident, and there are more than one proof and data sources in that situations [15].

For providing construct validity of the relevant research more than one type of data (triangulation) was recorded in data collection process. It can be said this study has both internal and external validity because of giving sample sentences from findings (internal) and external validity with the analytical generalization to the studies in related literature. To provide reliability the researchers has defined the all paces of the study clearly and saved all documents and data electronically.

2.2. Participants

This research was carried out with 3 people who are studying for graduate level education. Two of these people are studying on Computer Education & Instructional Technologies for master's degree and one is studying on English Language and Literature for integrated PhD education. The first Participant (P1) is in 5th term and has finished taking lessons and also writing his master's thesis. The second participant (P2) is taking lessons of 3rd term and the 3rd participant (P3) is in 3rd term of integrated PhD education. P1 is male and 25 years old, P2 and P3 are both female and 23 years old.

Qualitative researches allowing people to work in depth of the cases that are thought to be rich with information so in this research people are selected by purposive sampling (Yıldırım & _im_ek, 2006). Purposeful sampling is generally used in case study research; therefore, explain sampling procedures and case selection, and the defining characteristics and typicality or atypicality of the case (TESOL, 2009). The process of information gathering was only been limited to the internet sources it has been considered of participants to be able to use computer and internet well. Participants were asked whether they could reach easily to the information they searched on the internet or not and all three participants expressed they had any trouble in this regard. Just as participants are continuing educations for graduate-level and they already carrying out researches and preparing reports about the issues they interested in. Overall, it would not be wrong to claim for these individuals that "information gathering" process has become almost a part of their life.

2.3. Data collection and analysis

For preparing a presentation on "How developments in genetics will affect human life", participants were given a task of thinking aloud while gathering information on the internet. This method is widely used while studying cognitive processes, such as problem solving, learning, decision making, human–computer interaction, and cognitive task analysis [7].

Thinking aloud is explained to individuals by providing examples. Researchers reminded each participant to think aloud when he/she becomes silent in the process of gathering information. While choosing the task to be searched, it has been ensured that participants did not have any prior knowledge about the topic chosen. Also, it is assumed that with low or non-existing prior knowledge, participants could be more reflective while thinking aloud in the process.

In case studies more than one data collection method is usually chosen for trying to achieve rich data diversity and the data which can confirm each other [15]. While information gathering processes were being recorded by video-camera, the speech of participants were recorded by sound-recorder and an observation record was noted by the researcher. Thus, triangulation was ensured so that it is aimed to increase the construct validity and credibility of this research [15]. After the first interview with P1, it was seen that the sound was recorded clearly while video camera was capturing screen, so the sound recorder was not needed and then the speech data of P2 and P3 are written from video recordings. All data were taken electronically and saved in a directory so, in addition to the verbal data, electronic data is also kept.

While transcribing the recorded data, Microsoft[®] Office Word 2003 software is used. The screen captures are saved by using computer software that comes with the video camera and in the process of data encoding, when the text is inadequate, current screen image was considered. In observation report, computer and internet self efficacy perceptions of participants are noted, and also the reminder tips about participants are written. General information summarizing participants is presented in Table 1.

Participant	Age/ Sex	Department	Participation period	Data size	The numbers of participants get/download about given issue			
					Total links	ppt files	Documents (pdf, doc)	keywords
P1	25, M	CEIT	10:45 - 11:45	376 line	27	12	9	32
P2	23, F	CEIT	15:38 - 16:20	193 line	6	-	3	18
Р3	23, F	ELL	14:57 : 16:00	367 line	6	-	3	9

Table 1	General	preferences	of	partici	pants
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3. Findings

We observed the expert performance which is video recorded and coded by using of think aloud protocols and created the model of information gathering process as shown in Figure 1. It can be seen from the model that it is cyclic. Finding, accessing, and storing the information had various steps and runs in circular form, not hierarchical or linear [13].

The model that thought to be ideal has been created by bringing together the information gathering process of three participants. The arrows in the model show the direction of the relationship. Bi-directional arrows symbolize the two way movements between related steps, and one way arrows symbolize only one way movement. In evaluation level, there is a condition, and the process will either continue or halt according to the answer; Yes or No. Because of related model operates on the internet while gathering information, it is the pre-condition of individuals to be able to use computer and internet at basic level. The steps of model are explained below.



Figure 1. Modeling of information gathering process

Reading and saving task:

The initial state of information gathering starts with reading. In other words, the input for the process is initiated by encountering the task. Individuals read the task and develop strategies, such as writing it down or saving it as a file in their computers. Saving it as a file can be considered as a note-taking strategy for further reference.

P1: May I write the subject (title of given issue)? (And opens a .txt file for writing) P3: Ok, I'm writing on a paper.

Creating a directory and a tips file:

Individuals create a directory in which they will save all content they gathered and then rename it. And create a tips file or a notepad file in that directory for entering notes and/or keywords as a brainstorming area.

P1: Ok, Let me write the framework of the given issue. I'll talk about what is genetic, what it is trying to do. And, the studies on what has been done so far, what is being done currently with two perspectives; in our country and in the world. Then, in what areas it can affect human life, I try to detect what are these such as food, health...etc. . Then I'll give examples about these and in the future how can be affected in these areas?

P1: For example, here it says it could be used of the production of human organs. I can look something about this and then get information to my presentation. This is also an important thing in terms of developments in genetics. Let me write this to my tips file, Hmmm, because it is an interesting topic, production of human organs. This would be the biggest effect of genetics I suppose.

P3: I'm copying (selects all and then copies and pastes into MS Word.) Then, this is my own personal habit of writing where I get this from. Here the address is genetikvebilim.blogcu.com. I usually do it at that moment because if I use it for a research later I do not need to go back and look its source again. Let me write, on 5th December 2008.

Determining the requirements of task:

This step involves the determination of requirements, to which they will need in order to accomplish the task by the end of the process. For example if the task requires them to prepare a presentation, individuals should search audio-visual data (video, audio, images, graphics ... etc..) in addition to text. In a similar way, the expected presentation would be less intense than a critiquing task. If the task requires them to prepare an academic presentation, or to write a term report, they would determine different requirements for that particular task.

P1: If I'm going to prepare a presentation I look directly to the ppt sources. For example with the keywords of "genetics, how will affect human life". I'm designing the frame of topics, right?

P1: While designing the framework of given issue, I've taken the advantage of my prior knowledge about preparing presentations rather than the searches I made up to now. I created the framework by asking myself how can I explain this subject. Now I will identify keywords according to this framework.

P1: If I'm preparing for presentation I benefit from the interesting points for attracting people. I determine the interesting points while I'm reading and search something related them specifically. For example, I have given as an example of cloning sheep and try to find some visual graphics. What was the name of that friend, Dolly? I search with keywords of Dolly.

P3: If I'll make a presentation I search more pictures and graphics. Now I'll search visual graphics by looking Google Images with keywords of genetics and human and then copy the pictures I've reached.

P3: For example, Times. Maybe I can say something to audiences "it is written like this in Times", "according to Times this is the recently found" ...etc.

P3: And, I know BBC has documentaries and I want to look if they have anything about the given issue.

Choosing the search sources:

Where will an individual gather the information from? Search engines, databases and online libraries, ebooks or video and/or photo sharing sites? In this step, the nature of the task is again a determinant factor for experts to decide what source they need to choose:

P1: For example I'm taking this all and searching from Google at first.

P1: I look at images for preparing my presentation more attractive. And then search Wikipedia and read what it says about this issue. And I search with the keyword of "genetics"

P1: For example I try to find something striking from Youtube. I want to make my presentation more visual and show people the information with a different point of view. I'm busy with this idea now. I'm searching now for making the presentation more visual. I want to prepare attractive and well designed one which has less texts.

P1: I don't search the databases like Science Direct, because now I need general information more.

P2: At first I'm opening Google which is the most common search engine I've used. Then I'm writing the issue as a whole rather than separated by commas like genetics, human life and developments in genetics.

P2: I can open academic articles from here for getting other researches. I search from Scholar Google again.

P2: In fact, I can search from normal Google search page with English keywords.

P3: At the same time I want to search with the databases from our university, and opening hacettepe.edu.tr, from students, libraries. In fact, this is interesting. Interesting for me. I always used for the social sciences databases previously, I will look now to medical databases or those related to biology at the moment. I'm searching. Dermatology, Pediatrics, Neurology...etc.

P3: hmmm, I intend to search from Google scholar before this. What kinds of books are there related to this issue and what kind of books I can get. I want to look at them and I'm opening Google scholar.

Choosing the language of search:

An individual can reach rich data by gathering information with different languages which individual feel himself/herself competent enough.

P1: Let me search by writing "Genome Project". And look what is called in English. Human Genome Project information, impact on human health. These are important keywords for me.

P1: The human genome Project and its impact on society. I'm searching on a page in Turkish and another page in English. In fact I couldn't find enough information in Turkish. Future medicine, for example I couldn't find these titles, so I'm looking interesting titles in English. Let me take this, and save.

P2: I can look in English, Is it written as "genetics", let me look it. (opens a free dictionary for looking how is genetics' spelling). Maybe I can reach more sources when searching in English.

P3: hmmm, I decided to change my research language because of getting no more interesting results from Google.

Determining Keywords:

An individual should produce keywords from the given task for further exploration. While gathering information, keyword production is an ongoing process and after producing new keywords, all other steps in cycle continue.

P1: Hmmm... Let me add "future" and look like that. "future genome research" I'm saving this. Save link as. The future of genome Project for medical research. This is related to the thing I'm searching. And now, I'm adding "future" and "impact" to my keywords.

P1: Look I still am looking for new keywords. Yes, we found the thing we searched within this page. It was important for me. Future, impact on society. These are my keywords.

P1: I'm searching with "Genome Project", "drug". And adding "impact". "impact on drug". I'm looking this. Why did you add drug? I've seen it in a research which I didn't save about diabetics. I've written tips and when I've seen now, I remembered "drug" again. When I see an interesting word, I'm looking and searching it. Because I will add this to my presentation.

P2:I usually see "human development" so I'll change it with "genetic development".
P2:Let me search with genetic cloning in English. Genetics cloning, human clonning
P2: It has been written here about genes and as a science of genetics. I wonder if I get genetics as science. Genetic science, developments.

P3: Now there is a sentence as "genetics and danger" in this study. And it gave me another keyword; "genetic risk".

Filtering:

Individuals limit his/her search according to file or data types. This process is called "filtering". For example, if an individual wants to search some particular file extensions (such as .pdf, .doc, .ppt ...etc.), he/she can filter the search during information gathering process.

P1: Now I'll search the same keywords for looking to pdf files, but I won't read content of them I'll look just titles and decide if there was an interesting one. Let me search, future impact of human genetics filetype: pdf

P1: Human genome Project information, and let me search adding of it filetype:ppt

Scanning the output data:

The next step is scanning. Individuals must have skills of reading on computer screen, scanning the text on the monitor and using the preferences of internet browser (such as under Edit menu – Find). In addition to these computer-related skills, individuals are expected to be able to answer the following questions about the data they accessed:

- Is this information related to the given issue?
- Is it dependable?

- Is it actual?

P1: This resource is good, let me save it. I'm looking for if there were any other keywords in this text. Because it's a good resource. I'm looking to its bibliography. For example there is a given web address here, I can look what it has.

P1: Hmmmm. for example I can look if there was a word of "gene" in the lines of this text? (Opens menu of Explorer and run "Find") (find \rightarrow gene)

P1: Ethical values under ethics, I can take this, oh no, I don't think it is useful because of being k12.edu.tr.

P1: I found a thing here, I'm looking the source of this, who has done, it's belong to tip.hacettepe.edu.tr. We can say this is a reliable web site because of its education connection.

P2: Human cloning will be the most important development. Genetic modification. It's written here deeply. And in this page it is more biological. It says genetics engineering here.

P3: If it's a blog then it's a simple source. Because, what people usually do with blogs? Iummm, they usually make brainstorming. Such as, they usually share their ideas with others. And it takes place in an informal way. It's different from journal articles because they usually are not analyzed totally. They are written in daily language.

Selecting and saving output data:

Individuals select, save or eliminate data according to the answers to the questions asked in the previous step. Also in this step an individual must record bibliographies and create references. Individuals can use software or if he/she does not have an adequate level of technical knowledge they can index saved pages manually. At the end of this step individual can choose two paths. One is evaluating all data he/she had another is keeping on searching.

P1: Hmmm, it says here "developments in medicine". And, it is written here "developments in medicine" too. And there is another one. The three of them has the same texts I think. Let me look and compare each other. It says "The effects of developments in medicine to humanity". I'm looking now if all of them are the same. Yes I'm closing two others.

P2: I can use this while deciding the titles of presentation. So I save this.

P2: I've seen a title named "life that is reduced to the genetics". It requires membership to save the file, so I directly save the page. There is an article about genetics here. Hmmm. There is a sentence I interested in here, ...so there is a relationship with human. I'm saving this page too.

P2: These are the resources I've reached before. There is something here about recent developments and it says more about technology. I probably can use this. So I'm saving. There are academic studies here. G evaluation, N evaluation, genetic technology. Let me save this file too.

P3: And,, genetics and cell biology. I'm opening this as a pdf document and I'm saving this by renaming of "genetic1" to the folder of "genetic" which I opened on my desktop. And save it.

Writing tips and taking notes for remembering:

Individuals write down and keep notes for further use, such as "return here later", "look at later", "... is a page with too much detail about ...", "you definitely need to find this source" etc. In their cyclic process, they do not always follow this step; therefore, this process was drawn with cut point in Figure 1.

P1: Ethics and the point of genetics science has reached. This can be a good title for me either. Hmmm, I'll add an item here under the title of health. Illnesses and their reflections on Drug Industry. Because drugs are also related with genes in future (Writes the titles as a framework of his presentation in tips file).

P2: In fact I can write these one by one. Maybe by opening a new document from here. Generally "probable developments" and "their effecs on human life". Cancer, making longer of human-life, human. It says here the concept of "personality" will be solved. Gene teraphy, I've taken these related with cancer. Skin cancer,

"sleepiness gene" and arranging the biological clock. In fact this is the general title, I can move this to top. Second title is human cloning.

P3: But I want to copy the name of this journal because if I've had to focus on it at the end of my searches I want to look it again. And copying it to my word document and taking note as "there are more researches studied in 2008 so go back again!"

Evaluation:

Evaluation is the exit point of the information gathering process. At the end of the evaluation step, if individuals believe that they had gathered enough information and they make meaning out of data, then they are ready for preparing the output –whatever the task requires them to prepare. Otherwise, model operates in its cycle from the beginning, which is determining new keywords for further gathering.

P1: Normally, I have a break after searching and evaluate what kind of sources I've.

P2: Generally, I design a framework maybe in a word document. And I start to prepare the presentation at the end of my searches. When I totally searched and get everything I start to prepare my presentation. When I believe that was enough and got everything about that issue? If I get enough data to fill the titles and subtitles according to my framework, I can decide to finish.

4. Conclusion

In this research, information gathering as a process was modeled. To understand and explain the steps of searching and collecting information, there is a need for investigation this process in a context [12]. Researchers have created a context based on a given task of information gathering process and explored this process from experts' point of views.

Three participants in this study are from two different departments (CEIT & ELL) and they tend to reflect their background and study strategies during the information gathering process. For example, when "reading and saving the task", the two participants from the department of CEIT recorded and saved the given task on their computers while the other participant, who is from the department of ELL preferred to write it down on a paper. The same difference between individuals can be seen on the strategy of "creating a directory and tips file" such as the way they preferred. While two participants from CEIT created a directory and saved the shortcuts of the web pages in it, the other participant from ELL created a word document and then copied and pasted the pages and images in it.

The findings indicate that P1 is the one who had the most effective and productive result in terms of the numbers of files, documents, links and keywords gathered. P1 has also the most efficient computer skills (for example, filtering strategy used only by him). These findings might indicate that "having effective computer skills" enabled this person to be successful on information gathering process in networked environments.

Another finding of this research indicated that participants preferred different search engines and changed the search engines according to their needs. For example, they preferred WikipediaTM at first for getting general information. If they needed more academic sources, they preferred to look the databases such as Science DirectTM and Google ScholarTM. For getting information about scientific developments they preferred to look at BBCTM and TimesTM. They preferred YoutubeTM for video search and Google ImageTM to get visual materials (like photo, image...etc.). Apparently, knowledge about search engines and deciding on which one to choose become an important competency to be developed for novices.

Expert individuals are attended to this study by purposeful sampling. The results can be helpful for novices as a road map and the suggestions below can be provided based on the findings of this study:

- This model can be applied to teaching information gathering process to novices
- Assessment forms can be designed to determine how individuals perform through the information gathering process
- Certain diagnostic tools can be developed to identify the problems and issues for each individual to pinpoint the pitfalls in information gathering process
- The effect of computer expertise in information-technology based search could be explored with more diverse participants in computer experience.

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Supporting Higher-Order Thinking in E-Learning Environment

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Abstract

IT enabled teaching and learning systems have been widely used in higher education institutions. This paper describes how the e-learning environment, such as myCourses, can support teaching higher-order thinking. The theme of this study is the design of organizational structures of teaching and learning artifacts for higher-order thinking. The paper proposes a model of thinking inquiry-based structure of teaching and learning artifact for e-learning management systems. It presents a design case study of implementation of this model.

1. Introduction

E-learning management systems, such as myCourses (Blackboard Vista), have been widely used in education institutions. E-learning management systems are supposed to serve teaching, assessment, and learning [27]. For teaching purposes, an e-learning system posts course syllabi and teaching material. For assessment purposes, an e-learning system records students' assignments and tests as well as assessment results. For learning purposes, an e-learning system can provide an environment for communication, presentation, and collaborative activities. The current e-learning management systems, however, have not been effectively applied to enhancing students' higher-order thinking [16, 25]. This is mainly because generic e-learning management systems must meet a variety of needs in learning. Higher-order thinking is active learning process across the boundaries between courses, disciplines, or even fields to learn what the learner has experienced. This challenge raises a significant research question: how theories and practices of e-learning can be applied to e-learning management systems for fostering higher-order thinking.

Artifacts of teaching and learning are learning objects. As discussed in the next section, the literature of learning objects has suggested that an explicit organizational structure of the repository of learning objects can be an interface layer between the user and the teaching and learning artifacts. Accordingly, to make generic e-learning management systems more useful for enhancing students' learning, a layer of the e-learning environment must be developed to facilitate students' higher-order thinking. This paper describes how domain knowledge of teaching higher-order thinking can be used to develop an organizational structure of artifacts to achieve this goal. It proposes a model of higher-order thinking oriented organizational structure of artifacts. The ultimate objective of this study is to build on the theories and cumulative knowledge of IT enabled teaching and learning.

2. Higher-Order Thinking

Higher-order thinking is "an active, persistent, and careful consideration of belief or supported form of knowledge in the light of the grounds that support it and the further conclusions to which it tends" [7]. Higher-order thinking is a thinking process more than simple memorization and comprehension, and involves a variety of cognitive processes, such as summarization, identifying general principles, exploring various situations, reconciling options, monitoring progress, and so on. Although higher-order thinking is a rational process required for problem solving and decision making, it may not directly associate with solving specific problems or making specific decisions. Higher-order thinking has been studies for a long time [6, 10, 13, 17]. There have been many terms for phrasing higher-order thinking in the literature, such as reflective thinking, critical thinking, creative thinking, good thinking, deep thinking, self-learning, etc.

Although the real higher-order activities in the human brain remain by and large an enigma, descriptions of directed thinking routines [20] for the thinking process can make thinking visible as well as teachable. Research [18, 19, 24] has made connections between teaching and learning artifacts and higher-order thinking.

2.1. Higher-Order Thinking Modes and Support of E-Learning Management Systems

In this section, we discuss modes of higher-order thinking in the perspective of teaching and learning higher-order thinking through e-learning management systems. The taxonomy of higher-order thinking has not been made clear. Skeptically, as higher-order thinking is so complicated in general, any taxonomy is unlikely to be applicable to all disciplines. The reason is that discipline-specific and skill-specific knowledge plays an important role in higher-order thinking. Depending on the nature of a discipline, higher-order thinking may or may not directly associate with specific problem solving or decision making. In certain disciplines such as engineering, higher-order thinking may means solving problems using basic and fundamental discipline-specific knowledge. In contrast, for career development or self-regulation, higher-order thinking is generally non-discipline-specific and may not involve any discipline-specific knowledge.

Along with the proliferation of e-learning management systems, there have been discussions on nondiscipline-specific higher-order thinking through the use of e-learning management systems [1, 3, 28]. Essentially, three major modes of non-discipline-specific and non-skills-specific higher-order thinking are discussed in the literature: career *development*, *academic accomplishment*, and *extra-curricular learning*. Nondiscipline-specific and skills-specific higher-order thinking modes include: *problem solving*, *self-regulation*, and *motivation* [14]. Although higher-order thinking emphasizes general thinking strategies and abilities across diverse situations, discipline-specific knowledge can guide higher-order thinking that is relevant to the particular discipline [9]. Higher-order thinking on *decision making process* [26], *organizational learning* [22], and *system's factors* [5] are examples of discipline-specific higher-order thinking modes in the behavioral science fields.

Clearly, the cut-lines between the higher-order thinking modes can never be sharp. Also, it is not the intention of this study to identify all types of higher-order thinking modes. The focal point of this discussion is to gain more understanding about the different modes of higher-order thinking and to investigate how we can use e-learning management systems to support teaching higher-order in the common modes. Generally, the relationships between the diversified higher-order thinking modes and the support of e-learning management systems can be described in Table 1. As illustrated in Table 1, e-learning management systems can support higher-order thinking in many ways. This study concentrates on the design of interactive teaching and learning environment for higher-order thinking.

2.2. Models of Higher-Order Thinking

As higher-order thinking involves complex cognitive aspects and has a variety of distinct modes, there have been countless models of higher-order thinking in the literature. Nevertheless, models of higher-order thinking can be classified into two categories: procedural model and guiding model.

Procedural model – A procedural model of higher-order thinking describes share common basic stages of higher-order thinking: experiencing, analyzing the situation and knowledge learned from the experiences, and internalizing the learning to generalize wisdom for the future. Kolb's [15] structured reflective thinking cycle model is a representative higher-order thinking procedural model. It asserts that higher-order thinking is an experiential learning cycle which has four stages: concrete experience, analysis of observations, generalization, and planning future action. Similarly, Boud *et al.* [4] describe three-stage activities in higher-order thinking: preparation, engagement, and processing. In the preparatory phase, the learner examines the situation. During the engagement, the learner reviews the experience received from the practice. Finally, a learner must consolidate the experience to apply it in new context. Gibbs' [11] model is another popular higher-order thinking.

Types of HOT Mode	Examples of HOT Mode	Description of the HOT Mode	Support of E- Learning Management Systems
Non-Discipline-Specific	Career development	Think on personal mission, career selection, and long-term goals.	Accumulative assessments
Non-Skills-Specific	Academic accomplishment	Think to plan academic success, and to recognize gaps between the existing knowledge and curricula competences.	Learning portfolios collection
	Extra-curricular learning	Think to celebrate broad life experiences, to develop social skills and responsibility.	Reflection portfolios
Non-Discipline-Specific Skills-Specific	Problem solving	The thinking ability for solving practical problems	Interactive teaching and learning environment
	Self-regulation	The thinking ability to self-monitor and to learn from experiences and mistakes.	Interactive teaching and learning environment
	Creativity	The thinking ability to be effortful and creative.	Accumulative assessments
Discipline-Specific	Decision making	Think for rationale decision making and judgment.	Interactive teaching and learning environment
	Organizational learning	Think to fit the organizational environment and make contributions.	Interactive teaching and learning environment
	Systems thinking	Think on diversified elements and factors of systems and their interconnected relationships.	Interactive teaching and learning environment

Table 1. Higher-Order Thinking (HOT) Modes and Support of E-Learning Management Systems

Guiding model - Although higher-order thinking emphasizes general thinking strategies and abilities across diverse situations, structured thinking model can guide sophisticated higher-order thinking [9]. Boud *et al.* [4] suggest that structured higher-order thinking is the key to learning from experience. Aram and Noble [2] argue that instructional models of learning and thinking are appropriate for higher-order thinking. Dunne and Martin [8] maintain that, to teach and learn higher-order thinking, we need structured instruments or guidelines, and model is an important tool, if not the only one, that compels higher-order thinking. While the ultimate models of higher-order thinking in great students' mind might not be available, there is little doubt that instructional models can provide guidelines for higher-order thinking. We refer instructional structured thinking models for teaching and learning integrated higher-order thinking to as guiding models. For instance, SWOT (strength, weakness, opportunity, threat) analysis model can provide pertinent guidelines for students to conduct non-discipline-specific higher-order thinking. The decision making model [23] taught in social science fields can help students develop thinking dispositions of decision making. Students can apply this guiding model to any decisions across social science subjects and think about the decision making process as well as the important roles of data and information in decision making.

Clearly, teachers can use typical guiding models, or develop their own guiding models for teaching higher-order thinking.

2.3. Thinking inquiry

Posing questions to the student is an effective approach to teaching higher-order thinking [12, 21]. A guiding model can have its questions, or thinking inquiries, for students to think. A thinking inquiry can be very general. For instance, the SWOT guiding model can have generic thinking inquiries such as: What is your strength in pursuing your career? What is your weakness in your major courses? Do you perceive any opportunity in extra-curricular learning? etc. A thinking inquiry can also be specific to address individual student's work. For instance, the SWOT guiding model can have a thinking inquiry based on a specific situation, such as: What does make your success in the computer literacy courses?

In summary, higher-order thinking procedural models are general frameworks for teaching and learning higher-order thinking, guiding models are tools or instruments for teaching and learning higher-order thinking, and thinking inquiries are detailed instructions for teaching and learning higher-order thinking. Clearly, specific actualized thinking procedures, guiding models, and inquiries always depend upon the teacher's or the learner's own analysis of situations.

2.4. Challenges for E-learning management systems

Higher-order thinking should be a habitual activity. The education community has no doubt that elearning management systems provide supporting resource for higher-order thinking [28]. Nevertheless, the elearning community has not demonstrated how e-learning management systems can be effectively used for teaching and learning higher-order thinking. Specifically, organizational structures are still to be developed for e-learning management systems to organize teaching and learning artifacts to support higher-order thinking. To meet this challenge, we propose a model of inquiry-directed e-learning systems. The objective of this model is to gain more understanding about the roles of e-learning systems as an effective tool for teaching and learning higher-order thinking.

3. Embedding Thinking Inquiries in E-Learning Environment

As explained in the previous sections, guiding models and thinking inquiries are the instruments and instructions for teaching and learning higher-order thinking. To make an e-learning environment to be a useful source of artifacts for higher-order thinking, association between thinking inquiries and artifacts becomes the central issue of application of e-learning management systems for higher-order thinking. In this study, we propose two techniques to implement such association: thinking inquiry structure and semantic metadata.

3.1. Thinking Inquiry Structure

A guiding model can involve many thinking inquiries, and a thinking inquiry can have many subinquiries. Thinking inquiry structure defines these hierarchical relationships. For example, a SWOT model can have thinking inquiries on strength, weakness, opportunity, and threat. A thinking inquiry on strength can have specific inquiries on strength in verbal communication skills and in quantitative analysis abilities related to all courses. A thinking inquiry structure could be either "standard" for all students or customized for an individual student. A teaching and learning artifact can be linked to the relevant thinking inquiries so that it is integrated into the inquiry structure. A thinking inquiry structure would allow the learner to better understand the overall thinking tasks. It also allows the learner to follow instructions and review all relevant artifacts in conducting higher-order thinking.

3.2. Inquiry related semantic metadata

Inquiry related semantic metadata are keywords that best categorize thinking inquiries. For instance, thinking inquiry "What is your strength in your major courses?" can have keywords such as "SWOT", "academic accomplishment", and "career development". These keywords are semantic metadata that can be attached to teaching and learning artifacts. An e-learning management system can have a semantic metadata dictionary for all available guiding models and thinking inquiries. To associate a teaching and learning artifact with thinking inquiries, one assigns the artifact with relevant keywords.

Note that inquiry related semantic metadata are fundamentally different from content related metadata

which best categorize the content of artifacts. For instance, "advertising" is a content related metadata label which might provide useful content information about a marketing case, assignment, or video clip, but is not specifically related to higher-order thinking.

Inquiry related semantic metadata can be useful for a global search for relevant artifacts from the elearning system repository for a particular thinking inquiry. Clearly, a dictionary of semantic metadata is generated based on specific knowledge of teaching higher-order thinking. From the viewpoint of organization of teaching and learning artifacts, the inquiry structure implements the inquiry-directed organization in a static way, while the semantic metadata do so in a dynamic way.

The above two techniques implement the association between e-learning artifacts and thinking models so that artifacts can be accessed in line with thinking inquiries. The model of inquiry-directed organization of e-learning artifacts for higher-order thinking is depicted in Figure 1.



Figure 1. Embedding Thinking Inquiries in E-Learning Environment

4. Fostering Higher-Order Thinking in E-Learning Environment: A Design Case Study

To learn more about embedding thinking inquiry structure in an e-learning management system, a project was conducted to investigate the feasibility of implementation of the proposed model on an existing e-learning management system. We implemented the model on myCourses. We used the myCourses platform to implement a prototype of extension shell of the system, called myThink, for teaching and learning higher-order thinking.

4.1. Context of myThink

Higher-order thinking is conducted on the basis of multiple courses or even multiple disciplines. Commonly, myCourses is used as a web-based course management system on the basis of individual courses. In this case study, we use myCourses as an e-learning environment for fostering higher-order thinking that intersects the borders of individual courses. The myCourses platform does not provide a simple mechanism for integration of multiple courses. myThink is to provide an environment for integration of multiple courses across multiple disciplines. Figure 2 shows the context of myThink with relation to multiple courses in the myCourses system. In a nutshell, myThink is an independent course for teaching and learning higher-order thinking.

4.2. Features of myThink

Here, we present the features of myThink. This is merely to demonstrate the thinking centered organization of teaching and learning artifacts for higher-order thinking, but not the design of thinking inquiries which is a topic independent of this study. The example in Figure 3 shows the course artifact folders in myThink. These folders contain teaching and learning artifacts for individual courses that can be used for support higher-order thinking. Figure 4 shows that the higher-order thinking modes are learning goals which can

be linked to learning modules. Figure 5 shows the learning modules for higher-order thinking. The builder is able to build the thinking guiding models and inquiries within the learning modules. Relevant artifacts in course folders can be linked to the learning modules. A teaching or learning artifact can have multiple connections with many learning modules. In the current form of myThink which is based completely on the platform of myCourses system, this is done through physical replication. It has to be admitted that the myCourses platform is weak on implementation of semantic metadata. The search tools of myCourses seldom work adequately in our system. In myThink, a keyword is assigned to the name of a sub-folder within a course content folder, as shown in Figure 6. In such a way, the builder actually defines semantic metadata for the artifacts in the folder. The semantic metadata dictionary of myThink was implemented in an independent folder. When the student conducts higher-order thinking by addressing an inquiry, she is able to find all relevant e-learning artifacts in the corresponding folders. myThink uses the built-in functions of assessment of the myCourses platform.

Our design process clearly demonstrates that the thinking centered organization of e-learning artifacts is derived from the higher-order thinking procedural models, guiding models, and thinking inquiries. We believe that, to construct organizations of e-learning artifacts for planned teaching and learning higher-order thinking, disciplinary knowledge is indispensable.



Figure 2. Context of myThink



Figure 3. Course Artifacts Folders for Integrated Higher-Order Thinking



Figure 4. Higher-Order Thinking Modes Are Learning Goals



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Figure 6. Semantic Metadata Are Built-in Folders' Names

Figure 5. Higher-Order Thinking Learning 4.3. Discussion on Limitations and Evaluation of the Study

To verify the effectiveness and the usefulness of this approach of thinking-centered organization of elearning artifacts, rigorous experiments must be conducted. Preferably, test experiments should be carried out by researchers who are independent of the designer to reduce biases. This study has its limitation in that the proposed model and the prototype have not reached practical trials beyond the design experience. While it makes no claim to the validity of the proposed approach, this study is carefully based on the literature of higherorder thinking, and does offer original ideas of construction of thinking-centered organization of e-learning artifacts for teaching and learning higher-order thinking. To make an initial contribution to the accumulated weight of empirical evidence for establishing the validity of this approach, we discuss advantages and disadvantages of the approach, limitations and potential problems of the model, implications for teaching and learning of the study, and candidate criteria for further evaluation, as follows.

The approach is based on the literature of teaching higher-order thinking. The model is generic, and can be readily implemented on existing e-learning management systems, although individual system has its own way of implementation as demonstrated in our case study. On the weakness side, this approach might overemphasize the structure of higher-order thinking, and thus might exclude variant versions of ill-structured higher-order thinking activities.

This model adds an additional layer between the user and the depository of e-learning artifacts. This layer is a shell; that is, the user ought to provide the needed components for the layer. To apply this model, the teacher has to develop relevant thinking inquiries as well as semantic metadata. In fact, the more systematically the semantic metadata and the thinking inquiries are developed, the more useful the e-learning system would be for higher-order thinking. Furthermore, to use the layer, one must connect an e-learning artifact to the inquiries.

Modules

The tedious jobs could be a potential obstacle that interrupts the use of this model.

The effectiveness of higher-order thinking is the key criterion for evaluation of the proposed model. However, it is difficult to find a feasible objective measure of the effectiveness of thinking because higher-order thinking involves complicated human brain activities. Accordingly, we recommend the following subjective measures for evaluation of the proposed model.

• Comparison of the quality of reflection reports that are written by two contrast groups of learners (i.e., one group uses the proposed model and the other does not use it) and are assessed by the teachers.

- Ratings and opinions of teachers on the usefulness of the model for teaching higher-order thinking.
- Ratings and opinions of learners on the usefulness of the model for learning higher-order thinking.
- Ratings and opinions of administrators of academic programs on the usefulness of the approach.

5. Conclusion

The competence of e-learning management systems depends not only on the abundance of artifacts, but also the effectiveness of the use of e-learning management systems for active learning. This paper recognizes a lack of applications of e-learning management systems for higher-order thinking beyond course-based teaching and assessment, and proposes a framework of supporting higher-order thinking in the e-learning environment. The proposed model is based on the premise that higher-order thinking is teachable. It places the focal points on guiding models and thinking inquiries. It adds explicit relationships between the artifacts that would make higher-order thinking more visible. Technically, this study has primarily focused on the thinking related semantic aspects of artifacts for higher-order thinking. Apparently, massive semantic linkages of artifacts for higher-order thinking environment.

As an example, we have implemented a prototype of the proposed model through the use of myCourses. Our preliminary case study has shown new challenges for all parties involved in the e-learning community. For educational institutions, there is an organizational need to develop artifacts structures that contain semantic information about higher-order thinking in various disciplines. The artifacts structures should be maintainable to represent the currency of higher-order thinking. For e-learning management systems developers, new techniques and tools are imperative to develop comprehensive uses of e-learning management systems beyond posting teaching materials and assessment. In our view, the proposed model can practically be used for e-learning management systems development. For teachers, new skills of teaching higher-order thinking are required. They must clearly understand artifacts structures of teaching higher-order thinking, and transform unstructured thinking activities to structured tasks based on their own teaching expertise. For students, applications of e-learning management systems for higher-order thinking will be a new challenge of e-learning. In the long run, IT enabled e-learning systems will be indisputable effective tool for active thinking.

In future research, we will focus on the real implementation and formal evaluation of e-learning systems for teaching higher-order thinking. Education institutions, teachers and students shall all participate in the formal evaluation process of the systems.

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Confidence-Based Assessment of Two-Alternative Format Tests

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Abstract

The effect of guessing in multiple choice tests is usually reduced by using a large number of test items and increasing number of choices item. The addresses the per paper the important and practical issue of grading Two-Alternative that is, decision questions of the format tests. true/false type. where the answer is only one of two choices .This format is not only easy to construct, but could reflect real life situations such as when a judge has to decide between a GUILTY or a NOT GUILTY verdict, or when a computer science student is asked whether a given computational problem is NP-hard or not. In binary-choice tests where the number of choices per test item is restricted to two, the degree of certainty that the student has answering the test item becomes important in an factor in assessing his/her score.

procedure The standard for incorporating multiple-choice certainty/confidence levels in grading tests is to have each student attach one of several, usually four, confidence levels to each question separately. In this paper we suggest а different confidence-based procedure for grading binary-choice tests. Assuming that humans tend to be more comfortable their confidence in assessing level to different things in a relative manner rather than in an absolute manner. Each of relative uncertainty used. student is the concept is

asked to rank the test items relative to each other according to his/her confidence level answering the item correctly. in The according to sequence produced. There test is graded the rank is no penalty for wrong answers. А step-size is used to determine changes the student's confidence level based in on number of incorrect made. A reduction function the answers is used to determine the correct answers at the different scores to By confidence levels. varying the step-size and the reduction function, many different grading strategies can be obtained.

Key words: confidence-based assessment, binary-choice tests, true/false exams.

I. Introduction

Multiple choice tests are being extensively used as a means of objectively testing large numbers of students by standardizing the grading procedure . Standard procedures for testing include using a large number of test items, increasing the number of choices per item and setting a penalty for a wrong answer.

Computer-Aided Assessment techniques are also used in higher education as a means to keep down the time and effort invested in grading [1].

Automatic grading is not easily done with free answer exams, although some efforts are being made in this area [2].

As reported in [1] some students may not be very comfortable changing from a free answer test format to a multiple choice test, mostly because ,with the former type of test, the student can get a partial credit for his answer and there is no penalty for a wrong answer.

There are many ways to construct a multiple choice exam. In normal multiple choice questions ,each question has a stem and several possible answers of which only one is correct, the other choices are merely distractors. Designing good distractors for a given question is not a trivial matter.

Another is multiple-select exams, where more than one choice may be a correct answer. To get a question correct ,the student has to mark all of its correct answers, but there is no penalty for an incorrect answer. Improving on this format is the multiple T/F exam. The student is given several choices and has to mark each choice as either true or false. This allows for arranging questions with no correct answers. Still no partial credit is given for incomplete correct answers. Finally the simple format of individual T/F questions can be adopted, with questions grouped by topics to help the student concentration.

Studies have shown [3] that the simple format of individual T/F exams are comparable to open ended questions with respect to the score ranking.

The main disadvantage to the individual T/F format is their weak resistance to guessing, where a correct answer may be chosen based on intuition or chance instead of knowledge.

Some opinions accept guessing and feel that the students can guess with no penalty to make it fair [4]. Others disagree and believe that students should be penalized for a wrong answer to reduce guessing.

In an attempt to eliminate the effect from random guesses on the average, a popular grade assignment scheme [1] is +x points for a correct answer,0 points for an unanswered item and -x points for a wrong answer, where x is a positive number. A pure random guesser is expected to score a total of 0 points.

These kinds of grading assignments with true/false type questions fail to discriminate correctly between the students even when a heavy penalty is given for incorrect answers.

A grading system based on the student degree of certainty, here after called "confidence level", was suggested to provide better discrimination in students' grades [5,6].

In this system the student specifies his/her confidence level for each test item. Four confidence levels are suggested. The higher the level, the more the score for a correct answer and the more the penalty for a wrong answer as shown below.

Confidence Level	Chance of correct answer	Score for correct answer	Score for incorrect answer
0	0 - 25	0	0
1	26 - 50	+3	-1
2	51 - 75	+4	-2
3	76 - 100	+5	-5

Computer programs that generate multiple choice tests and support this grading system were reported [7, 8].

Although the grading system with degrees of confidence level is widely accepted [9, 10], studies have shown that it is not easy for the student to correctly measure his/her confidence level to a given item.
Multiple choice questions as well as yes/no questions do not provide sufficient information on how much information they have learned.

One unresolved question in the literature relates to the relationship between knowledge and perception of this particular knowledge. Answering correctly a test item relates to cognitive accuracy whereas perception of knowledge refers to confidence [10]. Two dominant approaches have attempted to explain the effect of confidence on performance. The ecological approach [11] believes that the type of questions on the test contribute to confidence levels. In other words, environmental factors out of the individual's locus of control affect the match between cognitive accuracy and perceptual knowledge. In contrast, the heuristics and biases approach believes that internal subjective factors such as negative feelings or previous experience contribute to a mismatch between what we know and what we think we know.

Previous work has attempted to apply the expectancy-value theory of motivation to test performance [12, 13, and 14]. This theory states that student's performance is highly connected to the importance of the task and the prospect of success. Researchers have included other variables that could affect performance such as emotional attributes, motivation, test anxiety, personal traits, perceived effort to effectively complete diverse items on the test (such as amount of time to study). Others attributes could include confidence level when answering questions on exams combined with one's positive or negative belief of personal test-taking abilities [19]

Previous work has demonstrated individual differences in confidence (e.g., [20, 21, and 22]. Literature regarding personal characteristics (such as affective factors) is relatively new and inconsistent. Some studies have demonstrated that confidence ratings increase with learning abilities. For example, [15] tested undergraduate students in an introductory psychology course and rated their confidence levels before and after the test. Findings indicated a positive correlation between test performance and confidence levels. Similar findings were reported when undergraduates where asked to rate their confidence levels when answering multiple choice tests especially with students who had higher memory aptitude [16]. In contrast, low performance students have been reported to overestimate their confidence levels in performance judgments. Overestimations of confidence have been correlated with test difficulty [17]. Poor performers tend to overestimate their abilities and in turn may not allocate enough studying time before taking the test. Other variables have been found to affect confidence. For example, [18] indicated that student's confidence levels and performance dropped when test items were placed randomly. Overall, most individuals tend to have biased perceptions and tend to overestimate their performance (e.g., [23, 24]

There is extensive research confirming the effect of study skills and abilities, anxiety etc. and performance but information regarding affective factors such as confidence is still scarce. According to [19] affective factors such as self-perception and cognitive abilities (such as grade point average) are strong predictors of test performance.

Understanding the effect of confidence on test performance would ultimately provide a more comprehensive approach to interpreting test scores.

Current procedures for incorporating confidence levels in the test score, is to ask the student to assign a confidence level to each answered item .Studies have shown that students tend to invariably misestimate their confidence levels. Some students tend to always overestimate their level of confidence while other conservative students almost always, when in doubt, underestimate their confidence level. Another drawback to the current system of grading is the penalty assigned for incorrect answers.

In this paper we suggest a novel system where students are asked to assign a confidence level to each test item relative to the rest of the items as opposed to an absolute confidence level assigned to each item separately. We believe this scoring technique is more transparent to the students and is more dynamic, allowing for many different grading strategies.

II. Relative Confidence Level

In a binary-choice test with K items, the student is asked to rank the K items according to his/her relative confidence level among the K items, by numbering them 1,2,3,...,K in such a manner that if C(i),C(j) are the confidence levels to the questions ranked i, j respectively then $C(j) \leq C(i)$ for j > I, that is the item with rank 1 is the one with the highest relative confidence level.

In order to make the task of ranking the questions easy, the value of K should be kept small, for example 10, by breaking the whole test into several modules each with K questions.

III. Scoring

The number of points the student gets for a correct answer to a question should decrease when the confidence level decreases. If 10 points are awarded for a correct answer to the question with rank 1, that is the question with highest relative confidence level, a reduction function R(C) is used to determine the value of the score when the confidence level C decreases.

There is no penalty for incorrect answers, they are merely used to indicate changes in the student's confidence level. The step-size S is the number of incorrect answers to reduce the confidence level by one step. Both the reduction function R(C) and the step-size S can be varied to achieve many different grading strategies. For example in a 10 question module with +10 points assigned to the highest confidence level, a reduction function which decreases the score by 2 points for every decrease in the confidence level will produce the score assignments shown

CONFIDENCE LEVEL	C1	C2	C3	C4	C5	C6
SCORE	10	8	6	4	2	0

If a "1" indicates a correct answer to a test item and a "0" indicates an incorrect answer, then a student's answer to the 10 questions can be represented by a 10-bit vector with the most significant bit representing the answer to the question with rank 1. Using the reduction function described above, the score for the answer vector "1101001101" will be

With step-size $S = 1$,	Score = $10+10+8+4+4+2 = 38$
With step-size $S = 2$,	Score = 10+10+10+8+8+6 = 52

IV. Grading

Once the K-bit answer vector is determined, the score can be calculated using the reduction function and the step-size defined for the test. The test administrator can then check the scores and may simply change the reduction function and/or the step size to get other score distributions. To avoid any errors made by having the students mark the rank of each question with a number from 1 to K, the tests were administered on computers with an interface that allowed the student to rank the questions by actually moving them up and down relative to each other, with the higher ranking question being physically on top of a lower ranking one.

V. Implementation

Several tests were administered to junior and senior students of the computer science department at the university of Alexandria in Egypt. All tests were of the true/false type. Both the grading system based on the relative ranking and the one based on independent ranking were used. The student felt more comfortable with the relative ranking system, but had some time trouble ranking the items when their number exceeded 20. With modules of 10 items no problems in ranking were mentioned.

What is the first perfect number ?	C1 C6	Clear Answer	Ì ✓ <u>D</u> one
What is the heaviest planet in the solar system ?	C Jupiter C Pluto	Clear Answer	Answers Can be
Number of planets in the solar system is	с. с. я	Clear Answer	
The Asteroid Belt follows	Mars C Uranus	Clear Answer	You can change your confidence in
The flag of the United Kingdom is named:Jack	C Union C Black	Clear Answer	any question by moving it up (higher
The average density of the Earth is about Kg/cubic metre	C 1250 C 5400	Clear Answer	down (less confidence).
What is the closest Star to the sun ?	C Alpha Cent C Beta Centa	Clear Answer	button for this purpose
Who is the father ?	C Kirk C Michael	Clear Answer	
What is the largest continent ?	C Africa C Asia	Clear Answer	Note: Unanswered questions are
Which number of those is a perfect cube ?	C 125 C 100	Clear Answer	automatically placed at the end of the

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Following are the results of a test administered to the senior class of 28 students. The test was of the true/false type and covered general topics in computer science. The test was administered on computers with the interface shown in Fig.1 which allows the students to rank the questions by physically moving them up and down relative to each other. The students were also asked to assign one of four confidence levels to each item separately according to the table:

CONFIDENCE LEVEL	C1	C2	C3	C4
CORRECT ANSWER	10	6	2	0
INCORRECT ANSWER	-10	-4	-1	0

The scores were computed using the confidence levels assigned by the students to each separate question and are shown in the first column, termed absolute, in table 1 below. Several grading functions based on the relative ranking proposed in this paper ,were applied to the ranked answer vectors ,shown in the last column of table 1 and the scores were included in the table.

The first column below gives the scores using the above table. The second and third columns give the scores based on the relative ranking for the two scoring functions (10-2p) and (10-p) respectively, where p is the number of incorrect answers to items of higher relative rank.

The entire test consisted of 10 modules each having 10 items. The table shows the results of the first module. The fourth column is an example of a harsh grading function where a lot of emphasis is placed on how well the student trusts his/her answer to a given question. The score is computed using the function (10-5p) thus the student is only allowed two errors in his test. Any correct answers after committing two errors will gain no score. These types of exams may be of great importance in jobs where the degree of confidence in one's actions is a critical issue, and they lead to better discrimination amongst the scores . On the other hand, column five uses the lenient scoring function with step size S=2 and a reduction value R=1, that is the score for a correct answer is only reduced by one every two errors . Column six uses a moderate scoring function with S=2 and R=2.Table 2 below gives the average and standard deviation for the different scores and different grading strategies. Fig.2a through Fig.2f give column charts of the different strategies, while Fig.3a through Fig.3f give the corresponding bar charts .

Absolute	(10-2p)	(10-р)	(10-5p)	R=1;s=2	R=2;S=2	Answer Vector
16	24	32	10	37	34	1001011000
38	44	47	35	50	50	1101110000
25	40	50	15	56	52	1010111010
24	30	40	10	47	44	0110101100
62	64	72	40	76	72	1111001111
80	90	90	90	90	90	1111111110
62	66	73	45	80	80	1011111110
37	42	46	25	50	50	1011110000
18	32	36	20	39	38	1011010000

51	64	72	40	80	80	0111111110
30	50	60	30	66	62	1110011011
86	78	84	60	90	90	1110111111
46	42	56	20	65	60	1100101111
30	36	38	30	40	40	1101100000
58	64	67	55	70	70	1111011100
49	62	66	50	70	70	1110111100
70	58	64	40	70	70	1011111100
38	42	46	30	50	50	1011110000
16	22	36	5	45	40	0100111010
41	40	45	25	50	50	0111110000
16	24	32	5	37	34	0101101000
0	24	32	0	27	24	0011100000
1	22	26	10	29	28	0110100000
29	30	35	20	39	38	1011001000
4	34	37	30	39	38	1110001000
28	30	40	5	46	42	0101110100
54	62	66	50	68	66	1111100110
40	52	61	30	66	62	1110011101

Table 1





Fig 2.b













R=2; S=2



Fig 2.f

Strategy	Average	Standard Deviation
Absolute	37.46428571	22.57084672
10-2P	45.28571429	18.21854396
10-P	51.75	17.3901313
10-5P	29.46429	20.19989
R=1 S=2	56.14286	17.98912
R=2 S=2	54.42857	18.44597

Table 2







Fig 3.b









R=2 S=2



CONCLUSION

The concept of confidence levels widely accepted in grading multiplechoice tests is modified to the benefit of the student when the test is of the binary-choice type. The student's level of confidence in answering an item is used to rank the test items relative to each other, a confidence level stepsize and a reduction function can be chosen in a variety of ways to provide different grading strategies. The proposed scheme has the advantages of being more dynamic, and more transparent to students than other used schemes.

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The MIT LINC 2010 Conference Parallel Presentations

Session #5:

Technological Innovations for Learning



A March Towards Constructionism based on Storytelling, Gaming and Collaboration

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Abstract

This paper describes a model based on learning by new and innovative methods including learning through storytelling, learning by gaming, learning by doing, learning by teaching, involving collaboration, etc. There are three activities developed for the Sugar environment, which is an open source software that can be run on any platform, that complement our educational model. These three activities are Food Force II, SocialCalc and Newspaper. Pilots were conducted where these three activities were implemented and results were obtained about how well these activities fit into the present educational system and help in removing to some extent the deficiencies that exist in this system.

1. Introduction

Epistemology is the construction of personal standards for telling fact from fancy, truth from fiction, and certainty from doubt. Ontology is the construction of theories of what exists. Ethical constructions remind us of what we think we should do even if we don't want to, and why [1]. Every person possesses these qualities but hardly any two people agree on them. Today around the world, most children view education as a repulsive phase that they must endure. We have a long way to go before children's right to pursue truth is seriously recognized. While the theoretical layer of didactic methods has advanced, unfortunately, in much of the world's formal education systems, there has been little progress. Newer concepts like 'edutainment'[2] have been introduced in order to engross the child in activities that are considered educational and because of the present curriculum, tedious. David Cavallo mentions in his paper 6 Models of Growth[3], "a major reason for the lack of change in education is not due to lack of ideas about learning on a micro or individual level, but rather is due to a lack of models for growth and change at a macro or systemic level."

Technology can undoubtedly bring positive changes in the educational systems around the world. The computer serves as a powerful tool for getting new pedagogical approaches into the system. But, while getting computers into the hands of more children is undoubtedly of benefit, the question remains, "how does one maximize the learning that occurs?" The question often is framed in terms of teacher-centric methods (Instructionism) versus child-centric or learning-centric methods [1]. We should be striving for a "learning-centric" approach, where teachers mentor students as they engage with powerful ideas, "teaching less and learning more."

Although there have been many educational models introduced into the system, none of them can be said to have been completely successful, each with varying degrees of progress. The problems with these models range from ineffective large scale implementation of models, little attention paid to systematic change, isolated experiences that do not influence the whole system[3], inadequate stress laid on the substance that is replicated from small scale models to large scale ones, etc. These educational systems lay more stress on bookish knowledge, rather than the knowledge that a child imbibes, leaving him/her without any practical knowledge or understanding of the subject.

It is important to give children access to knowledge—through media such as electronic books, the world-wide web, and multimedia, etc. We also should try to skew the odds toward children and teachers appropriating this knowledge by putting it to use and engaging in critical dialog. This can be achieved by giving them tools that put them in the roles of consumer, critic, and creator within the context of a learning community. One of the forces being unleashed by the one-to-one computing initiatives—where children have access to computing "anytime" and "anywhere"—is the change in the way software developers and computer-makers think about the education industry. A combination of strong and capable leadership—by technologists and epistemologists—and cross-community collaboration is necessary to ensure that the ideals of freedom, sharing, open critique, and transparency will be part of the interface to learning that touches children in the world's classrooms. While community collaboration may seem unrealistic from the vantage point of a model of economy as a machine, which individuals are single-purpose cogs wheels and gear,

collaboration—and the resulting synthesis of ideas—is the most efficient means of invention and subsequent development.

2. Proposal of a New Model

In this paper we propose a new model, for the educational system existing in India, which concentrates on and resolves the following issues-integration of the formal education system comprising of teaching a fixed curriculum via textbooks in a teacher-led classroom, peer to peer sharing of information i.e., collaborative interaction of students and teachers in order to learn by discussing, teaching, and development of community leadership skills [4].

Constructionist learning is inspired by the constructivist theory that individual learners construct mental models to understand the world around them [5][6]. However, constructionism holds that learning can happen most effectively when people are also active in making tangible objects in the real world. In this sense, constructionism is connected with experiential learning and builds on some of the ideas of Jean Piaget [7][8]. Seymour Papert defined constructionism: A New Opportunity for Elementary Science Education as follows: "The word constructionism is a mnemonic for two aspects of the theory of science education underlying this project. From constructivist theories of psychology we take a view of learning as a reconstruction rather than as a transmission of knowledge. Then we extend the idea of manipulative materials to the idea that learning is most effective when part of an activity the learner experiences as constructing a meaningful product."[9][10][11]

Learning by doing in a broader sense signifies a method where children are taught concepts and simultaneously they are given chances to apply them in real-time scenarios. Performing tasks practically makes it easier for the children to grasp a concept and helps retain it for a longer period of time. Educational games based on this learning concept itself can prove to be an important and versatile way to harness a child's untapped potential and gauge his true ability [12]. The concepts to be taught in class can be logically implemented in a game. Teaching by gaming will not only engross the child, but also give him reason to explore further on his/her own account.

Learning by teaching designates the method introduced by Jean-Pol Martin that allows pupils and students to prepare and to teach lessons, or parts of lessons. Learning by teaching should not be confused with lectures by students, as students will not only convey certain content while choosing their own methods and didactic approaches in teaching classmates, but also learn in the process, which is the main objective. Neither should it be confused with tutoring, as the main objective of learning by teaching approach is to concentrate on the process of increasing knowledge by exchanging ideas [13].

In this model, it has been proposed to give lessons to children in the form of stories also. The huge potential of this approach lies in the fact that children are able to relate very closely to stories. Researchers have proved that if abstract concepts to be taught are articulated in a meaningful way in the form of stories, then it can create a long-lasting impression on the minds of children [14]. Also, children tend to learn better when they willingly try to understand a concept and teaching through stories is one interactive way to grasp a child's curiosity.

The present system offers little choice of subjects, that too only in the senior secondary grades. The division into different streams too is more often done on the basis of marks rather than choice. Offering the child more flexibility in these areas would actually enable him to think of what he/she really wants [15].

We aim to achieve the ideals established by the above proposed model through the introduction of a few activities developed for the Sugar environment, a shell on the basic Linux operating system. This model concentrates on three open educational resources games which are interactively educational platforms that concentrate on mainly three objectives: incorporating our model into the current formal education system such that it helps in removing at least to some appreciable extent the existing deficiencies and complement further in achieving the objectives it was laid down for, accessibility of information which is a serious issue in the classrooms of India today achieved via peer-to-peer interaction and collaboration among students and teachers through an integrated mesh network and lastly, development of community leadership skills that comprise of the skill set of a person to recognize, understand and effectively address the issues affecting the community. These games primarily focus on diminishing the existing deficiencies in the present educational models all around the world by collaborative, joyful and self-empowered learning. This paper describes how these educative games can be seamlessly incorporated into the present curriculum and how this can help to develop a thought process in the children that not only familiarizes them with a few concepts of their academic syllabus but also prepares them for real life situations and tackling them skilfully.

Previous attempts at major education reform have foundered on the impossibility of rewriting all textbooks and retraining all teachers simultaneously, on the blank incomprehension of parents, and on political opposition to these new-fangled ideas [1]. Sugar gets around these obstacles by not confronting them. In particular, Sugar can provide the collaborative experience we associate with the Internet, without changes to textbooks or

curricula, and without major retraining of teachers. New textbooks will come in due course, and teacher training will eventually catch up. With computers and Internet, children can show parents what they are learning.

In this model we concentrate on three open source activities that can help in the implementation of this model. The three activities are Food Force II, SocialCalc and Newspaper.

These activities can be downloaded at:

Food Force II: <u>http://seeta.in/j/products/6.html</u> SocialCalc: <u>http://seeta.in/j/products/socialcalc-on-sugar.html</u> Newspaper - http://seeta.in/j/newspaper-feedback.html

2.1 Food Force II

The basic infrastructure of the game is like this – The game has a leader of a community and a child who is the protagonist of the story. The child is daughter/son of the leader. The daughter/son of the leader is supposed to work for the betterment of the community. He/she is put into various scenarios, given various challenges to meet. Through these challenges and tasks, the practical knowledge of children is tested. The lessons are given to children in the form of game chats between different characters. The elderly person generally plays the role of a mentor for the children and hence guides them through these challenges and tasks.

The teachers can incorporate simple lessons in form of stories to train the students in that particular subject. The lessons to be taught to children can be included in the form of a storyline and a game-play can be structured around this storyline. The children will have the power to give shape to this story as they will be the ones controlling the game. This can further increase the participation of children. Chats between game characters are used as a medium to narrate the story and hence the lessons to the children. This process can definitely teach children to tackle with real life problems involving optimization of limited resources, crisis management and sustainable development.

This method has two major advantages over the conventional form of teaching. First, the children are able to practically implement what they learn which results into a much better understanding of the concepts than it could have been by reading textbooks in classrooms. Second, the various challenges in the game provide the teachers and instructors a medium to test the knowledge and understanding of the children, making them think more innovatively, developing community leadership [12] and hence discover their weak areas. Moreover, this can be achieved with the willingness of the children which is another advantage that ensures enjoyability of children.

To analyze the impact of learning through storytelling and Food Force II in particular, we did comparative studies of children. We went to different schools to demonstrate and get feedback from children and teachers.

The content in Food Force II is meant for children in the age group of 9 to 14 years. So we implemented our pilot tests on the students in this age group. All the students were divided into three groups A, B and C.

Group A students played Food Force II. It was observed that they were actively engaged in a varied activity. Students also shared tips and trading skills, while playing. Group B students were given a lecture about urban issues. They absorbed this information in a routine passive manner. They regurgitated this knowledge on paper rather than applying it in any dynamic context. Group C students were given books to read and understand about urban issues. Group C students learned at a rather slow pace in comparison to the students of other two groups. They were given very little freedom to manage the content and pace of their learning. It was observed that these students performed in isolation and couldn't share their knowledge.

At the end of this session, all the students were given a questionnaire based on cognizance and logical reasoning. Questions based upon logical reasoning were for testing the ability of children to apply reasoning to various things learned in game play like trading, collaboration etc. Questions based upon cognizance were for testing the ability of children to perceive, or to be conscious of events, objects or patterns and cognitive reaction to a condition or event.

The results of this test proved that students who played Food Force II had scored better than students who learnt from books and lectures. It was also observed that the students were eager to learn by playing the game rather than the old traditional passive methods. Not only students but also teachers were highly impressed with this innovative method of learning. Some teachers even recommended this new education tool as a part of their academic curriculum.

2.2 SocialCalc

SocialCalc is a spreadsheet activity for functioning in the Sugar environment, OLPC's software paradigm. The main idea of the Spreadsheet activity for the Sugar environment is to include features that would enable children to make easy use of the typical features of Spreadsheet activities such as Organization, Tabulation, Graphing and simple Calculations [18]. The most unique feature of SocialCalc is Collaboration, the ability to support sharing of data over the network and multi-user editing. Interoperability is another feature that distinguishes SocialCalc. It supports interoperability between SocialCalc on

Sugar and Excel (.xls format) and SocialCalc on Sugar and Lotus Notes (.wk3 and .wk4 format) [16][17].

An XO laptop pilot program was initiated at the Cambridge Friends School in Cambridge, MA under a Harvard College Research Program headed by Katelyn Foley. They worked with 4th grade students. 27 students and 2 teachers received XO laptops. By reviewing 4th grade syllabi and meeting with teachers to discuss curriculum, they chose a bundle of 44 activities that would complement existing lesson plans. They developed several new lesson plans, including a matching game with states and capitals and a creative writing assignment.

As part of the laptop pilot, they piloted the activity SocialCalc which was then recently developed for the XO. They conducted these pilots in partnership with an Indian software development company, Software for Educational, Entertainment and Training Activities (SEETA). A survey was developed and an interview protocol to gauge how children navigate this program and what features they find effective or ineffective. The first half of the semester consisted of teacher training workshops and in-class activities designed to introduce students to the XO laptop. During the second half of the semester, activities were developed using SocialCalc and then implemented into the classroom. One example was a social studies activity in which students discussed common stereotypes and explored their meanings through online research. They collected and organized related data using different types of charts in SocialCalc.

The survey was given to 4th grade students at the end of the fall semester. 23 students took the survey, which consisted of four statements with ratings and an open-ended question about a new feature they would add to SocialCalc. Survey results are presented below (3 is positive, 2 is neutral, 1 is negative):

I like how it looked.





Features they wanted to include are – the graph should have numbers, the ability to pick color and font, not have it say an invalid or illegal string was identified, ability to pick colors of bars, erase one letter if you press erase and not all, etc. The feedback given by students demonstrates neutral to positive responses to the first four statements. The statement "It was easy to use" received the lowest score, indicating that this age group found this program challenging. Trends in new features include an emphasis on choice. Students wanted more control over font and chart colors. Although the font can be modified, chart colors are randomly selected every time a graph is loaded. In addition, students were confused by error messages when they did not select the correct data set. It might be helpful to have more specific error messages that allow students to understand how they can correct errors. Three out of 23 students stated that the program did not need improvements. These results were used by the SocialCalc developers at SEETA so that the next release could address these issues.

2.3 Newspaper

This activity was developed to support the development of community newspapers and publications, thereby encouraging the development of an ecosystem based on the foundation of sharing of ideas and active collaboration among the community members. The inspiration for this product came from three schools in Limpopo province of South Africa [19]. The learners from Mmaweshi, Driehoek, and Katane schools created their own newspapers and wrote articles dealing with issues that are important to them. They shared their newspapers with their communities to inform them about their schools and lives. It has content design and formatting capabilities. It has the option of five set of newspaper templates. One can use the "Create your own template" tool to create layouts of your choice through different sized and formatted text and photo boxes. It has the ability to share these templates without the internet when using a hardware device supporting mesh networking capabilities. We can also import pictures from the clipboard, load additional fonts that are related to the newspapers, share the newspapers with other community members without the internet, using mesh networking capabilities.

An important pilot study was conducted in Sagweshi village to help with the project. A local named Ronnie was employed to help carry out this pilot. Ronnie had studied journalism at university and was then unemployed, much like most of the area. Mmaweshi Primary School [19], which has been most promising with the newspaper, really took advantage of what Newspaper had to offer. Slowly, the learners' articles were developing proper headlines and conclusions. Using our explanations for the newspaper as a base, Ronnie had been able to help the kids understand their purpose for writing better.

3. Conclusion

Till date, many educational models have been proposed and implemented, none without merits and deficiencies of its own. In a step towards improving these models, we proposed a new educational model that emphasized befriending learning through gaming, storytelling and collaborating. This new model incorporated the ideals of constructionism, while keeping secure the already established system of teacher-led classrooms. To supplement this model, three activities developed for the Sugar environment were introduced. These were Food Force II, SocialCalc and Newspaper. Each of them was separately implemented and then surveys were carried out to gauge their usefulness and

bring further improvement in them. Many more such activities are being developed at SEETA [20].

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Prête-à-apprendre: Design and Implementation of a Wearable Assessment Tag Game for Children

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Abstract

There is an increasing recognition that low physical activity in children is causing both mental and physical health problems. In some sense, an increased reliance on the Internet to learn is causing children to spend more time indoors. Therefore, it is imperative that children somehow reduce the 'screen-time' by spending more time in outdoor learning activities. This paper describes the design and development of a tangible wearable learning system called the prête-à-apprendre (ready-to-learn). This system allows the children to be outdoors and to learn by engaging in modified forms of the popular tag game. The wearable learning system is based on the Lilypad platform and employs a low-power Zigbee network protocol to form an ad-hoc wireless communication network. The design and implementation of the overall system, associated wearable components and the pedagogical motivation and evaluation of a simple tag game based on this platform is presented.

1. Introduction

Using the Internet to teach and assess children is widely practiced. For example, U.K. has government funded programs to help children learn a variety of concepts online [1]. In the United States a similar service is provided by the Public Broadcasting Network [2]. While such services have 24x7 accesses and provide interactivity to children, they also may have an unintended effect of increasing screen-time for children. According to the National Institute of Health (NIH), the physical activity in children 9 to 14 years has significantly dropped and this drop is directly related to an increase in obesity and related medical problems [3]. Recent focus groups comprising of 6th grade boys have found that the most barriers to physical activity are motivation and lack of resources [4]. Excessive sedentary behavior like T.V. watching and computer usage has been found to be positively correlated with high blood pressure in children [5]. It has also been shown that high levels of television and screen entertainment time and low physical activity interact to increase psychological distress in children [6]. Therefore, while there is a need for "computer-tied" technology for children, increasingly, learning technologies that combine learning with physical activities are required to create a balance between cognitive and physical aspects of development.

Tapping physical aspects for children leads one to immediately consider game-based learning scenarios. For example, [7] found that in a controlled study, students picked a game-based version of the same instructional sequence 50% more than they did the drill version indicating the higher motivational value of learning games for children. A 'game' has many definitions. For example, [8] defines game as organized play. After analyzing many definitions of a game, [9] define a game to be "a system in which players engage in artificial conflict, defined by rules, those results in a quantifiable outcome." (pp. 80). For the research presented here, instructional or learning games are defined to be a system where learners engage in artificial conflict, defined by rules, that results in quantifiable outcome and enhances learning. While [10] ,[11] have outlined various principles of digital game-based learning, recent studies like [12] have shown that game-based learning actually improved student motivation as well as performance. There is also emerging evidence [13] that when using game-based learning as opposed to self learning, students not only thought that game was the preferred method and was more enjoyable but also showed willingness to continue to use this method of learning. [14] show that not only did children do better while using game-based learning, but playing games also developed them as independent learners. The current generation of children also grew up with mobile devices. By their nature, mobile devices can contribute to learning that

happens outdoors. Consequently, mobile or m-learning has received much attention recently [15],[16]. For example, [17] show that students learned history by walking around with their mobile phones and by sharing information about what they saw in the city. There are also efforts to move existing gaming platforms to m-learning platforms [18]. Mobile game-based learning has also been used in the context of providing mass learning in developing countries [19]. M-learning to extend a traditional LMS also received a positive response from college students [20]. Podcasting was also found to be more effective for revision of lectures than notes or other conventional means [21]. M-learning has also been shown to significantly increase environmental awareness [22]. A framework for designing m-learning games has been proposed [23]. Specific criteria for assessing the quality of learning games have also been proposed [24]. Issues addressing the quality of m-learning are also outlined in [25].

Pervasive games where children use location-based and mobile technologies to play a game in a technology-based physical environment have also gained popularity [26]. Cemelot [27] is an example of a pervasive game that does not include the 'screen' as a part of the game by embedding small microcontrollers in children's play environments. Similarly, the Heart Beat system [28] uses a small device measuring children's heart beat and broadcasting it to others to play an enhanced version of the tag game. [29] embeds sensors in the physical environment to augment traditional outdoor games. Use of technologically-augmented tangible objects has also been explored in the context of open-ended play [30]. Tagtiles [31] are the basis for similar technology-augmented tiles games. CurBall [32] is a tangible game between senior citizens and children and augments physical space with technology. SCORPIODROME [33] is a mixed-reality game where children interact with the environment by combining physical and virtual elements by overlaying physical trucks on top of a virtual display or terrain and behavior. Interactive slide [34] is also an example of augmenting traditional playground equipment by projecting pictures and games from inside the slide to engage children in physical activities.

Following the constructionist orientation spawned by the early work of Seymour Papert and influenced by philosophical traditions of Fröbel and Maria Montessori, a number of tangible kits for children have also been proposed; these learning kits can be used indoors or outdoors. PegBlocks was an early tangible kit that allowed children to explore relationship between kinetic and electrical energy [35]. More recently, [36] describe a toolkit that allows student as young as nine to construct various types of behaviors by putting together tangible cubes. [37] present a toolkit that helps children design and animate tangible robot behaviors. Posey [38], [39] is a ball-and-socket toolkit that, for example, allows children to build their own puppets or to play computational learning games. JabberStamp uses technology to help children augment paper drawing with audio-annotations [40]. Paper-based tangible computational kits that allow an easy integration of microcontrollers and sensors with potential educational applications have also been explored [41]. Body Suite project [42] attempts to combine bodily interfaces for children's play with musical interfaces allowing for both structured and unstructured play. E-Textiles use wearable computers and hence carry a great promise toward moving learning outdoors. In the constructionist tradition, one focus of this work has been to introduce tangibles in the curriculum to help children learn by building things [43]. For example, TeeBoard [44] is a t-shirt-based kit containing e-Textiles to teach electronics concepts. WeWrite [55] extends e-Textiles by connecting them to mobile phones and teaches tenth graders about technology in a constructionist manner as well.

This research presented here draws from much of the work presented above and provides a unique approach that combines wearable learning technology using e-Textiles with peer to peer learning. This approach is not constructionist in Papert's sense but rather, follows a constructivist orientation in that it allows children to learn by preparing assessments for their peers in the context of game-based learning. There are two major antecedents to the approach; game-based learning and peer to peer learning. Each is described next.

2. Background and Motivation

Games typically embody three levels of rules [46]. The operational rules are surface rules that come with the game. Constitutive rules represent the underlying formal or mathematical structure of the game. The implicit rules are unwritten rules of the game including soft issues like etiquette and sportsmanship. Simulation-based games like the Flight Simulator [47] are based on an isomorphism between the game and a real situation. An isomorphism is a map that preserves properties between two representations. For example, homeomorphism from mathematical topology is a type of isomorphism that preserves topological properties. For example, a 2D square disk and a 2D square are homeomorphic because it is possible to convert one to the other by preserving 'connectedness.' Games like Flight Simulator are based on isomorphic maps that preserve the most learning-relevant properties. For example, responses to changes in

a flying surface based on pilot's actions are preserved in the game. Similarly, a tangible bowling game on the Nintendo's Wii game console [48] is an example of such an isomorphism because the game reproduces a direct analogue of the physical environment of bowling; the relationship between a bowler's arm and wrist movement and path of the ball is preserved. On the other hand, a learning game using the format of 'who wants to be a millionaire' game to teach concepts in chemistry, is somewhat different. The gameformat has no deep relationship to competence in chemistry; the format simply acts as a container. Another example of such game-based learning is the use of the cross-word puzzles to teach a topic by selecting words and hints from a specific domain (say, chemistry); the syntactic relationships between chemical terms typically have no deep meaning in the domain of chemistry. In situation like these, it seems that the gaming format is primarily used for motivational impact; a learner who likes to do cross-word puzzles will learn chemistry to be able to play the game. Similarly, the excitement offered by 'who wants to be a millionaire' may be a reason to learn chemistry. [7] define such game-based learning formats to be exogenous fantasies because in such environments the game fantasy is directly driven by learning competence but not vice-versa. They give the example of a spaceship game where the ship moves forward on correct answers and backwards on incorrect answers. Endogenous [7] fantasies, on the other hand, depend on a learner's success being more directly dependent on desired competence. They give the example of a cave exploration game where reading and writing are required to be successful in navigating the cave. The point to note is that even in this instance, the endogenous fantasy acts as a motivational device for learning. However, unlike the chemistry example explained earlier, reading and writing will directly help the learner explore caves.

While desirable, it is difficult to construct endogenous fantasies in learning games. The specific game presented in this paper is based on using the common tag game as an exogenous fantasy. In this sense, the tag game is used as a container for a peer-to-peer assessment-based learning strategy. Chasing games including the tag game have a long history. For example, ancient Greeks played variants of this game in the second century and the tag game has existed in different version in various countries including Australia, Saudi-Arabia, Taiwan and Columbia [49]. Pieter Brueghel's 1560 painting *Children's Games* [50] shows a record of Dutch children playing various forms of the tag game was in the top two favorite games of children between ages of 8-10 in Minneapolis [51]. In short, the tag game is proposed as the exogenous fantasy for this game.

Peer-to-peer learning represents a second key component of game-design. Peer-to-peer learning is not a new concept. For example, upon observing Malabari children teaching each other alphabet in the sand, Andrew Bell invented the Madras system for schools based on peer-to-peer learning in the late 1700s [52]. Peer-to-peer learning fits well into a constructivist framework that requires learning though an active participation in the learning activity itself. As [53] points out, it is important to distinguish between peer tutoring and cooperative learning. Peer tutoring involves specific mentor or tutor and tutee roles being played by different students. Cooperative learning, on the other hand, may consist of pedagogical devices like the use of jigsaw [54] where students with different ability, preparation and background work towards a shared goal. Reinforcement is one of the key organizational variables that may impact the effectiveness of peer to peer learning [53]; some projects may involve extrinsic motivation like certification, course credit, or more tangible reinforcement such as money. Providing structured environment for peer learning also seems to have resulted in better learning as well [55].

3. The Game

The proposed game uses the familiar tag game format as a container and uses peer to peer assessmentdriven learning. The game consists of two stages; preparation and gaming. In the preparation stage students are asked to study a topic of interest and are asked to formulate three questions each on the topic. This is in contrast to programs like MunchCrunch [56], for example, that use teacher-created questions to help children learn about which foods to eat. The students are told to make their own questions challenging because these questions will be used in the tag game at a later stage. The students study the topic assigned and formulate three unique true or false questions on the topic. This first stage represents the learning stage where the student gathers enough information about the topic at hand to formulate three difficult questions for their peers. However, the first stage is motivated by the promise of the second stage where the student will compete with others in a familiar setting of a tag game. At the of the preparation stage, the three questions are placed on a prête-à-apprendre shirt to be worn by the children who formulated the questions. The shirt is designed in a manner such that it has an ability to tell other children that one of the questions is being asked by lighting up the question. Figure 1 summarizes first stage of the game.



Figure 1. Preparation stage of the game based on prête-à-apprendre

Second stage of the game is a tagging game. The proposed game is based on 'butterfly tagging' where the children are only allowed a small tap on the shoulder of the child they are tagging. As Figure 2 shows, the tag game starts with two teams of students facing each other. The children are not allowed to move at this stage and are watching each other to see whose question lights up. As children face each other, a question based on the order of difficulty as judged by the teacher is lit up by the computer on one of the shirts; easier questions are asked first in order to build the confidence of children. For example, Figure 2 shows that a question lights up on the shirt of one child (Mary). This means that children in the other team (team B) need to answer her question. However, before they can answer the question, they have to catch Mary. Mary starts running as soon as her question lights up. The opposing team has a limited time to answer her question. Either the time runs out or the opposing team is able to catch Mary and answer the



Figure 2. The tag game based on the prête-à-apprendre shirts

question by tapping on true or false buttons on her shoulder. This completes one round. Children face each other to start another round. Rounds are played until all the questions on shirts of all students are exhausted. For example, in Figure 2, four times three or twelve rounds will be played. In reality, rather than a single child's question lighting up, each round consists of multiple children's shirts from the same team lighting up at the same time. This gives the opponents a choice about which opponent to pursue. Results of the playing behavior of each child are transmitted to a computer using a wireless network. The team with the most correct answers and the minimum penalties wins.

4. Implementation

The hardware required to play the game is implemented using the Lilypad e-Textile components [57]. Communication between the onboard microcontrollers and the rest of world is carried out through an XBee module. XBee is based on the low-power, low-data rate Zigbee network protocol that belongs to the IEEE 802.15.4 family of PAN networks. Figure 3 shows the overall architecture of the system. The shirt worn by each child has a unique identification number. All the shirts arrange themselves in an ad-hoc wireless network in a star topology. Data from each shirt are transmitted to a main computer using the XBee module. Similarly, commands are sent back to each shirt using the same modality.



Figure 3. Prête-à-apprendre architecture

Figure 4 shows both sides of a prête-à-apprendre shirt. The front of the shirt consists of two sewn-in Arduino-based microcontrollers (LilyPad Arduino 328 Main Board) powered by a lithium battery. One microcontroller acts as a master while the other acts as a slave. The master microcontroller also talks to an XBee through a serial interface. A vibe-board is used to inform the wearer about important events. In addition, two tri-color LED's are used to inform a player about the various states of the game. For example, the player can not start running until the tri-color LED's have turned green. An accelerometer is used to detect movement and a penalty is recorded in the case of a player moving before the tri-color LED turns green. An LED-based count-down timer is provided on one side of the shirt to let a player visually see how much time they have left until the round finishes. Similarly, an LED "worm" made up of bright white LEDs creeps to the heart of the player based on the penalties and wrong answers they have given. For power considerations, XBee and the two microcontrollers are powered by two separate rechargeable lithium batteries (Polymer Lithium Ion Batteries - 1000mAh and Polymer Lithium Ion Batteries -100mAh). As Figure 4 shows, the reverse side of the shirt consists of true and false buttons. Under each button is an array of three sewn-in input switches that register the results which are sent to the main computer using the XBee. Finally, three simple pouches are provided in front of the shirt where true or false questions can be printed and inserted. Each question has an LED-based arrow next to it to indicate which question is being asked. A lit up arrow next to a question means that it is one of the question that needs to be answered in the current round.

After the initial research and development, each shirt took approximately forty hours of labor including rework to ensure that there were no shorts or loose connections in the circuits. Out of these, twenty hours were typically spent in creating the thread traces. Because children are running, the shirts are intolerant of loose connections. In order to keep the conducting thread in place, after much experimentation, a sewing technique was developed that winds a transparent sewing thread (100% Polyamide) around the conducting thread and pins the thread down to the fabric. This technique seems to have worked well even when the

children are running at a reasonably fast pace. However, it took about twenty hours of work per shirt to wind the Polymide thread around the conductive traces. Alternative techniques such as lamination or using an adhesive conductive tape are being experimented with to reduce this development time. The XBee module was found to be quite robust and did not have any problem transmitting even when the children were about thirty meters from the coordinator and running at a reasonable pace.



Figure 4. A prête-à-apprendre shirt

Figure 5 shows the deployment diagram for the system. As the diagram shows, each shirt consists of a master and a slave microcontroller. A slave microcontroller is required in order to light up the additional LED's. Master and slave microcontrollers communicate through an RS232 interface. The master microcontroller (LilyPad Arduino 328 Main Board) uses another serial port to interface to a XBee-based ZigBee stack (XBee 2mW Series 2.5 Chip Antenna on a LilyPad XBee board) based on the ZNET 2.5 protocol. This ZigBee node acts as an end-device in a ZigBee PAN network and communicates wirelessly with a coordinator ZigBee node which is hooked up o a PC or a laptop using a breakout board. Each shirt acts an end-node in a star-network topology where the various messages are broadcast to all the shirts and each shirt decided if it needs to act on a message based on its unique identification number.

Finally, as Figure 6 shows, the shirts were informally tested with children ranging in ages from 7 to 12 by running simple game rounds. Children 10 years or older did not have any problem comprehending the rules of the game. However, children under 8 had some initial difficulty in understanding how the game worked. However, they became comfortable after a few rounds were played. A more systematic evaluation of the pedagogical effectiveness of is currently underway.

5. Evaluating Learning Design

The learning design embedded in this tag game can be evaluated based on heuristics for designing intrinsically motivating instructional environments [7]. The heuristics are divided into *internal motivation* categories of challenge, curiosity, control, and fantasy and *external motivation* categories of cooperation, competition and recognition. Each of these as applied to learning design is discussed next.

The challenge criteria consists of four dimensions; goals, uncertain outcomes, performance feedback and self-esteem. Even though the goals of the game are fixed, the students are free to establish their own goals by formulating more difficult questions related to the topic. At another level, the students can postulate additional rules that make the game progressively harder by making the response time shorter, for example. Uncertain outcome is introduced into the game through the randomness of the order in which questions are asked. Performance feedback is provided immediately after a child hits the true or false button and through

a worm that lets each child know how they, as well as other children, are fairing in the game at any point in time. The self-esteem dimension is addressed by gaining confidence of the students by first lighting up the easier questions as judged by the teacher and by building confidence through the game.



Figure 5. The deployment diagram of prête-à-apprendre



(a) Waiting for a question to light up



(b) Chasing the child with the question



 (c) Tagging the child with true or false
 Figure 6. Children playing a tag game using prête-à-apprendre shirts (faces have been blurred to protect children's identity)

[7] discuss two types of curiosity; sensory and cognitive. The sensory curiosity is typically achieved by providing variability in audio and visual effects. This is provided in the game via the various bright white

and colored LED's and the buzzer to provide sounds. Since cognitive curiosity is mostly a function of how the learning content is created in a controlled manner to evoke surprise, for example, there is no specific mechanism in this game for cognitive curiosity because the students arrive at the various questions independently. This is an inherent limitation of the game because of its peer to peer assessment model.

Learner control and self-determination is established in this game by giving learners the choice of whom to run after, based on their perception about who they can catch as well as their own ability to answer questions. The fantasy aspect of motivation is primarily embedded in the emotional or psychological aspect of this being a tag game. As mentioned earlier, tag games have a long history and are found across cultures; there is something intrinsic about children wanting to play tag games. However, by the same token because the questions do not have a direct relationship to the mechanism of the tag game, one should not expect this game to have cognitive or *endogenous* fantasy components. Again this limitation primarily results from self-created assessment content by children. If the content were actually designed by a teacher, it is possible to weave an endogenous fantasy similar to RPG games on top of the existing toolkit. Like most outdoor games that are played in front of a large audience, this game also scores well with respect to the recognition aspect of the interpersonal motivation category; a winning player or a team have immediate visibility and recognition. Similarly, the game has a strong component of direct competition both in terms of the cognitive as well as at the physical level. The game has a component of cooperation within a team as different team members need to decide which opponent to pursue to maximize their chances. However, due to the student generated-content, the across-team cooperation component currently does not exist in this game.

6. Conclusion

This paper has presented the design and implementation of prête-à-apprendre, a wearable learning framework for tagging games. The primary purpose of this system is convincing children to engage in more outdoor and physical activities while learning at the same time. This paper describes the start of a journey. The focus has been on a simple two team tag game. There is a large variety of individual and group tag games that can be modified to run on prête-à-apprendre. For example, one common group tag game played in south-east Asia is the game of *Kabaddi*. In this tag game, one challenger enters the opponent's area and has a limited amount of time to avoid being tagged. The traditional game requires an opponent to physically hold on to the challenger to prevent them from leaving opponent's area. Using prête-à-apprendre would, however, require the challenger to be gently tapped by a team member of the opposite team before their time expires with the correct answer. The three questions on challenger's shirt can be lit up in a rotating fashion therefore requiring the right person in the challenged team to tap the challenger at just the right time before the time runs out.

The current work includes extending the kit to include fabric-based question modules that can be tied to trees or hung around Museum pieces, for example. This will enable the construction of learning designs that combine peer to peer assessments with scaffolding from teachers. For example, a teacher may tie a multiple-choice question fabric around a tree and ask the class to identify the type of tree. This will lead to the construction of a variety of foraging games to help children learn about an environment.

The work presented in this paper is in its initial stages and requires empirical validation to ensure that the children will accept these types of games and will actually be motivated to learn. A study including various schools in the region is currently being planned to assess and fine-tune the toolkit before a tournament between the various schools in the region is conducted to collect empirical data.

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A Tool for Arabic Handwriting Training

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Abstract

The percentage of people who produce a neat and clear handwriting is declining sharply. The traditional approach for handwriting teaching is to have a dedicated teacher for long hours of handwriting practice. Unfortunately, this is not feasible in many cases. In this paper we introduce an automated tool for teaching Arabic handwriting using tablet PCs and on-line handwriting recognition techniques. This tool can simulate the tasks performed by a human handwriting teacher of detecting the segments of hypothesized writing errors and producing instructive real time feedback to help the student to improve his handwriting quality. The tool consists of two main components, the guided writing component and the free writing component. In the guided writing mode the student is required to write over transparent images for the training examples to limit his hand movements. After the student acquires the basic skills of handwriting he can practice the free writing mode where he writes with his own style, as he usually does in his daily handwritings. The first version of the tool was tested in several schools for children with edge ranging 7-12. The results are promising and show that this tool can help students to analyze their own writing and understand how they can improve it.

1. Introduction

The ratio of persons who produce a neat and clear handwriting is declining sharply. The problem can be traced to the early stages of handwriting learning. Many students struggle to produce neat, expressive written work. It is generally recognized that correct stroke making techniques are essential to good hand writing skills [9]. These techniques can be successfully acquired only by practicing regularly and for long time periods. To date, methods of training handwriting in school mainly utilize the "blackboard and paper" approach that consists of blackboard based demonstrations by teacher followed up by paper based examples and exercises for students. The forming of each character is a dynamic process and students need to become proficient in both the process and the final result. The process is only visible each time the teacher is actually writing on the blackboard. This process is not present whilst students are concentrating on their own work. Therefore the students are practicing the sequence, order and direction of the strokes of the character (s) based on what they can remember from watching the teacher's action. This is not reliable as the students may not remember all the process steps for the strokes. Moreover, in a typical class room when writing or drawing the teacher's body will be between the students and the blackboard, and therefore vision of some students will be obscured at certain stages. When teachers come to assess handwritten work, they only see the final result, not the process that was used. It is impossible to tell whether or not the correct stroke making techniques have been applied. For example, the teacher will not be able to tell whether a pencil was lifted too many times when forming the character, or whether the character was stroked in an incorrect direction, or whether the writing was fluent or jerky. Another important issue is that having a dedicated teacher for long hours of practice is not usually available. For example in Egypt the number of the admitted students in the elementary schools stage can reach one million students per year. Schools simply do not have sufficient resources to teach all children the handwriting skills with the required interaction and attention.

To provide students with extra self practice some educational software tools for teaching handwriting have been developed [7]. The handwriting lessons in these tools usually display some animations for the writing models on the computer screen associated with instructions to help the student to imitate the displayed model. These tools are not interactive and the educational load is on the student to compare his handwriting on paper with the ideal one on the computer screen to find his errors and try to improve them using the try and error approach.

Recently, systems with combined LCD display and digitizers have been available. With these systems children can write with a pen directly on-screen without having to lift up their heads to look at what has been written. With these new hardware tools, we have reached the technological capability needed to build interactive systems to assist in teaching handwriting to children. Although these new systems provide a learning environment very close to the

real one for handwriting teaching they still have limited capabilities when compared with human teachers [4]. Most of the currently available tools for handwriting training only give a very rough estimate of the overall quality of the student writing [6]. They measure how close the student writing to some ideal handwriting samples. Though this approach can judge the student handwriting quality and can evaluate his progress after some amount of practice, it can not provide any feedback about the regions of handwriting errors in the student writing. Also it does not provide any information on the types of errors the student have done and how he can avoid them in his next trails. This type of information is very crucial for any useful handwriting training tool. The tool should provide the student the capabilities to analyze his handwriting samples and detect the segments of hypothesized writing problems and produce instructive feedback to help the student to improve his handwriting.

In this paper we introduce a tool that provides solutions for the problems outlined above. The tool was developed for teaching Arabic handwriting for children using tablet PCs and on-line handwriting recognition technology [2] [3] [5] [8]. The aim of this tool is to help young children to become good writers with fluent movements and a good quality of writing in shorter time frame. This handwriting teaching tool recognizes the student handwriting, detect the segments of hypothesized writing problems and produce instructive feedback to help the student to improve his handwriting.

In the following sections, section 2 includes the description of our "Handwriting Teaching Tool" and its overall architecture. The tool is composed of two main modules, guided writing module and free writing module. Section 3 describes the guided writing module and the free writing module is described in section 4. Section 5 describes the handwriting data corpus that we used for training the tool models. Section 6 includes the results of several evaluations that we made for the first prototype version of our tool. Section 7 includes the final conclusions and our prospected future work and enhancements for our handwriting training tool.

2. The Handwriting Teaching Tool

Following the methods used in schools for teaching handwriting, we designed our tool to consist of two main components, the *guided writing* component and the *free writing* component. Figure (1) includes a flow chart of the main modules of the handwriting tool.



Figure (1): Handwriting Teaching Tool Flow chart

The guided writing component is a preliminary level of education where students write characters or words on a transparent image for the training examples. This approach is equivalent to the method of writing over doted images, which is frequently used in the initial lessons of handwriting teaching. After the student acquires the basic skills of handwriting he can move on to the second level of practice using the *free writing* mode. In this mode students are shown an image or a video animation of a handwritten example, then they are asked to write that example on an empty panel that contains a single line. That panel is similar to writing books used at schools. In the free writing mode the student has more freedom to write with his own style, as he usually does in his daily handwritings, then the tool evaluate his handwriting and give him feedback messages about his errors. The following sections describe the detailed implementation of each one of these modules.

3. Guided writing

In this mode the tool displays a transparent image for an ideally handwritten training example. The user is required to write over this transparent image. On the transparent image the tool sets specific control points. These points aren't visible to the user but they are used for tracking the user handwriting. The tool evaluates the user performance using several measures. Each one of these measures uses a specific criterion to evaluate one of the properties that affect the quality of the user handwriting. Figure (2) shows an example for the guided writing training. The following sections include detailed description for those measures with illustrative examples.



Figure (2): Example for the guided writing training

3.1 Distance

The distance measure mainly calculates how much the student writing is close or far from the ideal sample. This measure is calculated by measuring distance between the written text and the control points that lay on the ideal sample. If this distance is greater than a predefined threshold for a segment we consider that the student didn't manage to follow the template for that segment and we display that segment in a different color. Figure (3) shows a sample for using that measure.



Figure 3: sample for using the distance measure

1.2 Number Of Stroke

Children tend to write in segmented style with large number of strokes. Figure (4) shows a sample for that segmented writing where the word "____" was written in 6 strokes instead of 4 as it should be. The reason for that phenomenon is that children tend to think while they write which interrupt their handwriting process. The increased number of strokes raises the possibility of making errors. Usually handwriting teachers encourage students to write words in paws, the ideal word parts, with each paw written in a single stroke if possible. Some exceptions are

permitted for complex paws. In our tool we use the *Number Of Strokes* measure to detect segmented writings. This measure is calculated by counting the number of strokes in each paw. If it exceeds the expected number the user gets negative feedback.



Figure 4: Sample of segmented writing

1.3 Direction

When students start to learn handwriting of complete words, if they have no guidance, they will develop their own way for the directions they follow. Sometimes these directions are odd and can complicate the handwriting process. Handwriting teachers usually advice their students to follow some ideal directions that will help them to do smooth and easy handwriting. In our tool we simulate that guidance by displaying an animation for the ideal handwriting directions for every training example. The student can play these animations whenever he wants. The *Directions* measure is used to check if the student followed the ideal writing direction or not. This measure is implemented in our tool by setting an order for the control points of the word. The student should pass over those points with the predefined order. If the student makes unexpected jumps he will receive low score with a feedback message that instruct him to follow the ideal directions. The segment where the student violated the ideal directions in his handwriting will be highlighted with different color as shown in figure (5).



Figure 5: Sample of direction errors

1.4 Completeness

This measure is used to check whether the user has wrote the complete example or not, by checking which control points the user have visited and which ones he didn't. If the ratio of visited points to the total number of control points is over a specific threshold then the user writing is considered complete. Figure (6) shows an example for incomplete word.



Figure 6: the character "taa' " isn't complete

4. Free Writing

After the student acquires the basic skills of handwriting using the guided writing mode he should move on to the second level of practice using the free writing mode. In this mode students can display an animation for the ideal handwriting of training examples. Then they can practice handwriting on an empty panel that contains a single line similar to the writing handbooks used at school. Before analyzing the user input for checking handwriting errors it is preprocessed. In this preprocessing step the points are removed to reduce the number of classes and the strokes are reordered to eliminate the delayed strokes effect as will be explained later. In the error analysis phase the user handwriting is segmented to the characters level, then these segmented characters passes through group of classifiers. Each one of these classifiers checks for the existence of a specific type of handwriting errors in the user handwriting. Figure (7) shows the processing steps illustrated on a handwriting example.


Figure 7: The processing of a free writing example

4.1 Pre-processing phase

In this phase characters are modified before they are delivered to the segmentation phase

a- Point removal

The Arabic language has groups of characters that only differentiate by the number and position of dots. For example in figure (8), we can easily notice that the three characters "_" 'baa', 'taa' "_", and 'thaa' "_" have the same body but different points so eliminating these points leads to the same character. In the preprocessing phase they have their points removed, and they are all assigned to the same class. Such process is developed using a specific recognizer to identify the points places. Such recognizer is easily trained with different shapes of dots as they are limited in Arabic script ranging between one and three dots. The detected points are stored for later processing to determine the handwriting errors related to the points.



Figure 8: Different shapes of dots

b - Rearrangement of strokes to solve the delayed stroke problem

Some characters in the Arabic language, and other languages, are written using delayed strokes. These cases happens when the writer moves back to complete some missing parts of a previously written character in a word. In the Arabic alphabet 20 out of 33 characters has delayed strokes. In some cases the delayed strokes is the only clue to differentiate between several characters. When we analyzed the children writing we found that they tend to use much more delayed strokes than the standard ones. In many cases they return to complete parts of the characters that they previously wrote or even rewrite several copies over the previously wrote characters. These features of children writing complicates the segmentation problem as the component strokes of a character are scattered and interleaved with strokes from other characters. For adults we can enforce some sort of handwriting restrictions, such as writing word parts in single strokes and forbidding back movements, to reduce the cases of delayed strokes. For children such kind of restrictions would be very hard and for sure they will not be able to follow them. We investigated some techniques proposed in literature for handling the delayed

strokes but they didn't provide an effective solution with accepted accuracy. We developed a new algorithm for handling the delayed stokes, more details can be found at [1].

1.2 Feature Extraction

In our tool we used the chain code features to represent the online handwriting. To consider longer directional segments we added two more features which are the difference between two successive chain codes which is named the "Delta" feature. The other one is the difference between two successive Deltas which is named "Double Delta]. This means we are modeling the directions of the previous 4 points in the feature vector for each online point.

1.3 Segmentation phase

Online handwriting recognition of Arabic script is a difficult problem since it is naturally both cursive and unconstrained. Arabic is written connected from right to left. Most letters are written in four different letter shapes depending on their position in a word. The analysis of Arabic script is further complicated in comparison to Latin script due to obligatory dots/stokes that are placed above or below most letters. The Hidden Markov Model (HMM) technique provide solutions for most of the difficulties inherent in recognizing Arabic script including letter connectivity, position-dependent letter shaping, and delayed strokes. The Hidden Markov Model is a finite set of states, each of which is associated with a (generally multidimensional) probability distribution. Transitions among the states are governed by a set of probabilities called transition probabilities. Figure (9) shows a sample HMM model. In a particular state an outcome or observation can be generated, according to the associated probability distribution. It is only the outcome, not the state visible to an external observer and therefore states are ``hidden'' Markov Model.



Figure 9: Sample HMM model

We use the HMM in our tool in the alignment mode to find the optimum segmentation points of a word to its composing characters. For the example in figure 10 the word "___" "boy" is composed of three characters "___". In our tool we report the handwriting errors for each one of these characters separately, so we need to locate the segment of each character before running the error analysis on it. The HMM is a flexible tool that can search all the possible segmentation hypotheses for a word to find the optimum one, with highest match with the training data that the model has seen before.



Figure 10: Segmentation process of the word " " (Boy)

1.4 Classifiers

This is the main component in our handwriting teaching tool. It is responsible for analyzing the student handwriting and giving him feedback on his performance. We collected a large data set of children handwriting samples from all the target grades. With help of some handwriting experts we made an analysis for this dataset to get knowledge about the type and rate of handwriting errors in the children handwriting. We found that some errors can be detected using simple geometric rules. Some other errors required the design of more intelligent classifiers. We run some initial experiments using Neural Networks (NN) and support vector machines (SVM) but we realized that our data is not enough to build robust classifiers. So we decided to use "Template Based" classifiers. This classifier does not require training data and can be tuned to be robust in specific areas of the space, where the writing errors are located. The following two sections describe the classifiers currently integrated in our tool.

I. Geometric rules

Examples of the rules that we used to detect writing errors:

- Slope for characters which must be vertical or semi-vertical Such as: " alif ".
- Height of some characters in proportional with the word containing that character such as: "alif" " in the middle position.
- Closed loops intersections for character that may have a circular shape to determine whether the shape is closed or not such as: "waaw".
- Equality of two parts in some characters such as the two sides of " daal ".

II. Template matching

In this approach the student input handwriting is matched against sample ideal writing templates and also against other templates that are representatives for the possible writing errors of that character. The matching score is calculated using Dynamic Time Wrapping (DTW). Figure (11) shows an example of the template based classifier. We provide several templates for each handwriting error type so the tool can recognize the several ways for committing that type of error. The more the templates we provide the more robust the tool will be, but this will increase the processing time. Also it is better to select the templates from different users. Also the ideal templates should be provided from several persons to accommodate the natural differences in handwriting. The template that gets the minimum DTW score derives the tool decision and feedback message.



Figure 11 : Dynamic Time Warping process

We have done some modifications to the standard DTW distance to match our application. Dynamic time warping (DTW) is a technique that calculates the optimal alignment between two time series. From our data analysis we found that the handwriting error is localized in small parts of the template. So this part should receive the highest attention while calculating the warping score. To add this effect in our tool we added two markers, the *Error_Segement_Start* and the *Error_Segement_End* for each error template. These two markers are used to locate the segment of the template that will be included in the DTW score.

5. The Training and Evaluation Data Corpus

This data corpus included three types of collected samples for Separate letters, Single words and Sentences. The list of words and sentences were selected to be simple enough for children. We wanted to make the child concentrate on the handwriting practice and not spend much effort in understanding the meaning of the training examples. The data included samples that represent the left and right handed subjects. Also the data included balanced numbers of male

and female samples. The data was collected for the two styles of the tool exercises, the doted templates and free writing. The data was collected from 9 schools and from 340 student. It is known from classical studies of human behavior that the process of learning handwriting skills begins around age five and finishes approximately at age fifteen. In this project we collected data from students in the age range 7-10 as we expect this would be the optimum range for improving handwriting skills. The collected data size is around 20,000 samples that included 100,000 characters. Table (1) include the details of the collected data corpus.

Table (1): Details of the conected handwriting corpus						
	No. of children	Age Ranges	Samples	Right Handed students	Left Handed students	
Male	197	7-10	70235	170	27	
Female	144	7-9	32517	110	34	
Total	341	7-10	102752	280	61	

Table	(1):	: Details	of the	collected	handw	riting	corp	ous
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A small portion of the corpus, around 10%, were selected to be manually segmented and annotated for the purpose of HMM models initialization. In this process each word is divided to its composing characters. If the character was written using multiple strokes they are grouped together and attached with the character label. We developed a special tool for data segmentation and annotation. This tool allows the user to do the segmentation by hand using the touch screen pen which accelerated the segmentation process. Figure 12 shows a screen shot for the data annotation tool.



Figure 12: The data annotation tool

6. Results

We run several internal tests with ourselves to check the functionality of the tool components and to make sure they perform as excepted. For the formal test we selected fifty children from an elementary school, there edges were in the range 6-11 years old. We created a test form that included 7 columns which are the word under test, the preprocessing result, the HMM segmentation result and the classifier result. We tested the accuracy of the main three components of the free writing tool: Remove point, Segmentation and the Errors Classifiers. Table 2 includes this test results.

Preprocessing Accuracy	94%			
Segmentation Accuracy	66%			
Classifier Accuracy				
Correct Feedback Message	79%			
False Feedback Message	21%			

Table (2): The free writing tool test results

From the results in table 2 we see that the preprocessing module achieved good performance and managed to detect the points and reorder most of the strokes correctly. The segmentation module still need more enhancement. Its performance has large variance as some words were segmented with accuracy more than 90% while others are still poorly segmented with accuracy under 30%. Figure 13 displays the segmentation result of some words from our database. Our inspection for the segmentation results has shown that most of the errors resulted from the chratcers that have a more complicate shape. We plan to increase the training data for those characters and try HMM models adaptaion techniques such as MLLR and MAP to capture the inter-person variability and boost the performance for those characters.



Figure 13: The segmentation result of some words

For the words that were correctly segmented we measured the accuracy of the tool feedback messages. The correct message means the acceptance of good written charaecters or the rejection of the badly writtin charaecters. The other cases, false alarms and false acceptance, are counted as incorrect feedback from the tool. The tool had variable performance for the different charaecters. As shown in Figure 14, the tool accuracy ranged from 62%-90% with average accuracy 79%. This means for each 4 out of 5 charecters the tool mangaed to provide correct feedback which can be considered a promissing performance for the first version of the tool. An inspection of the errors showed some new writing problems for some charecters that didn't exsist in the training data. Also we need to increase the number of representive templetes for some charecters to capture their different writing shapes.



Figure 14: The classification accuracy for some characters

We also noticed that the most significant improvement was for the 6-7 years old children. They managed to copy the ideal writings with perfect performance. They required around three hours of practice to reach that level with no teacher guidance. The older children had harder time trying to change there writing style and the final result didn't show much improvement compared to the younger ones. Figure 15 shows the improvement rate for the test students.



Figure 15: Students improvement rates

7. Conclusion

Handwriting does not have to be a battleground. By targeting specific and narrow objectives, praising efforts that are well-done as well as pointing out errors to be corrected, and scheduling regular, supervised practice, progress can be made much more rapidly than if students are left on their own to complete handwriting workbooks. Through this project we were able to explore, and also enjoy, an important problem which is teaching handwriting for kids. The Arabic language had its own challenges of cursive writing, the many dots and delayed strokes. Also the recognition of the handwriting of children is much more challenging than adult handwriting due to the increased irregularities, the lossy control of the pen movements and the fragmented writings. We implemented some standard techniques for Arabic handwriting recognition and also developed new techniques that can handle the challenging handwriting of children. We tested the components of the application in real usage scenarios. The tool works with reasonable accuracy considering it is the first version. Also considering this application is a new one and there are no similar products in the market that we can compare with.

This handwriting teaching tool can increase the effectiveness of classroom teachers in several ways. It can provide positive, independent, individualized, and effective practice for students, and it can give the teacher detailed feedback on each student's progress. It can help free teachers' time by enabling students who need more individualized instruction to work independently with effective learning tools on a computer, while other students in the classroom receive more interaction and attention from the teacher. The tool was developed for the Arabic language but can easily be ported to other languages since all the language related information are stored in external databases.

In our future work we plan to use other segmentation and classification algorithms that may enhance the accuracy. Extend the application to include non-native Arabic students. Increase the types of handled handwriting errors. Extend application's capability to be used on mobile phones enabled with handwriting input.

Acknowledgements

We express our gratitude's to Cairo Microsoft Innovation Center (CIMIC) team for the funding of this project and keen efforts to make this application a successes story. Also the all project team at the Faculty of Computers and Information at Cairo University (FCI) for sharing in the development of that application and in the data collection and annotation phase.

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E-Learning Tool for Autistic Children: Needs and Study

Abstract

Many traditional and modern techniques are used in autism therapy, and hence *E*learning is becoming an important tool to support the learning system to achieve its goals within learning process, in this paper an e-learning application were designed for autistic children. The designed application

This paper presents two e-learning applications the first one is to teach autistic children pets' pictures, sounds, and names in the Arabic language, and the other application is for teaching them basic body movements and to react to them. The application was tested in the Autism Academy of Jordan under professional supervision, and the results showed a good interaction by the autistic children with this application. The children were divided into three groups, depending on their disability level. The results of the study show that the average of attention, benefits and distraction for groups 1 and 2 relatively high. Group 3 gave bad results, because their poor communication skills and very low abilities to accept information affected their ability to interact with the application..

Keywords: e-learning, autism, autistic child, distraction, disorder.

1. Introduction

1.1 Autism disorder

Autism is a neurodevelopment disorder produced by alterations in the brain functionality which acts as developmental retardants during the first three years of the children life [5, 7, and 8]. The main causes of autism are still not clear, but there are some theories about the factors which may cause autism, such as inheritance factors, serum effects, or poisoning by heavy metals (such as mercury and lead) in polluted water and food, that produce negative effects on the respiratory and digestive systems [5,7].

Autism disorder symptoms vary from one autistic person to another, but the most widely spread symptoms are: a tendency to isolation and lack of social interaction; apathy; the establishment of a personal daily routine; an abnormal relation with toys and other objects; and strange possibly self-harming behaviors.

Some techniques used in autism therapy try to cure the negative and stereotyped behaviors by means of educational and rehabilitation programs designed especially for autistic children. Some of these programs try to make autistic children more interactive with their external environment by using images and facial expressions [1, 3, 5, and 6].

Other teaching programs take into consideration the learning difficulties that autistic children face.

1.2 Related works

Most applications and studies used in Autism therapy focus on the study of the abilities of autistic children to interact with their external environment, and their capacity to express their feelings and impressions, with the aim of helping them to become more social. Some applications have been implemented to engage the autistic child in a social atmosphere near to the real environment. In simulated real scenarios, such as a birthday party, the child chooses a suitable role.

Other applications try to teach autistic children about people interactions, by collecting images for different people in different feeling situations (sad, happy, angry) and making these expressions more familiar to the autistic child, thus providing them with additional social experiences [7].

This paper introduces an e-learning project that aims to teach autistic children of different ages some fundamental information, by taking into account the typical mental absorption of autistic children. Using this e-learning tool will be less costly and will help the parents to teach their autistic children at home.

2. Designed Applications

In order to design our e-learning application, a study has been made on the psychological aspects of autistic children, their characteristics and their ability to understand information .We consider it crucial to know which factors help increase the children responses, therefore this study has been very important in the designing phase of this project.

The project was tested at the Autism Academy of Jordan with the supervision of specialists and therapists. Some issues taken into consideration were:

- Autistic children suffer from a high level of distraction.
- Autistic children tend to be isolated and have poor interaction with people. This may cause difficulties which could affect the educational process.
- They have good abilities to deal with computers and material objects. This makes computers good tools for the teaching of autistic children.
- To improve the success of the educational process, as many senses as possible should be engaged, i.e. pictures and sounds should be used at the same time.

The mentioned factors have been taken into consideration in this project, to make it a successful and effective e-learning tool for teaching autistic children.

2.1 Application 1

The main goal of this application is to teach autistic children pet pictures, names and sounds. According to the advice of specialists, the application was designed to comply with the following features:

- Pet pictures are shown in the center of the window, to attract the highest attention to the picture and to ensure a clear reception.
- The name of the animal appears in a clear font above the pet picture.
- The picture has no background, because it may disperse attention.
- The sound made by the pet is played when the mouse cursor moves across the picture.
- The child hears the name of the pet when the mouse cursor moves across the word showing the pet name. At the same time, the color of the text changes, to attract the child's attention.

Figure 1 shows a snapshot from the application, with a cat (____) picture and its name.



Figure1. Application snapshot

All the previous steps aim to link the pet's picture with its sound and name. All these properties try to engage more than one sense at the same time, and this is done in an easy and attractive way without any distractions. This application has the ability to show several pets consecutively, to achieve the highest possible benefit.

2.2 Application 2

The second application shown in figure 2 focuses on teaching the Autistic children some basic body movements such as to stand up, set down and touch the ears .to make sure that the Autistic child will learn the movements correctly and efficiently the application will:



Figure 2. Application interface

1. A voice telling the child the name of the movement will be played.

2. After step 1, a video of a child performing the movement will be played, see figure 3.

Letting the child hear the name of the movement before seeing it through the video is to make sure that the autistic child will connect each movement sound with the behavior of the child in the video which represent the required movement.



Figure 3. A video of a child performing the action of touching the ears.

Taking into consideration the properties of Autistic children, like distraction, the previously mentioned applications must be tested in a special environment to assure reaching all our goals from this learning process.

3. Testing and results

To ensure that the project achieved the main objectives it was tested in **Autism Academy of Jordan** along three weeks; three hours per a day. Based on testing and the results the will be discussed next ,and based on an official report of the Autism Academy of Jordan, the specialist approved this project as a successful e-learning educational tool for a specific group of autistic children with specific characteristics.

3.1 Application 1 testing and results

Through the experiments, the specialists were monitoring the children behavior and their interactions. The first e-learning application was tested on 43 children with different disability levels and ages, 40 boys and 3 girls with age range between 7 and 14 years old. The test period was 20 days and each child goes through a 10 minute test.

The designed application emphasizes those issues that should attract most the autistic children, avoiding distraction factors; the test results were positive and show that autistic children have the ability to understand new information, when all these issues have been taken into consideration.

The children were divided into three groups, based on their communication skills and attention levels:

- Group1: A very good level group (22 children).
- Group2: A good group (11 children).
- Group3: An acceptable group (10 children).

The behavior of each group looks as follows:

Group1:

- Attention: Very good, but the attention percentage varies depending on each child's ability. The total ability of attention was rated at 86%.
- Benefits: The benefit percentage for this group was good, rated at 67%.
- Distraction: there was a low level of distraction, caused by the testing location and other external factors.

Group2:

- Attention: Good. The average was rated at about 73%.
- Benefits: Depending on the personal requirements and the academic and psychological characteristics of the children. It was rated at 52%.
- Distraction: There were different types of children in this group: some were very hyperactive, others were inactive and listless. Because of external factors, there was a high distraction percentage, rated at about 72%.

Group3:

- Attention: Approximately null, because of their poor mental abilities and low communication skills, rated at a percentage of 7%.
- Benefits: The attention of this group being poor, the benefits percentage was rated at 0%.

• Distraction: high as expected, because of their low realization and poor abilities to interact with the external environment. It was rated at 97%.

The attention level was measured as a function of the time that the child was focused with the application. For instance, if one child was focused with the application for about seven minutes in the ten minutes test, the corresponding attention percentage was rated at 70%.

Benefits were measured taking into account several aspects, such as the fact that some children kept repeating the pet name when they see the picture, while others, who have speaking difficulties, would repeat the pet sounds. Benefits were measured taking into account all these factors.

According to the specialist reports, the distraction factors were external spurs in the place the test was held.

3.2 application 2 testing and results

This application was tested on eleven autistic children; ten boys and one girl. Those children have different disorder levels, so the testing results differed according to these variation levels. The testing results measure the interaction of autistic children with the e-learning tool. The interaction ratio calculated by comparing the number of all showed videos with number of movements that done by all children correctly.

The number of movements that done by the children; comparing with all showed movements gave the ratio 68 %.

The first impression may consider that this value is not high, but there are some factors behind giving this ratio:

- Some children have poor communication skills because of having a high level of autism disorder. This factor affect in the interaction ratio with the system.
- Some distraction factors in the environment was attracting the attention of the children, making them not to interact with the system properly. These factors conclude some furniture pieces, toys and the attractive lights.

It is preferable for the child to use these e-learning applications in an environment that is clear of any distraction objects, in order to let the child attention be focused on learning the movements and performing them.

4. Conclusion

E-learning is becoming an important tool to support the learning system to achieve its goals within the learning process. So in this paper and based on a study of the autism disorder, its symptoms, causes and therapy techniques, two e-learning applications have been designed and tested at the Autism Academy of Jordan, having been applied to an average of 40 students for 21 days. The children were divided into 3 groups, based on their communication skills and attention levels. And the results discussed in this paper have shown a clear improvement in their responses and interaction levels.

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Vocabulary Building Support System by Converting Web Pages

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Abstract

An English self-learning system is proposed for effective vocabulary building. The system is based on the annotation technology of Web pages. Learners can provide quiz pages from active Web pages like Wikipedia. They read texts and fill the blanks on quiz pages. The system gives their feedback to the results immediately and records them for organizing their learning history to make their individual learning guideline and new quiz pages for them. This system works on the proxy server and can be setup easily by users. The features are that learners can make vocabulary building exercises by quiz pages automatically which include practical usage of the target words, and that learning processes are recorded to propose learners' better step-up. This technology of converting Web pages is not restricted in English learning, but specified subjects can be applied.

1. Introduction

International communication in education is based on the common language, English. Even in Chinese character culture countries of the East Asia area, each nation's people have to depend on English to communicate with the others, like other area of the world. Japanese average people can only guess meanings of text from Chinese characters in Chinese documents. They cannot understand oral conversations by Chinese language even one word. Learning English is better solution to communicate each other for the nations.

English language education in Japan has been kept several hours a week for 6 years from junior hi-school to graduation of hi-school. Besides, in many cases, college students have to study more specified English course. Generally, the learners' vocabulary building is not effective through their school learning, because there are few chances for practical use. While global culture mixing through the Internet and video media makes young pupils and students to access many English words, their perception may not reach to deeper meaning.

We propose a effective solution for English vocabulary building for English self-learner as a foreign language

1.1 Background in Japan

Learning Management Systems are applied in many schools and colleges in Japan. The learning system supplying problems for the vocabulary power improvement is, for example, working in English Language Education. It may, however, offer almost memorizing problems of separated word from English texts. Therefore, modern methods of natural learning in vocabulary building are not applied.

Even if effective educational support system is introduced, time for preparation is needed as well as the case of study by past "Paper and pencil" for making the problem. If the problem making work can be automated, such a load is sure to be reduced greatly. In this report, a system is proposed that automatically generates the making up problem for the English word acquisition on the Web page written in English as an example of automating the problem making work. This system is achieved by applying technology that rewrites the Web page proposed by Watanabe[1]. Effective study is expected to be done by recording user's behavior on the rewritten Web page, and making the learning scheme based on the record.

1.2 Purpose

The learning system that supports the vocabulary power improvement of English is developed. The system can provide a learning method that memorizes the word while reading English texts. English Web page in the Internet is converted into a fill-in-the-blank question, and apply to that. The load of the problem generation and teachers' load are reduced so that the system may do making and grading the problem by the automatic operation.



Web Page converted in Fill-in-the-blank question



1. System Outline

2.1 Features

-Conversion Web page to the making up problem

Arbitrary Web page becomes a fill-in-the-blank question by rewriting the key word part to the text box.

-The grading of the fill-in-the-blank question

The grading is done immediately after the input of the answer, and each learner's learning history is recorded as for the result, which word on which page when the preservation learner of the study history notified at once by the learner (The example: Change into red if it is an incorrect answer to blue if the text box is a correct answer) studied

- -Recording of each learner's learning context
- -Learning plan

To set the problem of the suitable word by the theory of the forgetting curve according to the learning context of the plan learner of the learning scheme based on

the study history at the appropriate time, the learning scheme is planned.

2.2 System configuration

This system consists of the grading server with the conversion server that converts the Web page into the fill-in-the-blank question. When the learner tries to access the Web page selected with the grading server, the Web page is converted into the fill-in-the-blank question with the conversion server. When the learner inputs the word, the content is transmitted to the grading server, and graded at once. The grading result is accumulated in the data base, and influences the selection of the Web page used next.

2.3 Generation of fill-in-the-blank question

The generation of the fill-in-the-blank question is achieved by rewriting key words part on English Web page to text boxes. The key words are selected from the list that the learner or the teacher prepared beforehand by the automatic operation (Details of the selection method are described later). Learning is done by inputting the answer to the corresponding text box. The screen can be divided optionally as shown in Figure 2. Japanese translation is displayed in the right side corresponding to converted original page in the left side as the fill-in-the-blank question. Learners can guess the answers by this translation as a hint.

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Figure 2. Web Page converted into Fill-in-the-blank question

According to the United States Census Bureau, the city has a total area of 81.7 square kilometres (31.5 sq mi). 68.3 km² (26.4 sq mi) of it is land and 13.4 km² (5.2 sq mi) of it (16.38%) is water.

The entire city of Huntington Beach lies in area codes 657 and 714, except for small parts of Huntington Harbour (among with Sunset Beach, the unincorporated community adjacent to Huntington Harbour), which is in the 562 Area Code.

[edit]

Climate

Figure 3. Automatic grading by color to answers

3. Learning steps

3.1 Rank division of word

To achieve Auto Select of the key word, this system divides the word in the selected list into five ranks. The rank division is done in consideration of the forgetting curve and the study history concept.

3.2 Forgetting curve

The forgetting curve is that shows the relation of forgetting a mid-term memory and time. According to the theory of the forgetting curve, the interval of first learning and second is 1 week, the one of second and third is 2 weeks, and the one of third and forth is 4 weeks. Then, when the fourth study ends, it becomes a long-term memory. To achieve this, the system divides the word into the following ranks.

- -Rank 1: Words never studied
- -Rank 2: Word the first study ends
- -Rank 3: Word the second study ends
- -Rank 4: Word the 3th study in rank ends
- -Rank 5: Word the 4th study in rank ends

3.3 Study history

URL, learner ID, word list on the Web page that became it in the fill-in-the-blank question, and the key words are each learners' learning history. The word is distributed to each rank by the study end frequency. It is judged that learning ends when a correct answer is input to the making up part, and one Rank : above. The learning end date of the history is used to decide the study time of each word. The study time is calculated by the theory of the study end date and the forgetting curve.

3.4 Automatic generation function of key word set

When the fill-in-the-blank question is generated, sets of words that become key words from the word into which the rank is divided based on the following priority level (key word set) are first generated automatically.

- 1. Key word set in all words that reached at study time of words from rank 2 to rank 4
- 2. Key word set in all words of rank 1
- 3. Key word set in all words of rank 5

The system will set the problem by the best word by prioritizing the set of the key word of the word that reached at the key word set learning time in all words of rank 5 at the best study time based on the forgetting curve.

3.5 Automatic generation function of page set

When the key word set is decided, the Web page to be converted next is extracted on the page of English version Wikipedia based on the word of the key word set. The extraction is done by searching for the set on the page where all words of the given key word set are contained by using the result of totaling the appearance word and the occurrence count in each page of English version Wikipedia preserved in the data base of the prior preparation.

3.6 Automatic grading

An automatic grading is done by communicating with the grading server at the input of the answer. ID is allotted to the text box in the page when the making up problem is converted, and ID of the text box and the correct answer corresponding to it are recorded in the grading server. Grading is done by comparing correct answers recorded as the answer that the learner input by the Ajax communication based on ID of the text box.

4. Implementation

In the grading server, an automatic grading is done by the Ajax communication. PHP and Relational Database Management System (MySQL) are used for the operation of the data base. The selection of the page that becomes original has been achieved by PHP. Moreover, the conversion of the page in the conversion server is done by PHP.

5. Conclusion

In this report, the system that applied the technology of rewriting the Web page to the English word study was developed. It is thought that this system enables problem generators' load reduction of incidence to feed back by the automatic operation after the problem is made, graded, and it studies. Moreover, this system provides the function to plan the learning scheme automatically in consideration of the forgetting curve, and, as a result, it is thought that effective study can be supported.

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The MIT LINC 2010 Conference Parallel Presentations

Session #6:

Implementing an E-Learning Initiative



Implementation of e-Learning in Ghanaian Tertiary Institutions (A Case Study of KNUST)

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<u>Abstract</u>

This study explores the implementation of e-learning in Ghanaian tertiary institutions with KNUST as a case study. The objectives of the study examined the advantages and disadvantages of e-learning to KNUST, the various types of e-learning systems considered by KNUST, the 'Moodle' E-learning system adopted by KNUST, the strategies involved in the e-learning system, the challenges faced by KNUST in the implementation of its e-learning system along with possible solutions and finally a recommendation on critical issues to be considered for the effective implementation of the e-learning system. A descriptive study with a cross-sectional design was done. For tertiary institutions in Ghana, recommendations were made for them to adopt e-learning to augment and highly impact teaching and learning given the ever-increasing enrolment figures. It was also recommended that they chose an e-learning system which blends open source system and course management system such as Moodle due to cost, features, specifications, support and mode of course management

1. Introduction

E-learning (or online education as it is still commonly termed) has been variously defined, but can be simply described as a learning process in which learners can communicate with their instructors and their peers, and access learning materials, over the internet or other computer networks (Curran, 2004). It therefore provides a means through which the powerful and pervasive computing and communications technologies can be applied to tertiary education – and to some of the key challenges now facing universities. According to a report by Ambient Insight, The global market for e-learning reached US\$27.1 billion in 2009 and its demand is growing by a five-year compound annual growth rate of 12.8% with revenues expected to reach \$49.6 billion by 2014.

E-Learning has become the protagonist for change in the education sector with the rising numbers in student enrolments and the masses of potential students that are turned away each year for lack of classrooms, accommodation and lecturers. Today lecturers are facing different challenges than their predecessors in teaching tomorrow's professional. In the past few decades, advances in academia have increased demands on academic faculty, resulting in less time for teaching than has previously been the case. Traditional instructor centred teaching is yielding to a learner centred model that puts learners in control of their own learning. A recent shift toward competency-based curricula emphasizes the learning outcome, not the process, of education. E-learning refers to the use of Internet technologies to deliver a broad array of solutions that enhance knowledge and performance (Mushin, 2008). E-learning can be used by lecturers to improve the efficiency and effectiveness of

educational interventions in the face of the social, scientific, and pedagogical challenges. It has gained popularity in the past decade; however, its use is highly variable among universities.

E-Learning has the potential to transform Ghanaian universities. E-learning is increasingly gaining universal acceptance as a viable means of enabling large numbers of students to access education. Kwame Nkrumah University of Science and Technology (KNUST) in Ghana realising the enormous potential of e-learning as against the university's ever increasing student population has chosen to adopt e-learning as platform to transform KNUST into a modern citadel of academic knowledge in all spheres of science, humanities, business and more.

While technology has enabled online education in many countries, the same cannot be said for African Universities. Universities in Ghana have made some progress in building network infrastructure and acquiring computers, but integrating technology into the teaching and learning process has been a challenge (Awidi, 2008).

1.1. <u>Background</u>

Kwame Nkrumah University of Science and Technology, a public university in Ghana has over the past two years been going through several phases in the implementation of the university's e-learning system. The university started off by looking at the advantages and disadvantages of e-learning, the various types of e-learning systems. Among the e-learning systems considered were commercial, open source, course management and learning management systems. In the second semester of the 2005-2006 academic year the web team of the University Information Technology Services choose an open-source and course management e-learning system called 'Moodle' to use as the university's e-learning system. The web team however, modified the Moodle e-learning system to suit the needs of the university.

In the first semester of the 2006/2007 academic year, the Moodle e-learning system was piloted for two courses using two classes in the university. The system was then fine-tuned from the inputs given by the lecturers and students involved. The system was expected to be used on a large scale from the second semester of the 2006-2007. However, due to human resource and other challenges the whole process of large scale implementation was suspended. The web team however, after the adoption of the ICT policy of the university has re-strategise to deploy the e-learning system again in the first semester of the 2008/2009 academic year at the College of Engineering and the College of Science.

This study seeks to examine the advantages and disadvantages of e-learning to KNUST, the various types of elearning systems considered by KNUST, the Moodle e-learning system adopted by the university, the e-learning implementation strategy of the university and the challenges encountered in the implementation process and their possible solutions. The study will also recommend critical issues to be considered for the effective implementation of the e-learning system. The aim of the study is to create awareness about the e-learning system of KNUST and bring to bear the pros and cons of e-learning for KNUST. It is also necessary to make the management of the university aware of the details of the type of e-learning system they have chosen and the challenges and solutions to the implementation strategy of the university's e-learning system. It is also to serve as guideline for other universities to follow in the implementation of their e-learning systems so as to avoid the pitfalls of the e-learning implementation strategy of KNUST.

1.1. Problem Statement

Despite the enormous benefits of e-learning systems, KNUST has problems and challenges with the implementation of its e-learning system after having piloted the system for a semester. Among the problems are inadequate ICT staffs to support and implement its e-learning systems, low motivation for lecturers to blend e-learning into their face to face lectures, inadequate bandwidth to support the e-learning system, poor financing for acquisition of ICT infrastructure and poor educational awareness of the e-learning system. Coupled with increasing student population and high student lecturer ratios, it is imperative that KNUST gets its e-learning implementation process going on and overcome the challenges involved in the process.

1.1. Objectives:

- 1. To examine the advantages and disadvantages of e-learning to KNUST.
- 1. To examine the various types of e-learning management systems considered by KNUST.
- 1. To examine the 'Moodle' E-learning system adopted by KNUST.
- 1. To examine the strategies involved in implementing KNUST's e-learning system.
- 1. To examine the challenges faced by KNUST in the implementation of its e-learning system and possible solutions.
- 1. To recommend critical issues to be considered for the effective implementation of the KNUST e-learning system.

1. <u>Methodology</u>

This was a descriptive study with a cross-sectional design. The study employed qualitative and quantitative variables. Specifically the study area covered KNUST's e-learning system and the implementation process of the e-learning system. Students and lecturers of KNUST who have used the e-learning system were interviewed. In addition, the ICT staff and personnel of KNUST who have been involved in the implementation process of the system were also interviewed

Students of the mechanical engineering department of KNUST who used the e-learning system in the first semester of the 2005-2006 academic years formed the sample units for the student interviewees. Lecturers who have experienced the e-learning system formed a part of the sample units. In addition, the university's administrators and information communication technology (ICT) personnel of the university who have been involved in the development and implementation of the e-learning system also formed part of the sample unit.

The sample size was made up of 50 students from each of the classes that used the e-learning system in its pilot testing stage, 5 lecturers, 15 ICT personnel and 5 university administrators. Questionnaires were used to collect the data from the sample. For sections of the questionnaire where an ICT expert advice was required, the sample size was narrowed to the 15 ICT personnel.

A semi-structured form of interview was used to interview the respondents. Students, lecturers, the ICT personnel and administrators were briefed about the purpose of the study and were assured of the confidentiality of responses. They were also informed to choose to answer and to stop at their own convenience. Responses were checked on the questionnaire as seem appropriate.

The study made use of Primary and Secondary data. The interview technique and records review were employed. Students, lecturers, ICT personnel and administrators were interviewed using semi-structured interviews; self administered questionnaires were given out to them to be answered. A checklist was used to collate information from the sample.

The pre testing of the interview guide questionnaire and checklist were done at the University of Ghana, Legon where a similar e-learning system called KEWL has been introduced. This was done to identify and detect ambiguous questions and level of interviewee's understanding with respect to the nature of the questions asked. Sentences, which were not clear and gave different, intended meaning and understanding by respondents, were modified accordingly. The checklist was also tested for suitability and precision as per the objectives of this study. This was to check for accuracy and completeness of data and to ensure quality. To do this questionnaire and interview guide were numbered serially. On daily basis, completed guides were checked thoroughly.

The analysis of data was done at the end of the data collection. The responses were grouped and categorized on the basis of information provided. The analysis was done using Microsoft Excel. The purpose of the research was explained to officials and those who were willing to respond to questions of the study.

1. <u>Results</u>

125 questionnaires in total were issued out to interviewees. The interviewees comprised of 100 students, 5 lecturers, 15 ICT personnel and 5 university administrators. The questionnaires were designed such that each section met one of the objectives of the dissertation. Out of the 125 questionnaires issued, 121 were received back representing a response rate of 97%.

1.1. Demography of Respondents

Out of the 121 respondents 96(79.34%) of respondents were students, 5 (4.13%) were lecturers, 15 (12.40%) were ICT personnel and 5 (4.13%) of respondents were university administrators (Fig 1)



Fig. 1 Demographic Characteristics of Respondents

1.2. Advantages and Disadvantages of E-learning for KNUST

To ascertain whether it was advantageous for KNUST to have an e-learning system, the question was asked if the KNUST e-learning system will enhance teaching and learning at KNUST. To this question, 119 (98.35%) of the respondents said yes whiles 2 (1.65%) said no. Furthermore, views on some of the advantages of e-learning for KNUST from respondents who answered yes to the question were collated and for respondents who answered no to the question their views were gathered on some of the disadvantages of e-learning for KNUST.

The advantages included the following;

- Courses will be accessible on your schedule
- Online learning will not require physical attendance of student or lecturer
- Learning is self-paced
- Courses will be available 24 hours daily.
- Geographical barriers will be removed
- Materials can be read online or downloaded to be read later
- Online course materials can be reused or modified for a new class
- It will promote collaborative learning among students through technology tools
- It will promote greater student and lecturer contact
- The global learning community will be made available to learners through e-learning online.
- For open source e-learning systems KNUST will have low cost and support will be highly available
- It promotes the computer and internet skills of learners and lecturers
- Draws upon hundreds of years of established pedagogical principles
- E-learning will improve learners retention of knowledge by drawing learners to their topics of interest

The disadvantages included the following;

- Little internet Bandwidth will make e-learning at KNUST very difficult to transform teaching and learning
- Inadequate computers and other ICT infrastructure will make e-learning very difficult to transform teaching and learning at KNUST

1.3. Types of E-Learning Considered by KNUST

For the question of whether respondents have heard about the KNUST e-learning system 119 (98.35%) of the respondents said yes whereas 2 (1.65%) said no. In addition, to the question of what types of e-learning system respondents know about 83 (68.60%) 77 (63.64%), 105(86.78%) and 103(85.12%) of respondents said Course Management System, Learning Management System, Open Source System and Commercial System respectively (Fig 2).



Various Types of E-learning Systems Known

Fig. 2: Types of e-learning systems known by respondents

1.4. Choice of e-learning system recommended for KNUST

Respondents were also asked to choose one e-learning system on the basis of management for KNUST. The results to this question showed that 71(58.68%) chose Course Management System and 33(27.27%) chose Learning Management System. To add to it, respondents were also asked choose one e-learning system on the basis of cost, development continuity and support. To this question, 92 (76.03%) of respondents choose Open Source System whiles 27 (22.31%) choose Commercial System.

With regard to which of the e-learning software to be considered by KNUST has been heard of by Respondents. 22 (18.18%), 25 (20.66%), 17 (14.05%) and 23 (19.01%) of respondents chose Moodle, Blackboard, KEWL and WebCT respectively. Furthermore, respondents were asked which of the considered e-learning software by KNUST they will recommend for KNUST, 21(95.45%) of the 22 respondents who knew about the Moodle E-learning system recommended it for KNUST, 13(52.00%) of the 25 respondents who knew about the Blackboard E-learning system recommended it for KNUST, 5(29.41%) of the 17 respondents who knew about the KEWL E-learning system recommended it for KNUST and 11 (47.83%) of the 23 respondents who knew about the WebCT E-learning system recommended it for KNUST (Fig 3).

Choice of E-learning System recommended for KNUST



Fig 3: Choice of e-learning system recommended for KNUST

1.5. Examination of KNUST's Moodle E-learning System

The results for this section had a sample size being the 15 ICT staff only. Fourteen 14 (93.33%) of the ICT staff respondents knew that the KNUST E-learning system was a Moodle E-learning System while 1 (16.67%) did not know. Also all the 15 (100%) ICT staff said the Moodle E-learning system was a good e-learning system for KNUST on the basis of its features, specifications and cost. Reasons for this assertion includes

- Moodle is widely around the world by most universities
- It is easily customizable.
- It easily plugs into third party applications
- It supports several databases including MySQL, PostgrelSQL, Microsoft SQL, Oracle and others
- It has different enrolment and authentication methods.
- It supports different operating systems including Windows and Linux
- It is free to download and use, making less costly to deploy.
- It has a large user and developer community and support.

In addition, ICT staff was also asked to ascertain whether the current extent to which Moodle has been developed to suit KNUST was a success. To this question all the 15 (100%) ICT staff said yes.

1.6. E-learning Strategy for implementing Moodle at KNUST

This sections sample size comprised of all 121 respondents. Seventy three (60.33%) of respondents are of the view that KNUST had the necessary ICT hardware infrastructure to implement an E-learning System whiles 48(39.67%) of respondents did not agree to this. For respondents who did not agree to this, views were sought as what kind of ICT hardware infrastructure was necessary to implement KNUST's E-learning system. The views included the following;

- Each college should have at least 300 computers to support the e-learning
- Enough high end servers should be provided to support the e-learning system
- There should be quick provision of network cables when they get spoilt to ensure constant delivery of elearning to all sections of the university.
- Replacement of computer parts should be done quickly to ensure that the computers for e-learning are in good shape.

Also, with regard to awareness and education, all one hundred and twenty one (100%) respondents said not enough. awareness and education has been done on KNUST campus about the KNUST e-learning system. The next question looked at whether KNUST had enough internet bandwidth to implement its e-learning system. The sample size to this question comprised of only the ICT staff. All the 15 (100) ICT staff said no to this question. Views were sought as what amount of internet bandwidth will be good to implement KNUST's E-learning system. The answer to this question ranged from 20MB to 100GB of bandwidth.

Also 37 (30.58%) of respondents were of the view that the implementation of the KNUST E-learning system has been a success whereas 84(69.42%) of respondents did not agree to this. For those who did not agree, their views were sought as to what has made the implementation not successful and what suggestions they have to make it successful. A sampling of these views included the following;

- For most students their view was that the e-learning system is good but not much educational awareness has been done about it to students.
- For ICT staff, their views were that, not much practical effort is being given by the university and its authorities towards implementing the e-learning system.
- Some ICT staff suggested that their initial plan of implementing the e-learning system across the whole university campus was wrong. They further suggested that the system should be implemented from college to college over a time span.
- For some respondents, they were of the view that because no certificate is given to lecturers for the e-learning workshops they participate in most of them don't take it serious. Furthermore, some suggested that such a certificate should have relevance on the promotion of lecturers given the fact that today's world is a digital world where e-learning in universities cannot be left out.
- Good use should be made of the big intranet of the university to cut down on bandwidth needed for elearning.
- Views from all respondents were also sought on some parameters they consider as a must for the successful implementation of the KNUST E-learning System. A sampling of these views included the following;
- The e-learning system should blend the traditional face to face with the virtual learning system.
- Online systems should be complemented with CD-ROM materials
- Deadlines for preparation of online material by lecturers and other activities so far as the e-learning system is concerned must be formulated and included in the academic calendar and ensured they are adhered to.
- The KNUST ICT Policy should elaborate more and be concrete on e-learning issues instead of being vague.
- Educational Awareness about the e-learning system should be done to gain student and lecturer support.

- The quality and assurance unit of the university should come out with an assessment mechanism to evaluate the e-learning implementation process.
- E-learning workshops should be conducted for lecturers to train them in content development and management during the academic year.
- KNUST authorities must do more to support the e-learning implementation process to ensure it success.

1.7. Challenges and Solutions in Implementing e-learning in KNUST

This section also had a sample size comprising of all the 121 respondents. The first question looked at whether KNUST has had some challenges in implementing its e-learning system. The results to this question showed that 108 (89.26%) of respondents said yes whiles 13 (10.74%) said they were not sure. For respondents who said yes to this question their views were sought on what kind of challenges KNUST has faced in implementing its e-learning system. The views included;

- Inadequate ICT infrastructure.
- Lecturers with very low ICT skills.
- Inadequate ICT staff to train users of the e-learning system.
- Low motivation for lecturers to blend e-learning into their face to face lectures.
- High cost of accessing e-learning by non-residential students.
- Inadequate finance for acquisition of ICT infrastructure.

The next question looked at whether to those who said yes the challenges were solvable. To this question, 101 (93.52%) of the 108 respondents who said yes to the initial preamble to this question said yes, 7 (6.48%) of the 108 respondents said no to this question. Views of solutions to the challenges were sought from the 101 respondents who said the yes. The views included;

- Organize e-learning training workshop for lecturers.
- Provide funds and a well elaborate plan for implementing e-learning at KNUST.
- Expansion of the university's network to non-residential areas via wireless.
- Provision of adequate ICT staff for e-learning training and management.
- Provision of adequate ICT infrastructure to support e-learning implementation

2. Discussion

Many institutions of Higher Education and Corporate Training Institutes are resorting to e-Learning as a means of solving authentic learning and performance problems, while other institutions are hopping onto the bandwagon simply because they do not want to be left behind. Success is crucial because an unsuccessful effort to implement e-learning will be clearly reflected in terms of the return of investment. This chapter discusses the results obtained from the survey in relation to the objectives set out for this thesis.

2.1. Demography of Respondents

Kwame Nkrumah University of Science and Technology has a ratio of students to lecturers and university administrators which include ICT staff of about 26:1(Planning Unit, KNUST). This high ratio shows that for a 121 respondent out of 125 interviewees with 79.34% being students, 4.13% being lecturers, 12.40% being ICT staff and 4.13% being university administrators a good distribution of the sample has being achieved. In addition, having ICT staff interviewee number of 15 is very good since certain sections of the questionnaire are technical

in nature and thus an expert's advice in the area is required to make sound judgement. To add to it, getting 121 respondents out of 125 interviewees which represent 96.80% response rate shows that the response obtained from interviewees is very good.

2.2. Advantages and Disadvantages of E-learning for KNUST

From the results relating to this section, 98.35% of respondents agreed that e-learning will transform teaching and learning at KNUST. This depict that e-learning is advantageous to transforming teaching and learning at KNUST. This observation affirms studies which showed that the pro's and con's of e-learning vary depending on program goals, target audience and organizational infrastructure and culture, but it's clear benefits will guarantee it a role in their overall learning strategy (Kruse, 2004). Among the e-learning advantages for KNUST cited by respondents, respondents said that learning will become self-paced and e-learning will improve learners retention this buttress some studies which showed that e-learning can improve retention, provide immediate feedback and allow learners to customize learning materials to meet their individual needs (Kirsh, 2002). Looking at the other advantages cited by respondents which include courses being available 24 hours daily, the ability to have materials both online and offline, the reusability of materials by lecturers, the low cost of open-source e-learning systems, the ability to have collaborative learning and access to information from the global community online indeed makes it a very good reason for KNUST to have an e-learning system to transform its teaching and learning.

There are however, 1.65% of respondents who said that e-learning will not transform teaching and learning at KNUST, thus to this few number of respondents e-learning is likely to be disadvantageous to KNUST. From their submissions on disadvantages of e-learning to KNUST, they cited limited bandwidth constraints as being a major reason why it will be disadvantageous. In addition, they also cited inadequate ICT infrastructure as another reason which make e-learning disadvantageous to KNUST. Indeed, these submissions are valid giving the fact that KNUST is located in a developing country where according to Awidi, (2008), the weaknesses in the infrastructure have hampered support of students both on campus and through alternative modes of instruction. As according to Kevin Kruse, (2004), the advantages and disadvantages of e-learning vary. However, the e-learning advantages will guarantee it a role in the overall learning strategy of an institution.

2.3. <u>The Various Types of E-Learning Considered by KNUST</u>

E-learning is grouped into various types. Prominent among these groupings are those grouped on the basis of management namely course management systems and learning management systems and those based on cost and support namely open source systems and commercial systems. Results for those based on management showed that 68.60 % of respondents were aware of the course management system and 63.64% were aware of the learning management system. To add to it, 58.68% of all respondents representing 85.54% of respondents who knew about the course management system said they will chose to recommend a course management system for KNUST as against 27.27% of all respondents representing 42.85% of respondents who knew about the learning management system. This observation may be due to the fact that CMS's were designed for universities and other academic environments whiles learning management systems were designed for workplace learning environments according to Carliner, (2005). Given the demography of the respondents all those involved are from the academic circles thus the tendency for them to prefer a CMS vis-à-vis LMS.

A comparison of the e-learning system on the basis of cost and development continuity showed that 86.78% of all respondents depicted that they knew about the open-source system whiles 85.12% knew about commercial or

proprietary systems. Furthermore, 76.03% of all respondents representing 87.61% of respondents who knew about open-source systems choose to recommend an open source e-learning system for KNUST vis-à-vis 22.31% of all respondents representing 26.21% of respondents who knew about commercial systems. This observation depicts that an open source system is indeed a preferred choice of e-learning platform compared to a commercial e-learning system on the basis of cost and development continuity. This observation affirms the fact that open source provides unique advantages which include filling the low-cost high-control niche that are difficult, if not impossible, to achieve through commercial, proprietary avenues. In addition it also buttresses the fact that open source removes the commercial imperative to compete, enabling genuine cooperation between developers and institutions, among developers and between projects.

Considering the question of those who knew about the various e-learning software which KNUST considered before choosing its e-learning software, the percentages of 18.18%, 20.66%, 14.05% and 19.01% for Moodle, Blackboard, KEWL and WebCT showed that very few respondents were abreast with the different types of e-learning software considered by KNUST. However, on the question of which of the e-learning systems respondents will choose for KNUST, the percentages were 95.45%, 52.00%, 29.41% and 47.83% of respondents who had knowledge of Moodle, Blackboard, KEWL and WebCT software respectively. These percentages depict that though a few respondents are aware of the various types of e-learning software quite a big percentage of these respondents prefer the Moodle software. This is likely due to the fact that the Moodle system is both a course management system and an open source system. From earlier discussions, it will be noted that the greatest percentage of respondents prefer both the course management system and open source system thus given the bridge the Moodle system is likely to be a much preferred choice compared to Blackboard which is a commercial software and a course management system. Though KEWL is a course management and open source system its popularity is not well known compared to the others thus accounting for its bad results from respondents is very low thus accounting for its bad results.

For Moodle and KEWL their recommendation may be primarily due to the fact that as open source software they are free to download therefore lower in cost. They are also flexible and capable of being customised by the university's programmers. For some respondents the choice may be due to the fact that Moodle and KEWL had widespread user communities that form a good technical support base. These reasons affirms observations made by Peters, 2007 as being true for open source software in general in her article open source vs. proprietary software.

For WebCT and Blackboard respondents choice may primarily be due to the fact that they are reliable, have professional support and training on the software could easily be done by the proprietors training personnel. For some their reasons depicted that they believe in cost going with quality. Thus, the need for proprietary e-learning software such as WebCT and Blackboard.

2.4. KNUST's Moodle E-learning System

Results from this section sought an ICT experts view on the Moodle e-learning system of KNUST. The first question in this section sought to find out whether the ICT experts knew that KNUST's e-learning system was Moodle e-learning software. 93.33% of respondents said they knew that the KNUST e-learning system was a Moodle e-learning system. This implied that the majority of the experts were much familiar with the KNUST system. Furthermore, a question of whether experts think Moodle is suitable for KNUST on the basis of its features, specifications, support and cost depicted that 100% of the ICT experts said it was suitable. Reasons

sought from the ICT experts as to why Moodle is a good e-learning system for KNUST though varied brought to bear Moodle's excellent features which included Moodle's extensive and multiple authentication and enrolment methods, its ability to work with other plugins of varied kinds, it versatility in working with other well known commercial e-learning systems such as Blackboard, WebCT and others and its ability to support different kinds of databases including Oracle, Microsoft SQL server, MySQL, PostgrelSQL and others to mention a few. For its excellent specifications much reasons given by the experts were around the ability of Moodle to operate on different operating systems including Windows and Linux compared to commercial systems such as Blackboard which primarily operates on Windows. In addition, for support of Moodle most of the of the ICT experts liked the fact that Moodle like all other open source systems had a large user and developer community from which support could easily be obtained from. In relation to cost, most of the experts were of the view the fact that it is free to download and setup under the GNU Public License made Moodle very suitable for KNUST given the fact that the university had constant financial constraints. The varied reasons given by the ICT experts buttresses Peters, (2007) acclamation about open source systems for which Moodle is one of them.

2.5. E-learning strategy to implement Moodle at KNUST

For 60.33% of respondents the hardware infrastructure of KNUST seems adequate for e-learning. This fact indeed is quite through given the data and information given by the UITS office of the university (UITS, 2008). It is estimated by the data that there about 3000 computers on the KNUST campus a number of them as computer pools at various departments, colleges and the largest number of close to 300 computers being at the ICT centre of the university. Given the student and academic staff population of the university to be about 23000 and 2000 respectively, it places the ratio of computer to student or academic staff at 1 : 8.3 which is an a good ratio for the hardware infrastructure. However, the distribution of these computers throughout the university is disadvantageous to the students of the university since not much of these computers are at student computer pools where students in university are believed to have laptops. This also seems to go a long way to supplement the computers needed for effective implementation of e-learning.

On the issue of bandwidth, additional information gathered from the UITS and the KNUST ICT policy of the university suggests that the current bandwidth of 9MB expected to be upgraded to 10MB by 2009 is woefully inadequate for the implementation of e-learning at KNUST given that the uplink bandwidth which is actually needed for hosting the e-learning is only 7.5MB. This is buttressed by the ICT experts answer to the question of adequacy of the bandwidth available to KNUST where 100% of respondents said that the bandwidth was inadequate. Furthermore, given that the adequate bandwidth suggestions from the experts ranged from 20MB to 2GB indicates that the 9MB bandwidth of KNUST is woefully inadequate for e-learning.

On educational awareness of the e-learning system at KNUST, the 100% respondent answer of no to the question shows that not much is being done by KNUST to make students and staff aware of the KNUST e-learning system. Indeed, a thorough look at the ICT policy of the university provision is not made for the educational awareness of the e-learning at KNUST. Information from the UITS depicts that not much support is being practically given to make students and staff aware of the KNUST e-learning system. However, the UITS admission to organising workshops for some lectures of the university shows something little is being done towards this awareness though the results yielded out of the initial workshops were not much successful. The implementation of e-learning system at KNUST has not been successfully given that 69.42% representing more

than two-thirds of respondents said no to the question whether the KNUST e-learning implementation has been successful.

Views gathered from the "no" respondents as to what has made the implementation not successful and suggestions they have to make it successful buttress (Heinrich et al, 2007) assertion of things necessary to affect the success of e-learning implementation. Heinrich et al, (2007) assertion included institutional support, student and lecturer support, evaluation and assessment and more to mention a few. In addition, the definition of e-learning as given by Govindasamy, (2002) includes teaching and learning delivery through electronic media such as the CD-ROM. This definition also supports the suggestion of some respondents to complement the online delivery with CD-ROM instructional materials.

2.6. <u>Challenges and Solutions in Implementing E-learning at KNUST</u>

For 89.26% of respondents to agree that KNUST has had some challenges in implementing its e-learning systems affirm why a large percentage of 69.42% of respondents claim that e-learning implementation at KNUST has not been successful. According to Mutula (2000), e-learning introduction into traditional learning has some ramifications, however in the case of KNUST it has been not been rewarding enough give that a great percentage of 89.26% respondents think that KNUST has had challenges in implementing its e-learning system and large percentage of 69.42% of respondents claim that the e-learning implementation has not been successful.

Views gathered from respondents agree with Mahmud (2009) assertion that inadequate ICT infrastructure is a challenge capable of hindering e-learning implementation success. Mutula (2002), also talks about the lack of funds being a challenge to implementing e-learning at KNUST. Thus, the challenge of inadequate finance to procure ICT infrastructure to support e-learning is a problem which needs to be resolved to ensure a successfully implemented.

To add to it, inadequate numbers of well trained staff to guide lecturers and students through the e-learning system is a challenge which Mutula (2002) talks about as necessary to provide solutions to ensure the success of implementing e-learning.

The unavailability of an established reward system to motivate lecturers to incorporate e-learning into their traditional face to face lecturers is a challenge which Mutula (2002), proposes must be solved to ensure e-learning successful.

For solutions to these challenges, the greater portion 93.56% of respondents who said yes to KNUST having had challenges in implementing its e-learning also agree that the challenges are solvable. This depicts that e-learning challenges are really solvable and solutions such as workshop training, available of funds, adequate ICT infrastructure, adequate ICT staff and expansion of wireless network as cited by respondents and buttressed by Mutula (2002) and Mahmud (2009) in their literature will indeed be helpful in overcoming e-learning challenges at KNUST.

3. Conclusion and Recomendations

3.1. Conclusion

The advantages and disadvantages of e-learning span from course accessibility on schedule, availability of courses 24 hours daily, removal of geographical barriers, reduction in the cost of delivering teaching and learning, increased interaction of students and lecturers, material availability both online and offline, improved computer and internet skills of learners and lecturers and accessibility to a wide array of learning resources via the web. Given the disadvantages of e-learning ranging from inadequate bandwidth to inadequate ICT infrastructure the advantages of e-learning for KNUST far outweighs the disadvantages of e-learning at KNUST and other universities in Ghana.

Looking at course management in universities, cost, features, specifications and support for an e-learning system, an e-learning which blends the advantages of a course management system and an open source system is ideal for universities in Ghana and KNUST giving that availability of funds is a major challenge for most universities in developing countries such as Ghana. The Moodle e-learning system considered by KNUST gives an excellent blend of a course management system and an open source system. For KNUST Moodle has been well customised to suit its teaching and learning environment by its programmers.

However, the e-learning strategy adopted by KNUST is not well elaborate in its ICT policy. In addition, the elearning implementation has been a failure due a wide variety of reasons notably among them is poor student and lecturer educational awareness, low motivation for lecturers to blend e-learning into their traditional face to face teaching and learning modes, the inability of the university to adequately support the ICT staff to implement the e-learning system, inadequate bandwidth for implementing the e-learning system and inadequate ICT infrastructure at the university.

Challenges are bound to come along in the implementation of any system. For KNUST, the challenges to implementing its e-learning system range from inadequate ICT infrastructure, poor ICT skills of some lecturers, inadequate funds for implementation, inadequate ICT staff, high cost of accessibility of e-learning by non-residential students and low motivation for lecturers to accept and use e-learning. However, the challenges can be solved using measures such as provision of ICT infrastructure over a period, expansion of KNUST intranet and internet to non-residential student areas via wireless, provision of adequate ICT staff, provision of adequate funds and organisation of e-learning workshops.

3.2. <u>Recommendation</u>

The planning and implementation of an e-learning strategy involves multiple dimensions that need to be taken together for the project to succeed. It is therefore recommended that;

- 1. A reconnaissance of the available ICT infrastructure at KNUST is determined and an elaborate plan drawn and implemented to provide and maintain ICT infrastructure at the university.
- 2. Wireless facilities should be extended by KNUST to non-residential student areas for them to have access to the intranet facilities offered by KNUST to reduce the consumption of bandwidth needed by the e-learning system.
- 3. Educational e-learning workshops should be organised regularly for students and lecturers of KNUST to bring awareness about the e-learning system to them.
- 4. An elaborate e-learning policy must be drawn out and used to implement e-learning at KNUST.

- 5. A reward system must be developed for lecturers who blend e-learning into their face to face lectures as a way to motivate lecturers to use the e-learning system.
- 6. Adequate and well trained ICT staff must be employed by the university to augment its existing ICT staff to help implement e-learning at KNUST.
- 7. A blend of open source system and course management system such as Moodle is ideal for Ghanaian universities given its cost, features, specifications, support and mode of course management.
- 8. E-learning should be adopted in all Ghanaian universities to augment and highly impact teaching and learning given the ever-increasing enrolment figures of most universities.

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"Twists and turns" of climbing the e-learning curve: The story of Masters in Project Management at the University of Botswana

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Abstract

This presentation relates a story of a new project that the University of Botswana (UB) hoped to offer as an online program: Masters in Project Management (MPM)in August 2009. MPM is a collaborative project between the Center for Continuing Education (CCE) and the Faculty of Engineering and Technology (FET) at UB. One of the key priority areas of the CCE at the UB is Extending Access and Participation. The university envisions the CCE as a technology-driven national center for tertiary distance learning which has capacity for expanding the number of part-time continuing education programs at certificate, degree level and professional qualifications (Proposal for the Introduction of Masters in Project Management (MPM) through Distance Learning). The FET on the other hand offers MPM as a conventional program on campus. The proposal to offer the MPM by distance learning reflects new priorities to engage in initiatives in areas where *CCE* has competitive advantages relative to new tertiary education providers; thus, realizing the high demand among working professionals for the current MPM whose recruitment areas is limited to Gaborone (the capital city) and the surrounding areas. The FET and CCE agreed in 2007 to explore opportunities for extending the provision of MPM to the rest of the country through distance learning. Since that time, consecutive meetings had been held with different stakeholders including the CCE, FET directors of Graduate School; Heads of Civil Engineering, Department of Distance Education (DDE), Information Technology Department (IT), Center for Academic Development (CAD) the Library and at a later stage the Faculty of Business (FOB). However, it is apparent that the roles of different stakeholders aforementioned were not clearly articulated and understood. Despite lack of role clarity, major events commenced in March 2008 including identification of tutors, their work expectations, training workshops and some documents providing structures and processes. The identified needs for the training workshop included pedagogical principles of developing course materials for distance learning; instructional design for technology learning environments; the use of the technology; e-moderating and information literacy skills. The proposed MPM project was supposed to start in August 2008. Two and years later since this idea was conceptualized, not much has been accomplished. This presentation highlights the twists and turns of climbing the e-learning curve via MPM project at UB. Some of the "twists and turns" include: unclear rational for starting the project, pedagogical issues, lack of role clarity and lack of commitment and ownership by program owners.

1. Introduction.

The advances of technologies over the years offered the new paradigms for university teaching and learning. The use of multimedia has strengthened the distance learning approach in general and e-learning in particular. The use of visual components such as graphics, video, animation (to mention a few) help to promote learner interaction with content and to understand meaning of what is displayed on the screen or in print. Universities embark on e-learning for varied reasons. Some of the reasons may include: using an online portion of the course as a supplement or hybrid; a standalone course where students are not in the same room at the same time at any point in the course; offering an online course to cater for the working segment of the population which cannot be on-campus ; or offering an online course to boost enrollment and retention in some cases.[1]

The University of Botswana (UB) is not an exception. The University of Botswana, the only national university in the country, has included in its vision statement 'lifelong and open learning approaches' as focal points for the institution. [2]. The university identifies student-centered learning as a key component in its vision, which is one of the important features of online learning. Distance education at the UB has been provided through print materials supported by occasional face-to-face interaction. In its pursuit to climb the e-

learning curve, UB embarked on online learning in 2001. "Online learning emerged as the vehicle through which instructional technologies could be used to teach courses online. It was hoped that the adoption of such technologies would create new avenues for learners to access educational opportunities both on campus and off campus" [3]. Since then, a number of blended courses have been developed and offered through WebCT.

2.1 Literature review.

It is important to revisit some of the research findings about teaching online courses. For the purpose of this paper, I will explore some of the advantages and disadvantages of online course and faculty perceptions of online teaching, in particular faculty involvement in the process of design, development and implementation. E-Learning differs from classrooms teaching in different ways. As a result, converting a face-to-face course to online requires "planning, monitoring and control, to make the conversion effective and economical" [4]. These authors recommend that, "unless the advantages of e-learning outnumber the disadvantages for both educational institution and the learners, converting to e-learning may not represent an efficient solution." The author of this paper concurs with the aforementioned assertions which suggest that needs or situational analysis should be conducted and agreed upon by all the parties involved before embarking in e-learning. All stakeholders particularly lecturers should have a "buy in." Faculty or lecturers should understand why and how they are involved in e-learning.

2.2 Advantages and disadvantages of e-learning.

The advantages and disadvantages of e-learning have been explored extensively in literature. It is important at this juncture to explore some of the advantages and/or benefits of e-learning. E-learning:

...is self-paced, faster, provides consistent content, ...works from anywhere anytime, ...can be updated easily and quickly, ...can lead to an increased retention, a stronger grasp on the subject and it can easily be managed for larger groups of students. [5]

Some quotas argue that e-learning can improve retention because of a wide variety of technology used in elearning such as images, sounds and text. The technology creates learner/learner; instructor and content interaction through chat rooms, discussion board, instant messaging and e-mail etc. Immediate feedback from the instructor is made possible through technology. Learning could be customized to meet the learners' needs which may lead to better understand of the content and fast learning.

The disadvantages of e-learning could include the following: it may be costly to develop, it requires new skills in content producers, and has to demonstrate a return on investment. [6] Some disadvantages of e-learning may include lack of visual cues, intimidation by technology, lack of personal touch and social interaction. If students are not technologically savvy and self-disciplined, learning online could be a challenge.

2.3 Faculty resistance to e-learning.

Faculty or lecturers involvement in e-learning is the cornerstone. If the lecturers are not impressed upon to teach online, the whole idea is bound to fail. Literature confirms some of the reasons why lecturers are reluctant to teach online. Some of the critical obstacles reported in studies are related to persons' resistance to or fear of the many changes that must occur at the individual and organizational level. The cause of reluctance may be due to fear of the unknown; and lack of support and the changing roles of the students. [7] Organizational cultural barriers are also noted as one of the most critical regarding elements of faculty resistance to online innovations. [8]. Perceived lack of institutional support may include inadequate compensation and incentive structures; loss of autonomy and control of the curriculum, lack of technical training and support; and lack of release time for planning. [9]. Lecturers also question the adaptability of courses to the online format. [10] Some resistance may be attributed to lack of knowledge about course design, technology and lack of confidence. Until and unless the

advantages and disadvantages of online, faculty and student involvement and institutional administration are ironed out and fully understood, e-learning could never be a success.

2.4. Lecturer resistance to online teaching at UB.

In a study conducted by the author in 2005 on "Motivational and deterrent factors of faculty participation in online learning at the UB: The case of the UB," the deterrents to participate in online teaching included the following: limited resources/access, lack of technical support and lack of students' readiness to online learning. In this study, lecturers expressed their concern about insufficient physical and human infrastructure. [11] There were not enough computers for students and access was very limited. Students could only access computers from the library when they were on-campus. There was not enough personnel to assist with breakdowns and slow network. Students on the other hand were sabotaging the innovation. Firstly, most of them lacked technological skills (computer literacy). Secondly, "because there were limited computer stations, students removed mouse balls so that no one else can use a computer. They return after they have attended a class and resume their work on what has now become 'their" computer. [12] Despite these challenges, however, " there were a few who despite affirmative responses, cited concerns about the time expenditure required, wanting to see if technical barriers could be removed and wanting more training and experience.[13]

2.5. Masters in Project Management (Online Project).

MPM is a collaborative project between the Center for Continuing Education (CCE) and the Faculty of Engineering and Technology (FET) at the University of Botswana (UB). One of the key priority areas of the CCE at the UB is *Extending Access and Participation*. The university envisions the CCE as a technology-driven national center for tertiary distance learning which has capacity for expanding the number of part-time continuing education programs at certificate, degree level and professional qualification. [14] The FET on the other hand offers MPM as a conventional program on campus. The proposal to offer the MPM by distance learning reflects new priorities to engage in initiatives in areas where CCE has competitive advantages relative to new tertiary education providers. Therefore, realizing the high demand among working professionals for the current MPM whose recruitment areas is limited to Gaborone (the capital city) and the surrounding areas. The FET and CCE agreed in 2007 to explore opportunities for extending the provision of MPM to the rest of the country through distance learning.

Early September 2008, a follow up meeting between Dean (FET), HOD (Civil engineering), HOD (Distance Education) and Director (CCE) established a consensus on the need to offer MPM by distance learning. The meeting agreed that the delivery mode for MPM by distance learning would be primarily online supported with other technologies such as print material, DVD and Video Conferencing. An expert from the University of South Africa (UNISA) who coordinates the MPM online program there and has experience in the provision of online program was engaged to assist in the development of the same at UB. The MPM would use WebCT/ Blackboard online platform as the learning management system. Some online supplementary technology for instruction would include DVD, Video Conference, mobile phones and Internet resources.

The MPM Committee was formulated early 2008. It comprised the Dean (FET) who is the chairperson; identified online tutors; the Dean of Graduate School; some representatives from the CCE; CAD; IT; Library; and the HOD (Department of Distance Education). Since that time, consecutive meetings had been held with different stakeholders including the CCE, FET directors of Graduate School; Heads of Civil Engineering, Department of Distance Education (DDE), Information Technology Department (IT), Center for Academic Development (CAD) and the Library. However, the roles of different stakeholders were not clearly articulated. Despite lack of role clarity, major events commenced in March 2008. These included identification of (would-be) tutors and work expectations. Online tutors for MPM would be lecturers involved in teaching MPM conventional courses. These "would-be" online tutors were lecturers from the Department of Civil Engineering who taught conventional MPM courses.

A training workshop for these "would-be" online tutors was held from 7-10 July 2008. The workshop activities included online pedagogical advice, technological tools and support, resources information (library) and online technical support. Work on course design and development commenced immediately with continued support of CCE and CAD. That is, "would-be tutors" would work collaboratively with continued support of CCE and CAD. A framework for the development and implementation of the online MPM project was developed. The

document outlines the following:

- The online course model and delivery methods that are recommended for the program;
- Maps out the course development process including training and identification of the role and responsibilities of the major stakeholders;
- Identifies an implementation strategy and suggests a roadmap towards the eventual
- launching of the program and;
- Highlights the possible budget items. [15]

Despite all these efforts, no progress was realized in months to follow. Some quotas thought that the "wouldbe" course developers were reluctant because the incentives were not in place and there were no contracts signed. Remuneration package for developing online courses and tutoring was finalized and agreed upon. The rates were adopted from the print-based programs of the university administered by the CCE. In October 2008, the lecturers requested a refresher workshop. The guidelines and a template were developed to aid the course developers.

The refresher workshop was finally conducted in February 2009. At this point a new group of 'would-be" online tutors from the School of Business were brought on board. Lecturers from the School of Business started working on their courses immediately. Interestingly, this group worked with great vigor and enthusiasm. Their counterparts from the Department of Civil Engineering on the other hand were not doing so well except for one lecturer.

Despite the training at both individual and group levels, the "would-be" tutors from the Department of Civil Engineering made no progress on course development. It is against this backdrop that the author wants to investigate why the "would-be" tutors from Civil Engineering are so resistant. One and half years later, not much has been accomplished. The proceeding discussion highlights the twists and turns of climbing the elearning curve at UB using MPM project as a case.

3.0. Twists and turns.

Since 2008, the design and development of MPM online program has been like a roller coaster ride. There had been twists and turns that could be attributed to the following (issues not exhaustive): the rational for MPM online program; lack of role clarity; pedagogical issues, and lack of commitment of some course developers.

3.1. The rational for MPM online program.

In the Proposal for the Introduction of Masters' in Project Management (MPM) through distance learning; the rational for introducing the MPM via e-learning states that:

The introduction of technology-driven graduate level program has been necessitated by recent developments in tertiary education which have witnessed the emergence of new tertiary education providers in Botswana. The introduction of predominantly pre-degree providers encourages CCE to undertake a review of its strategic operations and priorities within the content of its relative strengths and advantages. [16]

The development of tertiary education in Botswana particularly the new private tertiary education providers create competition among tertiary institutions. Presently there are about thirty-two private tertiary institutions in the country some of which offer franchised programs ranging from certificate to diploma levels. Most if not all of these institutions are dependent on the Government sponsorship of students, hence the competition for students and finance.

3.2 Lack of role clarity.

Even though at the beginning of the project, major stakeholders were identified and their roles defined, the implementation of such failed. The stakeholders identified for the project included the following: Faculty of Engineering(FET), Center for Continuing Education(CCE),Center for Academic Development(CAD),the School of Graduate Studies(SGS),Information Technology(IT), Faculty of Business(FOB) which joined a bit late in the process and Library Services(LS).Some stakeholders did not do what they were expected to do. For

instance, CAD is expected to play a significant role in the course design phase giving advice on appropriate technology (i.e. media/tools etc.) to use. But their contribution is not visible. Naturally, as a graduate program, the advice from the SGS is very crucial but "it looks like as and when their advice is needed they would not be available."[17] The examples are not exhaustive. Lack of role clarity may result in confusion and impede progress on course development and the ultimate implementation of the project.

3.3 Pedagogical issues.

The lecturers may be reluctant to online teaching if they have "strong pedagogical reservations about online teaching." The CCE's role was to manage the development of the course materials for delivery; in particular to provide pedagogical leadership. The CCE is/able to attain the role. However, CCE "has been slow in some instances to define and refine certain processes related to course development. For example, the ICARE Model seemed to be a challenge to lecturers and perhaps a clearer guide should have been given earlier." [18] Unfortunately, the design statement format used in course organization was not developed with the ICARE model in mind, "therefore, translating the design statement into ICARE reality has…been a challenge to the lecturers".[19] It is important to note that if the lecturers' apprehensions are not addressed and resolved, the possibility of course success is farfetched.

3.4 Lack of commitment and ownership.

It is quite clear from the performance of "would-be" online tutors from the Department of Civil Engineering that, there is limited ownership of the program. The lecturers from DCE are not giving the project the expected attention. There is total lack of motivation despite the financial incentives introduced. There is completely no "buy-in" from these lecturers. In its meetings with the "would-be" tutors, the Project Committee attempted to determine the reason for the lack of enthusiasm. Lecturers give several reasons that include: heavy workloads (of teaching conventional courses); lack of time due other work commitments; unclear pedagogical practice in online teaching particularly the ICARE model etc.

4.0 Conclusion.

This presentation highlights the twists and turns of climbing the e-learning curse at the UB through the proposed online MPM project. It is quite clear from the MPM proposal that the rational to start the MPM online program was a "top-bottom" approach. The decision to embark on this project was made by the university administration. The administration essentially forced lecturers to use online technology to teach MPM.As a result there is no "buy-in" from the lecturers. The UB management was reactive to current development of mushrooming private tertiary institutions that created competition instead of being proactive in its approach to focus on the current trends of improving teaching and learning through the use of technology. Management did not bring lecturers on board ahead of time to determine the reason and possibility of embarking on this project. Thus, lecturers did not know why they were undertaking this project hence, the resistance. The author believes that the lecturers are not enthusiastic to participate in this project because of "forced online teaching." "For some faculty a forced online adaptation can be the difference between a years or two earlier retirement."[20]

The MPM proposal which is a guiding document in this project is silent on whether a clear situational analysis was conducted to see the viability of the project (e.g. student and lecturer readiness, available technology, resources and e-learning solution etc.). At the beginning of the project there was a lot of uncertainty on the level of readiness and understanding of the nature of e-learning solution. [21] Pedagogical issues were evident as one of the reasons for lecturers' resistance. It was evident that the "would-be" online tutors did not fully understand how to convert face-to-face courses into online format. Some of the reasons given by lecturers for not writing included (a) time constraints, (b) lack of skills and understanding of how online course are developed, (c) absence of appointment letters to mention a few. Even after attending mini-workshops and contracts/appointment letters were finalized, there were still no results from the FET lecturers.

Structures and processes in the form of key documents such as (A framework for the development and

implementation of the online (MPM) were not readily available when the process of design and development of materials commenced. The remuneration packages and appointment contracts were developed in progress. These structures and processes should be ready before the design and development of course materials could be started. The University of Botswana should learn from the best practices such as the St Cloud State University for example, which provided a number of options for faculty training. One of such training includes "Boot Camp," for novices running four hours each day for three days, three hours of instruction, one hour for course development for three days. This gives the lecturers a one-on-one opportunity to meet with the instructional designers, media online developers, graphic designers etc. For any institution that embarks on an online program, management should consider both "Proactive vs. reactive training" and "Voluntary vs. forced online teaching." While I appreciate that it may not be an easy task for institutions to rely on voluntary participation of their lecturers to teach online, I argue that management should not force their lecturers to do this because it is a recipe for disaster. It is also imperative to conduct situational analysis before embarking not only on online programs but in any new innovation. Lecturers need a strong, positive administrative leadership to encourage them to incorporate technology in instruction [22] University administration should take heed of lecturers' perspectives since they are the ones that implement the initiatives that drive institutional growth and competitive advantage.

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Implementing E-learning in Higher Open and Distance Learning Institutions in Developing Countries: The Experience of The Open University of Tanzania

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Abstract

Tanzania like other developing and developed countries, one of the delivery modes of higher education is through open and distance learning. The Open University of Tanzania (OUT) is an accredited government institution that offers degree and non-degree courses through open and distance learning mode. The dominant content delivery mode at OUT Tanzania is printed-based materials supported largely by face-to-face sessions. However, the use of printed materials faces challenges as they are expensive and sometimes while printing the learning material new knowledge might emerge. With the current globalisation where communication is mediated through internet, e-learning can be used to supplement face-to-face sessions which are rarely organised. It cannot be underscored that e-learning has great potential in enhancing communication between the instructors and the learners, creates active engagement with the content, and do further create an avenue towards delivering instructional materials in open and distance learning (ODL) system. There are challenges pertaining to e-learning skill development among course lecturers and students that include low digital bandwidth; expertise in elearning; e-learning infrastructure; incentive packages for retaining skilled personnel; low budget, few funding for research on ODL; and costs of elearning equipments with its associated after sales contract adversely affects the implementation of e-learning.

The paper provides experience of implementing e-learning and its challenges and prospects. Focus is on managing e-learning, technical aspects on course development, and the skill development strategies among its educational stakeholders.

Introduction

E-learning can be referred to as the design, development and delivery of instructional materials by electronic devices, such as computers, mobile, CDs and DVDs [1]. In e-learning interaction between the learner, the instructor and the learning content is mediated by use of information and communication technologies (ICT). Implementing e-learning in open and distance learning (ODL) is imperative as shapes the study environment according to the learner needs [2]. E-learning supports both the traditional and the open and distance higher education delivery mode. In the era of globalization knowledge has no boundary. The transmission of knowledge from one end to another end of the world which in the past was difficult has been made simple with the use of internet. Internet, through e-learning has potential to change educational delivery from teacher centred to learner centred and thus seem to be one of the best support system in distance learning. Distance learners are characterized by being separated in time and space between the instructor and the learner [2]. A well established e-learning platform with barrier free to the learner might contribute much toward distance learner's achievement. Issues are how to implement elearning in higher open and distance learning institutions in developing countries where the economies of scales are lower.

ICT might increase flexibility to the learning process by providing instructions in formats that creates interest to the learner [3]. The interest is created through animation, drawings, figures, sometimes movies and the learners have options in selecting the format of learning content to use. The current ICT has changed not only educational delivery but also social interactions, business practices, political engagement, media, health, leisure and entertainment [4]. This compounds the necessity of e-learning not only by the developing countries but also the developed countries. Though internet started in Tanzania in 1996 [5] awareness has increased the demand of internet by different groups of individuals and has increased the demand of digital bandwidth.

Importance of ICT has been emphasised in Tanzania. The Tanzania vision 2025 document states clearly the contribution of ICT towards competitive social and economic transformation [6]. In the vision 2025 ICTs are acknowledged as the driving force for its realisation. Of the steps toward realisation of the vision 2025, Tanzania, has succeeded to attract donor agency to support efforts toward implementing ICT in schools. SIDA has supported ICT initiatives in Tanzania [7]. Tanzania has shortage of ICT-skilled personnel, and both internal and external connectivity are expensive. Regardless of the costs and skilled personnel, ODL is seen as a viable means to the attainment of the Tanzania vision 2025.

The experience of the Open University of Tanzania (OUT) is taken as an example because is the earliest higher education institution that provides both degree and non-degree courses in Tanzania. The non-degree courses are the courses that provide skill training like community development, distance education and computer application skills. There is also a non-degree course, foundation course, providing opportunity for those with low qualifications to join university upon successful completion in a degree programme of their choice. OUT was established through Act no. 17 of 1992 and became fully operational in 1994, admitted 766 students [8]. Through the expert advice from the Commonwealth of Learning (COL) for successful implementation of open learning OUT was advised to establish centres in all regions in Tanzania [8]. It started though rented buildings. By May 2009 OUT had already secured permanent buildings in Mbeya, Iringa, Ruvuma, Singida, Dodoma and Kilimanjaro while in Tanga, OUT arranged a 20 year agreement with the national trade union umbrella association (TUCTA). To speed up acquisition of permanent buildings in different regions, OUT, formed a management body at regional level that ensures the smooth running of the regional centres, Regional Advisory Committees (RAC). The RACs are headed by the Regional Commissioners. The aim was to speed up development in the rural areas through the expert advice from the RAC members toward supporting human development at local level. OUT believes that if in each region a large number of people join the OUT degree and non-degree programmes, it is likely that they would continue serving within the region and hence act as regional development catalysts.

OUT efforts like formation of RAC, ICT skill training in regional centres and implementation of e-learning are meant to increase higher education participation. In Tanzania like other sub-Saharan Africa, higher education participation is said to be low [9]. OUT by 2009 had enrolled 44,099 students of which 5117 have graduated from different degree programmes [10]. As the case in many developing countries, OUT is a fast growing institution, lecturer to student ratio has narrowed from 1:57 with 113 academic staff in 2002 to 1:108 with 246 academic staff in 2009. This partly is the impact of the successful implementation of Primary Education Development programme, PEDP [11] that has resulted to increased enrolment to about 83.5% [12] and the expansion of secondary schools. The success of PEDP resulted into another educational development programme, the secondary education development programme (SEDP).

Strategies to absorb the upcoming enrolment as a result of implementation of PEDP and SEDP might need to be laid down as the conventional universities

cannot accommodate all the students. One option is to enrol them in distance and open institutions that are likely to take many students. This might increase pressure among lecturers. At OUT lectures do face challenges on how to provide support to students [13]. Distance learners do require regular communication and interactions with the service providers. With increasing pressure of work there are possibilities of facing problems of insufficient and outdated reading resources and timely delivery of assignments and course materials [13]. Apart from other strategies that might be sought, ensuring implementation of education for all (EFA), millennium development goals (MDGs), poverty reduction and social inclusion of all people, quality higher open and distance learning through e-learning is seen to be imperative. E-learning is good to be used to up-skill or re-skill workers, students, adult learners, and employees. It is to this end OUT apart from the skimpy resources is embarking on implementing e-learning.

Challenges in implementing e-learning in ODL in developing countries

Different from the traditional universities, where student population normally is concentrated in one place, in higher open and distance learning, students are scattered in many places. Challenges then are how to support students who are located in different places. Sometimes, location cannot be a problem if infrastructures, in terms of communication, and physical buildings equipped with internet connectivity, ICT equipment, relevant software and training opportunity are in place. Like other developing countries, problems of poor supply of power, lack of internet connectivity, and in some places lack of telephone and mobile-phone services are widely acknowledged. The most affected places are the rural areas. Learners in remote areas where they have no access to ICT equipments, have to travel long distances for the services. Where university try to reach students in their places through building centres and supply centres with ICT technologies, there are limitations, that include low budgets, low capacity to purchase bigger digital bandwidth for e-learning, most of the staff and students lacking skills in use of ICT, ICT technologies fast turnover, low economies of scales in purchasing ICT equipment within the learners, shortage of technical staff to ensure smooth running of ICT equipment in the regions, and that it is difficult to estimate the resource needed in each region. Such challenges are non-existent in the traditional mode of higher education.

Apart from flexibility in employing e-learning, there are challenges in implementing it. The challenges are not only in the developing countries but also the developed countries. These challenges include reluctant of professors to put their courses online [14]. The policies guiding promotion and work retention, skills in developing content that guides self learning, the technological turnover, skill training to both students and staff in managing and using ICT equipment and the shift of paradigm from teacher centred to learner centred need to be looked into diligently. In the case of developing countries other challenges include costs of digital bandwidth, availability of funds to purchase ICT equipments, costs of software, large number of students as compared to available human resources, after sales contracts on ICT equipment, availability of power, and infrastructure for e-learning not well developed and limited choice of technology to use. The available open source software which might be seen as the best choice for software, meets a challenge of few expertises to develop e-learning platforms for students and lecturers to use [15].

The available opportunity for use of open educational resources is hindered by the poorly developed ICT infrastructures and shortage of experts to contextualise the materials [16]. Well developed e-learning infrastructures and the available OERs are likely to contribute in the implementation of millennium development goals (MDGs). Open educational resources are free to use and thus are likely to open access to many individuals who are constrained with space and time. The training requirement is much higher in the recruitment of teachers. Use of open educational resources has been cited as one of the viable means to educate many teachers, both pre-and in-service [17]. In this case introduction and implementation of e-learning is likely to contribute to the manpower development.

The open university of Tanzania is different from many other open universities as it embraces entry qualifications. However, those who do not meet the required qualification and have at least minimum set qualification are registered to the non-degree course, the foundation course. Those who succeed in the foundation course are registered to the degree programme. In that student population at OUT is of the same qualifications as other students in other conventional universities regulated by the Tanzania Commission of Universities, TCU [8]. With successful implementation of PEDP and the current SEDP a number of students who have qualifications do not get admissions in the traditional universities. Thus OUT still have many students in both degree and non-degree courses.

There are options in implementing e-learning using mobile phones, CDs, DVDs and audio tapes for delivery of learning materials. In using phones, it has been noted that there are more hidden costs to the students, and thus makes higher distance and open learning more expensive. Similarly, not all places are connected to the mobile phone technologies. Using the offline technologies meets challenges of equipments to read the materials stored in CDs, DVDs,

Audio tapes and other types of memories one uses to store documents for later retrieval. Taking consideration to people with disabilities, both acquisition and skill training on use of equipment are challenges to students and the lecturers, especially those with visual impairment. Where the technology is available literacy to use of ICT equipment such as computers and mobile phones to access information might be another hindering block to implementing e-learning in open and distance learning in developing countries [4,18].

E-learning at The Open University of Tanzania

The Open University of Tanzania, in realizing the challenges ahead on implementing e-learning, established institute specifically dealing with issues of ICT, The Institute of Educational Technology (IET). In ensuring that IET works smoothly, there are two major departments, these are the Information and Resource Management (IRM) and the E-learning. IRM is responsible for ICT infrastructures and technical support for the University and the E-learning department is responsible for e-learning services to students and staff, research and development (www.out.ac.tz).

In the e-learning department there are 5 sections these include the African Virtual University Learning Centre (AVU-LC) responsible for skill training and professional tailor made courses. The Print media section is responsible for the university publications, in terms, of editing, proofing, typesetting, publishing and printing various OUT documents including the study materials. The Assistive Special Technology Unit, the section supported by the David Anderson African Trust (ASTU/ DAAT) is responsible for facilitating learning of distance learners with special needs, including those with disabilities. The elearning development and multimedia section (EDMS) is made up of two units, the instructional design and delivery unit (IDDU) and the Multimedia and production unit. Both the two units in the EDMS are responsible for facilitating integration of technology in the distance teaching through providing both technical and pedagogical support for design and delivery of e-learning contents suitable for distance learners. The other section in e-learning department is the ICT research section, responsible for conducting research and evaluation on the learning support services available for distance learning in different course programmes. Therefore one can conclude that the e-learning department plays a greater role in the sustainability of distance learning at the OUT.

E-learning department is supported by the IRM department. E-learning materials in the process of development and delivery require special infrastructures in place, of which IRM is responsible. The IRM department is made up four sections. The infrastructure management section is responsible for

networking, hardware, and routine maintenance and repair. The database and system administration section is responsible for development of software and server management. The office automation section, responsible for website development, maintenance and administration, control of virus/worm/spam management, software licenses, patch and service pack development. The service control section in accomplishing its duties has four units include the system security and administration, helpdesk, quality and standardisation, and planning and development. Whereas the functions of e-learning is to provide learning resources in formats compliant to distance learner needs, the IRM ensures that there are infrastructures in place to ensure that materials are prepared and that prepared materials are delivered to the clientele for use.

In ensuring smooth running of operations in IET at OUT, policies and operational guidelines are developed and updated periodically to meet the emerging needs. The plan at OUT is to review ICT vision, mission, policy and implementation plan after five years. The current reviewed mission is "to use ICT as a strategic tool in facilitating provision of quality open and distance education, research, and public services" and the reviewed vision is "to have state of the art ICT platform to facilitate the delivery of affordable quality education through open and distance learning, dynamic knowledge generation and application" (OUT, 2004). In facilitating learning OUT through the use of ICT developed a website (www.out.ac.tz) where most of the educational resources placed for students to use. One of the major electronic learning materials for different subjects. The OUT website provides also a platform for OUT e-learning, student mails, different announcements and other relevant information for OUT students and the public.

With the support from Swedish program for ICT in Developing Regions (SPIDER) IET at OUT has made a progress in providing services to the public. SPIDER support started in 2006. IET in ensuring that electronic learning is a tool for academic, business and the general life activities established ICT skill training centres. By 2009 had 5 centres providing skill training that enable a graduate from such a programme to be able to confidently use ICT equipment for work and personal advancement. There are also professional and tailor made course offered in order to enable a graduate to perform specific job requiring special skills. Such courses are a bridge to skill training courses. This has increased demand for skilled staff to manage the emerging and increasing number of students at OUT. To ensure quality services in short courses, the skill training, the professional and the tailor made ICT courses, IET decided to hire trainers. The trainers are given a number of students to train, students and the

IET management evaluate the trainer. Once the trainer is seen not delivering up to the set standards and students are unsatisfied, such a trainer is stopped training. As IET always have a number of trainers another one takes the class. This has made OUT to have a large number of students to train ICT skills.

As OUT is spread through out the country, communication between the headquarters and the different regional centres has been enhanced through internet connection. For effective communication the OUT plans to have technicians in each regional centre with a student computer laboratory. The technicians among other things are expected to ensure that learning management system is always working. Currently, OUT is using MOODLE as an e-learning platform. Already there are courses that have been uploaded for students to use. Apart from learning platforms other services expected to be included are a number of e-journals, e-books and the general library information to be accessible through OUT website. Such developments are meant to realise the vision, mission and implementation strategies set by the IET at OUT for the purpose of easing the learner and researcher from learning resources constraints.

Periodically staffs are trained in new developments of ICT usage. For example in ensuring that lecturers and students are capable of using MOODLE platform, training is periodically conducted. Lecturers are trained how to develop the course and upload relevant information to the students and students are trained how to use. Apart from training in both skill and use of platform, lecturers are trained on how to conduct research in distance education. In collaboration with Commonwealth of Learning (COL) in 2009 a number of staffs have been trained on how to conduct ODL research and have prepared proposals for such studies.

There are positive changes, OUT students enrolment in skill training have increased. This indicates already there are some positive changes toward embracing e-learning. Efforts are underway to start training students with visual impairment in using ICT in their learning using the Dolphin Pen programme. The plans to implement the project for people with visual impairment are to liaison with the Tanzania Educational Authority (TEA) and the Sight Savers International in supporting students with visual impairment. The Open University of Tanzania started enrolling students with visual impairment since 1997 with support from David Anderson Trust Fund (DAAT) based in UK. DAAT provided funds that enabled construction of three recording studios. The studio is responsible for recording learning resources into audio cassettes and provides both audio cassettes and the cassette to students with visual impairment. This is one of the strategies to increase participation rate for people with special needs and disabilities in Tanzania.

Implementation challenges and prospects

Apart from support implementation of ICT at OUT has not been smooth. As an ODL institution in a developing nation is facing a number of challenges that include ICT infrastructures, human resources, attitudinal factors and the low budgets. Such factors are to be considered in order to effective implement elearning. The belief at OUT is that we can not stop implementing e-learning because of constraints, what is important is to address such challenges bit by bit and forge collaborations with other partners.

ICT Infrastructure

In addressing the challenge on ICT infrastructures, OUT made a number of plans that include: hosting OUT website to the Tanzania Telecommunication Company Limited (TTCL), use of mobile phone, establishing computer laboratories in regional centres, planning to use solar power in case of power cuts, use of VOIP and joining to Tanzania Education and Research Network (TERNET). TTCL is the largest telephone company in Tanzania. Hosting OUT website to TTCL meant to have an assurance that OUT website is likely to be accessible in all parts of Tanzania and outside Tanzania. As also TTCL is in a developing country faces challenges that eventually OUT faces. Such challenges include power problems, technical matters for maintenance and repair and lack of enough competent and skilled staff to manage the systems.

Use of mobile phone technology is in pilot phase and there is a discussion going on with mobile phone companies to reduce tariffs for e-learning materials. The use of telephone has been chosen because of the availability of phones in many places in Tanzania, including the rural areas. Our understanding is that if Mobile Phone Company reduce tariffs for e-content the realisation of education for all might be possible, as many people will have access to the learning resources. The use of mobile phone is flexible and that power challenges are minimal, as there are possibilities of charging phone using normal batteries. As OUT in addressing the challenge of power problem, in some regional centres, with computer training it is expected to have a standby generator. However a long plan solution is to use solar power.

As plans are to have internet connection in all regions and study centres, communication has been sought the main driver for change. In that VOIP has been earmarked to be one of the solutions for communication. VOIP are likely to reduce costs of normal telephone line and depend on internet communication on all matters, both academic and administrative.

Human resources

To embrace e-learning one need to have a motivated staff, enough number of academic staff, and e-learning development professionals. For one to be motivated there are important aspects that need to be considered: one need to have necessary skills for the job, resources necessary for the job to be performed, a working environment, assurance of the job security and assurance of the social support including the wages. However, apart from the institution incentive scheme, the institution has no power over the workers wage. Wages are controlled centrally by the government. The challenges at OUT has been how to get skilled personnel for e-learning and how to motivate them so that they continue delivering services at OUT. In that OUT established an incentive scheme, the skill training for the staff, and also established a course B.Sc(ICT). Both the incentive schemes, the skill training for the staff and the B.Sc(ICT) degree programme are meant to create e-content development professional and users.

Attitudinal factors

Attitudes in distance education implementing e-learning might include attitude toward the technology which is mediated by the fear of new technology. However, practice overtime might reduce the anxiety and make a person embrace technology [19]. It is these realisations OUT plans are to have students ICT laboratories in the regional centres. There are also attitudes toward distance education teaching methods which might also contribute to disliking of the distance education. OUT has employed a number of teaching modalities that would persuade students to learn through distance. For example, there are courses that have intensive face-to-face sessions such as MBA, B.Ed (special Education) and the B.SC (ICT). Similarly, all the ICT skill training courses are short courses where students are engaged in learning for about 2 hours a day. The variety of teaching modalities through distance learning provides students with a choice of the mode of study.

Most of the students are in remote areas, in that; OUT is suitable for many people as it is a unique government institution of higher learning in Tanzania that does not require its students to be on campus. On the contrary, it takes education closer to doorsteps of students and therefore enables them to study freely anywhere. This system not only does not uproot them from their employment obligations but also is so flexible that a student is allowed to learn at own pace, can postpone studies once finds oneself in difficulties and later on resume studies. For efficiency purposes, 25 regional centres have been established throughout Tanzania Mainland and Zanzibar. These centres function as nuclei where students meet OUT staff to acquire strategic advice on how to study on their own, obtain study materials and a place where students converge to study. Moreover, in such centres, where spaces are available, tests and examinations are conducted. The Modus Operandi of OUT if well supported is likely to increase the participation of many people including people with special needs and disabilities in education. In this way OUT has specified strategies to address issues of attitude toward student and teacher interaction and attitude toward being a remote student.

Conclusions and way forward

Contributions of e-learning toward design, development and delivery of learning resources in higher Open and distance learning institutions cannot be underscored. In Sub-Saharan Africa where participation in higher education is low [20], e-learning is likely to support efforts of increasing participation as creates learning environments that are student centred, free from barriers of space and time. Challenges of connectivity, ICT equipment, software, training, infrastructures, low budgets, scales of economies among learners and attitudinal factors among social members, are to be tackled while implementing. Research is needed in each case so that informed decisions are made in design, development and deployment of ICT components in supporting learners. Such research need to be carried periodically during implementation stages. Efforts by OUT is to staff all regional centres with academic staff and establish ICT skill training courses to the public in all regions. Improved support systems to the students are likely to encourage many students to join OUT and hence contribute more in the implementation of the Tanzania vision 2025, the EFA goals, the poverty reduction strategies, and the Millennium development goals.

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Investigating the Strategies to Cope with Resistance to Change in Implementing ICT : A Case Study of Allama Iqbal Open University

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Abstract

When technological change takes place, employees with positive attitude not only accept new ways of doing work but also become a motivational force to other staff members. Allama Iqbal Open University (AIOU) intends to make the best use of Information and Communication Technology (ICT) in administration, servicing and academic departments. Since it is partially launched but before implementation at mass level, this study is carried out to determine the staff attitude towards ICT. Technology Acceptance Model (TAM) is mostly used by researchers to predict the attitude and behavior towards technology and information systems in different settings. However an extended TAM model is used in this study to better predict the attitude with the help of perceived usefulness, perceived ease of use and an additional variable of subjective norm. By adopting stratified sampling the whole population was divided into three strata and 25 % of each strata was taken as sample. Quantitative results collected using questionnaire survey, indicate negative attitude in some employees but most of the respondents have positive attitude regarding ICT. This study provides empirical evidence to support theoretical model, which show that attitude is significantly associated with perceived ease of use, perceived usefulness and subjective norm, while behavior intention is found significantly related with attitude.

Introduction

In the current scenario, information and communication technologies (ICTs) have pervasive influence on the economy as well as other parts of society all over the world. ICT in educational sector is treated as application of computers and digital equipment to all phases of teaching and learning. Distance education based institutes and universities are taking full advantage of ICT, by providing education to widely separated students using computers and telecommunication means nearly each part of the world. Allama Iqbal Open University is providing education through correspondence and largely dependent on the postal and courier services. Admission processes, mailing of books and assignments submission are the main activities that are rendered through correspondence, bearing university huge amount of expenses. The management has planned to launch ICT in each phase of learning. Students will be sent soft copies of books through Internet, with schedule, assignment questions and related study material. They will be assigned user account, through which they can submit assignments and put queries with the lapse of time on academic and administrative matters. It is further planned to arrange E-meetings using groupware weekly or fortnightly to discuss problems and issues arising during course of study. Since all this process requires drastic change that technology (ICT) brings in the operations of teaching and learning. Therefore this survey is designed to determine the attitude of employees (officers/officials) about the implementation of ICT. Attitude reflects

how one feels about something. It is a favorable or unfavorable evaluative reaction towards something or someone that exhibit ones beliefs, feelings, or intended behavior. The components of attitude as defined by Robbins (1999) are, cognitive, affective and cognitive. The cognitive dimension relates with our thoughts, beliefs, and ideas about something while affective or emotional refers to the feelings or emotions that something evokes. Conative or behavioral component relates with the tendency or disposition to act in certain ways toward something. Whenever innovation is implemented on education or business area, it ultimately stimulates some responses. The reactions against technological change are quite natural. Employees usually resist change until unless they get tired of existing state or have negative view about present state. Their attitude towards change varies from time to time as they start understanding the impact of change. Staff with positive attitudes are desirable, and negative attitudes undesirable during the process of implementing and using ICT (Spacey *et al.* 2004a). Because attitude directly influence the services offered to the users.

Since ICT has brought fruitful results in different pubic and private organizations operating in Pakistan. Therefore employees of AIOU may voluntarily accept better and advanced way of doing official work. This study empirically tests the attitude and diagnose whether people are willing to accept technological means for the disposal of official work or reluctant in other way.

1. Literature Review

Extensive review of the literature reveals that there is not any instrument designed to measure the attitude towards ICT implementation. Most of the researches are based on analysis of Technology Acceptance Model (TAM), which is the most influential extension of Ajzen and Fishbein's Theory of Reasoned Action Model (Figure1. TRA) in attitude measurement context. Theory of Reasoned Action premise that a person's intention is the main predictor and influencer of behavior . According to TRA, there are two main influencers of intention. They are the attitude towards the behavior and subjective norm. Attitude towards the behavior is defined as "the individual's positive or negative feelings about performing a target behaviour". Subjective norm is defined as "an individual's perception that most people who are important to him think the behavior should be performed" (Ajzen and Fishbein, 1980).



Davis (1989) replaced many of TRA's attitude measures and introduced Technology Acceptance Model (Figure 2. TAM), suggesting how users accept and use technology. TAM was specifically designed to measure the technology acceptance rather attitude, because organizations

have a strong interest in understanding why people accept information technology (ICT), and a strong prediction be made about responses, while introducing technological change (Morris and Dillion, 1997).



User acceptance is defined as "the demonstrable willingness among a user group to employ information technology" (Morris and Dillion, 1997). Later another modification was made in TRA by Ajzen (1991) by presenting Theory of Planned Behavior (Figure 3. TPB) to link attitude and behavior. It proposed that attitude towards the behavior, subjective norm, and perception of behavioral control are the main elements of behavioral intention. If these three are positive, then behavior intention must be positive, performing ulitmate behavior.



TRA was mainly focused on the variables that caused performing behavior while TAM was more influential in predicting system acceptability. TAM was found to be reliable and user friendly model in predicting the system acceptability that is the reason it is used by many researchers to know the acceptance of software packages, IT system usage and different other information systems (Davis *et al.* 1989; Dishaw *et al.* 2002; Mathieson, 1991; Straub *et al.* 1997). Morris and Dillion (1997) state that TAM is proved to be valid and reliable instrument to predict technology acceptance. The main benefit lies in its simplicity, cost-effectiveness and predictability (Morris and Dillion, 1997). TAM is a parsimonious theoretical and empirically justified model, intended to explain the acceptance of information system (IS) (Heijden, 2003). The model suggests that when users are presented with a new technology such as ICT, a number of factors influence their decision about how and when they will use it, like, perceived usefulness

& ease of use (Davis, 1989). Perceived usefulness was defined by Davis (1989) as "the degree to which a person believes that using a particular system would enhance his or her job performance while, Perceived ease-of-use is "the degree to which a person believes that using a particular system would be free from effort". Since TAM has been used in different empirical testing and yielded statistically reliable results, therefore it is considered to be a useful theoretical model in helping to understand and explain user behavior in Information system implementation (Legris, et al 2003). Furthermore, they are of the view, the research using TAM may benefit from examining the introduction of business process application. But in the real world there are many other constraints, such as time constraints, environmental or organizational limits and unconscious habits, which limit the freedom to act (Davis, 1989).

This is the reason, mostly researchers added other external variables to minimize the constraints and social influences to fit TAM in accordance with respective business setting, as Malhotra and Galletta (1999) added a variable of psychological attachment that contained social influence on user attitude towards technology. Ong *et al.* (2004) proposed an extended TAM model with a new construct, "perceived credibility" to examine factors affecting engineers acceptance of E-learning. Results showed that perceived usefulness had most significant effect on user's acceptance of E-learning. Perceived ease of use was found to be an important antecedent to perceived usefulness and perceived credibility. In contrast, when TAM was used to know the Internet utilization behavior of individuals, perceived ease of use found to be the strongest determinant of user attitude towards Internet use (Shih, 2004a).

But when TAM was extended to predict consumer E-shopping behavior with the help of other variables such as web security, perceived quality and user satisfaction, the study confirmed the theoretical postulation of TAM as both PU and PEOU determined consumer attitudes toward Eshopping. Secondly, attitude significantly and positively affected consumer acceptance (Shih, 2004b). In another study to predict on-line shopping when augmented TAM was implemented with additional variables of compatibility, privacy, security, normative beliefs and self-efficacy. All augmented TAM variables along with perceived ease of use and perceived usefulness were positively related with attitude except privacy, while attitude was positively related with behavior intentions (Vijayasarathy, 2004). Therefore, different researchers made different attempts to tailor TAM to best suit with their respective environment and found varying results. In some cases perceived usefulness found to be positively related with attitude and sometime perceived ease of use, but most of the time both found to be positively related with attitude. At contrast, different findings were originated from the study of Hsu and Lu (2004), who used extended TAM to know the reason why people play online games. Results reflected no positive relation of perceived usefulness with intention to play online games. However, both perceived usefulness and perceived ease of use had direct affect with attitude. He further explained that online games are for entertainment and people play games only to satisfy fancy or leisure, therefore added variables like flow experience and social norm had direct impact on the adoption of on-line games .

Heijden (2003) made different attempt and extended TAM with the help of two constructs "perceived enjoyment" and "perceived attractiveness" to determine the factors affecting the use of websites. In this study, perceived usefulness and perceived enjoyment were mainly used as independent variables while perceived ease of use and some other external variables were mediated by these two key beliefs. It was concluded that TAM proved to be quite useful to explain behavior to use websites, as perceived usefulness, perceived ease of use and perceived

enjoyment were positively related with attitude and attitude was positively related with intention to use.

Different attempts were made to implement TAM in different organizational settings. By keeping in view the reliability, flexibility and simplicity of Technology Acceptance Model (TAM), the author preferred to use a modified version of TAM (Figure 4) with an extended variable of subjective norm. Subjective norm has been used by Davis and Venkatesh (2000) in TAM2, as they were of the view that subjective norm was among the external forces (other forces were image and voluntariness) that may have affect on individual decision to adopt or reject new system. Therefore, this study mainly focuses on understanding the relationship of perceived usefulness, perceived ease of use and subjective norm with attitude in terms of technological acceptability in AIOU.

2. Research Methodology

Objectives / Aims of the research study

The main objectives of the research study were:

- Determining the attitude of staff towards implementation of ICT.
- To investigate the relationship between Independent variables (Perceived Usefulness, Perceived Ease of Use and Subjective Norm) with dependent variable (Attitude).
- To recognize the degree of association between Independent variables and dependent variables.



Hypothesis

On the basis of Research model, following relationship was hypothesized. The basic assumption was that perceived usefulness, ease of use and subjective norm (independent variables) would have positive relationship with attitude (dependent variable) in AIOU setting, which in turn positively affects behavioral intention:

- H1 : Employees have positive attitude towards Technological Change (ICT)
- H2 a : Perceived usefulness is positively related to attitude
- H2 b : Perceived ease of use is positively related to attitude

- H2 c : Subjective norm is positively related to attitude
- H3 : Attitude is positively related to behavioral Intention

Research Instrument

Primary data was collected through questionnaire. The questionnaire had two sections, one for demographical information and the other was amended TAM section. The responses for questions made use of different methods like tick-boxes, circling answers and inserting their own comments and suggestions. Demographic section was based on tick-boxes and consisting of seven questions on age, gender, qualification, department, status, rank and total experience at AIOU. The amended TAM section, which was named as attitude measurement section, had five sub-sections to determine score of independent and dependent variables. It was based on five point likert scale ranging from 1. Strongly disagree, through to 5. Strongly agree, developed by Renis Likert to enable respondents to answer questions according to the intensity of their attitude.

Sample

For sampling, a combination of two sampling types was used. At first, by adopting stratified sampling method, the whole population was divided in three strata, i.e. administration, academics and servicing. Total staff strength in AIOU Head Office is 1272 apprx, with staff strength of 212, 440 and 620 in administration, academics and servicing departments, respectively. Then using convenience-sampling approach, 20 % of each population was taken as expected respondents, which became 250 approximately in total. Sample of large respondents were taken so that they could represent the whole population.

Survey Method (Distribution and Response)

The efforts were made to collect primary data, through self-constructed questionnaire. Though it was difficult task to collect response of about 250 employees, in timely and cost effective manner. Therefore total of 450 questionnaires were distributed, through mail. The questionnaires also contained brief background information about the purpose of the study, description of ICT, instructions and measures for confidentiality. Initially response rate was low, therefore individuals were personally approached and wherever required, they were briefed about importance of research and how to fill in questionnaire in true spirit.

By taking such steps, total responses received were 262. Which became 58.22% of total. But nearly 17 questionnaires were rejected on different grounds giving 243 responses. Ultimately, responses of 54% of distributed questionnaires were analyzed using MS-Excel.

3. Research Analysis

Demographic Characteristics of Respondents

Survey respondents included 199 male (81.9%) and 44 females (18.9%) with ages ranging 18 to 60 years. Respondents between ages 18-35 were 52.2 % and 36-50 were 38.7%. Only 9.5% were between ages 51-60. Most of the respondents were having the qualification up to

postgraduate (47.8%) and graduate (29.6%) level. 16.9% were intermediate and 5.9% were just matriculate. It shows that most of university employees are highly educated.

AIOU mostly hire individuals on permanent basis, therefore the contribution of permanent employees were 67.5% among all respondents, while daily wages (contingent workers) and contractual workers were 28.8% and 3.7%, respectively. About the rank¹, employees within BPS (1-7) were 50.6%, BPS (11-16) were 23.5% and BPS (17 or above) were 26%. It is also concluded that most of the employees are having more than 6 years of experience with AIOU, as their responses remained 64.6%. Employees having less than 1 year experience were 8.6%, 1-2 years were 7.4% and 3-5 years were 19.3%.

As the employees were also required to indicate their respective department. The demographic data shows that out of 243 responses, 70 received from academic, 43 from administration and 130 from servicing. It presents the major portion of servicing 53.5%, academic 29.2% and 17.3% of administration.

Descriptive Analysis

Descriptive results of TAM model in relation with ICT in AIOU, revealed positive trend of each variable i.e. perceived ease of use, perceived usefulness and subjective norm toward attitude and attitude was positively related with behavior intention. Likert scale helped to explain the positive or negative feelings of employees and their future intention about ICT.

	Perceived Ease of Use	Perceived Usefulness	Subjective Norm	Behavior Intention	Attitude (ICT)
Mean	3.51	3.81	3.47	3.38	3.69
Standard Error	0.07	0.08	0.07	0.08	0.08
Median	3.83	4.17	3.75	4.00	4.00
Mode	4.00	4.00	4.00	4.00	4.00
Standard Deviation	1.08	1.20	1.16	1.19	1.17
Sample Variance	1.16	1.43	1.35	1.42	1.38
Range	4.00	4.00	4.00	5.00	4.00
Sum	853.50	924.67	844.25	821.50	897.60

Table-1 "Descriptive Analysis"

Correlation Results:

For finding the strength of the relationship between several variables, "Pearson Product Moment Correlation Co-efficient" is used, in this tool the strength and direction of a linear relationship between two variables is indicated. Correlation is a statistical technique that shows whether and how pairs of variables are related or not. If two variables tend to increase or decrease in the same direction then the relationship is called direct or positive, however, if with the increase in one variable other decreases then the correlation is said to be negative or inverse.

¹ In AIOU, Rank is based on BPS (Basic Pay Scale)

BPS (1-7), lower rank employees

BPS (11-16), middle rank employees

BPS (17 or above), upper rank employees

	PEU	PU	SN	BI	ATT-ICT
PEU					
(Perceived Ease of Use)	1.00				
PU					
(Perceived Usefulness)	0.88	1.00			
SN					
(Subjective Norm)	0.77	0.78	1.00		
BI					
(Behavior Intention)	0.83	0.85	0.74	1.00	
ATT-ICT					
(Attitude Towards ICT)	0.88	0.91	0.81	0.87	1.00

Table-2 "Correlation Matrix"

Correlation of all variables is shown in Table-(III). As concluded in previous researches, significant positive correlation amongst the independent and dependent variables was found. Especially the analysis shed light on the strong positive effect of PEU on PU, as found by Saade and Kira (2006) and some others, which was calculated 0.88 in this study. It shows that if employees feel easy to use ICT, then they may take it as useful. But, if they think ICT a useful mean to work with, it doesn't mean they would feel easy to interact with. Strong positive effects (0.78) of subjective norm were found on perceived usefulness, showing that if people are forced to use ICT from higher authority (like boss) or when colleagues, friends and peers want practicing ICT, then they may consider ICT a useful way to work with. Perceived ease of use and attitude had correlation of (0.88), means that when employee feel ICT simple, effortless and flexible in doing work then their attitude become pleasant and also they enjoy while working with it. In other way, if employees feel that to be skillful at using ICT is easy then they may have favorable feelings about ICT.

Prior studies show that usefulness of technology mostly has the greatest association with attitude. A very strong correlation between these two was also calculated in the study of Spacey *et al.* (2004a). Correlation (0.91) between perceived usefulness and attitude was the highest in this study which indicates that employees have positive perception regarding ICT, as they think that it would enable them to accomplish task quickly and effectively, leading towards enhanced performance. Therefore, we can conclude that AIOU employees are of the view that ICT would increase their productivity. A correlation (0.81) between subjective norm and attitude shows that when employees have social pressure, for example from boss or people important to them, they ultimately formulate favorable feelings about technological change. It is also obvious from literature that perceived usefulness and perceived ease of use do not limit social constraints to predict attitude, it is better to take into account social influences. The behavior intention variable was added to reduce external constraint, which gives another high correlation.

In nutshell, coefficient of correlation between attitude and behavior intention was (0.87), that shows employees who regard ICT as pleasant and necessary, do intend to use practically. It concludes that, AIOU employees with positive attitude are willing to implement ICT in each phase of academic, servicing and administrative work.

Regression Results

The regression line expresses the best prediction of the dependent variable (Y), on the independent variables (X). However, there exist substantial variation of the observed points around the fitted regression line. The smaller the variability of the residual values around the regression line relative to the overall variability, the better is the prediction.

Table-IV presents the regression outcomes of equation-1, which shows that the dependence of perceived ease of use, perceived usefulness and subjective norm (independent variables) to attitude (dependent variable). Regression analysis shows the high significance of all independent variables on dependent variables, as we can see 87.25 % of the variation in attitude is explained by three independent variables, while 12.75 % is the inherent variability or remain unexplained. Correlation Coefficients, express the degree to which two or more predictors, independent variables are related to the dependent variable. We have values of coefficients *PEU, PU & SN*, 0.32, 0.50 & 0.18, respectively. The values reflect positive and significantly high relatedness of independent variables with attitude. Especially, perceived usefulness is significantly associated with attitude comparing other explanatory variables, that has also been concluded in different previous studies.

PEU, PU, SN (X) to Attitude (Y)	
Coefficients	
Perceived Ease of Use	0.3202
Perceived Usefulness	0.4981
Subject Norm	0.1826
Multiple R	0.9341
R Square	0.8725
Adjusted R Square	0.8709
Standard Error	0.4217

Table 3 "Regression Analysis"

Subjective Norm (Y) to Attitude (X)				
Coefficients				
Attitude	0.8592			
Multiple R	0.8687			
R Square	0.7546			
Adjusted R Square	0.7535			
Standard Error	0.5763			

Table 4 "Regression Analysis"

Table-V shows the results of regression analysis between two variables i.e. attitude (X_4) and Behavior Intention (Y_2) . From research model, behavior intention is the outcome of attitude. Therefore, an employee with positive attitude about technological change would form intentions to perform certain behavior. This is the reason, second equation yields significant impact of attitude over behavior intention. Approximately, 75.46 percent of the variation in the behavior intention is explained by attitude. The coefficient of attitude as determined by the regression is 0.86. Tables (IV&V) confirm the interdependence of perceived ease of use, perceived usefulness and subjective norm with attitude. Whereas, attitude is found associated with behavior intentions. All it shows that, since majority of university employees think ICT easy to use and also a useful tool to accomplish task quickly. Therefore, most of them have positive attitude. Here another aspect should also be kept into account that employees think the environment in which they are working, their co-equals, friends and even bosses also want the implementation of ICT, therefore the positive trend of these explanatory variables, ultimately shaped positive attitude. The practical implication of positive attitude is behavior intention, therefore employees intend to make use of ICT in each department (Academics, Administration & Servicing).

3. Conclusion and Recommendations;

Statistical analysis shows significant impact of perceived ease of use, perceived usefulness and subjective norm on attitude. Technology acceptance model (TAM) in Allama Iqbal Open University setting, is proved to be useful theoretical model to investigate attitude and behavior intention. The result findings are consistent with the findings of Spacey *et al.* (2004a) conducted research to explore the attitude of public library staff towards ICT in UK. Where TAM was proved successful in capturing staff attitude and indication of their future behavior. A strong postive correlation was measured between perceived usefulness and attitude, while attitude remained highly associated with behavior intention. The author also concludes these findings in less developed country like Pakistan where technology means are still to be implemented with full potential.

Our study further reveals that majority of employees have positive attitude, but 24.27% employees were found with negative attitude towards ICT. Consolidated ratio shows that 22.22% employees think ICT less useful and 26.7% as difficult to use. 36.62% employees are off the view, that their negative attitude is due to external factors. Though the ratio is quite low, comparing those having positive attitude but there is still need to tailor the negative feelings into positive, so that ICT could survive in each phase of academic, service and administrative working in short period of time. Normally, employees are not well aware of the benefits associated with IT, that's the reason they fail to adopt (Riemenschneider *et al*, 2001). Sandberg and Wahlberg conclude that attitude towards ICT is mostly reactive than proactive. If employees think ICT useful than it would probably be accepted. Some other reasons are as under;

- ICT cannot be demonstrated before implementation, therefore managers with no clear understanding usually found reluctant to the acceptance.
- The determination of efficiency after ICT cannot be assessed before launch.
- ICT is not considered as strategic resource.

Recommendations:

As some employees are with negative attitude, management will have to take measure to cope with it. Prior study in information sphere shows the major contribution of usefulness for shaping the attitude. The author also concludes that perceived usefulness is the main predictor of attitude. Employees with negative attitude, if convinced about the usability of ICT, then they may develop positive feelings.

Amoako and Salam (2003) evaluated the impact of shared belief, training and communication on perceived usefulness and perceived ease of use during technology implementation in Enterprise Resource Planning (ERP). Training and communication had direct influence on the shared beliefs that users form about the benefits of the technology. Training is

an important element to positively influence the formation of beliefs that affect attitude, which in turn affects behavioral intention. In the same way open communication has positive effects on the shared beliefs which in turn raise the acceptance of technology. Therefore, AIOU should arrange training sessions, in accordance with the current technological change. Employees after acquiring requisite skills would voluntarily accept new ways of official working. Secondly, open communication would also help employees to share problems or deal with impediments in effective implementation, as Kitchen and Daly (1997) stated, "employee can only work effectively if they can participate in the organization and they can only participate it they are fully informed".

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University- Industry Linkage: Sohar University Experience with Case Study on Cisco Event as Experience for Learning in Developing Local Talent in Sultanate of Oman

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Abstract

As the first university in the Sultanate of Oman to pioneer in connecting practical training with educational curriculum, Sohar University has begun collaborations between technology market leaders such as Cisco Systems, Microsoft, and Oracle and international academic institutes such as The University of Oueensland, Australia and the University of Mutah, Jordan. The goal of the university-industry connection is twofold: to focus technical degree programs at Sohar University to the job skills demanded of Oman's local industry, and to provide educational opportunities to the community in the fields of computer literacy and information technology. This practicaloriented method of education creates circumstances whereby the university's pedagogical method is closely linked with the requirements and demands of the job market. Thus, the university can institutionalize efforts to bridge the gap between the professional and educational world. This industry-focused approach to university education, in developing countries like Oman, will work to broaden the scope of economic improvement while nurturing a highly skilled workforce – a critical ingredient for the successful deployment of Oman's e-government by 2012. All levels of students are given an opportunity to work though the practical training component given by trained Cisco, Microsoft, and Oracle employees. In this model, all levels of students are given an opportunity to work through practical workforce training components provided by Cisco, Microsoft, and Oracle employees. While at the same time, partnering academic institutions such as the University of Queensland, play a vital role in Sohar University's global academic distinction by offering program development, academic review, and shared resources for joint research.

Key Words: University- Industry collaboration, Learning, Quality and Society, linkages, technology training.

1. Introduction

The Sultanate of Oman, with an area of 309,500 square kms, Sultanate of lies on the Tropic of Cancer in the extreme southeast corner of the Arabian Peninsula, covering an area of major strategic importance [1]. The country's breathtaking coastline stretches for over 1,700 kms, from the Arabian Sea and the entrance to the Indian Ocean at its south-western extremity, to the Gulf of Oman and Musandam in the north, where it overlooks the Strait of Hormuz and the entrance to the Arabian Gulf; a location that has played a vital part in Oman's strategic development. The population of Oman according to 2003 Census is 2,331,391 with expatriates forming 23.9% of total population[2], In an age of globalization the need for technical skills is essential, a realization that the country of Oman, and specifically Sohar University, has embraced. Sohar was an ancient capital of Oman and many believe it to be the birthplace of "Sinbad the Sailor". Having a rich sailing history, Sohar was traditionally a fishing town, but it is more recently known as Oman's industrial hub due to the massive developments in the Sohar Industrial Port. Figure 1 shows the location of Sohar in Oman.

Oman's economy relies heavily on its dwindling oil resources. Currently, Oman is planning to decrease its reliance on oil and move to diversification, industrialization, and privatization. Tourism is one of the areas that Oman starts to focus on increasing national income. Attracting new industries and opportunities in alternative fields is the other focus of this growing country. Trained and skilled manpower requirement is the foremost requirement for such venture for any country as the majority of Omani's is under the age of 35, with median age of 19. Oman has been a neutral country and has not been involved in any of the wars in the region. According to vision of humanity [3].org, Oman has been listed as one of the most peaceful countries in the world.

Oman's main economic driver stems from its internal population growth; it ranks 9th the indices of highest growth in the world at 3% per annum, based on The World Fact Book [4]. Following the footsteps of most developing nations, Oman adheres to the policy of developing and tapping the resources of its own 2.3 million populations - one of its most powerful major socio-economic influences, 83 % of Oman's population are under 35 with median age is 19. Further, according to Oxford Business Group [5], the publisher of Oman, 2010, Oman's growing demographic

trend is young, well educated, affluent and with an increasing proclivity towards western-style consumerism. Oman is currently experiencing a rapid growth in the adoption of mobile access technologies and social media due to the large population of the millennial generation, indicated by 55% of its population is under 20. This phenomenon is made apparent in the surge in mobile telecom sector, expected to reach almost 2 Billion US dollars by 2012, according to Pyramid Research [6].

In the age of globalization the need to learn how to use a computer is essential. So Oman is one of the developing countries that motivates its people to learn how to use computers. As a result, Sohar (Arabic: صحار) is the most developed city in Sultanate of Oman outside the capital Muscat. It is about 200 km north of Muscat and about 200 km south of Dubai. Sohar was an ancient capital of Oman and many believe it to be the birthplace of Sindbad the Sailor. Having a rich sailing history, Sohar was traditionally a fishing town, but it is more recently known as Oman's industrial hub due to the massive developments in the Sohar Industrial Port. Figure 1 shows the location of Sohar in Oman.



Figure 1. Sohar

Oman's youth population, with its propensity for using technologies as their medium of communications, provides a suitable backdrop for businesses willing to invest in Omani infrastructure both in private and public sectors. As a result, Oman has been heavily investing in the educational development of its youth population and has opened its education sector for privatization.

At present, there is one state university and four main private universities operating in Oman, providing various levels of expertise and demand-driven knowledge, in addition to a number of university colleges and colleges offering diploma, advanced diploma and bachelor degrees. In today's climate, the market requires an entrepreneurial approach to education and high demand for students who need *to create* opportunities *rather than search for* opportunities in the market.

2. Sohar University

Sohar University is the first private university at the Sultanate of Oman. It is founded as a college in 1998 and transfer to University in 2001. Sohar University's educational approach is entrepreneurial. The university is taking initiatives to enhance and innovate the education of youth in Oman through collaborations with education and industry partners [8]. As shown in Figure 1, Sohar University interacts with four groups in order to offer enterprise service to society. From the education side, Sohar University partnered with The University of Queensland in Australia in the areas of Computing and Information Technology, Engineering, Business, Translation, and Journalism. In addition, Sohar University partnered with Mutah University in Jordan to offer master courses in teaching methodology and curriculum development. As a private university dependent on student fees for growth, support, and research, Sohar University, has greatly benefited in 2009 from alternate funding totalling close to one million US dollar from a variety of streams. However, students are still expected fund their enrolment or find scholarships from the government or private sectors. In addition, Sohar University has number of scholarship schema to best students from secondary schools to complete undergraduate study. Sohar University recently approved partially scholarship to Omani staff to complete their postgraduate study at The University of Oueensland. This is based on the commitment of the university towards the development of Omani society. Furthermore, Sohar University is working with local industries to offer scholarship to Omani students. For academic year 2010-2011, Sohar University signs an agreement with Sohar Aluminium to offer number of scholarship to Level One students in

Faculty of Computing and Information Technology and Faculty of Engineering to complete their undergraduate program.

Sohar University works closely with industrial sectors to leverage the practical side of the offered program at Faculty of Computing and Information Technology (FCIT). Therefore, Sohar University through FCIT has established a number of agreements with global organizations to offer practical programs that are embedded with the current programs. Such programs include the Cisco Academic Program, Oracle Academic Initiative Program, Adobe Programs, Microsoft IT Academy and Digital Literacy Program (Internet and Computing Core Certificates (IC3)) from Certiport. The above programs are selected to cover some of the basic areas of computer sciences, such as: Networking, Database, Programming, Computer Concepts, and Multimedia. In some cases, the students need to pass a specified exam by the program in order to obtain a certificate. Examples include in the Cisco Academy, Adobe, IC3 and Oracle Programs.

Regarding the community services, Sohar University assists the community through offering training programs, free lectures to students in schools and others, and sharing in different community activities. Faculty of Computing and Information Technology run a training program on June-July 2009 in collaboration with Sohar Aluminum and Ministry of Social Development to train one hundred Omani people from community on digital literacy. Students from final year students and Level Three students acted as instructors in this session.

All the three parts of the university involvement assists the students to have better education, training and be more active in serving community. This has positive impact on the whole education process in the university and hence in serving society.



Figure 2. Sohar University Model

3. Challenges Facing Higher Education in Emerging Nations

Sohar University is a small regional university, owned and operated by private body in the sultanate of Oman and serves an on-campus population of around 4,500 students as well as over one hundred off-campus part time students. Like many other institutions of higher education, Sohar University sees the potential for learning through an entrepreneurial approach that addresses core costs, infrastructure, and quality issues related to instructional learning [11]. We have invested early and significantly in campus-wide systems to produce an improved method to coursework design and delivery. This approach and initiative has required close cooperation and coordination between the university's partners: University of Queensland, University of Mutah and industry market leaders in their respective fields. Ongoing collaboration amongst these and additional partners is needed to ensure a shared understanding of university-wide challenges that need immediate attention [7]. The choice of Sohar University for its leadership as a partner with world-class universities reflects their commitment to quality programs and follow-through for the long term. At the same time, Sohar University student's access equipment and labs that rarely, if ever, offered at the junior university level [9]. This collaboration assists Sohar University staff to do joint research
with the researchers at both universities. Sohar University is looking now for student exchange program with The University of Queensland to give international experience to Sohar University students.

3.1. Lack of Funding/Resources

Sultanate of Oman is a developing economy and institutionalization of entrepreneurial learning is very much needed. Contrary to popular belief, resources for private universities are not abundant and students cannot afford to attain various professional courses. The government is taking initiative in providing sponsorships for professional courses. However, the demand to cover the gap of offering professional skilled workers reflects a need similar to many developing economies [14, 15].

3.2. Lack of Local Expertise

Oman acknowledges a lack of trained manpower. At the same time, the industrial sector in Oman is growing very fast and the demand for a local skilled work force is high. Industries are looking for graduated students with strong practical experience. Sohar University, in particular, is taking initiative for developing local talent in the field of information technology and engineering.

4. Youth Engagement (Male/Female)

Sohar University represents an opportunity for enrichment, particularly because of the receptivity to women's education. At Sohar University, we found that the male- to-female ratio in technical education is comparable to the rest of the world. Female students formed approximately 65% of the total number of the students in the university and approximately 80% of the number of students in Faculty of Computing and Information Technology. Female students are diligent and motivated to learn. For example, in Level One in Faculty of Computing and Information Technology, up to 150 students are admitted. The current student ratio is around 130 female students to 20 male students. From Level One to Two, about 65 % of the female students pass the level, while only around 20-20 % of the male students pass to Level Two. In short, female students find greater success and are more motivated than their male colleagues.

Sohar University is aware of the need for all students to achieve, and is taking the initiative to motivate the local youth through these industry oriented courses. Secondary school students are invited into a number of technical training sessions in order to increase their interest and awareness in completing their studies. More focus and attention are brought to male students, because they are not doing better, there is scope of improvement in the area. Academic staffs of Sohar University are approaching students at the secondary schools through conducting lectures to schools.

5. Types of Jobs/Economic Opportunities

As discussed earlier, though Oman currently depends on its oil-based economy, the country is making efforts to diversify and invest in its other sectors such as metals, cements, building, fisheries, and seafood. The country has the intellectual resources amongst its youth to make this a reality. Information technology and allied fields also create ample opportunities in the country. There is a vast range of emerging industries in Oman now and several potential job opportunities. At the time of global recession, the country has survived with little effect on the economy. Most of the industries and government sectors are looking for skilled graduated students in these new ventures to ensure continued economic growth.

6. Government Proactive Programs to Overcome Challenges

The Ministry of Manpower, Ministry of Higher Education, Ministry of Social Welfare, and the Information Technology Authority of Oman are taking a proactive approach to overcome the challenge of preparing an Omani skilled workforce. Most of the ministries have scholarship opportunities for the students to continue their higher education. The government announced in 2010 a yearly scholarship for 500 female students to complete their university study. This is in line with increasing the education opportunities for Omani women.

The Omani government has recently created the Research Council of Oman, a new government body devoted to promoting research in the country. More specifically, the council is heavily funding research proposals and projects to develop the area of Information Technology.

The Information Technology Authority (ITA), the body responsible for bridging the digital divide in Oman, has launched an e-government initiative in August 2009. The mission of the initiative is to provide governmental

services to all citizens and residents through an E-Government Service Portal, through the mobile and fixed line services already in the country

In spite of the high coverage in telecom access, internet penetration is relatively low. An OpenNet initiative reported a 16.8% penetration rate in 2008, mainly due to a lack of competition in the telecom market - most internet services are provided almost singularly by OmanTel, a state-owned incumbent Internet Service Provider.

Additionally, a lack of adequate telecommunications bandwidth poses a serious barrier to providing 21st century communications-based technology, which has been the hallmark of many developed nations. High labour productivity in these nations has been largely attributable to the efficient incorporation of these technologies into the fabric of socio-economic infrastructure.

7. Engagement with Secondary Schools

Sohar University takes the responsibility towards assisting the students in secondary school in improving their skills. Therefore, the university conducted number of lectures and training programs for the students at the secondary schools. The programs are distributed among IT, Engineering, Physics, Chemistry and others which have positive impacts on the students. Faculty of Computing and Information Technology conducted number of lectures in concepts of computers, introduction to multimedia, computer troubleshooting and others. Faculty of Engineering run a workshop for secondary schools students at university labs to do some basic physics and chemistry experiments.

8. Community Project

Sohar University is taking its role in assisting the community through conducting number of training programs, lectures and workshop. For example, Sohar University, in partnership with Sohar Aluminium, the Ministry of Social Development and ITA implemented the idea of teaching a group of people from the local community about how to use computers. The idea of the course was initiated by a small group of students from the Faculty of Computing and Information Technology at Sohar University, which supported by the staff at that faculty. The selection of participants was organized by the Ministry of Social Development and Sohar University on the basis of 80 people from the Ministry of Social Development and 30 from Sohar University. The Ministry of Social Development selected participants from the families that they look for a job. The course ran for 2 months (June and July, 2009) covering 33 hours. The number of participants on this course was 110 and their ages ranged between 20 and 38 years. Figure 3 shows the number of male and female participants. The course covered computer concepts, working with Web and e-mail, and using Office applications.



Figure 3. Participants in Community Training Course

9. Case Study: Sohar-Cisco Program

A joint-venture effort between Sohar University and one of technology market leaders, Cisco Systems, took place mid-December 2009. It took about a year and half from the time the idea was conceived to executing it into reality.

A Cisco volunteer team and Sohar University faculty and staff collaborated to organize a training week for young Omanis at Sohar University on December 2009. The goal of the training program is to showcase the important role of information and communication technologies (ICT) in bridging the gap between the haves and have-nots in an education vertical as depicted in Diagram 1.



Figure 4 Economy driven by innovation and knowledge

A global team of 27 Cisco volunteers representing employees in Dubai, Egypt, KSA, Lebanon, Belgium and the US along with a team of 5 Sohar University faculty members came together in Sohar, Oman, with Fast Lane, a Cisco Learning Partner, to conduct technology training and promote discussions on how ICT training can facilitate the transformation of Oman's society by developing and empowering Omani youth. The first event after beginning of the event included a panel discussion then followed by technical talks and then technical sessions for the students. Local governmental (Information Technology Authority of Oman) and industrial partner (Sohar Aluminium) participated in the discussion panel along with the senior people from Cisco. The target of the discussion panel was to increase the awareness of young Omani towards information technology

9.1. Business Outreach: Setting the Course

The goals of delivering a pilot training program to university students and high school students were three-fold

- Increase technology awareness,
- Enhance technical and business skills for local workforce development,
- Focus on philanthropic and community outreach.

9.2. Knowledge Exchange

In December2009, Cisco volunteers delivered a five day IT development workshop to over 120 university and high school students at Sohar University at one of 12 Academy sites in Oman. Sohar University hosted the event and both private and public representatives from local IT sectors attended the opening session. Women pursuing bachelor degrees in Computer Science and IT related to engineering careers comprised more than 80% of the attendees.

The training tracks included IP Telephony, Wireless, Green Initiative and Professional Development. The topics, content and audience were selected based on input from various stakeholders, including Dr. Wail M. Omar, Dean of Faculty of Computing and Information Technology at Sohar University, Oman's Information Technology Authority (ITA), and Cisco Networking Academy teams based in Dubai and Lebanon [12, 13].

The following is a detailed description of the four courses being offered during Dec 12 through Dec 16, 2009:

• IP Telephony:

 This course provides an introduction to converged voice and data networks as well as the challenges faced by its various technologies. The course presents Cisco solutions and implementation considerations to address those challenges. In this course, students will learn about Cisco Call Manager Express (CME) architecture, components, functionality and features. They will also learn some Voice over IP (VoIP) and Quality of Service (QoS) technologies and apply them to the Cisco CME environment.

• Wireless:

- This introductory course to Wireless LANs focuses on the design, planning, implementation, operation and troubleshooting of Wireless LANs. It contains a comprehensive overview of technologies, security, and design best practices with particular emphasis on hands on skills in the following areas:
 - Wireless LAN setup and troubleshooting
 - 802.11 (a, b, and g) technologies, products and solutions
 - Radio Technologies
 - WLAN applications and site surveys
 - Resilient WLAN products, design, installation, configuration and troubleshooting
 - WLAN security
 - Vendor interoperability strategies
 - Emerging wireless technologies

• Green Initiative:

- This course provides an introduction to Green Technologies as well as raises awareness on Green practices to help reduce one's environmental footprint. The focus of this course are listed below:
 - Green Overview Introduction to Green technology and practices Visual Demo showing technology in action
 - Cisco On Cisco Case Study Green Technology as adopted by Cisco IT and Work Place Resources
 - EnergyWise Lab Exercise Familiarizes the student with Cisco EnergyWise, an innovative technology embedded in Catalyst Switches that manages and monitors the power consumption of the network. EnergyWise provides optimizations in GhG emissions and operational efficiency and helps customers to proactively lower their operational costs while minimizing their carbon footprint at the same time.
 - Interactive Activities Involve students in group activities to come up with Green Initiatives. Form a University Green Board for future participation and ongoing involvement.

• The Professional development:

- The curriculum was divided into 4 classes:
 - Resume Writing: This class will demonstrate the importance of a well-written resume and provide useful tips about the do's and don'ts for preparing a resume. Students who have already prepared their resumes will have the opportunity to have their resume critiqued by the instructors.
 - Interview skills: This class will introduce the various types of interviews that employers may use to assess a suitable candidate. The class will then proceed to focus on the most common type of interview technique used by multinationals firms the competency based interview. The students will have the opportunity to participate in mock interviews with their peers using their own resumes as a basis for conversation.
 - Teamwork and importance of collaboration: This class will focus on the importance of teamwork in the workplace. Students will participate in two fun team-building exercises. The instructors will provide feedback to the groups about individual as well as overall performance.

 Non- verbal communications: The class will address the topic of non-verbal communication. Students will be presented with differing scenarios that will demonstrate how body language can either enhance or endanger an individual's performance or perception.

The volunteers, who delivered the training on site, were motivated to openly share their knowledge and professional expertise in both theory and practical hands-on labs. The success of this program emphasized the importance of connecting academic offerings with practitioners and experts in the field.

The initial feedback collected from the university staff, students and IT professionals was very positive with requests for future programs. The students requested another training week in the second semester and following years. For the Cisco team, this was an opportunity to further develop their own professional skills, extend their professional network and gain a better understanding of the ICT needs of the region. For Sohar University staff, the goal was to increase the involvement of the university staff in community services and to assist the students in getting more practical experiences.

On the last day of the program, Sohar University arranged a special training session for high school students. A total of twenty students, fourteen females and six males from around the region participated in the session. The session comprised of a campus tour, briefing about the Sohar University and a workshop on Cisco IP Telephony and Profession Development. The session lasted from 9:30 am to 2:30 pm with a 30 min lunch break.

The students were very enthusiastic to learn about the Cisco technologies. They wanted to know more about the concepts and technologies. It was a very interactive class and students were really excited to work on the lab exercises. Students were seen enjoying their labs, interaction and calling each other on a Cisco IP phone. All the students were able to successfully complete the lab exercises with minimal help.

In the professional development class, the students learned about the importance of a team and team building in a professional environment. The students were divided into four groups with five students in each group for the team building exercise. As part of this exercise, students were given two tasks, "Survival Story" and "Lego Building".

In survival story, each group has to come up with a hypothetical story about how the team would survive a plane crash in Amazon Jungle. The teams were asked to select six items from a total of fifteen items found along the panel, debris that could help them in survival, and make up a story on how they used these items in their journey from the Amazons to civilization.

In the Lego building session, the teams were asked to replicate the prebuilt Lego model. Only one of the team members was allowed to see the model for two minutes. He/she then has to describe the model to the rest of the team and try to replicate the model. Both exercises were really fun and students enjoyed every bit of it. They were willing to extend the class duration to do more lab exercises. We received positive feedback from the students about this session. Some comments included: "[This session was] the best class I have ever attended", "After I graduate from high school, I will attend Sohar University to learn about Cisco Technologies", "Before this class, I had plans of becoming a doctor, but now I will reconsider it, I may become a computer engineer, I will join Sohar University", "This was an easy and fun way of learning new concepts, I learned a lot from this class", "When are you taking this class again, we want to attend again and invite our friends too", "It as a very good class, it's very good, one of the best.

9.3. Post Project Analysis for Developing Local Talent at Sohar University

9.3.1. Panel Discussion

In the panel discussion, panellists touch on sensitive issue about the lack of practical pedagogical methodologies. Though academics try to remain vendor-neutral, in Oman's current economic and educational situation, specific technology training is vital to the countries growth. Vendor-specific training is necessary at this time. The panellist identified the following points:

- Need a program track for the 5-day to be displayed as part of the opening session
- Need to have a key takeaways to deliver to the students

- Need to involve more people, invite more government sector
- Need to focus on different technologies not just Cisco's
- Need to discuss specific elements of improving Omani talent how can Sohar University help with both technical and academic parts
- Need to bring additional dimension to the program by adding coop/internship/job fair/exhibits
- Invite other industries such as financials, health, IT to present at the forum
- Bring topics to the forum to discuss government need to create more opportunity address the issue of talent pipeline and supply chain to produce the talent

9.3.2. Training

There was a practical training session meant for students to acquire practical knowledge of the networking and following was some of the observation of the session

- Optimize the material to the right student level
- Provide pre reading course content for students
- Provide a 10 min video for the course covering overall course content, goal and lab takeaways
- Students are eager to learn and need practical experience. University needs to do better job to give the students the appropriate-level program to achieve this goal. The academic world most often is removed from the real world.
- Pre-requisite for online survey to find out the level of IOS familiarity
- Create follow-up plan for the students how can we continue to engage and mentor the students. How the students gone thru the program can take lead and conduct similar course for their juniors
- Would like to offer similar training over WebEx once-a-month. Technology starving with hard working and fast learning students wanting to gain knowledge to support their country and the rest of the world

9.3.3. Professional Development of the Cisco-Sohar University Team

The following represents feedback received from Cisco volunteers regarding how the event had contributed to their personal and professional development growth

- Diverse group of people never worked with each other before yet driven by a single goal to give back to the community.
- Most unexpected and pleasant surprise to note that 80% of the students were females. They were more interested to learn and complete the course content than their male counterpart.
- Corporate Social Responsibility (CSR) employees working with Non-CSR employees in different level of engagement and interaction as in difference between working with paying customers vis-à-vis non-paying customers.
- Challenges of inclusion how to be more inclusive with team members who are less vocal but play a significant role. Could unintentionally send a wrong message resulting in a disengaging team member.
- Focus in higher collective value; deliver a cohesive solution, inclusive and collaborative. There are different approaches in the culture we celebrate the diversity.
- Volunteers should share each other's tracks to broaden the scope of knowledge and share ideas. Digital Media Signage demo could have been delivered better with video portal/source avail from another volunteer.
- Learn to be more engaged and listen to the students' needs.
- Plan to develop a different method of teaching lecture intersperse with labs rather than a whole day lecture and a whole day of lab.

Additional feedback for the event is posted on Ayelet Baron's blog [16]. Ms. Baron is the Cisco Director of Sales Strategy& Planning for emerging markets.

10. Conclusion

In this paper, we presented our experience of a successful university-industry linkage and how it facilitates the public-private partnership through a recent "Developing Local Talent" workshop event, which was successfully executed through a tight collaboration effort between Cisco and Sohar University. This event showcased how the delivery of practical network technology training, conducted by Cisco professionals, brought a glimpse of the real-world experience into the classrooms for university and high school level students. With this kind of learning approach we can produce a skilled workforce from eager Omani youth working to promote the economic success of Oman.

Currently, Sohar University is looking to leverage Teachers Without Borders' [17, 18] Web 2.0 toolset as a valuable communication and collaboration platform to connect the learners to instructors, content and program designers, locally and globally. The use of an online collaboration tool will reflect a fundamental shift in how the society can participate in education, where learning can take place anywhere and anytime. The adoption and deployment of Web 2.0-based tools in our university environment, such as the one currently being developed by the non-profit organization Teachers without Borders, is critical to the continued success for sustainability and growth of our educational programs.

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Automating PAAET: the Kuwaiti Distance Learning Project – a Personal Reflection

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Abstract

This is a personal perspective of the implementation of a distance learning project in a Kuwaiti organization. This paper reflects the involvement of the author in the project and explores the reasons behind the failure of the first phase of the project. The absence of a strong pedagogical reason for such a project, the erasure of faculty and students' voices, and the failure to recognize that e-Learning is different from face-to-face are reasons that have contributed to the failure of the project so far. A shared responsibility of all parties involved and a clear pedagogical vision could save this project.

1. Introduction

This paper is a personal account of my own involvement in the Kuwaiti distance learning project at my college. I reflect back on the initiation and implementation of this project, and use my personal experience as the platform to evaluate the events that took place informed by the different views in the literature. Personal reflection and inquiry involves the researcher in a conscious and critical reflection into the researcher's own experience. "Such a process is founded on the assumption that personal experience is a valid source of knowing and that critical reflection is an essential process in this coming to know. The critical element of the reflection involved brings a rigor into the process which would otherwise risk falling into self-deception and self-

absorption. The understanding gained through such a process both informs the researcher's personal understanding and research purpose, and forms a framework within which to further investigate the issues raised" [1].

I divide the paper into three main sections. The first section I call 'My Journey in Distance Learning.' In it I give a general view on how I got interested in distance learning and I lay out the series of events that took place and led to my involvement in the Kuwaiti distance learning project. 'PAAET and the Distance Learning Project; Automation or Innovation?' is the title of the second section where I discuss the main objectives of the project raising some issues of concern. In the third section: 'Video conferencing; automation and cost-cutting' I briefly discuss the Kuwaiti administrators' efforts to initiate the video conferencing technology.

My analysis throughout the paper focuses on two main issues. The first issue that I discuss is the cost effectiveness and the technical claims for enrichment that underlie the Kuwaiti distance learning project. I also allude to the second issue which is to do with the methodological concerns that a technological approach rather than a human centered approach is used. I end the paper with the conclusion.

2. My journey in distance learning

The Public Authority of Applied Education and Training (PAAET) is a government organization which offers education and training to students of different educational backgrounds. The applied education sector in PAAET consists of five colleges, while the training sector comprises twelve institutes and centers. Education and training in all colleges and institutions is segregated so there are women's colleges and institutes and men's colleges and institutes. The biggest of all is the College of Basic Education which hosts around six thousand women students in the women's college and around two thousand men students in the men's college. Students receive a Bachelors degree in education after successfully completing a 4-year program in a field of their choice. I work at the department of Educational technology at the women's College of Basic Education.

My first experience with distance learning was in 2002 when I enrolled in an online module offered by a U.K. university on networked learning. My decision to enroll was affected by what was happening in my department. At that time everybody was talking about computers and e-learning. In my department there was a serious dispute taking

place amongst my colleagues concerning the suitability of certain staff members teaching courses related to computer technologies. The argument grew out of a belief that tutors should teach courses related to their area of expertise determined by their Ph.D. research. 'The best interest of students' was the catchphrase that those colleagues used in their argument.

This disagreement amongst staff members in my department prompted me to enroll in the networked learning module. I wanted to see for myself what was so special about computers and advanced technologies. Because this was my first experience of participating online, I had doubts concerning the effectiveness of the learning associated with this form of distance learning. One important thing I have learned is that online learning is just as effective as face-to-face learning.

This experience marked my journey in distance learning. And as a result of it I drafted a detailed proposal and presented it to the curriculum development committee at my department suggesting that our department should take the initiative to offer online courses and increase students' choices, to what I believed to be pedagogical innovations. I heard nothing from the committee and the proposal died.

Around a year later, the Head of Educational Technology Department was approached by two professors, acting as representatives of an American university, to initiate e-learning in our department. This project was funded by the American Government, as we were told, to strengthen relations with Arab and Muslim countries. To be involved in such a project we had to get a chain of approvals starting from the Dean of the college up to the Director of the Authority. The project collapsed because no Kuwaiti decision was taken.

During 2004 my department was approached, this time, by the Information and Computer Centre (ICC) at PAAET. We were told that there was a surplus in the budget which they wanted to invest in elearning. They had already approached a specialized computer company to initiate the e-learning project. A proposal was drafted by the company and was forwarded to us.

A small departmental team was formed to study the proposal. Several fruitful meetings took place between representatives of the ICC, the Educational Technology Department and the supplier company. It was then decided to implement the e-learning project on a smaller scale within the Educational Technology Department including the installment of a video conferencing system. We also agreed to carry out an evaluation proceeding the experimentation period of the system before expanding e-learning to other departments and colleges. The department was asked to write a case for the e-learning project. The expanding numbers of students, the shortage in staff members, the quality and choices of learning and the life circumstances of students especially women (being married and raising children) were the main reasons we argued for.

Few months later our department received a letter from the ICC (at PAAET) informing us that a fixed budget has been allocated for the first phase of the distance learning project. They asked us to review the Request for Proposal (RFP) of the distance learning project prepared by them. To our surprise this report was the same as the initial one which we had already seen and discussed with the supplier company.

In May 2006, an e-learning team was officially formed which consisted of representatives of most colleges and divisions under PAAET. This team was to pursue the implementation of the project. I represented my department. It was during the first meeting of the team that we learned that PAAET embraced e-learning and the General Director supported the project and requested the implementation to be carried out on a large scale (the whole organization).

This came as a surprise to us because it contradicted the initial understanding and agreement which was important to us as none of the tutors in the department taught in an online environment. And most likely most of our students (if not all) had not been in an online classroom. Reflecting upon how the e-learning project developed it becomes clear to me that our department was used to agree upon a project already tailored for the whole organization.

3. The Kuwaiti distance learning project; automation or innovation?

The first phase project report describes the aims of the distance learning project and Suggests that the rapid technological development will have a deep impact on training and educational institutions. The booklet further spells out the vision of the project by stressing that "the implementation of the Kuwaiti distance learning project will allow PAAET to join other major educational institutions in providing educational and training services to a large number of clients using advanced technology" [2]. This vision of the distance learning project in effect emphasizes that using advanced technology guarantees a (higher) status with 'famous' international educational institutions, placing PAAET now and the education and training associated with it at a lower status.

The number of students enrolled in all colleges and training institutes under PAAET is around 30,000 with a yearly increase of 2% [2]. Being one of the two higher educational institutions in Kuwait which are governmental, PAEET is under the pressure of accepting the increasing numbers of Kuwaiti students. Transforming PAAET into a virtual one seems to be seen as the solution to the increasing numbers of students and at the same time cutting the costs of delivery. Cost effectiveness and technical enrichment are the most important elements argued for concerning the Kuwaiti project. In fact they appear to be the driving force behind the whole project. In addressing the introduction of online education to his university (San Diego State University), Feenberg alludes to a similar point which connects online education with expense. He argues that "Administrators hope to use new technology to finesse the coming crisis in higher education spending, and to accommodate exploding enrollments of young people and returning students." [3]

In an automated system, as Feenberg further explains, it is expected that by reproducing the physical presence of a tutor in a classroom and making it available in one form or another for example over the internet, greater savings will be made. The connection between elearning and greater savings is supported by advocates in both sectors; education and training. For example within a business setting, Mackay states that there are claims that training based on e-learning is cost effective compared to the traditional instructor-led and classroom-based training. The reason behind this claim, as Mackay suggests, is that "There's a lot less traveling to class for students and instructors, which means lower costs for the company and more time on the job." [4]

Whether in education or training, the argument of cost effectiveness is based on a comparison between the e-learning classroom and the face-to-face classroom. The two types are seen in opposition to each other. No real attention is given to difference between the two types, such as in pedagogy and environment.

Knowles, for example, addresses what he refers to as 'shifts in pedagogy' as a result of using IT and advanced learning technologies in higher education. He stresses that the use of IT and technology has raised a number of issues. Such issues are related to the challenges that these technologies pose to traditional approaches to teaching and learning. For example issues related to the type of classroom that online learning creates, the role and identity of the instructor and also of the student, and the "level of interactivity and the loss of face to face contact between learners and instructors." [5]

The Kuwaiti distance learning project does not suggest any pedagogical model or raise any pedagogical issues concerning the elearning environment. It is left to the faculty members to find out 'what to do' and 'how to do'. In a response letter addressed to me, the Head of Information Systems at ICC statement clearly states that "this project was initiated without a clear vision. It was not clear what was supposed to be accomplished by e-learning. This must be addressed before expanding the project" [6]. The fact that the project study and the final report was carried out by the supplier company instead of staff members and administrators at PAAET is another indication of the lack of serious thought put into the project. To say that "PAAET has no previous experience in writing e-learning study proposals" [6] as an excuse to adopt the same proposal prepared by the supplier is erroneous.

The Kuwaiti situation resembles that of San Diego State University when online education was introduced under the sponsorship of Microsoft, Fujitsu and others. Regarding the order of events of how the online project developed Feenberg wonders: "Would you build a house this way or design a new kind of car or refrigerator? Surely it is important to find out how the thing is going to be used before committing a lot of resources to a specific plan or design." [3] His explanation for why things occurred the way they did is that the technology of online education is not conceived "as a system, including novel pedagogical challenges, but as an infrastructure, an "information superhighway," down which...faculty were invited to drive. And just as drivers are not consulted about how to build the roads, so faculty were not involved in designing the educational superhighway." [3]

So what kind of innovation do the Kuwaiti administrators expect the technology of distance education to encourage, and how do they expect technology to enrich students' and tutors' experiences? Kilmurray associates innovation with the process of delivery (tutor-student interaction). He sees e-learning providing "a different learning environment in which instructors can employ *new* learning models and *new* instructional practices." [7] But he contends that most courses offered online today appear to follow the traditional classroom norm; instructor-directed classes. And therefore Kilmurray asserts that "*Automation is happening, but not innovation.*" [7] In relation to the Kuwaiti distance learning project not much thought (if any) was put into the process of delivery - online pedagogy. Hence pedagogical

objectives seem to "take the back seat to prestige and budgetary ones." [3]

In 'Multimedia Learning', Richard Mayer presents two views of multimedia design. He explains that "The most straight forward approach to multimedia design is technology-centered. Technologycentered approaches begin with the functional capabilities of multimedia and ask, 'How can we use these capabilities in designing multimedia presentations?' The focus is generally on cutting-edge advances in multimedia technology" [8]. In this approach all attention is given to the technology while learners receive secondary attention. So in effect instead of adapting technology to fit the needs of learners, they are, in this approach, forced to adapt to the demands of technology. Mayer contends that the technology-centered approach fails to lead to lasting improvements in education. On the other hand a learner-centered approach begins "with an understanding of how the human mind works and ask(s), 'How can we adapt multimedia to enhance human learning?' The focus is on using multimedia technology as an aid to human cognition." [8] In this sense learners and their needs come first.

The Kuwaiti project, PAAET seem to have opted out for a technology-centered approach where technology takes precedence over learners. There is an apparent erasure of the tutors and learners. For example, there is no mention of their needs, the skills they need to acquire, and changes they have to adapt to. In accordance, Altuhaih writes about his experience as a tutor at Kuwait University. He alerts that choosing technology is a difficult matter and that the biggest of mistakes that could be committed is not to involve students and tutors in the decision making process. Often, Altuhaih goes on explaining, neither tutors nor students are consulted, on the contrary they find themselves obliged to use what have been decided by others [9].

In their research regarding developing online courses in some Latin American countries, Zurita and Ryberg have noticed that "the degree of motivation varied between the different teachers. Most of them had an idea of wanting to learn about ICT in teaching and learning, but not all knew why. Many of them seemed interested in learning mainly because they were told to, not because they felt any need for the change" [10]. As a result they conclude that not all the teachers were interested in changing their pedagogical practice, but mostly in having a new tool to continue using the same techniques. [10]

Finally, the Kuwaiti administrators and supplier company maintain that e-learning offers the opportunity for education and training to all individuals at any place and any time [2]. Many advocates of distance learning and automation of higher education do stress this point as well. Knowles, for example, identifies IT and asynchronous learning networks as a significant force affecting higher education and dissolving the boundaries of geography, time and space" [5]. Some are convinced that students will learn just as much if not more, and they will be free to study at their own pace. [3]

Automating Kuwaiti higher education in essence is not only seen to offer a solution "for larger numbers at a discount" [3] but it is also seen as having a transforming capacity which brings with it 'suitable, innovative and high quality' Kuwaiti higher education. But since the implementation of the first phase of the system to this point time, the system remains unused by staff members [6].

4. Video conferencing; automation and cost-cutting

Video conferencing is an important part of the first phase of the Kuwaiti distance learning project. By August 2006, two lecture rooms were equipped with video conferencing technology, with the purpose of "enabling tutors to teach a large number of students at the same time by creating virtual classrooms." [2] These two rooms are the first of many to be established around campus for both men and women colleges. Video conferencing is seen to create opportunities for students to attend lectures despite their geographical positions. Hence, offering multi-site access to on-campus lectures.

This technology was not received with open arms by some of the members of staff in my department. There were heated discussions around the 'real' purpose of this technology and in fact of the whole e-learning project. Few members thought that there was a hidden agenda. Others opposed the technology because they doubted that it would work. They could not see how a face-to-face experience could be reproduced virtually. There was also genuine worry about the students and their readiness to such technology and the virtual classroom. Tutors expressed their concern regarding managing the virtual classroom and the work load that the virtual class would bring with it. Part of the rejection might have been caused by tutors' fear of change.

In the departmental meetings faculty members expressed their refusal to use the technology. In fact they boycotted all training sessions held by the supplier. The two video conferencing rooms remain locked and unused to this day.

Video conferencing is seen as a major solution for the growing numbers of students. It is so because, as Feenberg explains it, "Video conferencing allows a professor to address a large number of students in remote locations. Live interaction can be supported by a two-way video feed. The physical presence of teachers and students in the classroom can be reproduced electronically at some cost but more students can be served without expanding existing campuses." [3]

During the e-learning team meetings it was clear that the Kuwaiti administrators were unable to see that teaching and learning in a virtual classroom is in itself a challenge to both tutors and students and needs more thought put into important matters such as teaching strategies and methods. O'Donoghue et. al records mixed students' and tutors' reactions to video conferencing [11]. Nonetheless video conferencing is seen to provide the closest equivalent to the classroom experience [3]. But what seems to be naïve, to me, is that PAAET administrators had bought these expensive technologies with the belief that tutors would simply use them. What is even more bewildering is that they expected tutors to use the technology under the same set of organizational rules. There was no mention of the changes that the organization should embrace as a result of the new technology, to say the least, for example, the structure of the academic programs and rules concerning teaching hours and extra pay. Regarding this Knowles identifies information technology as one current force affecting higher education organizations as they relate to alternate delivery such as video conferencing. He states that

"The impact of IT on higher education organizations requires that universities and colleges not only consider alternative organizational models, but also examine their policies. In this regard, there is a need for revision and coordination of policies, not just for individual institutions, or even a network of institutions, but on a provincial and national level." [5]

So while PAAET administrators seem to see education and the educational organization as static while money and revenue as changing, staff members see the contrary. But at the same time, by refusing to accept any responsibility for using and experimenting with video conferencing the Kuwaiti tutors in my department are in effect refusing their share and responsibility to shape this technology and its usage.

Finally, what I find annoying is the erasure of the students' share in the distance learning project on a whole and the video conferencing part specifically. Students have not been recognized as subjects who have interests in this project. It was agreed that during the first phase of the project some effort will focus on "preparing a work plan that supports the shift towards using e-learning and minimizing the cultural and social obstacles that might prevent accepting the technology as a learning tool." [2] This work plan was referred to as 'change management'. Yet there has been nothing done so far which reflects such effort. No research has been conducted to see what cultural or social barriers exist if they do at all. There have been no seminars conducted and no lectures presented to students in the different colleges and Institutes to introduce the project.

The Kuwaiti distance learning project could be enriched and modified to fit Kuwaiti tutors and learners' needs by researching other similar projects whether locally or outside Kuwait, and by investigating how other institutions implemented e-learning [12].

5. Conclusion

Two important issues surface the analysis of the Kuwaiti distance learning project; cost-effectiveness which is based purely on technological concerns is one, and the second is to do with the technological approach to project management. Although the Kuwaiti administrators have a genuine concern to improve education for students in the different colleges their unawareness of the importance of the human involvement brought the e-learning project closer to failure. From the start there was an absence of the human voice; departments, faculty members, and students were not consulted at any stage of the project. There was no clear pedagogical reason for implementing e-learning and the new technology, and the project was not based on learners' and tutors' needs. The Kuwaiti administrators have also failed to understand the nature of e-learning and that it is different from face-to-face learning.

This project needs to be seen as a shared responsibility amongst administrators, faculty members and students in order for it to succeed. In my opinion efforts should be geared towards investigating the pedagogy of e-learning to better understand the changes to be made and the skills to be acquired. Exploring the cultural and social matrix within which these technologies are implemented is crucial for the success of this project. As it seems now the Kuwaiti administrators had bought the idea that the advanced technology is suitable for every context and that it will solve the problems that face-to-face education could not.

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The MIT LINC 2010 Conference Parallel Presentations

Session #7:

The Educational Impact of Web 2.0 Technologies



Creating politically educated citizens: Web 2.0's struggle in Pakistan

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INTRODUCTION.

As classical literature states, media performs several functions.

- To inform citizens
- To critique situations in society
- To entertain
- To opinionate and let others express their opinions on issues
- To educate citizens
- Commerce: media is just a business [1], [2]
- To play the role of a watchdog and be a part of the system of check and balances in a political system [3]

When the global educational community witnessed the birth of media known as Internet in the early 1970's, it was beyond their imagination to conceive what shape this technology would take in future. But today, educationists in every corner of the world have realized the web's extraordinary power and influence on each and every aspect of our lives.

Thus, all the above mentioned roles of media are now applicable to Internet as well, specially in the age of Web 2.0 due to which, during the last decade, social connectivity of citizens has increased and more and more people now use the web to create and exchange knowledge and information among themselves.

Examples include the online encyclopedia Wikipedia, which is written by citizens; YouTube, where citizens can upload their own video's; Twitter, where citizens can inform others what they are doing; and social networks such as MySpace, LinkedIn and Facebook, where citizens make their own personal profile pages.

The power of Web 2.0 has also been realized by several citizen movements, civil society organizations, protest groups and even political parties who have also started to offer their own pages on social networks. This gives them a chance to get in touch with their target citizens and to exchange knowledge and information with them.

Tom Armitage [4] rightly renames this new media, as "the next media".

In the year 2008, Barack Obama used this next media for his presidential election campaign. Experts such as Frissen [5] are of the view that this was one of the most successful examples of the use of Web 2.0 in politics.

Obama used several Web 2.0 applications, including social networks, instant messaging and YouTube, and combined all of them on his own social network: MyBarackObama.com. These applications did not only help him to reach his supporters, but that they also activated his supporters to spread the Obama message of change and to raise new funds. Web 2.0 mobilized the masses and gave an impressive result: the largest collected campaign budget in history and a landslide victory.

On the other side, his opponent John McCain's efforts on the Internet could not generate the desired results. This was not due the reason that McCain was not familiar with the web. There was a time in 2000 when he was the master of online technology. It was, after all, his strong online fundraising haul that kept him in the presidential candidate race that year.

The reason was the changed face of Internet. In 2000, the web was a different place. It was Web 1.0, with brochure-like websites with almost no interactivity. In 2008, the Web had become highly interactive and engaging with Web 2.0. John McCain seemed to have missed the transformation that was cashed by Barack Obama. If McCain had taken care of this aspect, results of the election, fate of the American nation and the state of world affairs could have been different.

Is Obama's example relevant for Pakistan's political environment? Can the citizen's of Pakistan be educated politically by using Web 2.0 in order to achieve desired results? There is no research to answer this question. And this absence compelled us to see what role does the web play in the politics of Pakistan, through our television show "Wired and Active".

PAKISTAN'S STORY.

Democracy in Pakistan can be termed as an audience democracy, where a majority of the citizenry is politically inactive. Many citizens do not vote when elections are held. The voter turnover pattern during elections held during the past two decades is an indicator of the above statement.

Election Year	Voter Turnover in %age
1988	43.1%
1990	45.5%
1993	41.0%
1997	35.2%
2002	41.8%
2008	44.0%

Source: Election Commission of Pakistan

In such an environment, the Internet becomes an important tool for the political parties to establish connection, especially with the youth of urban areas and to try to develop their interest in the political affairs of the country.

In order to find out whether the political parties are using this medium, we examined the web presences of the major political parties including Pakistan Peoples Party, Pakistan Muslim League – Nawaz, Pakistan Muslim League – Quaid-e-Azam, Muttahida Qaumi Movement, Jamaat-e-Islami and Pakistan Tehreek-e-Insaf.

Our findings show that websites of almost all political parties are very similar to offline folders: they give citizens only a lot of information, but they offer almost no possibilities for interaction. They do not use the potential of new applications that could lead to interaction and stimulate knowledge exchange.

Only the website of one party i.e. Pakistan Tehreek-e-Insaaf offered their registered members a dedicated blog section.

Shifting focus to individual politicians, we found out that there are only a few politicians who are familiar with how powerful Internet can be in terms of tie up with citizens. Each of the major political parties had only one or two officials who were using applications such as Facebook and Twitter to engage with the online community.

So the view that Web 2.0 can be used to politically educate citizens and to attract voters seems to be contradictory to Pakistan's political reality. Political parties as organizations and politicians as individuals are yet to exploit the potential of the web to engage citizens and gain advantage over their competitors.

But this contradiction has not stopped political awareness from growing in the cyberspace because there is a small mass of youth that are both, politically active and online. It is Pakistan's bloggers community that includes bloggers from all walks of life including students, print and electronic media journalists, doctors, engineers, bankers and even a few politicians.

This community maintains a number of blogs where they express their opinion on the political happenings of the country almost on a daily basis and it is their blogs, which caused the youth to actively participate in many political movements. Two major instances that can be quoted where blogs played their part were the movement against the ban on electronic media by the former President Pervez Musharraf in the year 2007 and the restoration of judiciary movement, more popularly known as the lawyers movement, during the same year.

As described by Pool [6], "Freedom is fostered when the means of communication are dispersed, decentralized, and easily available, as are printing presses or microcomputers. Central control is more likely when the means of communication are concentrated, monopolized, and scarce, as are great networks."

At a time when the mainframe computer was seen as a symbol of bureaucratic control, Pool envisioned a decentralized and participatory media environment. He predicted that this would strengthen democratic culture, enabling citizens and grassroots organizations to circulate their ideas more widely than ever before.

Following the same lines, the active participation of bloggers and blog readers in Pakistan's political and social movements has provided the confidence to the Internet community to believe that they can bring about the much awaited revolution in Pakistan's political atmosphere. They feel that they are on their way to knowledge democracy.

On the contrary, Reymond Williams [7] challenges the belief that new technologies have power to shape and transform society. Instead, he argues, that we must understand that the emergence of new technologies, and in particular new communications systems, is a result of complex interactions among technological, social, cultural, political, legal, and economic forces. When a new medium strikes an 'old regime,' the political effects depend on both the technology and the regime and on the decisions, both technical and political, that shape the new medium and the institutions that grow up around it.

The impact of new media, in Williams's model, is evolutionary, not revolutionary.

Moreover, as more and more of the youth try to get educated and opinionated through blogs in Pakistan, they fail to realize a few of the core issues that are associated with this media, the most important of which is information integrity, which can be defined as the dependability and trustworthiness of information.

In the cyber-world, integrity is generally measured by applause, popularity and search engine ratings and not by critical evaluation of the sources of knowledge. And it is due to this imperfection that big power and big money find ways to control access to virtual communities. We find that some of the "democratic contributors" to online information are hired hands of politicians and corporations who want knowledge to suit their interests, as well as their opponents of who want the opposite.

But despite the integrity issue associated with new media, popularity of Web 2.0 is increasing among Pakistan's youth and this popularity is of concern to news television channels in three main areas.

First, the popularity of news channels is decreasing among youth as a large number of youth have actually switched from news channels and started to use blogs and services such as Twitter to get news updates. To retain this niche of audience, news channels need to develop expertise in offering news through new media, which is a specialized domain altogether.

Secondly, if news channels do not report a news item or an event making waves in the world of blogs, there is a high risk that netizens will loose confidence in that particular channel. And many news organizations might not be able to understand this diminishment of confidence due to their own lack of understanding of the power of new media.

Finally, news reporters are also developing a habit of using blogs and collaborative services such as Wikipedia as their only news source. The scope of their research is becoming limited, and that too, in this age of massive information. With today's news consumers sometimes being more aware than journalists themselves, this lack of research by journalists causes their own credibility to be on stake.

CONCLUSION.

Theoretically, Web 2.0 has a great potential to serve as a facilitator of knowledge and information exchange between citizens and politicians, and also amongst citizens. But in practice, in Pakistan's scenario, this role is very limited.

However, for Pakistan, the situation can change, if two areas of key concern are addressed.

On one front, political parties of Pakistan have a critical role to play, as played by Obama, in enabling the public, particularly the next generation, to interact with them through interactive websites using the latest of communication techniques.

Secondly, online citizens, both news consumers and news creators, need to be educated in order to leverage the emerging forms of power enabled by new media. An overload of indiscriminate information, as occurs in well-wired societies, reduces powerful information to meaningless gossip. It is only an educated online community that can separate information with integrity from information generated by popularity contests and clever manipulation.

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The Use of Acronomy in the Net Communication

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Abstract

The present study is devoted to tackling the use of acronomy in the net communication. Acronomy is a term that refers to initialisms which are produced as single words (Crystal, 2003:124). The first section of the silrdy sheds light on the impossibility for one to exploit the internet service unless that one is competent in the English language. While the second one is to present the notion of acronomy as a sort of linguistic abbreviation which must not be pronounced as series of letters but as a word (Enarsson, 2006: 3). The second section itself is subdivided into three subsections the first of which is to manifest acronomy as a form of jargon through which the cultural identity of the communicator may be identified. The second is to show how such a linguistic variety, acronomy, may be manipulate to save effort and time for the originator and the receiver of the communication. The third subsection introduces acronomy as a register; a variety of language that is resorted to in a particular situation. It is a distinctive medium of the net communication. At last, the conclusion sums up the findings of the study.

"1.1 Internet and English Language"

Internet is considered the latest in a long succession of communication technologies. The importance of internet grows rapidly in all fields of human life. This, implies that it becomes more and more important to know how to use and exploit internet service, and as a part of this, to read write English. This necessitates the idea that should be competent in using English to keep pace with the development of the world. Thus, people who are ignorant in English might find themselves in an awkward position of using internet. (Korpela, 2003:7)

In general, it is easy to learn to use internet service but one will find himself isolated on the internet if he is not familiar with English language. This reflects the fact that knowledge or lack of knowledge in English represents one of the most severe factors that causes polarization. Being in the age of information, people are continually in a constant need of new words to satisfy their daily needs.

To Quirk et al. (1985: 1530), describing any new word should be concerned with the processes of word-formation that are productive at present time. English has acquired new words by borrowing words from other languages it has been in contact with. A part from borrowing is to give a new meaning to old words thereby get a new word with a different meaning as in the word 'cool', originally meaning, 'chilly' which is now used as another word for " outstanding ". Another way to create completely new

words is through certain regular and predictable processes such as compounding, clipping, backformation, derivation, blending and acronym (Enarsson, 2006: 2). Such processes, to Haspelmath(2002:25), represent apart of the language productivity in communication.

Creative capacity means producing and understanding indefinite number of words that are sequenced according to certain grammatical rules. It is also used in a more restricted sense referring to the language user's production of a specific feature or pattern. A pattern is productive if it is repeatedly used in the language to produce further instances of the same kind (Crystal, 2003: 347).

Being used in the internet, English is expected to be learned by all those who exploit internet service. To Fasold (2006:55-6), "the foremost task of any language leaner,... is to figure out how to segment and analyze the wall of talking -noise around them into meaningful parts". The ability to express meaning is an indispensable aspect of a language. Studying meaning in a language is connected to the study of the grammatical structure of words and sentences in that language. (Trask, 1999:47-8).

Moreover, Quirk et al. (1985: 1532) state that:

the ordinary user of English who is neither a poet nor an experimental scientist must be seen as having a fairly passive role in word-formation ... truth this does not mean that it is of no practical concern or interest to ordinary user of the language. If the ordinary user is rarely called onto construct words, he is prone to analyze them and inclined to expect that complex items are composed of a relatively small number of basic ones.

This implies the idea that each language has its own rules and processes for creating new words. Studying word - formation should not stop at the station of the existing, listed dictionary words since new ones are continually being added and dictionaries are always revised and updated. In other words, not all of the words that one can produce and interpret are listed in the lexicon, because the number of the possible words is infinite. Such an infinite number of words in a language, according to Hudson (2000: 73), make up its lexicon that is a dictionary which enables one. to find morphemes in many ways. Such morphemes are interpretable in their context even if they are never recoded in a dictionary. The forms of morphemes may be simple or extremely complex. one's Knowledge of the mental rules and categories that enable language user to produce and interpret them make up the subject of morphology.

Morphology is concerned with the systematic scrutiny of the form and meaning of the word. It is necessary for this form –meaning cove ration to occur systematically in group of words. Having just two words with parcial form - meaning resemblance may be merely accidental. Thus, one would not say that the word "hear" is morphologically structured and related to "ear". Conceivably, "h" could mean 'ouse", so "hear" means "using one's ear ", i.e. "hear ". But this is the only pair of this kind in the sense that there is no "heye" "use one's eye". (Haspelmath, 2002: 1-2)

In addition, morphology is not limited to the internal structure of morphemes but also studies the combination of morphemes to yield new words. To Quirk et al. (1985: 1580), such a combination of morphemes may be achieved through abbreviations which represent the essence of lexicalization. The meaning of the combination is not recovered from the constituents but from its individuality as a whole. Acronymy is one of the productive processes in which abbreviation is involved in English word formation. English acronyms are highly resorted to in the net communication nowadays.

" 1.2 Acronymy"

Acronymy is a term that refers to the words which are formed from the initial letters of a set of other words, for example, NATO meaning "North Atlantic Treaty Organization" NASA standing for "National Aeronautics and space Administration" LASER which refers to "light wave amplification by estimr-rlated emission of radiation "RADAR means radio detecting and ranging and SCUBA referring to "self contained underwater breathing apparent". To be acronymys, such abbreviations, to Enarsson (2006: 3), must be pronounced not as series of letters by as a word.

Acronymys that are pronounced as a sequence of letters are called "alphabetisms", for instance, C.O.D /si:eudi:/. Such acronyms are like ordinary abbreviations here most peripheral to word formation. The use of capitals does not reflect the idea that the abbreviated items are proper nouns, i.e. there are certain letters representing full words like C.O, C.O.D, U.F.D, EEC, F.C. which respectively standing for '(in) care of,', 'cash on delivery', 'unidentified flying object', 'European Economic community', on the other hand, there are some letters representing constituents in a compound or just parts of a word as in GHQ, ID,TB, that respectively referring to "general head quarters", "identification

card" and "tuberculosis" (Quirk et al., 1985: 1582).

"1.2.1 Acronymy and culture"

Language, in general, is the main means where by one conducts his or her life. Its use in context of communication is bound up with culture in multiple and complex ways. People use words to refer to common experience. They express facts, ideas or events that are communicable because those words refer to a stock of knowledge about the world that other people share. But such a social group do not only express experience, they also create experience through the use of language. They give meaning to the language through the medium they select to communicate with each other, for example, writing a letter or sending and e-mail messages, reading the newspaper or interpreting a graph or a chat etc. (Kramsch, 1998: 3).

Living in the age of rapidly changed concepts, inventions, products and organizations, people feel themselves in a constant need for new vocabulary. Such newness in life needs new terms. The trend toward reducing the new terms or acronyms and then throwing away the original words has been spread far beyond the world of technical and other specialized jargons (Miller, 2007:3). To Kramsch (1989: 7), language, from which acronymy is a part, is a system of signs which has a cultural value. Speakers identify themselves and others through the use of language, i.e. they view their language as a symbol of their social identity. People may use an excess of acronymy in their writing and speech to reinforce their image as knowledgeable

members of the group, and hide their insecurities about their true worthiness. So it is to be expected that the group members will feel comfortable communicating in their jargon that is a subset of a language.

Moreover, if acronymys, as a form of jargon, are used knowingly in the presence of an outsider, the speaker or writer may try to exclude or intimidate the outsider or perhaps simply to impress the outsider, with his or her own membership in the group. This reflects the idea that acronyms are sometimes culture-specific. In other words the originator should not expect that acronyms are well-known or familiar to all members of other societies.

"1.2.2 Acronymy and communication

Practically speaking, the use of an acronymy standing for a long term or phrase represents a communicative strategy for saving effort and time for both the originator and the recipient of the communication. For example, it is difficult to predict that one would argue against using the acronymy

"DNA" instead of writing or saying "deoxyribo nucleic acid" in popular media discussions of murder case evidence. Another practical move is the simultaneous invention of a term and its acronymy so that the acronym itself carries a meaning evocative of the full term. (Miller, 20A7:6)

Even when defined initially in a document or article, acronyms may slow receivers down and frustrate them in their attempt to understand even the main points if those receivers are not familiar with such acronyms; see (1.2.1). Lacking semantic content, a new acronym must be encountered many times before it is likely to become a comfortable part of an individual's vocabulary. To be understood and used communicatively, such abstract concepts need a process of parsing a symbol or sound into meaningful idea. Thus when those acronyms are pushed to further level of abstraction that leaves behind intrinsic semantic content of communication gets left behind too (Enarsson, 2006: 5).

To achieve successful communication, the originator should save using acronyms for terms repeated many times in tire text. For a term likely to be new or unfamiliar to most of the receivers, one should avoid using an acronym if the term, according to Miller (2007:10), is used fewer than six or eight times in ten pages of a text. Also if the term is likely to be new to the receiver, one should define it more than once. Such a process of definition or re -mentioning should be done whenever the originator introduces other acronyms or time has passed. other people share. But such a social group do not only express experience, they also create experience through the use of language. They give meaning to the language through the medium they select to communicate with each other, for example, writing a letter or sending an e-mail messages, reading the newspaper or interpreting a graph or a chat etc. (Kramsch, 1998: 3).

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Buehler (1986, cited in Miller, 2007 3) states that there are three important requirements for technical communication that are: completeness, conciseness and fidelity. The acronym is an example of tension between the need for completeness and the desire for conciseness, presumably in the achievement of fidelity. However, the reason for completeness is also ethical and that of conciseness is practical. Therefore if the writer has to choose between completeness and conciseness, he should choose completeness, since an ethical reason should outrank a practical one.

Having certain instant messages, it is discovered that the following	ng
acronyms are most commonly used with their counterparts:	

1. BRB	Be right back
2. CTRN	Can't talk right now
3. IMO	In my opinion
4. HTH	Hope this (or that) helps
5.IAM	In a meeting
6. WFM	Works for me
7.BFO	Blinding flash of the obvious
8. DHTB	Don't have the bandwidth
9. IHMB	I hate my boss
10. SLAP	Sound like a plan
11 - AKA	Also known as
12. ATM	Automated teller machine
13- COP	Cash On Delivery
I4. CPA	Certified Public Accountant
15. DOA	Dead On Arrival
I6. IRS	Internal Revenue Service
17. VIP	Very Important person
18. VP	Vice - president
19. UPS	United Parcel service
20 .AFK	Away From Keyboard
21. BAK	Back At Keyboard
22. BFN	Bye For Now
23. CU	See You
24.LTNS	Long time, no see
25. GAL	Get A Life

26. TSWC	Tell Someone who cares
27. GFET	Griming from Ear To Ear
28.AAMOF	As A Matter Of Fact
29.AFAIK	As Far AS I Know
30. DAMHIKT	Don't Ask Me How Know This
31. BTW	By The Way
32. DGT	Don't Go There
33. DQYDJ	Don't Quit Your Day Job
34. TMI	Too Much Information
35. FMDIDGAD	Frankly My Dear, I Don't give A Damn
36. FYSBIGTBABN	Fasten Your Seat Belts, it's going to be a
	bumpy night
37. GMDTS	Give My Daughter The Shot

Some of the above mentioned acronyms may be adopted for more specific meanings within the context of a particular company or industry or other social members. For example, the acronym "UPS" has another meaning which is "Uninterruptible Power Supply", and the same is with "CPA" which also means "Command Processor Assembly". Such a case of having the same abbreviations standing for more than one term or phrase is not good even if the context provides differentiation. It is a case that creates some sort of confusion to the receiver. (Enarsson, 2006: 7)

As far as internet terminology is concerned, Bill Earles's dictionary,2005 on line, provides the following acronyms:

1. Acl	Access control List
2. ADO	Active Data Objects -
3. API	Application Programme Interface
4.ARPA	Advanced Research Projects Agency
5.ASCII	American Standard Code for information Exchange
6. ASDL	Asymmetric Digital Subscriber Line
7. ASP	Active Service Page
8. BPS	Bits Per Second
9. BBS	Bulletin Board System
10. BITNET	Because [t's Time Network

"1.2.3 Acronymy and Style"

To achieve meaningful communication, one has to recognize the structure and content of what is being written or said. The writer or speaker has to package the message in accordance with what the reader or listener does or does not know sequencing every thing in a coherent way. Consequently, the writer has to adopt a more explicit communication.(Yule, 1996: 83)

Ancient scholars believe that each one has a unique style of his or her own. Style is the personal use of language, the self conscious process of composing a text to achieve an aim. Some people, particularly those who are internet users have certain strategy in using unique set of linguistic items and structures expressed in a special way that is recognized as a personal style. Such a style represents "the qualities that result from a particular kind of diction, figures, and sentence designs". Klaus (cited in Love and Payne, 1969: 52-3)

The use of acronyms represents an inevitable part in-the internet users' style. It is a style that is seen as "a means by which one personality moves others" or "means by which a human being gains contact with others; it is personality clothed in words, character embodied in speech.".(Lucas, 1965: 38-9)

Using acronyms as a stylistic mechanism in the internet communication, the user is seen as manipulating or exploiting language not only in its 'interpersonal function' i.e. participating in social interaction, but also in its 'textual function', composing a well-formed and appropriate text, and also in its 'ideational function', introducing thought and idea that the user is either lax or economic, (see I.2.2).

To Flaubert (in Murry, 1976:2), style is the writer's individual way of seeing and expressing things in certain situations. Style is the writer himself. To Fasold (2006:190),'Each situation makes its own communication Demands-informational, social, referential, Expressive and people use the features of their language which meet the communicative demands of the situation. The set of language features phonological, lexical, syntactic, and pragmatic which are normally used to meet the demands of a particular communicative situation is the resister of that situation.

Being highly common and depended upon in the internet communication, acronyms represent the 'register', a variety of language that is typical of a particular situation, of the internet exploiters.

To Crystal (2003: 425), using the distinctive features of a certain linguistic variety outside its original situation reflects the impression that a new variety has arrived in the language. Several of the net speak distinctive forms can be encountered in the everyday communication. A great deal of the lexicon of netspeak has entered the general vocabulary to be part of the speakers' style. The following examples may explain such a phenomenon.

- Let's go offline for a while: Let's talk privately.
- He started flaming me for no reason at all : shouting at me.
- I'll ping you later: get in touch to see if you're around.
- I need more bandwidth to handle that point: I can't take it all in at one.
- Are you wired: ready to handle this.
- Get with the program: keep up.

As with all slang, some of these usages may have a short linguistic life. To examine the linguistic properties of the netstyle is, Crystal adds (ibid),hard to ignore the fact that netstyle is not simply a new variety of English, but it represents a completely new medium in comparison with speech and writing in its 'distinctiveness' and 'generality'.

1.2.3. Acronyms and E-Learning""

It has become a fact that technological revolution has far-reaching effects on the aims of language teaching methods and research. Electronic developments and computer science have deeply changed the way in which language studied and seen. In other words, all areas of English language study have been profoundly influenced by the

technological developments. The new technology sheds light upon sociolinguistic studies of dialect variation. For further information, see Crystal(2003: 446).

To Kaplan(2002: 498), it is possible for the teacher to exploit the development of technology in assisting language learning process through what is called " Computer-Assisted Language Learning", henceforth, "CALL". It is a term that refers to " the search for and study of applications of computer in language teaching and learning.". To him(ibid), the teacher can design CALL tasks that develop language learners' competence and performance depending on task goals, learners activity, specifics of software design, and the number and roles of learners. Underwood(1984: 18) defines CALL according to certain qualifications, the first of which is 'language learning potential 'that refers to the significant roles the CALL activity play in the language learning in highlighting linguistic features in the input for learners to achieve the ' input enhancement'. If that CALL activity does not keep pace with Krashen's features of input, that are comprehensibility and simplicity, learners have to interrupt the normal interaction. Schmidt, unlike Krashen that sees language acquisition as unconscious process, states that what might be learned or acquired is what learners consciously notice. Schmidt's view is applicable to all aspects of language, lexicon, phonology, grammatical form, from which acronyms represent a part, pragmatics, etc., Kaplan(2002:499). This implies the fact that the teacher has to focus on interaction using CALL activity through which acronyms are used among learners to acquire such forms that facilitate knowledge interaction.

The second qualification that Underwood states is 'learners fit' which means the appropriate fit of CALL material to learners' linguistic ability level and individual characteristics. If the language of a CALL task is already known to the learner, psychologically speaking, the task presents no opportunity for development, but language that is beyond learners' grasp relative to their ability is equally ineffective. Task choice, to MacIntyre et al.,(1998: 545), depends on the learners' willingness to communicate, age, and learning style. Kaplan(2002:500-501) states that the CALL task should be both positive and practical where the former refers to its effects beyond its language learning potential. Classroom language learning tasks teach more than language; they should aim at developing metacognitive strategies. While the latter means how easily learners and teachers can implement the CALL task within the particular constraints of a class or language program.

The third qualification that Underwood uses is the 'authenticity'. It is the degree of correspondence between the a CALL task and the language use that learners are likely to engage in outside the classroom. Being necessary in communication to satisfy learners' daily needs, acronyms must be manipulated in the E-mail or chat communication to keep time and efforts. Current theory of communicative language ability as situation specific implies that development of ability in language for particular purpose requires practices in using language for those purposes.

To Crystal(2003:433), electronic conversations, as a way of information exchange, are " unusual, compared to face-to-face interaction- but they are conversations". It is useful for learners to know how to communicate using E-mail, that can be the most rapid and economical way of sending and receiving information, or chat that represents a single stimulus which can elicit several responses, scattered during certain period of time if the message of a particular topic is sent to a site. The use of acronyms in such a sort of electronic communication helps learners to express the content or meaning of the message with a less number of forms.

Conclusion

Net technology plays a significant role in influencing the character of the linguistic varieties. Abbreviation from which acronomy is a part represents the most noticeable means of the electronic communication. Resorting to the abbreviated forms reflects the desire for linguistic economy. Abbreviation contributes highly to make one's style concise. It also helps to convey a sense of social identity; to use an abbreviated form is to be familiar or known to the social group to which that abbreviated form belongs. To Crystal (2003: 425), electronic communication is affected by the size and shape of the screen, and the organization of the available visual space into functional areas just like newspaper language that is influenced by the size and shape of the spontaneous and rapid communicative possibility.

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Collaborating Towards Learning: Using Web 2.0 for Educational Idea Development

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Abstract

The rise of Web 2.0 technologies has vastly changed the field of collaborative work and collaborative learning. This paper introduces the design goals and features of the ScalableC project which is being implemented by SEETA (Software for Educational, Entertainment and Training Activities). ScalableC is a novel attempt based in India to develop trust and collaboration among the community through the use of social software. It aims to interest the community in the development of projects from the stage of ideas. It is designed for use by general users who wish to develop and receive feedback on innovative ideas as well as by organizations desirous of community involvement in idea development. It can also be used as an educational tool for facilitating learning through collaborative projects. Some of the key features of ScalableC are the use of multiple forms of media, apart from text, for effective collaboration, and simplicity in order to avoid overloading the user with information.

1. Introduction

Collaboration, projects and learning have long been interlinked. "Constructionist" ideas consider that knowledge or understanding is built especially well when learners are "consciously engaged in constructing a public entity" [1]. Even outside of such approaches, the importance of learning through projects that involve group work and collaboration is recognized. The nature of what is often called "Web 2.0" makes it, ideally, suited for use as a platform for such projects that aim at collaboration.

The term "Web 2.0" refers to a range of concepts, technologies or "practices" [2] [3] on the World Wide Web that usually involve more user-created content, and more freedom by the user to edit other content. Instead of remaining passive consumers of information, users can become publishers themselves. Users of Web 2.0 also associate tags with the content they upload, creating a form of metadata known as "folksonomies" which contrast with traditional metadata that is structured, hierarchical and predetermined [2]. More recently microcontent sites like Twitter have challenged the popularity and influence of blogs [4].From the point of view of collaboration, the most remarkable Web 2.0 tools are social software: platforms that connect people, through shared interests, knowledge or social needs, over the medium of the Web. Thus the Web is no longer a vast library of information, or even a network of resources, but may be

viewed as a network of individuals. For a generation that is used to Facebook and Twitter, there is nothing new in this view of the web. Surveys indicate that the greatest users of Web 2.0 technologies are young people below 18 and those in the age group of 18-24 [5]. As this is also the time when learning is of the greatest interest, it is worth harnessing social software and Web 2.0 as collaborative learning tools.

Section 2 of this paper elaborates on the definitions of Web 2.0 and social software, and compares the latter to collaborative software. Section 3 then reviews some applications of social software to the field of education. While social networks such as Classroom 2.0 (http://www.classroom20.com/) as well as other Web 2.0 - based tools have attempted to exploit its ease of access, editing features and connectivity with peers for educational purposes, the term "social software" still remains attached, in general, with informal modes of interaction and not with serious cooperative work or projects.

In section 4 of this paper the ScalableC initiative (<u>http://www.scalablec.com/</u>) that attempts to resolve this issue is described. ScalableC is conceived of as a platform that can be used both by individual learners or groups of learners for project-based learning, as well as by organizations that may use it in order to nurture and develop innovative ideas for educational initiatives, and to receive inputs from a wider community of experts on the same. The basic design goals that guide the development of ScalableC are described in this section, and some early case studies reviewed. . SEETA has developed and deployed various activities for the Sugar environment, through collaboration with OLPC (One Laptop Per Child) and Sugar Labs. These have been developed by our organization using strong community feedback and inputs. The projects discussed here are outcomes of the work done at SEETA through its association with the above organizations and with the community. Finally in section 5 the challenges faced in implementing the ideas behind this initiative are discussed.

2. The Participatory Web

2.1 Definitions of Web 2.0

"Web 2.0", rather than embodying a single technological shift, is viewed as the gradual shift away from regarding the Web as a source for information (a library) to a platform for creating content. Technological developments such as AJAX have of course been the factors making this possible. The massive implications of this new capability have led to the "participatory web" description of Web 2.0 [6], and a great deal of hype has been generated over the way the Web has been "democratized". Still, precise definitions of Web 2.0 are either unavailable or do not encompass all the platforms generally accepted as belonging to it.

It is argued [3] that the definition of Web 2.0 can be most usefully spelt out in terms of its "practice logics", that is in terms of certain types of uses of Web technology. Thus, according to this view, an activity (carried out through the medium of the Web) belongs to the Web 2.0 framework if it satisfies most or all of the following conditions: collaboration or distributed authorship, "bottom up" participation, distributed ownership or open content, use and reuse of material and lack of finality about the end results of the activity [3].

In general one is led to the conclusion that "Web 2.0" activities, platforms or tools involve greater community participation, more user-created content, and the production of material through peer collaboration. Thus a different attitude to information building is involved here: instead of static content imposed on the user, who merely "reads" it, there is creation of content

by the user, for the use of others of his peer group, and for potential editing by other users. The "publisher" in one instance can be the "reader" in another instance. For example, Wikipedia, the first port of call for many seekers of information, may be edited by those very users.

Another aspect is the logic of the "wisdom of the crowds" as opposed to a hierarchical, topdown approach to information management. This is exemplified by the use of tags or labels as metadata, by the users themselves, to make finding information easier. With easier generation of content by users and the portability of this content across platforms, it has become imperative to tag content, which in turn has led to the evolution of "folksonomies", a new-form of usergenerated metadata. Unlike traditional metadata, which is usually structured and predetermined "from the top", this involves a "wisdom of the crowds" approach [2].

The "practice logic" of Web 2.0 and the explosion in information on the Web as a result of user-generated content have their own applications as well as challenges when the Web is viewed as a source or platform for learning. Meanwhile, the most visible aspect of today's Web has been the increased use of social software, with its attendant rich possibilities for collaboration.

2.2 Social software and collaborative software

The idea that computer networks could be used to increase people's learning dates back to the 1960s [2]. Collaborative software is closely related to CSCW (Computer Supported Cooperative Work). It was used in corporate networks. Lotus Notes was an early example of software designed to promote remote collaboration.

Social software continues to be applied as a term to describe more informal ways of interacting, communicating and sharing information over the Internet. Generally these platforms are easy to use, which accounts for their popularity. The tendency to associate "social software" with informal activities and CSCW or CSCL (Computer Supported Collaborative Learning) with "serious" work has been remarked upon by previous researchers in the field [7].

Nevertheless, social software has potential for use as a platform for collaborative work and learning. As opposed to traditional CSCW approaches, it relinquishes a top-down approach in favor of active participation from the individual user's side. It is the user who can post content, create, join or leave groups, and comment on other's contribution. Past CSCW approaches have seen a lack of user initiative, which may be tackled through the use of social software because of the above characteristics [7].

Specifically from a learning perspective, what are the implications of the nature of social software? Because any user can upload or create content, the amount of information available to the user may become too much to effectively aid in learning, if it is not somehow streamlined. Secondly, the lack of a final authority on information can make dependence on social software (and in fact, Web 2.0 approaches in general) problematical for students in a formal educational set up. Because of the peer-review approach, the student may find it hard to find a "responsible" source to which she can refer in examinations for example [3]. On the other hand the same quality makes it suitable for use in project-based situations, where the focus is more on learning through interaction with one's peers [7].

3. Applications of social software to education

It is instructive to examine the different "types" of learning before exploring the use of social software for that purpose. Traditional learning, of the type that is practiced in formal educational

institutions, considers knowledge as a "substance" and education or learning as the process of transfer of this knowledge [8]. This process is usually defined as one-way (from the teacher to the student). It reinforces competition, as students compete with each other in the race to acquire knowledge. Testing is done to gauge the quantity of knowledge acquired by the student. John Seely Brown [8] describes this as the Cartesian model of learning, whose motto is "I think, therefore I am".

Collaborative learning is based on the idea that people create understanding (learn) through collaboration and participation. Although it is a wide field, there are some key assumptions about learning that it makes. Learners are responsible for one another's learning as well as their own; thus a sense of "positive interdependence" is created [9]. Learning is seen as an active, constructive process. Learners are diverse, and they react to the learning process in diverse ways, bringing different perspectives to the same process depending on their backgrounds, aspirations and experiences. [10]

The importance of group participation and involvement as a support to learning is being recognized. While there may be tensions between the basic concepts or assumptions underlying Web 2.0 and those of formal educational systems [3], social software can offer a platform for project-based learning that utilizes the ideas of collaborative learning, either as individual efforts to supplement formal education, or as a part of the traditional education system. As pointed out in [7], social software may not be applicable in the context of learning engineering equations, but it can certainly be used to support collaborative projects.

Educational blogging, wikis, photo sharing and learning management systems have been developed for use by learners. Moodle (http://moodle.org/) is a learning management system that is fairly popular and is used for curriculum management. Curriki (http://www.curriki.org) concentrates on community sharing and editing of course material, while Classroom 2.0 (http://www.classroom20.com/) is a social network for educators, where they can share resources and connect, with a focus on using Web 2.0 in education. These are just a few examples from the many tools available on the Web to assist education. However, the mere use of a certain technology does not make the resulting learning process collaborative or "Web 2.0"; for example, a teacher using wikis as a one-way information source, editing all the entries herself [3]. Along with course management systems, project based collaboration tools like Launchpad, Trac, Project Wikis and mailing lists exist. Most of these are oriented towards software development, which makes them difficult to use for nontechnical users. It is also observed across Web 2.0 platforms that most of them have user interfaces that promote browsing through pages rather than in-depth reading. An excessive availability of links to tools and resources can create confusion and distraction. While this may be permissible for general-purpose social software, it cannot be conducive to working or learning. Even the general social networking site Facebook owes its popularity to a relatively clean interface [11].

4. The ScalableC platform

An initiative by Software for Education, Entertainment and Training Activities (SEETA), ScalableC has been started with the aim of building community around ideas. Many platforms exist for managing projects. ScalableC concentrates more on collaboration over innovative ideas for developing learning. Social software and the connective nature of the Web can be harnessed to build community around issues of importance. Learners of all groups and not just students of a formal education system should be able to benefit from the platform as well, by collaborating on
projects that are oriented towards these issues. Open-source software development was an inspiration, as it encourages groups of dedicated individuals to come together and collaborate on projects. However, ScalableC will not merely look at software projects. Rather it will concentrate on using technology in learning. It will try to serve as a base on which ideas about this concept, still relatively under-utilized in developing countries, can be formed and taken up to the blueprint stage.

4.1 Design principles of ScalableC

A few of the basic principles of ScalableC are:

Collaboration

Currently ScalableC supports asynchronous and synchronous collaboration, the former through messaging systems, blogs, audios and videos, the latter by a chat facility. One of the issues with CSCW, as outlined in the section titled "Social software and collaborative software" is the problem of having participants take the initiative. On ScalableC, individual members can create organizations, groups and blogs. Secondly, the user interface design tries to encourage doing things rather than merely browsing through the site. Third, we plan to include an extensive guidelines section that tries to make collaboration easier.

• Community and inclusiveness

ScalableC aims to involve the community – non-technical people, experts in the fields of education, and interested and dedicated individuals. It is felt that a collaborative project, if it aims to make a large impact and not remain restricted to a niche group, should involve organizations, civil society, members of the formal educational systems and individual volunteers. As described in [12], attempts at reform have sociological and institutional components which we cannot neglect if we are serious about change.

This translates into the necessity for a user interface and a general design which should be easy to use and comprehensible, not only to technology experts but to people from other fields –education, schools, NGOs. This necessity has been felt for some time and ScalableC aims to fulfill it.

• Context

Even though an estimated 500 million to 1.8 billion of the world's population [13] –and a large percentage of that of India – understands English, there are still subtle difficulties that emerge when two people from different environments and cultures try to communicate with each other. This can lead to miscommunication and difficulties in collaboration and learning together. Sometimes a need is felt for using a medium other than text. This necessitates the functionality in ScalableC by which videos and audios can be used for collaboration and responses. The audio function is especially useful as videos require higher broadband speeds, not yet available everywhere in developing countries such as India.



Figure 1: Design principles of ScalableC

4.2 Community guidelines

The basis of the ScalableC project lies in harmonious collaboration. To this end, it is planned to include some basic guidelines that, if followed, will enable healthy collaboration and group interaction.

The Wikipedia project has a detailed category of articles on etiquette, courtesy, conflict of interest situations and other potential sources of conflict or dissatisfaction among its member contributors [14]. A basic code of etiquette is necessary for collaboration. Human group dynamics are complex. Differences in culture and context may change the definition of what is considered courteous and what is not. As the Wikipedia project puts it, "treating others with respect is the key to collaborating effectively". It must be remembered that the people who are working together can come from different countries and cultures. What may be acceptable in one culture may not in another. A conflict of interests may happen if a person is put in a position where he has to write (in the case of Wikipedia) or judge objectively on issues in which he has a personal stake. This too will need to be avoided. Being courteous towards new members of the group is essential.

Apart from the above, content guidelines are needed to help maintain the relevance of the information that is shared on the site. These include labeling of content and verifiability of claims. This is, of course, not a complete list of all the kinds of behavior that contribute positively to collaboration and clarity between members. Since ScalableC is aimed specifically at supporting collaborative projects, especially for education, we have currently kept membership on an invitation-only basis. Members can send invitations to their associates, or an organization with an account at ScalableC can invite its employees to join. A person wishing to join and contribute can request an invitation directly by clicking "Register" on the main page of the website (http://www.scalablec.com).

4.3 Case studies

Two of the projects currently associated with ScalableC are directly related to children's education, and involve the XO laptop developed by OLPC (One Laptop Per Child). The Digital Literacy Project (formerly 'Hello Laptop, Hello World') is a non-profit Harvard student organization whose aim is to promote the integration of the XO laptop into classrooms [15]. It seeks to do this by developing training material and curricula around it. Among its current

projects is a pilot project in Nicaragua, in which they seek to improve accessibility to hearingimpaired children by developing course materials aimed at them. This project, a combined initiative with SEETA, is trying to harness the fact that technology can give hearing-impaired children access to newer modes of communication. Working with the InterAmerican Development Bank and the Nicaragua Deaf Association (ANSNIC) [16] [17], it is trying to set up an XO laptop lab for such children. The members of this group are using ScalableC to develop and test videos in sign language through collaborative methods [18].



Figure 2: Developing course material for hearing-impaired children (Digital Literacy pilot project)

Another current use of the ScalableC platform which has seen contributions and efforts across international borders is a collaborative effort at developing and improving an educational software product. SocialCalc on Sugar is a spreadsheet activity developed for functioning in the Sugar environment, which is OLPC's software paradigm [19]. One of its key features is the support of collaboration over the mesh network. SEETA is collaborating with OLPC and Sugar Labs over this activity. The community initiatives aspect is currently being carried out by this organization. The SocialCalc on Sugar community too is using ScalableC currently.



Figure 3: SocialCalc in Spanish at ScalableC

A group has been started on ScalableC about SocialCalc on Sugar for educators, content engineers, translators and other professionals to develop case studies on using this software in schools, and also to collaborate on ideas related to developing curricula. Videos on using the charting tool have been uploaded on the ScalableC site. The significance of context is highlighted by this project, as some of the contributors do not have English as their first language. This underlines the importance of laying stress on videos.

A third project currently using the ScalableC platform is aimed specifically at young children who are just learning the alphabet. The Wellness, Inc has developed the concept of integrating alphabet learning into physical fitness exercises. This approach to alphabet literacy involves, according to the organization, better physical fitness as well as better learning of the alphabet, based on the claim that people's bodies move in rhythm with their speech [20]. The aims of the project are to improve the following in young children:

- Physical, mental and emotional well being
- Creativity
- Team work
- Socialization

SEETA is collaborating with Wellness, Inc over the development of a software activity with a similar emphasis on alphabet literacy through team learning, oriented towards the OLPC laptop (XO-1 and XO-1.5).The community outreach and feedback on ideas and project development will be carried out over ScalableC.



Figure 4: Alphabet Fitness Program at ScalableC

Another recently-concluded event that used ScalableC was especially tailored for universitylevel students with an interest in software and game development. The Global Game Jam is a collaborative game development event. The year 2010 marked the first time that it was held in India, the venue for the event being the Netaji Subhas Institute of Technology (NSIT), New Delhi, India. The theme for this year's event in India was the development of games that are focused towards social good [21]. ScalableC was used as an organizational forum for collaborative game development efforts in this event. The platform was used to report the event as well as for collaborative discussions among the developers (for example, through the chat facility).

An upcoming initiative on ScalableC is aimed at developing an open source tool for ABA (Applied Behaviour Analysis) for helping children with autism. Three organizations – SEETA, Solution Grove and Sugar Labs will be collaborating over it. It is planned to use ScalableC as a platform to develop the specifications document for the tool, with feedback from the community.

4.4 Roles of the co-authors

In order to develop community projects at ScalableC, strategic collaborations with the Digital Literacy project at Harvard University and Wellness Inc were built by Manu Sheel Gupta. He was also responsible for managing the financial budget of ScalableC Web 2.0 development and processes, for developing the vision statement and roadmap and for managing the project development and software engineering at ScalableC. Krittika Adhikary is carrying out research on Web 2.0 practices, community guidelines, educational models, tools and frameworks. She also researched and developed the design goals and community guidelines of the ScalableC project. The study of the best software engineering practices for Web 2.0 platforms was carried out by Ekansh Preet Singh. He conceptualized and implemented the software design of ScalableC and initiated the idea of building a simple and elegant user interface. The introductory flash video for ScalableC was developed by him. Swarandeep Singh is responsible for community outreach initiatives. He organized the Global Game Jam 2010, India at ScalableC and is also responsible for organizing feature requests for ScalableC.

5. Conclusion and challenges ahead

The idea of learning through actively building projects and interacting over them has received wide acceptance lately, and atleast to some extent even formal education systems have tried to incorporate project-based learning. The development of tools for community collaboration over ideas for wide-ranging issues, of which education and learning is a prime example, is one area of current interest. Though collaborative tools like Launchpad already exist, most of them provide text-based collaboration and document management services. A need has been felt to have collaborative platforms that can handle multiple types of media, so that they could be used effectively by people from various fields (such as educators, designers and content developers) which require collaboration over non-textual content. The collaboration platform should be simple in design and so designed that the community and not just those already familiar with technology can use it constructively. Also, a more light and clean user interface design was required which would support the process of learning through doing projects and thinking about them, rather than browsing through content which is the case with most social software applications at present. In this paper we described ScalableC which uses Web 2.0 ideas to enable collaboration through video and audio as well as text. Synchronous and asynchronous modes of communication are supported.

The impact of such a project will only be clear after a period of time. As in many typical Web 2.0 applications user feedback and reports will form an essential part of the continual improvements and development that we are planning. Some of the challenges we have already identified are related to keeping the content relevant and weeding out of irrelevant content, which we would like to do in an automated manner. To this end, one of the ideas that we are

thinking of exploring is that of the Semantic Web, in which machines are envisaged as understanding knowledge and processing "knowledge" instead of merely text; this area is in a very nascent stage and requires further research. User interface design too is something that we would like to constantly keep improving.

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Blogging as Adult Learning: Meaning of Adult Bloggers' Experiences

Abstract.

This study identifies a blog that can facilitate adult informal learning practice. The study is based on an online survey with 70 adult bloggers in Korea undertaken to understand the nature of adults' blogging and its meanings in terms of learning. It investigates (a) adults' blogging experiences related to learning, (b) bloggers' perceptions of the usefulness of blogging in terms of four perspectives on learning processes (i.e., learning as an acquisition process, a reflection process, a practice-based community process, and an embodied co-emergent process), and (c) the link between adult informal learning and blogging. The findings show that the majority of participants became aware of positive changes, including learning experiences, in everyday life after blogging. Bloggers perceived blogging mainly as knowledge-acquisition and/or reflection oriented learning process and defined the characteristics of learning through blogging as 'self-directed,' 'practical,' 'situative,' 'unlimited and accessible,' and 'self-regulated.' These characteristics are distinguished from those of formal education in schools. This study therefore implies that the blog can be a meaningful learning environment facilitating the informal learning for adults more enriched and fulfilled.

1. Introduction.

This study intends to explore blog as a meaningful environment for adult informal learning. Blog, a social phenomenon for the last decade (Boyd & Ellison, 2007) functions various with the latest development in web-based technology. Today, more people are reading and keeping blogs (Universal McCann, 2008). For example, as of February, 2007, 2.5 million blogs posted at least one tagged post; 1.5 million blogs are posted per day; 1.4 new blogs are created every second (Masternewmedia, 2007).

For the perspective of teaching and learning, some studies prove that the features of blogs are used for educational purposes, particularly for various kinds of classroom instruction (Boling, et al., 2008; Glass & Spiegelman, 2008; Haramiak, Boulton, & Irwin, 2009; Kajder & Bull, 2004; Martindale & Wiley, 2005; Quible, 2005; Ray, 2006; Wassell & Crouch, 2008). In these studies, researchers argue that blog is an effective instructional tool

in which instructors and students can communicate with each other to discuss issues raised in class. While most of studies have dealt with the usefulness of using blog in formal classroom settings, the self-directed use of blog by bloggers and its embedded meaning has still been an area of exploration. Also, less research has been conducted to explore blogs as a newly emerged space where learners can gain learning informally. This study aims, therefore, to explore the nature of adults' blogging and its meaning in terms of their everyday learning. It investigates the reasons of adult bloggers' use of blog, conception of learning, and the interpretations of the linkage between their blogging and learning. Therefore, the research questions were:

- (a) What are features of using blogs and the adult bloggers' perceptions of the blogging experiences related to learning?
- (b) What are potential uses of blogs for the learning in relation to the perspectives of adult learning processes?
- (c) What are characteristics of the blogging as the adult informal learning in distinction from the formal education?

2. Theoretical Framework.

2.1. Characteristics of adult informal learning

To respond to the accelerated changes in a society, lifelong learning has been considered as a required and essential one. Since adult learning has become a major part of lifelong learning discussion for the last few decades (OECD, 1996), contemporary adults have been encouraged to find learning opportunities in diverse spaces they reside including home, educational institutions, workplace, community, and even cyberspace (Kwon, 2001).

Unlike children or adolescents who are supposed to learn in formal educational settings such as schools, adults learn more in diverse and flexible settings. Adults may learn significantly in more incidental and spontaneous learning situation even inside educational settings. They also plan and conduct learning without any direct reliance on teacher or instructors or just gain learning as serendipity. These cases correspond to informal learning (Marsick & Watkins, 2001). In broader sense, informal learning includes the experiences of everyday living from which we learn something (Merriam & Cafarrella, 1999).

Informal learning has a formidable merit, in that it has wide flexibility that makes people involve freely and voluntarily in learning without the presence of instructors and externally imposed curricular criteria (Livingstone, 2001). With less restriction, it can be more learner-centered when learners can actively decide important things from time and place to learn to purposes and outcomes of learning.

This flexibility in informal learning has been favored by adult learners. Empirical studies regarding adult informal learning have shown that the overwhelming majority of adults spend a substantial amount of time in their pursuit of informal learning (Johnstone & Rivera, 1965; Tough, 1971, 1978; Livingstone, 2001). For example Tough's study found that over two-thirds of adults' intentional learning occurred outside schools or educational institutions (Tough, 1971). According to these findings, informal learning can well be

defined as one of the important and predominant form of learning in adult lives.

Informal learning, however, is hard to distinguish it from life experiences since it occurs in every part of the lives of the learners. So much of it is invisible and easy to be underestimated. Either visible or invisible, comparatively less studies have been conducted on how effectively informal learning enriches adults with tangible learning outcomes (Livingstone, 2001; 2002). According to Schugurensky (2000), informal learning can take different forms due to the non / existence of intentionality and awareness of learning. He defines informal learning in three forms - self-directed learning, incidental learning, and socialization (see Table 1).

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Forms	Intentionality	Awareness
Self-directed	Yes	Yes
Incidental	No	Yes
Socialization	No	No

Table 1. Three forms of Informal Learning (Schugurensky, 2000, p.3)

In Schugurensky's classification, self-directed learning refers to 'learning projects' carried out by individual learners. This type of informal learning is intentional because the learner intends to learn something. It is also conscious process in the sense that the learner is aware when the learning is happened. Incidental learning, meanwhile, refers to the learning experiences that occur when the learner may not intend to learn something. After the experience, however, she or he becomes aware of it. Thus, it is unintentional but conscious process. Socialization, which is also referred as tacit learning, refers to the internalization of values, attitudes, behaviors or skills that occur in everyday life. It is very hard to research due to its nature. Therefore, socialization or tacit learning is hardly discussed in this present study.

2.2. Processes and outcomes of adult informal learning

Adult informal learning takes different process and yields diverse outcomes. No single theory of learning comprehensibly explains various learning processes. For example, adult learning not only includes the acquisition and accumulation of information, but also embraces "making sense of our lives, transforming not just what we learn but the way we learn, and it is absorbing, imagining, intuiting, and learning informally with others" (Merriam, 2001, p. 96). To address the adult informal learning processes and outcomes through blogging, this study depends on Fenwick and Tennant's (2004) categorization of adult learning process. Adult learning process, according to Fenwick and Tennant, can be grouped as four different perspectives: learning as (a) an acquisition process, (b) a reflection process, (c) a practice-based community process, and (d) an embodied co-emergent process.

First, "learning as acquisition" understands knowledge as a substantive skill or competency, concept, or new language, which a learner can acquire. Second, learning takes a reflection process. "Learning as reflection" interprets learning as a meaning-making process. Third, learning can also be viewed as a social activity embedded in real social relations. The fourth perspective views adult learning as a co-emergent process. From its perspective,

learning viewed as participation in a community of practice is criticized that it still separates individuals from group, humans from environment, subject from object (Fenwick & Tennant, 2004). The meaning of this classification of adult learning in terms of its process can be connected to the issue that this study focuses on - adult informal learning. As addressed, adult informal learning takes place very often in adults' everyday life and holds high value. In this study, various scholarly definitions and classifications regarding adult informal learning are used to conceptualize the meaning of blogging as adult informal learning. Schugurensky (2000)'s categorization of informal learning, incidental learning, or socialization depending on whether there is intention or awareness. By using Fenwick and Tennant (2004)'s categorization, blogging activities are to be understood as learning activities which take uniquely different processes to yield various outcomes of learning such as acquisition of knowledge, reflection of experience, formation of identity by participation, and co-emergent change of both learners and the system.

3. Methods.

Along with a mixed model research (Johnson & Christensen, 2004) approach, an online survey questionnaire was developed to explore the ways in which adult bloggers use blogs, their general understanding on the usefulness of the blogging, and the meanings of blogging in their everyday life and learning. The survey questions were generally grouped into three categories: demographic background, personal experiences with blogs, and the perceptions of learning in relation to blogging experiences. As a part of the survey, a set of questionnaire (see Table 2) consisting of twelve items on a Likert scale (from 1, strongly disagree to 5, strongly agree) was developed specifically to investigate bloggers' perceptions on the usefulness of blogging for certain types of learning. Items of the questionnaire were designed based on the four perspectives of learning process identified by Fenwick and Tennant (2004): Learning as (a) an acquisition process, (b) a reflection process, (c) a practice-based community process, and (d) an embodied co-emergent process.

Learning	Items	
perspectives		
Learning as	1. Blogging can be useful in acquiring various kinds of knowledge	
an acquisition	and information.	
	2. Blogging can help me develop my own expertise on some areas.	
	3. Blogging can help me engage more actively in my fields of	
	interests.	
Learning as	4. Blogging can help me experience the 'a-ha' moment that my old	
a reflection	views transform to a new one.	
process	5. Blogging can provide me opportunities to grow by looking back	
	on my own thoughts, views and experiences.	
	6. Blogging can be useful to describe and/or express my thoughts	
	and views.	

Table 2. Questionnaire for the usefulness of blogging for learning

	7. Blogging can help me gain new awareness and set up plans on the
	basis of it.
Learning as	8. Blogging can be useful to build up some social networks around
a practice-based	me.
community	9. Blogging can help me realize the influence of other bloggers on
process	me.
	10. Blogging can help me realize the importance of it as a collective
	activity in a community.
Learning as an	11. Blogging can make me communicate with the world and can
embodied co-	influence every area of my life.
emergent process	12. Blogging can help me create new knowledge and I can share this
	with others as an expert.

3.1.Data Collection

Seventy Korean adult bloggers (i.e., over 20 years of age) were finally recruited for the study. They were users of Naver (<u>http://www.naver.com</u>), which is one of the representative blog service providers in Korea. Bloggers who were enrolled in any formal education programs (e.g., college, university, graduate school) were excluded because their uses of blogs could be influenced by formal education, which may influence unnecessarily to the focus of the study, adult informal learning.

The majority of survey participants were in their 30s (57.2 %), female (75.7 %), and office workers (40.0 %) or have professional jobs (20.0 %). Forty-three participants (61.4 %) had used blogs for more than two years.

3.2. Data Analysis

The data were analyzed using both quantitative and qualitative methods to investigate any feasible correlations among the various aspects of the relationships: the participants' demographic information, their patterns of using blog, the blogging experiences, their descriptions of learning, and their perceptions on the usefulness of blogging for learning. The data obtained from the open-ended survey questions were qualitatively analyzed using microanalysis method (Strauss & Corbin, 1998) to fully understand their blogging experiences by "coding the meaning found in words or groups of words"(p.65).

4. Findings.

4.1. Blogging experiences related to learning

In terms of the behaviors of bloggers, the statistical analysis of the survey responses did not offer any meaningful correlations between and within variables: the participants' demographic information and their patterns of using blog. The results show that it would be difficult to articulate the behavioral patterns of using blog in short. Hence, it is required to investigate more qualitatively regarding what various features would be found from their blogging experiences.

Out of 70 survey respondents, 61.4 % had used blogs more than two years, 68.6 % indicated that they engaged in blogging about two hours per week, and 13 bloggers (18.6

6

%) had spent more than five hours. Regarding the purposes of using blogs, 43 participants (61.4 %) indicated that they had used blogs for the sharing of information in relation to general issues. Other reasons of using blogs were to satisfied personal interests and hobbies (40.0 %). Based on their blogging experiences, forty-six respondents (65.7 %) gave positive answers on any changes in their life as below:

(a) Ways to deal with information and knowledge (23%),

"I got a habit that I searched and collected information like collecting different coins. I became sort of expert-minded on certain topics."

(b) Personal ways of thinking (23%),

"I reflect myself by sharing thoughts with other people."

(c) Self-development (40%),

"I could see myself more objective while writing a blog. And I could arrange and organize the things around myself better."

(d) Social relationships (15%),

"My relationship with friends and colleagues is more extended and deepened since I could stay in touch with them using blogs."

Meanwhile, 24 participants (34.3 %) reported that the blogging had no influence on ways of thinking or on their life. No matter whether they recognized any changes in their life, the majority of the participants (90.0 %) agreed that they had experienced some kinds of learning through their blogging activities. For further discussion on this issue, the following section will illustrate their perceptions on the relationship between blogging and learning based on the perspectives of adult learning.

4.2. Perception on the usefulness of blogging for learning

To understand bloggers' perception on the usefulness of blogging for learning, the results of the questionnaire asking the relationship between blogging and learning (refer to Table 2) were analyzed. In Figure 1, X-axis indicates four perspectives of learning process: Learning as an acquisition process, a reflection process, a practice-based community process, and an embodied co-emergent process. Y-axis shows how strongly the survey participants agreed to each perspective of learning process in relation to blogging.



Perspectives of Learning Processes

Figure 1. The degree of agreement on blogging as learning process in relation to four perspectives of learning processes

The result revealed that blogging is perceived as the most valuable in acquiring specific knowledge, expressing thoughts and opinions, and maintaining their interests. At the same time, the participants were not sure of the value of blogs on other perspectives such as community-based learning and co-emergent learning process. Overall, most of participants agreed strongly that blogging would be the most useful in knowledge-acquisition.

4.3. Link between adult informal learning and blogging

To clarify some characteristics of blogging as informal learning, the survey participants were asked to compare it with learning at schools, namely formal education. The foremost expressions were identified, characterized, chunked into groups, and organized as seen in figure 2.



Figure 2. Descriptions on the characteristics of informal learning through blogging

These characteristics were largely categorized into three themes: (a) learners' role, (b) contents of learning, and (c) learning process. Speaking of learners' role in blogging, 'self-directed' was mostly highlighted. Bloggers believed that blogging facilitates users to be active, learning process also to be self-regulated and open to any direction. The contents of learning are, meanwhile seen as more practical information generated from individuals' own experiences, or views, thoughts which although were not yet authorized as approved facts or truths. In sum, the findings show that the characteristics of blogging match well with the characteristics of adult informal learning, such as self-directed, self-regulated, and learner-centered learning. The adult bloggers seem to understand the notions of informal learning and to gain the benefits through blogging.

5. Discussion and Conclusions.

In this study, the majority of participants became aware of positive changes, including learning experiences, in everyday life after blogging. The changes indicate the ways to deal with information and knowledge, personal ways of thinking, self-development, and social relationships. In examining the usefulness of blogging in learning process, many participants believed that blogging is valuable in acquiring specific knowledge, expressing thoughts and opinions, and expanding their interests. Yet the blogging was not perceived as an activity which can play an important role in creating membership in communities or building new fields of knowledge/expertise. Third, adult bloggers identified the learning through blogging largely as 'self-directed', 'practical', 'situated', 'unlimited and accessible,' and 'self-regulated'. The participants seemed to agree

that blogging would generate ideal learning environments, particularly for adult learners who aim learning informally.

Even if the study has a few limitations, its findings provide us several fundamental insights. First, blogging may be useful helping learners' knowledge acquisition and reflection process. It is not a surprise since bloggers can access easily unlimited resources through the Internet and express their views and thoughts without any structured regulations. Next, the findings of this study indicate that blogging is a significant factor in having the informal learning for adults more enriched and fulfilled. Adults learn more efficiently if learning can be self-directed, practical, and reflection-oriented and blogging helps for adults have that kind of learning. Moreover, with the current emphasis on multiskilling and continuous professional development, the meaning of adult learning becomes more important. Blogging can be used to empower adult learners from across the spectrum of different backgrounds and skill-sets. Blogging can be used to teach and share specific knowledge and help promote a deeper learning by linking multiple ideas and concepts together within a personally engaging environment. The proliferation of social networking in society will aid these notions of blogging from merely one of the alternative learning environments to the one that integrates to the core learning across the disciplines, age, or types of learning. Overall, the further guidelines and studies in the broader context of learning and social networking and technology are suggested.

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The MIT LINC 2010 Conference Parallel Presentations

Session #8:

Matching the Student's Learning Style through Technology-Enabled Education



Training personalization with Knowledge Technologies and Contextualization

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Abstract

The state of the art in educational technology at the moment is limited to few technological platforms and devices which cannot allow learners to gain the most out of education content and context. In this article we will present some technologies for educational contents that will break the barrier of learning applications and will demonstrate some advanced knowledge technologies combined with contextualization tools which can do on the fly personalization for users of specific knowledge domains.

1 Introduction

The current state of the art in educational technologies is mostly based on user environment personalization and not content personalization. Technological platforms and learning devices enable only superficial or design oriented personalization which affects only the learners viewing, interaction and not full educational experience. In order to shift the focus centre from superficial or design oriented to deep knowledge derived experience we developed a new set of applications that will provide the learner with a completely new learning experience namely a personalization of content for his specific needs based on a deeper profiling set of information. In order to do this we developed a suite of tools containing a service oriented text enrichment tool, a user targeting data mining tool and a recommendation content system based on user preferences. We will also present relevant results from a questionnaire on training in academic and business institutions which points out a need for more advanced technology enhanced functionalities and a more holistic user/learner oriented use of educational content within the current state of technology enabled education. Finally we will describe a typical learner using the proposed new system in an admittedly hypothetical mode.

2 Background

The potential of these tools can solely be used if there exists a sufficiently large pool of educational content. As content can only be created in educational institutions we aimed at establishing an umbrella initiative that could create a large enough sustainable pool of knowledge and educational content. For this purpose the Knowledge for all Foundation will be created, which will join together an alliance of established international institutions into a forum for discussion and dissemination of advances in innovations in technology enabled education at the university level in established and emerging nations.

Knowledge for All Foundation for the purpose of this article theoretically could mainly try to bridge and give additional value to two large education oriented consortiums namely the OpenCourseWare Consortium (<u>http://www.oewconsortium.org/</u>) and Matterhorn Opencast Project (<u>http://www.opencastproject.org/</u>). OpenCourseWare is an initiative that produces free and open digital publications of high quality educational materials, organized as courses and is a collaboration of more than 200 higher education institutions and associated organizations from around the world creating a broad and deep body of open educational content using a shared model. Matterhorn is an open source project working within the Opencast Community to develop an end-to-end, open source platform that supports the scheduling, capture, managing, encoding and delivery of educational audio and video content. In this way OCWC brings a large pool of educational institutions which

produce value content in textual form and Matterhorn can be a possible solution for captioning video content within those institutions. The dissemination of the video output from these two projects could appropriately be channeled and provided by the educational video repository VideoLectures.NET (<u>http://videolectures.net/</u>). The main purpose of this web page is to provide free and open access of a high quality video lectures presented by distinguished scholars and scientists at the most important and prominent events like conferences, summer schools, workshops and science promotional events from many fields of Science. The technologies for training personalization taken into consideration in this article will be implemented in the Matterhorn Opencast project as VideoLectures.NET is also one of the core partners within this project.

Knowledge for All Foundation at the moment has a programme of five pillars of activity namely:

- Infrastructure: ICT Matterhorn Interoperability, Channels, Semantics
- Science: Journal and conferences
 - Online scientific video journal to global university
- Education: courses and content
 - Quality assurance peer reviewed content
- Research:
 - o facilitating the systems, accessing the content, enabling interaction
 - IPRs, multilingualism, standards
 - Business models (added value models)
- Other continent connections: case study in engagement and interaction

As we try and combine the two initiatives there is no apparent focus on the user's needs or perception of how users will manage to obtain reasonable knowledge from this pool of textual and video content. As text and video represent knowledge or basic fragments of it, there is a need to extract and properly display in a personalized way the information users might be looking for or need. Therefore the personalization of the users experience must be forwarded and provided with new existing technologies not yet used in the educational sphere as such. These are based on the following Knowledge Technology techniques:

- Text-Mining, Data/Web-Mining, Stream Mining
- Network-Analysis
- Statistical machine learning
- Semantic-Web, Context technologies
- Complex data visualization
- Cross-modal analytic
- Semantic Web Services
- Language technologies
- Knowledge formalization, Reasoning

Within the framework of Knowledge for All Foundation the main purpose is to use the before mentioned Knowledge Technology techniques for providing content knowledge services such as:

- On-the-fly personalization, contextualization and recommendation
- Video scene recognition, automatic annotation and categorization
- Semantic and multilingual search
- Accessibility, Internationalization (subtitles, transcripts)
- Advanced presentation services with direct user involvement
- Textual, graphical, video (audio) content integration services and enrichment

In this article we will further present and focus on one section of services namely On-the-fly personalization and contextualization.

3 Educational Training Needs Analysis and Users Study

In order to understand the real situation and basic needs of users and learners we present a selected set of questionnaire results of the users study that was aimed at getting information about current training habits of educational institutions and about their training needs and preferences. For this purpose we used an existing survey that was made by the Centre for knowledge transfer in information technologies, JSI for a European

Research project COIN [1] (Collaboration & Interoperability for Networked Enterprises). The plan in Knowledge for All Foundation is that more detailed assessments should be made in order to refine strategies and approaches. Based on the results from this analysis the technological activities of Knowledge for all Foundation and plan have been developed.

3.1 Questionnaire

To the extent that it is practicable and meaningful, the user needs and preferences for training in knowledge intensive organization have been assessed for the organizations according to several criteria:

- Organization type (enterprises, SMEs, industrial associations, professional communities, research organizations and academic institutions),
- Organization focus: industry, service, mixed
- Geographical location: west Europe, east Europe, rest of the world

Since quite an extensive research has been done in the past by European Research project ECOLEAD (only academic institutions in 2006), ToolEast (only industries in 2007) and currently in ACTIVE (industries and academic institutions in 2008), we have used these results and enrich them with some additional data that was gathered from the questionnaires sent to some of the target group representatives that were not contacted before. Those were in particular national industry associations (Chambers of Commerce and industry clusters, enterprises and academic organizations from the countries that were not taken into consideration before) and organizations inside leading Universities in the world that are responsible for Technology Enhanced Learning from the two communities OpenCourseWare Consortium and Matterhorn Opencast Project.

Because of the two distinct worlds of academia and business we decided to prepare two questionnaires one for the businesses and the other for academia. The aim of these questionnaires was to get the information about:

- Existing educational programs in the academic institutions and methods of learning,
- Existing training behavior but also training needs and preferences of business type of organizations.

We have asked business organizations what type of learning methods they use in their training. Figure 1 show that the most used methods are traditional training seminars, self-learning and consultations and also ICT (Information and communication technologies) supported learning. What is interesting also is the information that the institutional training is not that important. When the organizations answered with "other" to this question some of them proposed additional methods that were not mentioned in the answers. 85% of answers were proposing collaborative type of learning (collaborative learning, collaborative problem solving, group learning, and learning by help of social software).



Figure 1: Learning methods used

Figure 2: Preferred methods of learning

When asked about their preferred type of training events the answers as showed in Figure 2 were: self learning, face to face consultations in the company as well as online training (traditional workshops and e-learning) are the most important training activities. The offline learning (self-learning) is also quite important. The final question was asking about the type of methods, tools and techniques that organization use for the company structure, knowledge resources and social structure analysis. The answers show what was expected. Most of the

organizations are using traditional and statistical methods. Very few are using tools for more in-depth analysis or semantically enhanced tools.



Figure 3: Type of tools used for analytics



Figure 4: Used TEL methods in Academia

The first question asked to Academic institutions was about the technology enhanced learning methods that they might use. Answers show that there is not only high level of awareness about TEL (Technology enhanced learning) but also that many institutions already use in their normal operation TEL methods. The most used is ICT-supported self-learning that is mainly demonstrated as Web based learning. Surprisingly, learning through social software is also very popular. There is also some distance learning courses as well as online seminars.

We have also used results from the market studies made in ECOLEAD [2], PROLEARN [3], Tencompetence [4], Prolix [5] and Kaleidoscope [6]. Findings from the questionnaire that are interesting for Knowledge for All Foundation are as follows:

- learning from experience is preferred
- lecture-style delivery is unpopular
- only Web based/multimedia learning is not attractive
- the preference is to learn outside of the workplace
- courses longer than one day are difficult to attend
- training costs are usually too high

4 Knowledge technologies solutions

The answers in the questionnaire point in the direction that standard learning techniques, blended learning approaches, and similar are favorable in institutions but show a lack in penetration and not enough content retrieval to enhance and gain the maximum out of the educational potential of the content at hand. There is a clear need for stronger exploitation of technology enhanced learning (TEL). The ultimate goal of every TEL system is to support personalization of the complete learning process that includes: personalization of content, methods, guiding, motivation and learning goal. Since we are dealing mainly with the established training channel VideoLectures.NET, a predefined set of learning methods and self-learning approach, our focus is to personalize content objects (videos) based on user needs and preferences. In order to understand user needs and preferences on one side and provide learning environment and content adaptation on the other, advanced knowledge and context technologies needs to be applied. This is why we applied a set of tools that enables better representation, organization and exchange of information and knowledge and thus showing a more personalized approach for user solutions. We propose a suite of tools that are able to understand user behavior, the content that they are accessing and construct a user model accessed competences. Here we introduce a personalization process that is based on the three sets of tools that has been proven with their limited purpose in the real case implementations for (1) website visitors modeling and segmentation, (2) content recommender and (3) content contextualiser. Personalization loop as seen through knowledge technologies has a strong focus point on online users' dynamics and can depict a very clear picture of the actual status, needs and desires regarding real time on the fly needs.



Figure 5: Developed personalization loop

In the chapters below we describe in more detail each of the three personalization toolsets.

4.1 User/Learner Targeting

Quintelligence Miner (QM) is a decision support environment that integrates several data mining techniques and OLAP-style splits of large-scale data stores containing structured information (e.g. customer information). QM is being used by online publishers to model and understand the users, their needs and preferences and behavior characteristics. It modeling is based on the content users are reading in every web service session. It can model a particular user, cluster them in the interest groups and develop the most used user scenarios which is in particular important for the personalization of training.

A unique part of the tool is the ability to handle unstructured data such as text. In default setting, the analytic user can filter and split the data along any dimension in structured (e.g. gender or age) and unstructured data (e.g. topic, keywords, named entities). The system can aggregate all other dimensions for each split and visualize those using standard techniques for structured data (e.g. pie charts, histograms, world map). Aggregation of unstructured data is done using text mining techniques such as clustering, feature extraction and text visualization. An additional result of each split is a machine learning model which can be used for database fields (e.g. gender of a customer based on their shopping or reading behavior).

QM presents a successful approach for user modeling and understanding user behavior which is the entry point and first part of functionalities in the personalized training loop.



Figure 5: Quintelligence Miner Architecture

4.2 Recommendation Content System Based On User/Learner Preferences

The recommendation system currently used in the online video educational repository VideoLectures.NET (<u>http://videolectures.net/</u>) is another functionality that reflects a personalized service delivery to the user/learner.

The growth of information on World Wide Web makes users/learners more difficult to search for relevant information as the amount of product in e-education increases rapidly. Learners greatly suffer from searching for interested products or content. To avoid this problem the recommendation system helps users in finding the right resources they are looking for in a certain environment. Data collection in the recommendation system is managed with content-based filtering which includes observing the content that the user views online, analyzing the content/user viewing times, storing data about the content that a user views in log files format, analyzing the user's social network and discovering similar likes and dislikes. More explicit collecting of data includes the activities within collaborative filtering monitoring such as users rates on specific content on a sliding scale. The system makes crossover calculations by using a specific set of algorithms which combine users view history and server log files and the textual, temporal, visual metadata related to the specific content, in this case video lectures and which eventually show a logical and semantically based recommendation set for the user. Therefore by using a specific set of knowledge content a suggested and contextual preference set can be made therefore again personalizing the training experience.

This recommendation system presents an approach which comes after the user modeling and behavior understanding as it derives the users' behavior once the user reaches the content. It presents the second part of functionalities in the personalized training loop.



Figure 6: Recommendation system on VideoLectures.NET

4.3 Service oriented text enrichment

Enrycher (<u>http://enrycher.ijs.si</u>) is a set of web services that enable automated content enrichment and knowledge extraction functionalities. Enrycher services form an umbrella part of the basic services of innovative tools that enable building up many complex knowledge extraction scenarios that are needed in the environment of training personalization. Enrycher consist of several levels of basic technologies:

- Language processing services: Sentence splitting, Tokenization, Part of speech tagging, Entity extraction
- Entity level processing services: Named entity extraction, Anaphora resolution, Co-reference resolution, Semantic entity resolution
- Entity graph processing services: Triplet extraction
- Document level processing services: Semantic graph visualization, Taxonomy categorization, Content summarization

The schema that is used in the inter-service communication is abstracted to the point that it is able to represent:

- Document-wide metadata: identifier, document wide semantic attributes (e.g. categories, summary)
- Text: sentences, tokens, part of speech tags
- Annotations: entities and assertion nodes, identified in the article with all identified instances, possibly also with semantic attributes (e.g. named entities, semantic entities)
- Assertions: identified <subject, predicate, object> triplets (where subjects, predicates and object themselves are annotations.)

The datasets that can be used is any type of textual information. Since these are the basic services for dealing with textual information, many new applications can be built on top of it. In the case of training, these services are related to competency extraction and management, contextualized search over distributed information sources, information categorization, knowledge extraction and formalization, document linking and context preservation for the archives, educationally relevant topic detection and many others. We have already implemented some more general services that were also used in European Research Project COIN platform like (1) visual analytics services, (2) semantic integration of texts and ontologies, (3) question answering service and (4) story link detection service. Another potential use scenario is from a related domain of computational linguistics as evaluating local discourse coherence of text or extracting knowledge from large-scale document collections, such as news corpora, training course documents, etc.



Figure 7: Enrycher

5 Personalization learning environment test case

As the main purpose of this paper is helping the learner in new and unique ways we would like to propose a hypothetical scenario of a learner trying to access a course on an educational web page that consists of video, audio and textual content. For the purpose of this paper we decided to hypothetically use VideoLectures.NET (<u>http://videolectures.net/</u>) as the testing page although we feel that these tools should be implemented and used on a more broad and higher level repository or unique set of pages with educational content. The test page has been pre-monitored for a certain period in order to accumulate a sufficient minimum amount of user data in order to understand the user culture and trends that inhabit the page.

Suppose we know that a user comes to this particular web page every day and browses its content. The content the user is reading and watching in every web service session is monitored and stored; we know on the fly the users geographical location, country location, type of personal computer, browser, internet connection, gender, social status (student, worker), financial income, native language, etc. By this user/learner targeting we later model this particular user, cluster him in an interest group of similar users and get information about his browsing experience through the page via hints (not direct questions), that way we develop a set of most used content scenarios that he will decide to take. This is the user modeling and user segmentation part.

A this point we know his details and content viewing habits so we can use an automatic recommending system in order to show him what his interest target of users group saw based on the same viewing habits. If his viewing habits show that he is from a technical university, is an English speaker, has a good internet connection, he is able to stream video, and is ultimately interested in Physics and additionally the system knows that he already watched the introductory courses of MIT professor Walter H. Lewin, namely "MIT 8.01 Physics I: Classical Mechanics - Fall 1999" thus recommends him the "CERN Colloquium on Fundamental Constants in Physics and their Time Dependence" as the system supposes that based on the content he has seen so far, his knowledge on the subject should be adequate enough to see the CERN Colloquium. Here the content and user matching takes place.

Once the user decides that his video session is over, he tries to find out more on the subject of Physics, so he decides to browse and use a text enriching function over the term "Physics"; the result he gets is a visualized, contextualized search over distributed information sources (lecture description, physics course text and descriptions, news articles on the same web page or on related pages), and get a delivered information categorization of the text over this specific chosen topic. The text before him is enriched with semantic attributes, sentences, parts of speech, that can follow up into different search and topic contexts. Here the contextualization of learning objects takes place.

This scenario can continue invariably as it represents the personalized ongoing learning loop where the learner gets driven into the content with the help of contextualized personalization tools. As this all happens on the fly, this means that for each decision the learner makes, the tools adopt a suitable solution that keeps on driving the user toward his needs.

6 Conclusion

In this paper we have presented a specific framework for training personalization based on advanced knowledge technologies combined with contextualization tools which can do on the fly personalization for users of specific knowledge domains. All three technologies take into consideration that there is an existing pool and deep body of structured open educational content which has an immense knowledge potential and is not fully exploited towards learners needs. The Centre for knowledge transfer in information technologies at the Jožef Stefan Institute is familiar with these technologies, has implemented them on several test cases and proposes for the first time such an analytic and innovative approach towards training. As these technologies have in practice been used separately for specific purposes when merged on one location and in one tool suite, they can become a powerful technological resource for the broader learning community.

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EDUCATIONAL TECHNOLOGY: THE NEED FOR BETTER ASSESSMENT STRATEGIES AND FOR CONSIDERATION OF STUDENT LEARNING STYLES, TEACHING STYLES, SPECIFIC TYPES OF PERFORMANCE SCORES, AND STYLES REFLECTED IN THE INDIVIDUAL TECHNOLOGIES

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ABSTRACT

The use of technology by students and faculty within classrooms, for homework, and research projects is essentially omnipresent and seems indispensible at this point. We all believe that this will only increase. However, there is little empirical evidence that educational technologies of any variety actually improve student performance. The majority of assessments of educational technologies base their conclusions on subjectively based evaluations and general impressions. Despite this, the application of scientific controls can be achieved. There is also a good rational and empirical evidence concerning what we would need to incorporate in order to realistically specify the benefits of educational technology. This could include the differentiation of the learning styles of students, teaching styles, specific performance scores, and the learning styles reflected in the educational technologies used.

Introduction

Evaluations of the assessment strategies used for educational technologies reveal that little empirical evidence exists that is convincing. Controlled studies using empirical methods that are the framework of psychology and the hard sciences are not common in education. Further, advances in psychology, child development, and neuroscience all point to the need to include additional assessment variables. These include student learning styles, teaching styles, specific performance scores, and the learning styles reflected in the actual software or hardware product.

<u>Assessment</u>

In a review of over 160 papers dealing with the assessment of educational technologies in education, many limitations were discovered. A few of these include the following:

1. There is a not a generally well accepted definition of what constitutes learning in education! The types of performance scores that a student must obtain in order to receive a given grade vary dramatically across schools and campuses. Tests, quizzes, midterms, finals, homework, projects, class participation, etc. have been combined in motley ways to determine how much a student has learned. However, each type of performance score can reflect a different type of learning, and each can correlate differently with the software or hardware that has been used. In order to assess the effectiveness of a technology, the definition of learning must be clear, widely agreed upon within the school community, and measurable.

- 2. Assessment usually only deals with the mean change in students' attitudes or performance. Students who perform worse than or better than the mean have not been differentiated. We can ask, for instance, what effect a new educational technology might have for students who might otherwise score near or at the top of their class. On the other hand, it is likely that an educational technology could benefit students who might otherwise do poorly, have a learning disability, a specific learning style, or who might be unmotivated. Our research seems to indicate that (Singer, D.A., Ten Ways You Might Be Fooling Yourself about Assessment, Campus Technology, April, 2006).
- 3. Less than 10% of evaluations or research on the effect of educational technologies focuses on quantitative measures of student learning or performance. Most evaluations or research base their conclusions on student and teacher opinions, surveys, and anecdotes. These are rarely reliable or valid assessment measures upon which to base conclusions.
- 4. Popular teaching methods such as collaboration, application of information to real world problems, and hands-on learning methods may not be effective for all students and may be counter-productive for some. As a result, software that incorporates such methodologies may benefit students differently. On the other hand, specific educational technologies may be especially beneficial to certain students. Because of different learning styles, educational technologies affect student performance differently. This can be taken into account in an assessment protocol.
- 5. Improvements in learning often cannot actually be attributed to the technologies that were being used in schools. Research involving educational technology has historically been very poor. Many investigators do not have training in basic research methodologies.
- 6. Once methodologies and technologies are in place, it can get harder to apply them consistently. It is a common problem that instructors often fall back on old habits or teaching methods significantly before the school term is over.
- 7. Student motivation to try a new pedagogy can decrease the validity of the findings. The socalled "novelty effect" increases student motivation and does not address the real question regarding the pedagogical effectiveness of the educational technology. This factor can be easily differentiated in an assessment protocol.
- 8. An instructor's enthusiasm for educational research can detract from the validity of results. An instructor's enthusiasm or interest in determining the benefits of a new educational

technology can, in itself, improve students' motivation, interest and therefore, performance. This factor can be differentiated in an assessment protocol.

9. An important factor when considering the utility and effectiveness of educational technologies is the amount of time that they are used within the school setting, or after school, or at home. Few schools consider the amount of time that specific technologies are actually used, or are available to students, or the number of different students who use them when they try to assess the benefit of the technologies that they purchased. This is another critical variable. If a student is given the opportunity to spend twice as much time using one software product as another, the time spent learning alone could explain at least some of the improvement in performance.

Controls for these and other factors are essential, and they can be introduced. However, in addition to these types of empirical controls, it would be best to take into account additional factors in order to obtain valid and reliable evidence that a given educational technology can benefit students' learning. I will start by describing the concept of the distributed curve and its relevance to educational assessment. I will then briefly reference brain-based education and learning theory. From there I will discuss student learning styles, teaching styles, and the learning styles reflected in some actual software or hardware products.

Distributed Curve

The relevance and premise of the bell curve is simply that any learning style, any ability, any behavior that we define may have a normal or at least a relatively normal distribution among students or children. It is not difficult to argue that a distribution of any of these parameters may not follow a normal Gaussian curve. It can be skewed and the standard deviations may be of any size. Nevertheless, we can argue that no matter what form a distribution of a learning or behavioral parameter takes, there will be members who are above and below the mean in some measurable distribution. More simply put, we know that no matter what type of teaching methods we use, what type of educational technologies we incorporate, and no matter what basis we use for grading students, some students will benefit more than others independent of ability.

This distributed curve is, as we shall see, essential in trying to assess the benefit of any educational technology and how it might best be used by a teacher or by students.

Learning Theory

Much of learning theory as it evolved in the twentieth century has remained relevant and has been implemented in virtually all teaching methods and in every educational software product in various ways. This includes such obvious variables as positive reinforcement, repetition and distributed learning. However, there are, of course, many other variables that have relevance when we are talking about the impact of teaching styles, learning styles and educational technology in education. For instance, the timing of feedback based upon a student's response is significant. If a student learns that his response to a question or problem was incorrect, most of us would recognize that the sooner the student can get feedback about why he was wrong, the better.

Another example is the use of so-called "hints," such as developed by David Pritchard at MIT. David Pritchard developed an educational software product called CyberTutor. One of its attributes is the opportunity for students to get hints, if need be, about how to solve a particular problem before they try to complete the problem themselves. Incorporating "hints" is a concept within learning theory. That relates to the well-known types of memory called recall and recognition.

The important point to remember is that the degree to which each student benefits from the application of such concepts as positive reinforcement or from teaching methods that incorporate recall or recognition in different ways reflects a distribution of some kind, probably a more-or-less normal distribution as seen in numerous intelligence tests that are used today. For instance, incorporating the use of hints in an educational software product will benefit students to various degrees. Some students will benefit tremendously, others hardly at all.

When we evaluate the concepts of learning theory that are incorporated in any teacher's teaching style, in any student's learning style and in any educational technology, the amalgamation is almost always unique.

Brain-Based Learning

There are many check lists and theories of what it means to incorporate brain-based learning in education. It could be said that the first real effort was developed by Dr. Maria Montessori. Montessori's methods were integrally related to her understanding that neurologically based multisensory and motor experiences were necessary for children to develop normally and fully, and that each child was unique from that vantage point. She believed that learning did not just involve the development of reading and mathematical skills, each of which reflects well-known specific areas and networks of our brains. For instance, she recognized that the development of visual spatial ability and the ability to create three-dimensional models was significantly independent of reading or writing. The brain requires that the child sees and engages with spatial views of objects and creates three-dimensional objects with the hands.* This theory reflects our understanding that very different areas of the human brain are involved in such learning. But regardless of how we define brain-based learning, neuroscience has provided us with a new perspective.

Brain-based education is a perception, a sense, that any legitimate, effective, appropriate teaching method must ultimately have a basis in brain functioning in order to be considered real. It is more convincing than just traditional psychological or educational studies. As such, it compels us to recognize that education is not ultimately a soft science. It must be based upon how our brains function. Advances in neuroscience, including the use of fMRI, PET and MEG technologies, are bringing us to face this at an unprecedented rate. This perspective also helps us

to recognize that just as no two individuals have the same fingerprint, no two people have the same brain. No two students respond exactly the same way to one educational teaching method or educational technology - hardware or software.

Learning Styles

The concept of "learning styles" reflects the different ways that we learn. Each child, each student, learns

*Today the Montessori methods are often described in the context of the Constructivist Theory of education. This, however, is a limited view since Montessori methods do not exclude formalized learning methods.

best in different ways even if most students are educated where there is an emphasis on reading and mathematics and even if most students adapt and adjust successfully to these methods. Now we find ourselves increasingly incorporating educational technologies to incorporate different learning styles. This also includes group processes and so called "real world" applications. We think that it is better. It might be in most cases.

The numerous theories of learning styles such as Howard Gardner's Multiple Intelligences, David Kolb's Experiential Learning Theory and even the Myers-Briggs Topology model, as different as they may first seem, can describe theorized neurophysiological underpinnings. Few, in fact, really contradict each other. Whether they might include verbal-mathematical or interpersonal learning styles as described by Howard Gardner, concrete or abstract learning styles as described by Gregorc or any others, we presume that their legitimacy ultimately rests upon their neurological foundations. These foundations are being uncovered.

One student might learn more readily or more comprehensively through verbal skills and benefit from courses that define learning and thus, grades, in terms of reading and answering questions in written form. Another might do better if learning is defined and grades achieved where there is more emphasis placed on the interpretation and creation of spatial configurations (architecture). Each of these two types of learning styles represent well known and distinct networks of the nervous system. Another student might do much better where interpersonal teaching methods, such as those involving group work, are used to help define learning and compute a grade. Another student might learn best through extroversion techniques described by Myers-Briggs. This would include presentation methods of learning and grading students. The areas and circuitry of the human nervous system that would be reflected in each of these preferences are distinct even if there is overlap.

From the perspective of the brain, the most direct theory of learning styles might be one that leads us to evaluate students according to the types of sensory inputs provided and the motor outputs that they engage in within the educational setting (classrooms, labs, etc.). Some students learn best through reading text while another might have a stronger preference for representation of information in the form of spatial displays of information (e.g., neuroanatomy). Another student might benefit from the aural presentation of information rather than from reading. These differences can sometimes be dramatic.

In one neuroanatomy class at MIT that involved the presentation of literally hundreds of slides, approximately one out of every thirty five students did not take notes. When asked why, these students said that they could only really learn through listening. They recorded the lectures and listened to them once the same day as the class was given and then once before each test. Another example of learning style differences, even more dramatic, was one student who actually had to translate each slide into verbal text. Her reason was simply. "I can't learn very well from pictures!" These extreme examples only serve to emphasize that students have different strengths in any learning style that we might want to define.

Another learning style that we identified in classes at MIT involves what we called cognitive processing (Singer, D.A., Schneider G., Microsoft, iCampus Report, Massachusetts Institute of Technology, Cambridge, MA 2006). What this refers to is the learning style of students who seem to benefit more when they have the opportunity to ask questions or answer questions (Cognitive Processing) in class rather than just listening (Aural Monolog). The experience of listening and taking notes in a more rote method seems to benefit others much more.

Cognitive processing involves well-recognized areas of the nervous system, particularly the prefrontal cortex. From this learning style perspective, over a period of two years, the learning styles of students within the classroom were assessed (Singer, D.A., Schneider, G, Microsoft, iCampus Report, Massachusetts Institute of Technology, Cambridge, MA 2006). Here is a typical example of what we found.



FIGURE 1

This figure describes a randomly chosen sample of the learning styles of eight students: A = Aural learning, that is, learning through simply listening, AP = Aural Processing, that is, learning through asking and answering questions, V = learning through reading, VP = Learning through answering written questions (homework!), VC = Learning through using color in taking notes or in looking at slides, I=Interpersonal learning, that is, learning through group work where the student can both help other students, learn from other students and interact with other students in spontaneous ways, M= Media and includes learning through the use of a variety of media, including videos, animation, etc.

The students' learning styles were assessed through a rigorous process. This included administering learning styles surveys twice, once at the beginning of the term and once at the end. Most students were also interviewed in order to cross validate their survey results, and, lastly, up to eight 5-minute observation periods were made of the students' in class. While such a comprehensive assessment is unusual, it was undertaken to insure the validity and reliability of the results.

It was clear that each student had a unique and preferred way of learning that she or he considered the most beneficial.

Regardless of how we might describe the learning style of a student, we must recognize that every student probably has some degree of ability in the use of any learning style. Because one student may have outstanding musical ability that does not mean that that student may not possess excellent ability in verbal reasoning, spatial reasoning or any other learning style we might describe. A complete lack of any given learning style probably would describe a rare anomaly and probably reflect a neurologically based pathology.

With regard to our distributed curve theory, it is likely that the relative abilities with respect to any learning style reflect a relatively normal distribution among students. It is also probably important to add a few additional points in order to consider the importance of learning styles in teaching. First, when given free choice and open opportunity, students will most likely adapt to their classes and their approach to learning based upon their preferred learning styles. Second, to the degree that students are given predetermined methods of learning, they will adapt with varying degrees of success or failure. The teaching style of any teacher is best suited for some and more of a struggle for others even if they achieve the same grades.

Abilities

We generally describe the term "abilities" as meaning some forms of intelligence. The well known Wechsler Intelligence Test probably best represents the way we have standardized intelligence. However, if we evaluate the ten subtests of the Wescler Intelligence test we find that they reflect very different abilities and consequently very different neural circuitry. For instance, among the subtests, there are such scales as vocabulary (rote memory), comprehension

(of written material), digit span (short term aural memory, and block design (manipulation of cubes to match a specific pattern). As a result, as described here, no matter how we might define intelligence, we are really describing the different learning styles of students.

Performance Scores

As previously stated, each learning style is represented among a student body as a distribution of some sort. Every faculty member knows that some students do better than others even if we could control for the amount of effort that is put in. What is interesting is how the performance might vary when we evaluate the individual performance scores. Some students do better on projects, some on multiple choice tests, some on open-ended questions, some on participation, or presentation, some on invention and the application of what was learned to a new creation. If we evaluated our students on the performance scores we use, we would probably see that few students score at the same level on all measures when compared to the rest of their classmates. This both reflects the individual learning styles of each student and, as a result, an important variable to consider when we evaluate the effectiveness of any educational software product.

Teaching Styles

Teachers teach in different ways. Over several semesters we evaluated the teaching styles of fourteen professors at MIT. We wanted to observe a representative sample of categories that might describe different styles of teaching. For instance, some professors are almost pure lecturers. Others spend a significant amount of class time answering students' questions or asking questions. Some professors emphasize new material not available in the textbooks the students buy. Others emphasize review type teaching. Some use many slides and other media sources. Others do not. In addition, the basis for grading a student can vary widely among professors (Singer, D.A., Schneider, G, Microsoft, iCampus Report, Massachusetts Institute of Technology, Cambridge, MA, 2006).



FIGURE 2

Figure 2 reflects the amount of time that different MIT professors spent engaging in the teaching styles shown. For instance, the amount of time professors spent asking students questions or answering questions varied between 0% and 50%. The presentation of material in the lecture-only format without complementary media or writing on the black (or white) board varied between 10% and 80%.

While this small sampling certainly cannot strongly support any specific scientific conclusions with regard to teaching styles, one result is clear. Professors can teach significantly differently. A very important point here is not that one teaching style might be better than another. However, based upon what has been described above, we can conclude that there will almost always be an advantage to some students and a disadvantage to others no matter what style of teaching is employed. These advantages or disadvantages can seem small as most students have all of the learning styles described to varying degrees and can adapt to the teaching styles offered. However, the result is essentially that some students with a different profile of learning styles may have to make a greater effort to learn the same material than other students of equal "ability" or potential. Or, perhaps, a given student will not do as well as a student of equal ability just because of the teaching styles used by the professor or the criteria upon which a grade is based.

When we consider what has been discussed so far, we can consider that the greater discordance between the students' learning styles and the teaching styles, the greater difficulty the student will have in learning the material. We could probably not expect the teacher to adapt to the ideal teaching style of every student. However, it may be possible that the use of educational technology can help ameliorate that problem.

Educational Technology

We can evaluate any educational technology and create a specific profile of what aspects of learning theory are used and what specific teaching styles are incorporated. By doing this, we have the potential to offer students methods of learning that can compensate for what might be lacking for them specifically in any course that they take. Whether the educational technology used would be accessible within their classroom with their laptop or desktop computer or accessible in their libraries or at home might be another question that needs to be addressed, but, nevertheless, the opportunity to have access to such technologies could only improve learning for a given student.

In Figure 3 below we show our evaluation of representative software products and a representative sampling of the range of teaching styles reflected in the software. This also includes some of the motivational and testing subsets we evaluated. What became evident was that the differences were sometimes very large.

FIGURE 3

DISTRIBUTION OF TEACHING STYLES AS SEEN IN VARIOUS EDUCATIONAL SOFTWARE PROGRAMS

	ACADEMIC	
	Aural – Visual/Text	0% - 50%
	Aural – Visual/Spatial	0% -100%
	Aural – Real world applications	0% - 50%
	Visual only	0% - 100%
	<u>AFFECTIVE</u>	
	Aural/Positive Reinforcement	0% - 100%
	Visual/Positive Reinforcement	0% -
100%		
	TESTING	
	Fill-In (Recall)	0% - 25%
	Multiple Choice (Recognition)	0% -
100%		
	Comprehension	0% - 75%
	Hints	0% - 100%
	Immediate short-term memory	0% -
100%		
	Delayed short-term memory	0% - 60%
	Timed	0% - 100%

While there is not enough space here to correlate the representative teaching variables that we have selected to corresponding teaching styles of teachers and with the learning styles of students, suffice it to say that in an ideal world we would be able to interface the learning styles/abilities, teaching styles and educational technologies so that a learning environment could be created that reflects the optimum educational environment for students individually. For example, with an educational software product that emphasizes text in neuroanatomical or architectural descriptions, we would expect that students whose learning style strength includes reading and not spatial representation of information would benefit from this product. This would be even truer if the teaching style of the faculty member included an emphasis on pictorial slides.
One additional point should be made here. There would remain a question as to whether an educational software product should be used by a student to augment the student's strengths or assist in relative weaknesses. At the university level, it would probably be the decision of the student. In the elementary grades this would be a very important question to be addressed since the child's brain is much more malleable and can benefit from both enrichment and remediation.

Conclusion: Assessment and Application

The use of educational technology is here to stay. There now exist an estimated 30,000 to 40,000 educational software and hardware products to choose from. There is no reason to avoid undertaking more empirical assessment efforts in order to determine how they might best be used for students. The hit-and-miss approach that now predominates wastes time, money and effort. In addition, the results are questionable. To ameliorate this, we must apply some standard scientific controls. Educational technologies offer us the opportunity to address the unique learning styles of every student. In order to do this, we should and can incorporate student learning styles, teaching styles, specific performance scores, and the learning styles reflected in the actual software or hardware product.

While it may seem impractical, unobtainable and maybe even too futuristic to create a learning environment that incorporates these variables, it should not be. Every year we already spend many billions of dollars to develop, sell and incorporate educational technologies in education. Billions more are spent trying to develop new learning environments and teaching methods to help students.

At the rate that we are uncovering the workings of our nervous systems, and as we recognize that it is an inescapable truth that each child has a unique set of learning styles, there is no reason that educational hardware and particularly educational software cannot be created to customize education for every student.

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A Learning Passport for Your Lifelong Educational Journey

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Background

OpenCourseWare (OCW) and Open Educational Resources (OER) are both references to learning materials that have been digitized and made available for free on the Internet. Both concepts emerged around 2002 along with several initiatives to publish and make available college course material for use, remix, and redistribution under an open license such as a Creative Commons license. The most notable initiative is the OpenCourseWare project launched by MIT in late 2002.

Over the next several years, global players picked up the cause of OER and OCW, driving the discussion and practice to new levels. The Hewlett Foundation supported multiple projects, committing their resources and reputation to incubate an environment of experimentation. And over the same period of time, international organizations, led by UNESCO, have created a space for the analysis and understanding of the OER movement as it evolves and develops.

The resulting environment, almost 10 years later, is beginning to yield truly "disruptive" change while opening up world class resources to millions of previously marginalized learners. Importantly, however, the emerging environment has changed the very questions we can ask about learning as we come to understand it as nothing less than a "new ecology of learning". As is often the case with profound change, people thought in a linear fashion when they initially considered OER, projecting forward the institution of education as it currently exists. In this view, OER and OCW would help current faculty, and current students. And it has done so, richly. But it has also changed the way we think about content, curriculum, and their relationship to both formal and informal learning.

Originally intended to provide lecture outlines and other learning materials to fellow educators, the OCW/OER movement has generated the emergence of several other, unanticipated applications. College students migrate to open educational resources to support their learning from instructor-led college courses. Groups of learners and faculty combine forces to establish new organizations, such as P2PU. And "self learners" – those who just want the knowledge – have emerged as the major users of OCW/OER. While OCW/OER resources don't typically come with instruction or assessment, many self-learners indicate they would like the opportunity to obtain college credit for the learning they achieve through the study of OCW/OER.

The OpenCourseWare Consortium (OCWC) is a collaboration of more than 200 higher education institutions and associated organizations from around the world creating a broad and deep body of open educational content using a shared model. Formed in 2005 by a small group of early OCW practitioners and incorporated in 2008, OpenCourseWare Consortium is a non-profit organization which has as its mission to advance formal and informal learning through the worldwide sharing and use of free, open, high-quality education materials organized as courses. The OCWC's interest in promoting the development and deployment of the OCW Passport is to extend and to further promote and provide free resources that support this mission.

KNEXT is an independent third-party assessor of experiential learning owned and operated by Kaplan Higher Education, a division of Kaplan, Inc., a world leader in education and training services owned by the Washington Post Company. The KNEXT vision is to create the standard for recognizing and making portable the college-level learning derived from non-traditional sources such as personal and professional experience and self-directed study of OpenCourseWare (OCW) and Open Educational Resources (OER). KNEXT's interest in developing and deploying the OCW Passport lies in connecting self-directed learners using OCW/OER to assessment services, and eventually to college degree programs that will value this form of learning and agree to grant credit for it.

Overview

The OpenCourseWare and Open Educational Resource movement is largely supported, technologically across the Internet, by Content Management Systems (CMS) that serve course outlines as well as learning materials. What makes these "courses" different from online courses is the fact that they are not served using a Learning Management System (LMS), which would deepen the experience through interaction with faculty and between fellow students, as well as the ability to accumulate course work. Colleges and universities use dozens of Learning Management Systems (LMS) to facilitate structured online courses and programs. There is no current universal standard.

While the value to faculty and the value to students is clear, what isn't so clear is what the value is to those describing themselves as self-learners. OCW learners are neither uniform nor predictable in terms of aspiration, motivation, and intention. If gained knowledge is the value, then wouldn't that value be enhanced through more structure in the current environment? Or by interacting with faculty and fellow learners? Or by working towards a particular learning outcome and documenting the progress? Or, perhaps it is all of the above? The current situation seems to beg the question, "what is the real higher purpose for these self-learners?"

For the purpose of this project we are positing that self-learners, especially those who would like to ultimately earn college credit for this learning, will desire all three value propositions -1) structure around learning outcomes, 2) collaboration with faculty and fellow learners, and 3) the ability to accumulate course work towards meeting course

learning objectives. To solve this problem we propose a new dimension to OCW/OER movement that improves the value to self-learners. We call it the OCW Passport.

OCW Passport

The OCW Passport will be a tool for self-learners to track their usage of OpenCourseWare and other Open Educational Resources. Putting structure around otherwise unstructured learner behavior, the Passport operates like a "mini LMS" for self-learners much like eCollege® or Blackboard® works for students enrolled in degree-seeking programs. Thinking in terms of what a typical student's Passport might include, the tool was constructed to provide the ability to include digital copies of course learning materials and course outlines, as well as course notes, and assignments completed by the student. Since the OCW Passport is a digital web-based tool, our version of the "student Passport" may include deeper and broader functionality, including the ability to collaborate with other self-learners or the ability for a student to share portions of his or her profile through social networking platforms.

Basic Functionality

OCW and OER users have the ability to create an OCW Passport account by visiting www.ocwPassport.com. In keeping with the spirit of free educational content provided through OCW sites, and open educational resources, there is no charge for an OCW Passport.

Users are classified into three categories: students or self-learners, faculty, and administrators. All users have the ability to create a user profile, which may be private or may be shared with other users. A student or self-learner user profile will contain basic contact information with the possibility of adding more in depth profile data in the future. With the initial launch of the OCW Passport, a user's profile includes basic contact information including first name, last name, email address, and physical address, as well as limited information about educational history and the ability for a user to upload a photo of oneself. Faculty user profiles include more detail about the user including academic credentials and positions, as well as courses taught and other limited Curriculum Vitae information.

The sole purpose of providing more information about the academic qualifications of faculty users is to present faculty as more of an authority in the Passport environment. Those users with administrative rights are not apparent to the general user population.

Learning Resources

The amount and types of open learning resources available on the internet is rapidly expanding, with an existing base of courses numbering in the thousands from hundreds of different universities both domestic and abroad. Recent attention to open learning, and

the unbundling of higher education, leads us to believe that open resources for education will continue to proliferate long into the future. The challenge is not in the development or identification of resources but rather in the logical organization and access to those materials. The OpenCourseWare Consortium and a few other OCW/OER groups provide entry points via web portals where users can search for OCW courses and OCW websites hosted by colleges and universities. Up until this point, OCW users were only able to track their use of OCW courses by bookmarking the website in a web browser. The OCW Passport changes that.

OCW Passport users, as a core function, have the ability to "add" OCW courses to their electronic OCW Passport. The Passport includes search capability where users can locate courses or course materials by subject, by school, or by keyword supplied by the user. The base of information that is searchable includes all course information and course ware published via RSS – a commonly used data format or web feed used to dynamically provide users with regularly updated content. The decision whether or not to publish OCW or other OER resources via RSS is at the discretion of the source school, however we believe the perceived value of the OCW Passport will drive more schools to publish content via RSS. Currently, approximately 50 OCWC member institutions currently publish their OCW content via RSS.

As will become apparent in the following sections, the purpose of adding OCW courses to a Passport goes far beyond simple personal bookmarking. However, even as a personal bookmark, the Passport includes more robust capabilities. The foremost of these being the ability for users to "rate" courses and course materials they have added to their Passport. All courses and course ware are not created equal. This is our attempt at creating an Apple iTunes®-like environment for the OCW/OER space. For those users who agree to share their Passport profile, the ability to share which courses are in their Passport will help to create more user cohesiveness. The OCW Passport site will publish to all Passport users the top rated courses, and all references to courses will include the current course rating in the course heading. This function is completely dynamic and 100% driven by the Passport user base.

The potential feature set for the organization of learning resources, outside of simple bookmarking and the rating system, is limitless in a Web 2.0 environment. The first version of the OCW Passport includes a few additional features. Users have the ability to tag OCW courses with a progress level – creating a pseudo study plan. OCW courses, once added to a Passport, can be marked "complete" indicating the user believes he/she has met the learning outcomes for the course. Additionally, courses the user is currently working on can be marked "in-progress" and courses the student has not yet started working on, but is interested in, can be marked "planned." Passport users also have the ability to add Learning Outcomes and notes in a "notebook" arranged in their Passport by OCW courses. For notes or assignments created outside of the Passport, i.e., in other software applications, the user has the ability to upload and attach multiple file formats, including any type of document or media file to a course in his/her Passport.

Study Guides/Faculty

Users qualified as faculty – those users who are interested in creating learning materials – play an important role in the function of the OCW Passport. Faculty users, as mentioned earlier, have a more robust user profile in order to display academic credentials, qualify themselves as faculty, and play a part in helping to structure the learning environment for OCW Passport student users and self-learners. The initial base of faculty users of the OCW Passport are those early adopters who understand the importance of the OCW Passport tool and who want to help transform the OCW/OER space into something greater than it is today. The primary role of the faculty user is to create, and maintain, Study Guides.

Study Guides are an integral component to tracking the learning that results from the use of OCW/OER resources. A Study Guide is an arrangement of OCW courses and/or other open educational resources that together support a defined learning outcome or set of learning outcomes. Faculty users have the ability to create Suggested Study Guides and publish them through the OCW Passport site. Other users have the ability to search, browse and view Suggested Study Guides. If the user likes a particular Suggested Study Guide, he or she can adopt it as one's own. Users can have multiple Study Guides in their Passport, and users have the ability to adopt Suggested Study Guides in their entirety, or modify a Suggested Study Guide to fit their unique needs. Also, non-faculty users have the ability to create their own Study Guides, but may not publish them as a Suggested Study Guides for other OCW Passport users.

Like with OCW courses, a rating system is applied to Suggested Study Guides by the user base thus making it easier for Passport users to search and browse the base of Suggested Study Guides, which could eventually number in the tens of thousands. Searches may be performed by subject, by course, by faculty, or by keyword string. Using the rating system, the OCW Passport site will publish the top rated Suggested Study Guides as well as top rated faculty based on the rating of Suggest Study Guides they create. Again, this function is dynamic and 100% driven by the Passport user base.

Collaboration

Collaboration is a core component to any learning environment therefore we feel it important to include through the OCW Passport the ability for faculty, students and selflearners to collaborate with each other. Collaboration over the Internet is nothing new, and there are thousands of existing methods for collaboration in production today. Adding the ability to collaborate through the OCW Passport is not just adding one more channel for communication. It also does not duplicate any existing method of communication, including forms of social networking. Collaboration through the OCW Passport is unique because users are connected only through commonality created virtually through content they store in their OCW Passport, so long as the user makes this information public as part of one's profile. That is, users are only connected with other users who have the same OCW courses or Suggested Study Guides in their OCW Passport. For example,

John is a self-learner interested in learning more about computer programming. Turning to the Internet to obtain learning materials, John discovers the OpenCourseWare Consortium, and the OCW Passport. John creates a Passport for himself and adds to his Passport a Suggested Study Guide created by Professor Sarah. John and Professor Sarah may now collaborate with each other in a blog space created to support the Suggested Study Guide.

The Suggested Study Guide, designed to support a learning outcome around introduction to computer programming and computer programming theory, includes OCW courses identified from several different OCWC member institutions. One of the courses included in the Suggested Study Guide is MIT course 6.821 – Programming Languages. As a result, John is now also connected to and able to collaborate with Mary since Mary, as a Passport user, has included MIT 6.821 in her own Study Guide. Mary and John collaborate through a blog space created to support MIT 6.821 and all others users who include this course in their OCW Passport. It is important to note here that Professor Sarah and Mary are also linked together with the ability to collaborate.

As is the case in traditional classrooms, collaboration between individual students, and between students and faculty is intended to promote learning. While the intent here is also to promote learning, the fairly unstructured environment of the OCW/OER space is not conducive to "teaching" per se. Instead it is our hope that student and faculty users alike take advantage of the opportunity to collaborate with each other to freely and openly promote individual learning. Again, this is our effort to put some structure around an otherwise unstructured learning environment.

<u>Future Roadmap</u>

The alliance between OCWC and KNEXT to develop and deploy the OCW Passport as the first user-driven web tool to structure open source learning is not without consideration for the future. The idea was born from the desire of many self-learners to earn college credit for the learning acquired through OCW courses and other Open Educational Resources. The ability to assess the learning documented in the OCW Passport by self-learners is exactly where we are headed with this project.

The second generation OCW Passport, available in late 2010, will include user options to turn OCW coursework into a learning portfolio that may be used to petition for collegelevel credit. To do this, users will be asked to add an educational goal statement as well as a learning autobiography. For each course contained in the users Passport, a credit request must be added and linked to course and Study Guide learning outcomes. Course work, including notes, assignments, exams, and summative assessments are added to the learning portfolio as documentation to support the learning. Leveraging the form and function of all materials a user has added to his or her Passport in a Web 2.0 environment, the process to transform the Passport into a learning portfolio is relatively easy.

We cannot address learning recognition and the assessment of prior non-validated learning without also addressing prior validated learning, i.e., learning for which an individual has already received college-level credit. There are over 33 million individuals in the United States alone who have earned some college credit but never earned a degree. We believe the international body of self-learners includes a substantive number of individuals with prior validated college credit. This learning should be documented both to determine applicability towards future college degree plans, and also to avoid counting the learning in the learning portfolio assessment process. The second generation OCW Passport will include the ability to document this educational history on a web-enabled school agnostic transcript.

KNEXT, positioned as a third-party independent assessor of experiential and open-source learning, will provide a fee-based service for those wishing to have their learning portfolio assessed by college faculty, and receive a recommendation as to the award of college credit. Users electing to transform their Passport into a learning portfolio will have their portfolio pushed electronically to qualified and trained national and international faculty, as well as other Subject Matter Experts, from the area in which the learning has taken place. In most cases, claims for credit are routed to faculty who teach the course for which the user is petitioning for credit.

Users choosing this option will be able to port their agnostic transcript to any college or their choosing, for evaluation and recognition. To stabilize and deepen the value of the assessment, however, KNEXT has partnered with Kaplan University, a regionally accredited fully online university, to "warranty" the credit recommendation. That is, Kaplan University will accept the credits recommended through assessment by KNEXT for students who matriculate into a Kaplan University degree program. The award of credit for any previous learning is at the sole discretion of the receiving institution, and students will be encouraged to use the credit recommendation letter as well as the "warranty" by Kaplan University when shopping for degree programs who will accept the credits. It is our hope that other schools – public, non-profit, and proprietary – will join Kaplan University as colleagues in recognizing the portfolio development and assessment process.

Conclusion

We are certain of one thing, at this stage in the development of the Passport. We know the process will be iterative and uneven, leading us to new conclusions and products that we cannot see clearly, if at all, today. In this regard, the OER movement and OCWC within it continue to be a laboratory for disruptive change.

Application of Learning Styles in a Model Based on Ontology: SIMBAD

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Abstract

The developments of applications to strengthen the learning process through internet, known as e-learning, have involved the revision of different learning theories with the objective to determine its possible application in these environments. The learning objects have became in a fundamental element to develop educational contents for e-learning based environments. In this article we used the learning styles theory and its relationship with the learning objects to improve the quality of these objects. Extracting the metadata, using a tool described in this paper, can determine the learning styles in each learning object, then are selected the adequate objects per student depending on his/her preferred style. We applied this functionality in SIMBAD, a model created for the semantic web.

1 Introduction

In this article we applied the obtained results of the extraction of learning styles in learning objects described as per [1], in SIMBAD[2] that is ontology based model. This model has been developed with a high semantic richness. Our proposal intends to improve either the possibilities to adapt the contents to the student preferences and assist the authors in the selection and development of learning objects adapted to the student. The article starts defining the general concepts of the learning styles theory and learning objects technology, then is described the SIMBAD model and finally is shown a case of study where is demonstrated our proposal functionality.

2.1 Learning Objects

The e-learning technology has proposed various applications to support the learning process; one of them is learning objects technique. The IEEE Organization defined the learning objects in LOM, as "whatever entity, digital or not, that can be used in the learning, the education or the formation process" [3]. Other formal definitions are: "... digital resources, with a unique identification that can be used to support the learning..." [4], "...whatever digital resource that can be used or reused to support the learning..." [5].

2.2 Learning Styles:

The learning styles make reference to de individual differences between persons when they are immersed in a learning process, this theory defined in the 50s but started to be applied in the 70s. The learning styles are a combination of cognitive, emotional and physiologic characteristics. The Kolb model or Experiential Learning Model [6], is based on the idea that the experiences are a previous requirement to acquire physical abilities, reflexive observation, abstract conceptualization and active experimentation. The learning is a cycle where each person has specific preferences for some part of the process. Honey and Munford [7] identified four learning styles based on Kolb s experience. They started studying the LSI (Learning Style Inventory) and Kolb theory, to propose the four learning styles (activists, reflectors, theorist and

pragmatics) and the LSQ (Learning Style Questionnaire) test, this study was applied to a group of UK managers.

Honey & Alonso [8] took the Honey and Mumford experience and brought it back to the academic world. The CHAEA questionnaire is a result of the translation and adaptation of the LSQ of Honey and Mumford applied in Spanish Universities to 1371 students in different areas.

2.3 Learning styles metrics:

We have defined it in [9], this is a group of metrics that apply to reusability, complexity and pedagogic dimensions. In [1] we proposed to improve the learning objects quality using the learning styles, by presenting a group of indicators taken from Honey and Alonso theory. These groups of indicators have been evaluated by a team of learning styles experts. As a result we prepared a group of metrics to identify the indicators presence in each learning object. We also came out with a relationship between the learning objects and styles. Finally, we decided to evaluate the learning objects from their metadata. The metadata provides the information required to classify the learning objects. Given the fact that there are different metadata models, we choose to select the Learning Object Metadata (LOM) [10] model due to it has became in a standard applied to almost all learning objects environment.

Pedagogic Quality Metrics		
M1: Number of persons who can take part		
M2: Level of the people who takes part		
M3: Number of theoretical concepts		
M4: Number of practices concepts		
M5: Number of videos		
M6: Number of visual models and images		
M7: Number of text content		
M8: Number of sound contents		
M9: Time by content		
M10: Number of structure contents		
M11: Number of linear contents		
M12: Number of exercises or questions		
M13: Number of complex content		
M14: Number of simple content		
M15: Number of new concepts		

Table 1. Learning Styles Metrics

2.4 Metrics description and how to be obtained:

To obtain the metric it was developed an algorism to allow working on a flexible mode, this way we would apply the metrics into a different models and environments. It also allows to aggregate new functionalities from the historic data as well as to add the authors and teachers experience.

2.5 Definitions to conceptualize the metrics:

Definition 1: Component is defined as any unit that is part of a learning object. Considering the definition of learning objects given above, the components associated to this definition are: unit contents, concepts, files, e-medias, and whatever other element that could be used to support the learning process and has relevance from the point of view of the didactic strategy.

Example 1: The object C_{12} has inside the C_3 element that is a web page integrated by text and images, but should be accessed as a whole not in parts. That is why C_3 represents a component.

Example 2: The C_{12} has inside the C_6 element that is a chat reference, this reference is part of a designed strategy for the learning object, this way C_6 is considered a component.



Figure 1. Content object

C is set of all components.

 C_i is unique ID of the component.

 $Cx = \{C_1, C_2, \dots, C_i\}$ where Cx contain the components C_i .

Example 3: for the object C10 their components are {C1, C2, C3, C4, C5, C6}

Example 4: for the object C12 their components are {C1, C3, C4, C5, C6}

Atomic component: A component is atomic when is composed for a unique element:

 C_{atomic} if $\exists ! Ci \in Cx$

Example 5: for the object C1 their component is {C1}, therefore C1 is an atomic component.



Figure 2. Atomic and composed components

Composed component: A content is composed when it contains two or more atomic elements.

```
C_{compose} if \exists Ci \in Cx and |\{Ci\}| \ge 2
```

Example 6: for the object C11 their components are {C1, C6}, therefore C11 is a composed component.

2.6 Components associated metadata:

Each component has defined characteristics through the LOM, they allow to define the functions to extract relevant information from the contents. In our case we use the following functions, where Ci is the identification of the component:

Table 2. Functions to extract	learning object metadata

Function
RES(Ci) = get ressource(Ci)
IUR(<i>Ci</i>)=get LOM.Educational.IntendedUseRole(<i>Ci</i>)
LRT(<i>Ci</i>)=get LOM.Educational.LearningRessourceType(<i>Ci</i>)
FTE(<i>Ci</i>)=get LOM.Technical.Format(<i>Ci</i>)
TLT(<i>Ci</i>)=get LOM.Educational.TypicalLearningTime(<i>Ci</i>)
GES(<i>Ci</i>)=get LOM.General.Structure(<i>Ci</i>)
DIF(<i>Ci</i>)=get LOM.Educational.Difficulty(<i>Ci</i>)
PRE(Ci) = get Prerequisite(Ci)

2.7 Metrics and the way to obtain them:

Using the functions identified on the Table 2, we defined how to convert these data into the metrics defined in the Table 1. Following it is shown an example of the Metric 4 (Practice concepts number), where are defined the metric types, definition/relevant comments, rule to obtain the value and scale how to present it

Metric	M4 Number of practice concepts		
Туре	Attribute		
Definition/ commentaries	Into metadata LOM LearningResourceType, the values associates are (simulation, diagram and experience).		
Rule to obtain the value	$M4 = \{ \forall Ci \in C LRT (Ci) \in \{application, demostration, annotation, conclusion, example\} \} $		
Scale of preference			

2.8 Presence or absence of value on the metrics:

As per Honey & Alonso [8], for the persons with *high* or *very high* preferences of a specific learning style they are learning strategies that ease or difficult the learning. They mentioned that, a reflexive student works better alone. In an opposite way, an active student the performance improves by working in groups. These two examples help to give value to the data that can be obtained from the metrics. We defined, from the opinion of the experts, the values associated to the metrics that are favorable, unfavorable and neutral per each learning style. Finally, from 15 metrics, the result was: 5 favorable (+), 5 neutral (O) y 5 unfavorable (-) per each learning style (see Table 3).

Table 3. Application levels of metrics.

Metrics	Pedagogic Quality Metrics	Activist	Reflexive	Theorist	Pragmatic
1	M1: Number of persons who can take part	+	-	0	0
2	M2: Level of the people who takes part	0	0	-	+
3	M3: Number of theoretical concepts	0	+	+	-
4	M4: Number of practices concepts	+	-	-	+
5	M5: Number of videos	-	0	0	+
6	M6: Number of visual models and images	0	+	+	0
7	M7: Number of text content	-	0	+	-
8	M8: Number of sound contents	-	+	0	0
9	M9: Time by content	-	+	0	-
10	M10: Number of structure contents	0	0	+	-
11	M11: Number of linear contents	0	-	-	+
12	M12: Number of exercises or questions	+	-	-	+
13	M13: Number of complex content	-	+	+	-
14	M14: Number of simple content	+	0	-	0
15	M15: Number of new concepts	+	-	0	0

3 SIMBAD model:

The SIMBAD model is divided in three parts (learner model, domain model and resources model) that have a complementary interrelation to offer an environment of great semantic richness, focus on the student. The Domain model contains concepts associated to the specific subject, the Learner model contains personal characteristics and the Resources model integrated by the learning objects. Following are shown each of these models with its components.



Figure 3. SIMBAD Model

3.1 Domain Model:

It is used to describe all the concepts included in the system. Following De Bra [11] the Domain model identifies the structure of the domain in terms of concepts and their relationships. In SIMBAD the concepts are described by a graph where the nodes are the concepts and the arcs are the semantic relationships between concepts. There are in use two types of relationships, hierarchical and rhetorical. The hierarchical relationships are established from the "father/son" concepts, this happens when a concept depends of other concept, this way it can only be explained from this other. In SIMBAD the domain graph is represented by ontology. The domain model will serve as a reference to semantically index learner with resource.

3.2 Learner Model:

The learner model storage the user characteristics to make the adaptation. It includes the knowledge of the user about the concepts of the domain model De Bra [11].

The preferences are considered by many e-learning systems in different ways, Brusilovsky [12] considers the preferences as the adaptation of the language or the presentation of the learning contents. The SIMBAD student model contains factual information of the users. The content of this model will change in a dynamic and automatic way to allow the student follows the courses and acquires new knowledge. The user model SIMBAD is represented by the tupla:

<learner, {preference}, {knowledge}>

Where *Learner* corresponds al *userid*, the group *preference* are different aspects related to the student represented by the tupla *<attribute*, *value>*, and *knowledge* is the group of values represented by the tupla *<domain-concept*, *role*, *educational-state>*.

In order to add the learning styles to the user model, we use the preferences to indicate the levels of each learning style. Then, we have *attribute* that means each learning style and *value* the style level, for example: *<reflexive, medium>, <activist, high>*.

3.3 Resources Model:

They are the group of objects or resources selected and included in the system, from one repository of learning objects that can be related to de domain model in determined contexts. A domain is a group of concepts, while a context is a group of situations and learning contents. Each of the resources included in the system must have a complete semantic description in order to have them reachable and reusable; it means that must be described by a group of meta-data. In the fig. 4 are shown the components of the resource model.



Figure 4: Resources description in SIMBAD

In SIMBAD one Educational Component is represented by the tupla:

<Ci, Metadata, Composition>

Where *Ci* is the unique identifier of the component.

Metadata: includes the following items per each component: *Contents, Prerequisites, Adquisition Function y Other-Characteristics.*

Composition : a composed component is specified by a composition graph (an acyclic directed graph).

At the same time, each item is described as follows:

Contents : a component that can be related with at list of one domain concept, this relationship is defined by the tupla

<domain-concept, role>

Where *domain-concept* is a piece part of the learning object and *role* describes the topic developed by a component in reference to the domain concept; $role \in \{application, definition, demostration, description, experiment, history, introduction, summary, annotation, conclusion, explanation, example, exercise, hypothese \}$

Each component could perform one or more roles, the creator defines this Group of results in terms of the pedagogic goals.

Prerequisites : each component can require prerequisites, this means the previous contents required to get access to the current content. The prerequisites are represented by the tupla:

<domain-concept, role, knowledge-level>

Where role is optional and knowledge-level is some of the following values {very low, low, medium, high, very high}

Acquisition Function : is a function F(a) that represents the knowledge acquired by the student after using a component. In the other side it defines a mapping between educational levels used by this model and the educational levels used by teachers. The Acquisition Function takes two possible values: success or FAIL. Depending of the result it is incorporated or not this component to the user model.

Other Characteristics : is the Group of metadata used to describe non-functional properties of the component. For example author, title, format, copyrights, context, etc. They are represented by the tupla :

<tag, value>

For the implementation of the learning styles in SIMBAD we extract the metrics M3, M4 y M12, from the *role* in *Contents*.

The value extraction functions are specified as follows:

Function
RES(Ci) = get ressource(Ci)
IUR(Ci)=get LOM.Educational.IntendedUseRole(Ci)
LRT(Ci)=get contents.role(Ci)
FTE(<i>Ci</i>)=get LOM.Technical.Format(<i>Ci</i>)
TLT(<i>Ci</i>)=get LOM.Educational.TypicalLearningTime(<i>Ci</i>)
GES(Ci)=get LOM.General.Structure(Ci)
DIF(<i>Ci</i>)=get LOM.Educational.Difficulty(<i>Ci</i>)
PRE(Ci)=get Prerequisite.domain-concept.knowledge-level(Ci)

The metrics are converted in percentages to facilitate the locations in the values {high, medium, low}. The result value per each metric is incorporated to the model through the metadata "Other Characteristics", being *tag* the metrics and *value* the calculated percentage per each one. For

example, the metric M7 obtains the value 78% can be aggregated to the following metadata: $\langle M7, 78 \rangle$

In the same way we will insert the level resulting value of each learning style obtained through the function *Niveau.Style* in "Other Characteristics", being *tag* the learning styles and *value* the level obtained, for example:

<reflexive, high> <active, less>

When each metric is expressed in common scale, this means in percentages, we can divide the scale in three equal parts to identify the metrics with high, medium and low level. The presence of a *high* in the analyzed metric is favorable for the style selected. In opposite, the presence of *low* in a metric is favorable for the style in which the indicator harms the learning.

3.4 Rules to determine the level of the metrics in the resources:

Rule 1: Rule to extract if the metric is favorable or not.



 $Total. Metrics = \sum application(Mx) | prefer(Mx) =' negative' or \ prefer(Mx) =' positive'$

Rule 5: To obtain the level of each learning style for the selected object.

IF 0<Total.Metrics<3 THEN Niveau.Style='Bass'; IF 4<=Total.Metrics<=7 THEN Niveau.Style='Medium'; ELSE Niveau Style ='Haut';

3.5 Resources composition:

A composed resource is structured by the application of the resources composition operators. This creates a composition graph. In SIMBAD exists 5 operators, three simple (SEQ sequence, PAR parallel, ALT alternative), and two complex (AGG for resources aggregation and PROY to define one resource as a projection of other).

3.6 Interaction modes:

In SIMBAD are defined three different selection types that corresponds to different pedagogic modes; course mode that represents the classic learning model, concept mode that represents an active mode for the student and the query mode that is similar to the concept mode but it is expressed in non semantic parts of the description model.

Each mode performs the customizing process to finally provide the student with a component as a result of the process. The customization is done in all the selection modes and is integrated in four parts; Composition Expansion, Prerequisites Filtering, Prerequisite Rewriting and Preferences Filtering.

Composition Expansion: The composition graph is transformed to obtain one Group of Delivering Graphs. Prerequisites Filtering: it is related to the student background and expressed in the prerequisites. In the user model are selected the adequate delivery graphs. Prerequisite Rewriting: if there is not a delivery graph that complies with the prerequisites of the student, it is performed a process of rewrite of the prerequisites until some adequate result apears. Preferences Filtering: when a group of adequate delivery graphs are found, they are filtered based in the student preferences.

We have expanded this last aspect by introducing the learning profile inside the preferences. It is clear that the preference of the learning styles, as per the description in this article, presents an integral vision of the learning process. Due to the above mentioned, to select the Delivery Graph (DG) we use the learning profile. There are 4 ways to customize with learning styles: selecting the DG s with total coincidence with the learning profile (all the styles in the same level), using the style with *high* preference (preferred style), considering the style with *low* preference that needs to improve (deficient style) or selecting the style that best fits with the student learning style (favorable strategy).

3.7 Concepts and rules for adaptation process:

Following are described the basic concepts and rules to make an adaptation process by using learning styles.

Variables:

```
Fuction user-style-level:
user-style-level(:uid, :style)is {low, medium, high}
Fuction user-style-level(:uid, :style)is {low, medium, high}
Fuction user-style(:uid) = (user-style-level(:uid, "active"), user-style-level(:uid, "reflexive"),
user-style-level(:uid, "theoric"), user-style-level(:uid, "pragmatic")
Fuction content-style-level(:coid :style) is {low, medium, high}
Fuction content-style(:coid) = (content-style-level(:coid, "active"), content-style-level(:coid,
"reflexive"), content-style-level(:coid, "theoric"), content-style-level(:coid, "pragmatic")
```

Rule 6: To determine the preference contents per learning profile:

Rule 7: To determine the contents by preferred style:

```
IF q-contain(:uq, :coid)
AND equal(user-style-prefer(:uid), content-style-prefer(:coid))
DO
USE-CONTENT (:coid);
```

Rule 8: To determine the contents by styles with low preference:

```
IF q-contain(:uq, :coid)
AND equal(user-style-low(:uid), content-style-prefer(:coid))
DO
USE-CONTENT (:coid);
```

Rule 9: To determine the roles for the theoric style:

```
IF q-contain(:uq, :concept)
AND equal(user-style-prefer(:uid), "theoric"))
DO
USE-ROLES ("Description", "Definition", "Example", "Introduction", :concept);
```

Rule 10: To determine the roles for the pragmatic style:

```
IF q-contain(:uq, :concept)
AND equal(user-style-prefer(:uid), "pragmatic"))
DO
USE-ROLES ("application", "demostration", "annotation", "example", :concept);
```

Rule 11: To determine the roles for the activist style:

```
IF q-contain(:uq, :concept)
AND equal(user-style-prefer(:uid), "active"))
DO
```

USE-ROLES ("application", "demostration", "Experiment", "example", "exercise" :concept);

Rule 12: To determine the roles for the reflexive style:

```
IF q-contain(:uq, :concept)
AND equal(user-style-prefer(:uid), "reflexive"))
DO
USE-ROLES ("Description", "Definition", "history", "conclusion", :concept);
```

3.8 Case of study:

In the following case of study we can observe the rules defined previously, first of all we have the function user-style that obtains the learning profile of the students and then the function content-style obtains the styles profile of each learning object.

Function user-style:

<pre>user-style(Student-1)=("high", "medium", "medium", "high")</pre>
<pre>user-style(Student-2) = ("medium", "low", "low", "medium")</pre>
<pre>user-style(Student-3)=("medium", "medium", "medium")</pre>
user-style(Student-4)= ("medium", "high", "high", "low")
<pre>user-style(Student-5)= ("medium", "medium", "medium")</pre>
user-style(Student-6)= ("low", "medium", "high", "medium")
user-style(Student-7)= ("high", "low", "high", "medium")
user-style(Student-8)= ("high", "medium", "low", "medium")
<pre>user-style(Student-9)= ("medium", "low", "medium", "low")</pre>
user-style(Student-10)= ("low". "medium". "medium". "high")

Fuction content-style:

```
content-style(object-1)= ("low", "medium", "high", "low")
content-style(object-2)= ("low", "medium", "high", "low")
content-style(object-3)= ("medium", "low", "medium", "low")
content-style(object-4)= ("low", "low", "medium", "low")
content-style(object-5)= ("medium", "low", "medium", "low")
content-style(object-6)= ("low", "low", "medium", "low")
```

For the student 9, the objects 3 and 5, are in correspondence with their learning profile, this means:

```
user-style(Student-9) = content-style(object-3)
 ("medium", "low", "medium", "low") = ("medium", "low", "medium", "low")
```

For the student 6, the objects 1 and 2, are adequate for the preferred style, this means the theoric.

```
(user-style-prefer(student-6) = content-style-prefer(object-1))
("high") = ("high")
```

For the students 2 and 8, the objects 1 and 2, are adequate to strengthen its low style, this means the theoric style.

```
(user-style-prefer(student-6) = content-style-prefer(object-1))
("low") = ("high")
```

4. Conclusions

The application of the learning styles in learning objects is a powerful way to improve the contents quality, by presenting the adequate objects for the student's preferences.

We have applied the metrics of the learning styles in the selection, indexation and reutilization of learning objects.

The tool developed to extract the metrics can be used in different environments, being a source of assistance to the contents authors in the design and selection of the objects. In the other hand it contributes with the students by adapting the environment to the learning styles preference.

The application of our proposed tool in SIMBAD model allows completing the pedagogic dimension associated to didactic strategies that is a coherent mode to extend the model by adding the student's individual differences.

In future studies we will be able to refine the metrics group and the validation scales from the data mining to allow quantify in a direct mode the preferences and learning styles. This would be obtained from the student's navigation data taken from their interaction with a variety of domains.

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Session #9:

National and Regional Approaches to Developing ICT for Education



JAPAN PACIFIC ICT CENTRE & ICT FOR HUMAN DEVELOPMENT & SECURITY AT USP

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Abstract: The South Pacific Region has many problems related to environmental and economic issues. The University of the South Pacific (USP) is an ideal platform for provision of development of Human Resources and enhancement of Human Security in the Pacific. Main objective of Japan Pacific ICT Centre is to build human-resource for ICT capacity development all across developing countries in the south pacific while "bridging the digital divide". Main Goal was to provide USP with appropriate resources to take the lead role in driving the Pacific through Human Resource Development Programs. Specific Goal is to focus on developing and strengthening ICT skills applicable at the e-services level. The author discusses the development of new Japan Pacific Information Communications Technologies (ICT) Centre at the University of the South Pacific and ICT for Human Development and Security in the South Pacific Region. USP motivation was to accommodate increasing demand for ICT-related education and training in the region and to accelerate research and development activities in the Pacific. The Japan Pacific ICT Center will play a facilitator role for ICT related education, Training; and Research and Development for the Pacific. Japan Pacific ICT Centre will promote innovation and development in the areas of e-Learning, e-Health, e-Government, e-Journalism, etc. The Centre will support software development in the areas of Web 2.0 combined with the 3D Telepresence, Future Internet, Semantic Web Technologies to support creation of social networks, content retrieval and analysis. This will contribute towards the research and innovation in the areas of future fully automated cyberspace. Current dynamic Internet developments and continuous demand for the ubiquitous connectivity combined with the next generation of networks contributes towards creation the future cyberspace infrastructures worldwide. Implementation of the cyberspace in the government and corporate infrastructures, contributes towards creation of new paradigm in the decision making processes. Decisions that are currently governed by the human intelligence knowledge and intuition may be influenced by the cyber-data and processes. Future cyberspace will ultimately impact the decision making processes by government, corporate, industrial and academic institutions worldwide. In conclusion the author promotes discussion on the role of the Japan Pacific ICT Centre at USP and in the Region. The author opens discussion on Japan Pacific ICT Centre social and ethical impact in the south pacific region in the context of governance vs. privacy.

Keywords: Japan Pacific ICT Centre, Human Development and Security, Future Cyberspace, ICT Technologies, Governance, Security, Privacy, 3D Tele-presence, globalization, Information Technology Age, Future-Net, Next Generation Internet.

I. INTRODUCTION TO USP

The University of the South Pacific is the premier institution of higher learning for the Pacific region, uniquely placed in a region of extraordinary physical, social and economic diversity. Established in 1968, USP is one of only two universities of its type in the world. It is jointly owned by the governments of 12 member

countries: Cook Islands, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Solomon Islands, Tokelau, Tonga, Tuvalu, Vanuatu and Samoa. The University has campuses in all member countries. The main campus, Laucala, is in Fiji. The Alafua Campus in Samoa is where the School of Agriculture and Food Technology is situated, and the Emalus Campus in Vanuatu is the location for the School of Law. The academic Schools, Institutes and Centers at the University of the South Pacific are organized into three faculties and led by Deans. These are: the Faculty of Arts and Law; the Faculty of Business and Economics; and the Faculty of Science, Technology and Environment. Each faculty comprises of a number of schools which offer a wide range of academic programs and courses at the undergraduate and postgraduate levels. The University also offers programs through distance and flexible learning in a variety of modes and technologies throughout USP's 14 campuses [W1].

Advanced communication technologies through USPNet are used to reach distance and flexible learning students across the vast expanses of the Pacific Ocean. The multi-cultural nature of the staff and student body give USP an exceptional character. It is a quality institution producing degrees comparable to those awarded by universities in Australia, New Zealand and the United Kingdom. Graduates from USP are found in important executive positions throughout the public and private sectors in all member countries and in numerous countries around the world. The University has set a high standard for quality in its research. Major research commitments include business management, teacher education, Pacific studies, marine studies, agriculture, science and technology. In the first section author introduces USP and its history. In the second section author presents USP region and USP administration. The third section discusses ICT background at USP. Section four presents project phases of Japan Pacific ICT Centre. Section five discusses ADB-JICA partnership with USP. Section six discusses the ICT current state of the art. Section seven discusses 21st century ICT and author's personal philosophical and visionary comments. The final section eight concludes the article. followed by references and authors brief biography.

II. USP REGION & USP ADMINISTRATION

The University of the South Pacific region spreads across 33 million square kilometers of ocean, an area more than three times the size of Europe. In contrast, the total land mass is about equal to the area of Denmark. Populations vary in size from Tokelau with 1600 people to Fiji with more than 800,000. The total population is

about 1.3 million. International airlines flying routes between Australia, Japan, Korea, New Zealand and the United States link a number of the island countries. There are also airlines which service the region. Within countries, interisland shipping is used to reach smaller islands without air services. Because of its strategic position and facilities, USP attracts eminent scholars and staff from all over the world. USP is governed by its own Council, which includes representatives of the member country students. governments, academic staff. communities and business leaders, the Pacific Islands Forum Secretariat, Secretariat of the Pacific Community, the American Council of Education, the Privy Council, Australia and New Zealand. The Senate is the academic authority of the University, responsible for matters such as teaching and research. The Council and the Senate are served by committees working in such areas as Finance, Human Resource Management and Academic Planning. Other committees deal with special projects and the day-to-day work of the University. The ceremonial head of the University is the Chancellor [W1]. USP's Chancellors have been drawn from the leaders of the University's member governments and include Prime Ministers, Presidents and Heads of State. The Pro Chancellor is Chair of Council and the executive head of the University is the Vice-Chancellor. The Vice-Chancellor is assisted by a Deputy Vice-Chancellor and three Pro Vice-Chancellors. The Registrar is responsible for the welfare of the University community. The Director of Finance is concerned with control of University finances. The Director of Planning and Development plans the use of the University's financial and human resources. In total, USP employs more than 1,500 staff [W1].

III. ICT BACKROUND AT USP

Many member countries in the south pacific region were and are still struggling to take full advantage of benefits from ICT. They lack appropriate ICT infrastructures and do have resources to build proper ICT in their nations. The member countries were unable to use ICT as a strategic tool for addressing socio-economic development issues. USP wanted to become an active partner in the social, economic and political development of its Member Countries. The USP vision was to become a fully global but located and engaged in the Pacific a regional University of excellence. In the final analysis, the USP needed to answer fundamental question: "Why USP?" The response was based on the well-being of Pacific peoples and their needs. USP has high quality graduates who are getting good employment and possess skills, knowledge, and social and cultural competencies required by employers. USP produces high quality research relevant to the Member Countries and, offers variety of outreach programs while making major contributions to the cultural and economic development of the region.

The USP was an active participant of ICT-related activities including

- Introduction of USP Satellite Network (USPNet) in 2000;
- Becoming a Member of the "Open Learning Health Network" in 2003;
- Enhancing the USPNet in 2005;
- Starting ICT Capacity Building Project 2002 - 2005;
- Adopting the International Open Source Network (IOSN) Sub-regional Secretariat in 2006; and
- Creating the ICT Tax-free zone of the USP Statham Campus in 2006.

IV. PROJECT PHASES OF THE JAPAN PACIFIC ICT CENTRE AT USP

In collaboration with the University of the South Pacific (USP) and Japan International Cooperation Agency (JICA), the "ICT Capacity Building at USP" First Project ended on 30th June 2005, having achieved goals under its various components [W2].



Figure 1: From the Government of Japan [W2]

The Project was launched on 1st July 2002 with a three year implementation period. This section presents project outputs and lessons learnt during the Projects 3 year period at USP. This information and resources was used as guidance for all stakeholders who were interested in ICT developments in the South Pacific. Japan is funding a \$30 million ICT centre at the University of the South Pacific Laucala Bay campus. Construction will include:

The centre will serve the needs of ICT to the Pacific region and will house three buildings with facilities consisting administration offices, computer laboratories, classrooms, conference rooms and a multipurpose lecture theatre all equipped purpose specific equipment. (Source: Pacnews)



Figure 2: Laying the foundation for a brighter ICT future [W2]

Japan continues to play a key role in promoting economic development plans in the region:

"Understanding the difficulties associated, not only with the geographical isolated location of the small island nations, but also with sharp information differential in the Pacific region, Japan acknowledges distance and flexible learning as a more convenient approach in the new ear," Ambassador Yoshizawa said."Japan is hopeful that the new ICT Centre will significantly improve the current information and communication technology education and training functions of USP, which is providing remote island countries in the Pacific with distance education and learning activities using USPNet," he said.



Figure 3: USPNet [W4]

When opened, the center is expected to become a hub for distance learning programs in the region [W2].

The Project was a pioneer project in the ICT arena of academic setting in the South Pacific region [W3]. The project overview was:

- The overall goal was to support USP as a centre of excellence and high standards of human resource development, through an improved educational service in terms of both quality and quantity.
- The purpose of the project was to ensure that more students received a superior educational experience through the enhanced IT capacity of USP.
- There have been four long-term experts from Japan brought in to work closely with USP counterparts on the main components of the project. They were experts in, Computing Science, Distance and Flexible Learning, and ICT Research and Training.
- JICA experts were and are working with USP counterparts for technology transfer. USP Counterpart education includes short term visits to Japan and scholarships including PhD level. Equipment provision is also a key scheme; which included multimedia equipment, computer laboratories, and equipment for USPNet enhancement. Project activities were conducted in USP member countries.
- The Project Office was located at the Laucala Campus with the three project

experts plus a team of local staff to assist with ensuring that the project was managed well and operated smoothly.

All 12 USP member countries are expected to benefit from the Project, which is being implemented under JICA's Pacific Regional Programme to utilize ICT for advancing human development and ensuring human security in the Pacific Region.

VI. CURRENT STATE OF THE ICT

The past sixty years have witnessed the most rapid transformation of human activity in history, with digital electronic technology as the driving force. Nothing has been left untouched. The way people communicate, live, work, travel, and consume products and services have all changed forever. The digital revolution has spurred the rapid expansion of economic activity across the face of the planet [1]. In this paper author discuss the unprecedented outburst of advances and innovation in Internet and Information Communications Technology (ICT) that drives the digital revolution today. Authors further discuss how innovation of ICT works, its learning technologies impact on and methodologies, and what forms of communications technologies based on current ICT can be expected in the future. Since innovation does not happen in a vacuum, the author also discusses the current technological and social factors that can accelerate or impede changes in the field of current ICT and future cyberspace. The current trends in globalization create neither a level playing field nor a truly "flat world." [1]. The Governments worldwide are focused on creating best market opportunities while educating and industrializing as quickly as possible in the face of growing competition [2]. Attempts to gain national competitive advantage promote creation of artificial walls that may trigger potential conflicts and disagreements. Today, the Information technology systems are essential for organizations worldwide to deal with current challenges and dynamics in global business enterprise. Information Technologies with Information systems provide firms with necessary communication and analytic tools required to conduct successful business globally. The market is growing and new technologies dramatically improve access to learning resources and offer the potential of linking learners and teachers in completely new ways [3]. Demand currently exceeds supply in this dynamic new market [4].

Information technology systems are the foundation for services in knowledge economies while facilitating management of knowledge assets and business intelligence. Information systems make it possible for businesses to adopt more flexible arrangements of employees and management that can coordinate with other organizations across great distances [5]. Organizations are trying to become more competitive and efficient by transforming themselves into digital firms where nearly all core business processes and relationships with customers, suppliers, and employees are digitally enabled. The Internet is bringing about a convergence of technologies that is further widening the use of information systems in business and transforming industries and business models. There are five essential key management challenges in developing and using information systems today [6]:

- Obtaining business value from information systems;
- Providing appropriate complementary assets to use information technology effectively;
- Understanding the system requirements of a global business environment;
- Creating an information technology infrastructure that is flexible enough to support changing organizational goals;
- Designing systems that people can control, understand, and use in a socially and ethically responsible manner.

Most of the organizations regardless of nature of business are interconnected via high speed Internet connection and operate in global market with partners from all over the world. The applications of Information Technology are essential to any business, manufacturing, education or government institutions worldwide. In 2005, the Accenture commissioned its researchers to deeply analyze the entire IT landscape and develop a vision for the future of information technology. The researchers analyzed more than 150 technologies and spent more than 10,000 man hours to generate 42 predictions about the future of information technology [5]. The purpose of the exercise was to re-evaluate our own approach to R&D and to help our clients prioritize their investments in and use of technology innovation to drive business performance. The team concluded that

developments in four major technological areas such as:

- intelligent device and sensor networks,
- analytics: distributed intelligence,
- human to computer interaction, and
- new approaches to system building and integration

As a result, the future of information technology will continue to be driven by above listed areas with research focus on:

- Intelligent Device Integration: As devices gain in diversity, density and intelligence, so does the opportunity to gather knowledge.
- Analytics and Insight: Exploiting emerging data sources for high performance.
- Human Computer Interaction: The impact of emerging technologies and new business needs on workforce productivity and business performance.
- Systems Integration: Exploring tomorrow's enterprise ICT systems.

As a result, in order to facilitate the fullautomated processes within the Cyberspace, the Information technology is yet at new beginning of dramatic phase of innovation and developments.

VII. 21ST CENTURY

The 21st century has open new platform for the full automation via ubiquitous cyberspace and Internet. Text published by ComputerWorld [6] reflects the essence of work publishes earlier [7, 8, 9, 10, 11, 12]. For technical clarity the paragraph written in italic print was adopted from [6]:

...In two to five years, autonomic computing will foster technologies such as self-healing software, IT service provisioning, MPP grids external to organizations, root-cause discovery and correction, and self-healing hardware, Gartner says. Between 2008 and 2013, Gartner predicts major innovations such as general-purpose grid computing as well as service billing, service governing and service policy managing systems that shift IT resources to meet business needs at the lowest cost....

The technical development of Internet and ICT Technologies established a platform for the next generation Internet and ICT often referred to as

the 21st century cyberspace. The ever increasing accessibility of connectivity by anyone, to anyone, at any time, at any place from any place to any place ultimately creates a cyber-net and/or cyberspace facilitating creation, manipulation and sharing of information globally by many in real-time fashion. The current cyberspace is already changing the way we work, study, live, socialize, etc. Te future cyberspace will revolutionize the way we live, while enabling automatic real-time visualization and audio connectivity worldwide. The 21st cyberspace combined with the future ICT technologies will drive the e-type applications, such as e-health, egovernment, e-security, e-law, e-learning, ecommerce, etc., to the next level of fully automated cyberspace. The 21^{st} century cyberspace will have significant global impact on societies, economies, political and legal structures. Some people may want to ask what will be the 22nd century cyberspace? Will it be safe, human friendly, or will be unsecure and potentially harmful to humans? Answers to these and similar questions will most likely depend on how the global team of scientists, researchers, technology developers, sociologists, educators, thinkers, engineers, lawyers, businessmen, politicians, ect., works together today and will work tomorrow. This may be a good time to start developing ICT and cyberspace related technologies that will contribute towards betterment of live for everyone. Instead of mechanizing the relationship between peoples and nations motivated by economic and/or political benefits of very selected groups.

VIII. CONCLUSIONS

The Japan International Cooperation Agency and the University of the South Pacific officially held a Signing Ceremony, to launch the "ICT for Human Development and Human Security Project" on Friday 30 October 2009. The Project aims to strengthen USP's ability to produce cutting-edge ICT resources for the Pacific region through the introduction of new Computer and Information Science degree programs, enhancing the utilization of USPNet for the delivery of distance learning, and supporting maximum utilization of the new Japan-Pacific ICT Centre as a regional centre of excellence.

Construction of the new Japan-Pacific ICT Centre, a \$US 21.5 million (F\$43 million), Japanese Grant Aid Project, will be completed in March 2010. Over the course of the three-year project period, several ICT-related experts from JICA will be dispatched to support USP faculty and staff in the Project implementation. Short-term and long-term training opportunities will also be offered, and the necessary equipment provided for the Project operation. The Project cost is around \$US 2.8 million (F\$5.6 million).

USP graduates from ICT programs will undertake research and development in institutions and industries in the Pacific, and create income generating activities. Community capacity and security in the Pacific could be enhanced through ICT services and USP could become a center of facilitation of international technical exchange.

The principles of current and future cyberspace are based on technological advances and innovation of Information Communications Technologies and Internet. One may ask, what will be the future research and development directions of ICT. Two centuries ago, people did not talk about Radio, TV, Internet, thought they might have think and/or dreamt about it. Today most people aren't surprised by the prediction that the Information Age will probably transform their lives beyond recognition. Let's consider the trends in the development of computers and communications and, most excitingly, the area where they intersect [6]. Three principal Directions of Computer Development are:

- Miniaturization: Everything has become smaller. ENIAC's old-fashioned radio-style vacuum tubes gave way after 1947 to the smaller, faster, more reliable transistor. A transistor is a small device used as a gateway to transfer electrical signals along predetermined paths (circuits).
- Speed: due to enormous large volume of transaction and information processes the highest processing and communication speed is essential in all sectors.
- Affordability: The cost is critical to all business worldwide.

The 21st century cyberspace and ICT technologies have become platform for most of the businesses worldwide. The future directions are as visible as the first transistor was seen then in 1940's. Author's work promotes continuous discussion of individual experts, scientific team of researchers and developers to work, as well as well established multidisciplinary research teams worldwide to define the future directions of future education and to find the optimal solution

for the 21st century cyberspace, next generation of ICT technologies while contributing to betterment of all [9, 10, and 11].

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The Use of Technology to Build 21st Century Skills in Formal Education

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Abstract

Transformative changes have taken place in the world during the last decade due to the explosion of interconnectivity linking people from all walks of life across the globe. Low-cost Information and Communication Technology (ICT) tools, especially, internet and mobile technologies are powering this wave of change. As a result, new skills and innovative abilities are required of students and workers in their learning, livelihood and life.

In the 21st Century, virtual learning, online discussions and tele-meetings are becoming basic requirements. This demands a workforce with excellent collaboration, communication and critical thinking skills. The challenge for formal education is to build these 21st Century skills through a blend of technology-powered learning experiences throughout a student's education.

The Author has drawn this from over 25 years of experience in non-formal IT education using blended delivery methodologies to explain how the education systems and the workforce in India and other Asia Pacific countries have evolved. During this period, he was also involved in building partnerships between industry and tertiary education institutions to reduce the IT skills gap in the rapidly growing business environment. In the last 4 years, he has been working extensively with Education Ministries, not for profit organizations and large schools in Asia Pacific countries to support the building of 21^{st} century skills like critical thinking, collaboration and communication in primary and secondary schools using technology. From this experience, a number of recommendations are offered to propel education and learning towards a 21^{st} Century model that will serve many students and workers.

This focus of this paper is on:

- How businesses in the world are changing and what this means for education?
- How different 21st century learning is compared to 20th century learning and the stake holders in it?
- Some of the key barriers limiting the use of technology in formal education in Asia Pacific countries.
- The importance of 21st century skills in work-life and the ways they can be embedded into formal education using ICT.
- Why there is no one solution to address the complex, rapidly changing environment, especially in Asia Pacific?
- How a forward thinking residential school model is supporting students coming from semi-urban and rural areas to build 21st century skills powered by technology?

1. Introduction

The premise of this paper is that existing test-based education systems will not be able to produce the innovative, skilled work-force required in the 21^{st} century, unless it changes course by incorporating Project Learning using technology as part of the formal curriculum.

Recent experience shows that many global organizations have started moving their businesses and knowledgerelated activities to low cost countries. In Asia Pacific, large countries with English language fluency as a part of its formal education are benefitting the most. Some examples include the rapid growth of outsourcing businesses in countries like India and the Philippines, which have created huge employment opportunities for their youth. This form of rapid growth is changing their economic and social opportunities at an unprecedented rate. In another shift, local businesses in developing countries are moving away from large cities to smaller locations due to the high cost of technical infrastructure, travel time and scarcity of skilled staff. The smaller locations with good IT infrastructure and skilled staff are benefiting from this change.

Currently, a population of around 1.5 billion attends primary and secondary schools globally, which is approximately 75% of all school age children. Though 1.5 billion students attending primary and secondary schools is a staggering figure, most countries find it challenging to provide learning opportunities beyond the basic curriculum designed to prepare students with traditional basic skills and a content-focused education; this is creating a huge gap between the demand for 21^{st} century workers and the short supply of future-ready school graduates.

"... To be ready for the future, our children need to grow up as independent thinkers, with the habit of questioning and thinking for themselves. They need to be well-rounded in outlook and abilities, have good values, and be robust in the way they approach challenges and obstacles... They should be culturally-intelligent, able to understand the work well in global economy... ", Lui Tuck Yew, Minister of State, Ministry of Education, Singapore (16th Jan 2008).

Many governments implemented formal education in a **survival** mode during the 1960s and 1970s and were focusing their energies to build basic literacy and numeracy. In the 1980s and 1990s, the focus was on **competence** to build basic capabilities for graduating students to be productive in the workforce. In the 21st century, the focus on education has shifted to the **aspiration** level to maximize the employment of talent potential at the quickest pace through a more tailored education powered by Information and Communication Technology (ICT).

In recent years, governments are spending a huge share of their country budget and time to redesign their education systems with expert support from industry to help learners participate in the globalization process and help prepare students with the 21st century skills most needed, such as collaboration, communication, critical thinking and technology literacy.

2. Information Technology evolution and its role in the education system

Earlier, to support the changing needs of business, technology was introduced in formal education in a variety of forms, but was mostly focused on talented student groups in Asia Pacific countries. Now, it's becoming critical to use technology in education for all students and working populations to meet 21st Century business demands.

In the 70s and 80s, large computers were used in automation processes which created limited role-based jobs with specialized skills developed mostly during tertiary education. Two of the most common methods used during this period were Video Aided Instruction and Computer Based Instruction.

In the 90s, the personal computers held an important place in formal education as they likewise played a significant role in creating new job opportunities across the globe at various levels in business. This trend has resulted in a huge push to expand IT skills especially in secondary and tertiary education coupled with continued skill upgrading programs for the workforce. However, the benefits of computers were limited to a very few countries due to the high overall cost, and ICT literacy was offered only in selected institutions. Job creation was predominantly IT related which led to huge knowledge gaps among students in developing countries. Many product companies contributed to closing this gap by helping to integrate their product knowledge into the formal curriculum to ensure that students developed adequate skills before entering the job market.

Worldwide PC use has grown from 98m units in 1990 to nearly 1.1b systems in 2007 and is projected to top 1.78b units in 2013. To support the PC's penetration, many organizations adopted and adapted interactive Computer Based Instruction learning using multimedia technology to build the needed technology skills.

PCs in-use for the main regions of the world



Figure 1. PCs In-Use by Regions in *millions* of units [1]

3. New learning balance

Now, students need to compete globally and they no longer have the luxury of learning communication, collaboration and basic technology skills separately. Ideally, they must possess all these skills by the time formal education is completed. This comprehensive learning is only possible through the expanded use of ICT in learning, as technology provides speed, consistency, access to quality content and subject experts. The following graphs illustrate the population vs. internet users which demonstrate the need to address the shortage of 21st century skills.



Figure 2. Population of some Asia Pacific countries [2]



Figure 3. Percentage of some Asia Pacific population with access to internet [3]

Ministries and other educational agencies have started investing in the learning of technology skills in formal education and 21st century skills independently using different delivery models to ensure their students are equipped for 21st century jobs and are successful in the job market.

Ideally, the application of 21st century skills should be intertwined with conventional education practices. The framework below aims to highlight the importance of blended education, infused with technology use, rather than solely "chalk-and-talk" classroom curriculum learning.



Figure 4. 21st century skills learning framework [4]

As the Figure 4 illustrates, the conventional modes of education should be bolstered with 21st century skills. The application of both 21st century skills and conventional education would lead to a more holistic learning approach.

With more widespread technology use, there is an ongoing transformation in society and also in formal education. If technology is powering this transformation, it's also a catalyst for building 21st century skills. There is a whole new architecture of thinking about learning evolving:

- 1. Learning is no longer a one-way information flow and now it's flowing through a network of diverse individuals and organizations. It is developing capacity for becoming self-reliant learners, which is critical for higher education's increasingly blended and self-directed learning methods.
- 2. Learning networks are promoting collective listening, dialogue and collaborative projects that prepare students for innovative teamwork that business now demands.
- 3. Technology is supporting the ability to be non linear thinkers with the capacity to work in less structured and more innovative environments.
- 4. Increased technology use is creating a positive tension among teachers and students to better deal with ambiguity and risk taking, leading to the realization that leadership is rooted in self-motivation and self-learning.
- 5. Technology encourages sharing of thoughts and a diversity of thinking that characterizes a 21st century creative knowledge economy. As students become more technically literate and connected, they are encouraged to think with the future in mind and to confront the issues of our times.
- 6. Connectivity provides access to resources that support the 21st century skills learning on a continuous basis through online teacher training, online curriculum and references, teacher managed student projects, online evaluation and feedback, etc.

While there are many key educational stakeholders like Ministries of Education, Non-Governmental Organizations, Foundations, and individuals in this transformation, teachers will have huge responsibilities for helping students develop 21^{st} century skills, and they also need to be equipped with these skills. Some of the skills that they need to develop in today's changing balance are:

<u>From</u>	<u>To</u>
Teacher-directed	Learner-centered
Direct Instruction	Interactive exchange
Knowledge	Skills
Content	Applied Skills
Basic skills	Applied Skills
Facts and principles	Questions and Problems
Theory	Practice
Curriculum	Projects
Time-slotted	On-demand
One-size-fits-all	Personalized
Competitive	Collaborative
Classroom	Global community
Text-based	Web-based
Summative tests	Formative evaluation
Learning for school	Learning for life
	A



Figure 5. New Balance in Education [5]

In the developing countries, the education system is closely guided by the government to ensure education improves the literacy rate of as many students as possible. Depending on the economic conditions, the local country culture, and the language barriers, countries are devising new models that better serve the educational needs of their citizens. As the rural population ratio is higher and shortage of trained teachers is acute in most Asia Pacific countries, access to quality education remains a challenge for children unless technology can bring education closer to them.



Figure 6. Percentage of Population living in Rural Areas in some important Asia Pacific countries [6]

The challenges students face during advanced phases of education and employment include the language of instruction in secondary school education and tertiary education (teaching is normally delivered in local language/dialects).

One example of an effective use of technology in education is the use of cell phones to learn English among students in Bangladesh. They realized good communication skills are vital to enhance their employment opportunities [7]. The wide use of current mobile technology by students has led to expanded learning opportunities at an affordable cost.

Another great example of technology use in schools is a unique educational model introduced by the Indian government in the early 80s through Jawahar Navodaya Vidyalayas (JNV) under Navodaya Vidyalaya Samiti (NVS) [8]. These are governed by the Ministry of Human Resource Development, India (http://www.navodaya.nic.in).

These schools provide good quality modern education including a strong component of culture, inculcation of values, awareness of the environment, adventure activities and physical education to talented children predominantly from rural areas. Currently, there are over 557 residential schools across most states in India providing education from grade VI till Grade XII (free till grade 10). These schools initiated many ICT programs by partnering with local and large global corporations to get access to the latest technology and teacher training with the objective of reducing the digital divide between rural and urban Indian populations by providing high quality learning environments powered with technology. While the teachers had the opportunity to learn Information Technology concepts through their other partnerships, the Oracle Education Foundation (www.oraclefoundation.org) introduced the teachers and students to a free and protected ThinkQuest Projects online platform which provides an opportunity for students and teachers to learn and practice 21st century skills using technology.

With a very humble start, NVS piloted ThinkQuest Projects in 2006 in some of their schools and started using this platform to communicate amongst themselves, eventually moving to build a number of real world projects with students.

This ThinkQuest online platform is used to develop student's independence as learners and problem solvers and build skills that can be applied to innovative situations that go far beyond the classroom environment.

Mr. Nageswara Rao, Deputy Commissioner NVS-Hyderabad Region has said, "ThinkQuest by Oracle Education Foundation is creating opportunities for collaboration, learning from peers and self-learning, which are key 21st century skills. Given the semi-urban settings of Jawahar Navodaya Vidyalayas, we are happy that technology has transformed our campuses into learning organizations."

While there are many examples of quality projects done using this protected platform by thousands of students (these can be viewed in the ThinkQuest library – www.thinkquest.org/library), the story of Radha, a first generation student attending a JNV school in India, shows how powerful learning with technology can be. She used the ThinkQuest platform in her school to build collaboration and research skills, and gained recognition in her village. а seven minute video accessible from the Oracle Education Foundation website In (http://www.oraclefoundation.org/single player.html?v=4) [9], you can clearly see how Radha developed 21^{st} century skills and how it changed her life. The learning opportunities and life-changing experiences that can be achieved if these skills are provided through formal education are made quite clear in Radha's story.

Mr. M.K Mishra, a JNV English teacher from Chhattisgarh, India shares his views on how his students who are using this technology as a part of their curriculum in their schools are benefiting:

"It has offered them the grit of leadership, innovative critical thinking (thinking things in a different perspective), and a marvelous style of working in a team, respect for the others, stupendous time management, and above them all, the zeal to excel others in their creativity. They have learnt confidence of doing independent work."

As NVS progressed in the use of this platform, some of the teachers, the key stakeholders from NVS were selected for a very intensive training program to learn advanced project based learning skills through Oracle Education Foundation's Project Learning Institute.

As G. Nageswara Rao, a JNV school teacher (and President Awardee) has said, "The Project Learning Institute is a unique experience of learning things from the real life, using technology for the enhancement of teaching. It may provide a strong bond between the teachers and students to bring them closer. Our rural talented children have experienced the effect of ThinkQuest Projects and are very happy."

4. Steps towards transforming formal education through 21st century learning

While many countries have realized the importance of changing their direction to incorporate 21st century skills, there is no single solution to address the current digital divide and lack of key skills for our times. Therefore, we need a collaborative approach to address this situation. The following steps are recommended while covering child safety issues where required:

- 1. The vast efforts of large corporations and non-profit organizations to address the needs for 21st century skills should be put together to avoid duplication of efforts and provide a powerful united force for change that Ministries of Education can use to ensure consistent implementation.
- 2. There should be an increased use of blended technologies like TV, Internet, mobile and digital media in formal education at all levels to ensure widespread, high-quality access to some of the best curriculum available for all sections of teachers and students.
- 3. Introduce Project Learning skills regularly in formal teacher training programs. Teachers' projects should be developed in a collaborative environment using technology.
- 4. Teacher networks and online communities are critical for success. Strong initiatives should be undertaken to ensure that teachers' skills are upgraded to support student projects using technology. Students' involvement in learning projects is essential to developing 21st century skills and should be evaluated through ongoing, formative evaluations that are part of the learning process.
- 5. As the Internet is key component, local Internet Service Providers should be approached to grant access to teachers and students at minimal cost. Where schools don't have quality access to the Internet, efforts should be made to provide access through community centers or public libraries with local government support.
- 6. Academic institutions with good IT infrastructure should be linked with primary and secondary schools and be encouraged to develop technology based projects for students. Qualified academic staff and students may be encouraged to provide guidance to teachers and students in schools that need support.
- 7. Introduce Project Learning into classroom curriculum for at least 2 hours per week with teachers evaluating learning projects like any other curriculum approach.
- 8. If the schools are using local language as the medium of instruction, involve teachers, locally or globally online, who are fluent in English as a part of the projects to help students to collaborate globally.
- 9. Students' social networking experiences should be leveraged to build basic communication and collaborative skills.
- 10. With the ongoing economic stimulation offered in various developing countries, it's a great opportunity for Education Ministries to raise the level of learning opportunity equality through ICT. This will help the students in tertiary education to deeply focus on the core concepts in the subject areas and use their 21st century skills to apply that knowledge to solving real problems to create a better world.
- 11. To support the students who weren't able to develop these critical skills in their early education, they should be provided with an accessible, technology based 21st century skills curriculum. This technology based curriculum should be supported by local facilitators to help students build skills essential to joining the 21st century workforce.

5. Conclusion

Internet technology is eliminating the boundaries in education and creating a flat learning world in the 21st century. Skills like communication, critical thinking, collaboration and use of technology are becoming necessities for students from all walks of life to step into this new world, hence, 21st century skills development needs to be a vital part of formal education at early levels of education. This will prepare students to further their education anywhere in the globe and gain the confidence needed to successfully step into the world of work and civic life.
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Lessons Learned in Managing ICT Systems for Online-Learning

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ABSTRACT

This paper discusses the challenges faced and lessons learned during the management of an online educational network in Sri Lanka. In all aspects of learning, technology can make a significant impact. Technology, when used appropriately, can be very effective in terms of interactivity among learners, between learners and the content and between learners and teachers, especially in contrast to print-based traditional distance education. Most difficulties that arise are due to constraints of scale, time and space and can be effectively addressed using technology. When implemented effectively, learners, teachers and educational institutions all benefit. Opportunities created in such a context for a country like Sri Lanka are enormous. At the same time, any failure to access teaching/learning material can create a very negative impression and is instantly compared with the face-to-face learning environment. Managing Information and Communication Technology (ICT) systems to cater to the above requirements is a challenging task. A major national initiative in Sri Lanka, the National Online Distance Education Service (NODES) is discussed in this context.

KEY WORDS

Managing ICT systems, online learning, e-learning, technology, content delivery, interactivity, opportunities, challenges, distance education

1. Introduction

According to the statistics of the University Grants Commission in Sri Lanka [1], every year there are about 125,000 qualified students who fall into the category of "higher education opportunity less" due to the fact that the conventional university system does not have the capacity to accommodate them. Education is well known to be a life-long process. Consequently, a segment of those who are employed continue to engage in learning to keep abreast with the latest knowledge and skills in their own fields. As a result, there are a large number of professionals, scattered across the country, who seek higher education opportunities as well as continuing professional development for which no opportunities can be found in their respective geographical areas. In addition, most of the employers operating in the developed western province need to train their employees in other provinces. All of the above issues regarding the limited enrolment capacity of conventional institutions and the lack of continuing education opportunities are affected by access to content and to tutors and mentors who can facilitate learning at a distance.

Based on experience elsewhere in the world [2], online learning has proven to be an effective way to address the challenges noted above. Even though the concept is not new, it is new in the Sri Lankan context. As with the introduction of any new technology, the needs of learners and organizations that use the learning system must be addressed [3]. Based on our experience, the items below are crucial to the successful implementation of online learning.

• Availability

: Regardless of the time of day, learners must always have access to online educational resources. Communication and data access delays should be minimized.

• Responsiveness

: How fast the system responds to learner requests depends on the speed or bandwidth of the communication link and how quickly teachers or online tutors respond to queries. The shortest response time is preferred and guidelines should be established for the provision of learner feedback.

• Trust

: The extent to which key stakeholders trust the system to meet their needs and deliver what is promised is crucial to the success of e-learning systems. Every opportunity must be taken to establish, build, and sustain trust.

This paper addresses the role of technology and technology selection to achieve a networked environment that is accessible, responsive, and reliable or trusted by the stakeholders. It is based on the establishment of the National Online Distance Education Service (NODES, http://www.nodes.lk) which was funded by the Asian Development Bank to increase access to educational opportunities, particularly to post-secondary students and working professionals. The paper covers the following:

Stakeholder expectations

: The key stakeholders in an online learning system and their expectations are discussed as well as the expectations of those in traditional face-to-face systems.

- Selecting technologies
 : A number of hardware and software options are reviewed. Both commercial and open-source software is discussed.
- Managing and monitoring ICT systems

: If the system is to be managed effectively and efficiently, pro-active management is crucial.

- *NODES Management Information System* : Briefly covered is the need to provide information to all stakeholders.
- *Conclusion* : Key observations are summarized.

2. Stakeholder expectations

Online education is all about the effective delivery of learning material to the end users and an equally effective way of evaluating the learner. Thus, it involves these stakeholders: learners, teachers, the institution for which the teacher works, and the ICT infrastructure or network. This organization too becomes a key stakeholder, hereafter referred to as Partner Institute (PI). The organization managing the entire ICT infrastructure through which the programs are delivered is the last stakeholder. In this case it is NODES.

The learner has the following expectations: accessibility to learning materials from anywhere in the country or world, the capability to interact freely with fellow learners, the ability to submit assignments online, the ability to interact and receive responses to queries from the results of evaluations completed anywhere and easy access to administrative information. This information may include the course module the learner is registered in, the list of modules already taken, and the amount of fees paid and/or need to be paid. Similarly, a teacher has a list of expectations that may include the following: managing the learning materials, managing the online assignments submitted by students, making available the evaluation results and accessing resources from anywhere and at anytime.

In order to determine whether the online program is on the right path, the PI needs to know the capability of the system to register and track students and to monitor the activity of learners and teachers who use the system. Concurrently, a PI would like to know the availability of key online resources on which the entire teaching/learning environment is based on. This is primarily information about the availability of key servers which hold the learning material, how secure these contents are and the availability of connectivity to these servers. This information is a key ingredient for the building of trust which was mentioned in the previous section.

Finally, NODES needs to have reliable mechanisms to ensure that all the above expectations of stakeholders can be attained. The trust stakeholders place on the system depends on the extent to which the above expectations are met.

In order to address all of the above, the ICT network infrastructure should have the following features: high availability, redundancy, back-up facilities, network management and monitoring facilities, and help desk or hot line services. The technology selection to achieve the above is discussed in the next section of this paper.

3. Selecting technologies

It is important to understand the context within which one has to select the technologies to achieve the required objectives. NODES act as an intermediary between learners, who want to obtain a particular educational qualification (at the certificate, diploma or degree level) and organizations who have educational/professional programs that can deliver what the learners expect. The learners could range from school leavers, who want to obtain the required educational qualifications to seek employment, to those who are already employed and want to enhance their professional career through furthering knowledge in specific areas.

An organization could offer multiple programs and each program could accommodate from one to several hundred students. Add to these complexities are different demands placed by the organizations on students. For example, academic institutions may require students to participate in a minimum number of online interactive sessions, to adhere to assignment deadlines, or to participate in online real-time evaluations during which the enrolled students can sit for the assessment at the nearest NODES Access Center (NAC). Additionally, an organization could demand that main servers be made available 99% of the time as a pre-condition for making their program available through NODES.

Scalability is another important aspect that needs to be considered. In the NODES environment, the number of organizations offering programs could increase over time and the total number of students accessing the learning management servers will increase correspondingly. Each program can place varying loads on the servers as well as the network but all students/teachers accessing the servers must experience a system response that is well within human tolerable limits.

High-speed connectivity to the servers that host learning materials and to other networked locations is fundamental to satisfy the anywhere, anytime accessibility requirement of learners and teachers. Since the ultimate objective of NODES is to increase the higher education opportunities available to all school leavers, it is mandatory to consider all areas of the country rather than a selected set of provinces. To this end, NODES has established 26 NODES Access Centres (NACs) around the country with state-of-the-art facilities that include high quality video conferencing. These NACs are expected to remove the main obstacle that many rural students face – lack of access to high-quality computing resources. [4]

The selection of technologies to satisfy multi-stakeholder expectations is not an easy task. The sustainability of the entire system depends on the ability of NODES to generate sufficient revenue to meet the recurrent expenses and build up sufficient reserves.

Considering all of the above requirements, NODES has decided to deploy a mix of proven open-source technologies along with some commercial software. In terms of hardware – active network equipment and servers – redundant configurations have been adopted for increased resilience.

The online teaching/learning environment is provided through the open-source Moodle Learning Management System [5]. This is a proven system used in many institutions around the world [6]. The number of migrations from well known commercial learning management systems to Moodle in many developed countries has justified the selection of the system.

Some of the open-source operating systems and software that have been used are: FreeBSD and Linux, Apache Web Server, Postfix SMTP server, PostgreSQL Database, Nagios Network Monitoring software, MRTG (Multi Router Traffic Grapher) to monitor traffic in Internet and VPN links. Windows Active Directory Server is used for authentication and access control.

Considering the criticality of the need to back-up the system in case of an emergency/disaster, NODES required a disaster recovery (DR) site. Despite the high initial investment that was required for this site, it was and is essential to the success and reliability of the network. If the main system fails, a DR site will provide redundancy by mirroring and backing up all the services provided by NODES.

4. Managing and monitoring ICT systems

Thousands of learners and teachers currently use NODES online resources and it is mandatory they be given the best possible service in terms of average system response time. Some organizations insist on signing service level agreements with respect to the availability of the network and servers.

All these requirements lead to the establishment of appropriate systems for the continuous monitoring of ICT systems. NODES makes use of a pro-active approach towards the management and monitoring of ICT systems. The following sub-systems are in use for this purpose:

- Multi-Router Traffic Grapher to monitor the network traffic on VPN link to each NODES Access Centers [Refer Figure 1 below]
- Open Source Nagios Network Monitoring tool for the availability and load on all ICT systems at NODES and within the NODES Virtual Private Network. [Refer Figure 2 below]
- A commercial network monitoring tool with powerful visualization ability to see the complete logical network with real-time indication of any failures [Refer Figure 3 below]

The above monitoring tools and their alert systems keep the NODES technical staff informed about the system status at all times.

When operating a complex ICT system, the key to building up the trust is to establish mechanisms for the technical staff to be aware of the problems prior to the actual detection by key stakeholders (in the case of NODES, learners and teachers). In a pro-active monitored system, possible system failures are detected before they actually occur and immediate remedial measures can be taken. As an example, technical staff can investigate high network link utilization and can take appropriate measures before the congestion leads to lengthy response times.

5. NODES Management Information System (NMIS)

NODES role as a technology facilitator for online education does not end at the provision of ICT resources for online education. Catering to different information requirements of multiple stakeholders is a daunting task. NODES Management Information System has been developed exactly to meet these requirements. NMIS caters to all stakeholders and allows them to retrieve all the information they require through a user friendly web based system. Without the management information system, one would need to resort to traditional methods in finding that information with associated delays. NMIS would be another factor to improve the overall trust, different stakeholders have on NODES.

6. Conclusion

This paper discussed the lessons learned in managing an ICT system that was designed to deliver a novel concept in Sri Lanka – online education. Meeting multi-stakeholder expectations in a technology-based teaching/learning environment is a difficult task. However, when accurate needs assessments are conducted and expectations determined, it is possible to identify the overall system requirements and select technologies that can meet all needs and expectations.

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Figure 1 - Network Link Utilization using MRTG

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Figure 2 - Online Resource Availability through Nagios



Figure 3 - Logical Network of all Online Resources

The "Corporate University" as Technological and Scientific Support of the Virtual Education in Latin America

Abstract

The technological and scientific world is more complex every day, to innovate from within the minimum requirements include: top knowledge, creativity, productivity and financial backing, otherwise this innovation would not be possible in a globalized and cybersocials environments.

On the other hand, there is an "engineering problem" visualized by the UNESCO. They stated that there is an annual deficit of 3 million of engineers, the projection by 2025 will be an annual deficit of 5 million. The core of the problem is that the youth does not want to be involved in a cognitive effort in the education that is currently being offered.

Taking the last statements into account (complex world, and, apathy to academic cognitive effort) there is an inquisitive question to develop the virtual education:

¿How can Latin America produce the virtual education it requires?

Additionally, Latin America does not want and must not transform from being an underdeveloped region to be a cybercolony. Especially in an educational cybercolony.

Must we be prevented with the virtual education that comes from developed countries?

The objective of this document is to present "corporate university" as a strategic ally in Latin-American universities in:

- Scientific research in the implementation of the virtual education for our educational idiosyncrasy
- Development and implementation of technological platforms for the virtual education.

We hereby introduce the LatinCampus Corporate University organization which in actuality assist more that seventy (70) universities in eleven (11) countries, and have placed a larger effort in the following investigations:

- Pedagogy and Didactical abilities for virtual environments.
- Develop a "mathematical equation" to propend the pertinent virtual education.
- Build e-content for cybersocial environment with a sense of pertinence
- Design a next-generation LMS/LCMS platforms (artificial intelligence agents, and robotic agents)

The scientific research with technological development has as a goal to prepare Latin-American universities and the corporate universities, using the virtual education.

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Introduction

The world is more complex every day; we have achieved scientific and technological advances of such magnitude, that in order to generate innovation we require: *top knowledge, top learning abilities, creativity, productivity and financial backing.* Additionally, innovation must be generated in highly productive environments thus being competitive and sustainable in current globalized market economies.

The complexity in our days has taken our youth to be away from professions like engineering, in which the tutoring is developed as a major part of innovation required to maintain our "quality of life" that science and technology has envisioned for us. By 2025 we confirm the higher deficit of engineers which will border the five million annuals, and if we continue in this path we will certainly have a scientific and technological deceleration.

Nor the universities nor the virtual education are strangers to the "engineering problem". With regards to this subject we can only foresee a global and cybersocial education, but the real productivity will change, then we ask ourselves.....

¿What type of engineers we will require to produce the e-learning, e-training and the equipment-trainer required sustaining the global e-content demand?

In Latin-American a vast majority - if not all – are currently discussing about virtual education, but, the reality is that they do not have the e-content nor the personnel to generate the pertinent e-content.

We currently possess the infrastructure in telecommunications, servers and platforms but we do not have the e-content. Is like having a new aqueduct but no water to deliver.

The solution we wish to present in this document is based on alliances between Universities and the "corporate university", a figure that in Latin-America is completely unknown. The presentation of the facts contained herein speak about the scientific and technological advance we have done in virtual education and have established strategic alliances with universities in Latin-America so that this innovation may be visible to other universities in developed countries.

The strategic alliances of LatinCampus with universities in Latin-America are over seventy (70) universities in eleven (11) countries. By 2011, we foresee that we will have more than one hundred (100) universities in seventeen (17) countries.

The positioning and continuous growth of the organization dedicated to science and technology confirms that we are certainly in the knowledge era, and that we must be innovative to attain "partners for the journey".

1. Areas of Innovation.

Initially we will like to introduce the areas where LatinCampus has done scientific and technological innovation which has allowed us to become competitive globally:

- ✓ Virtual Education equation
- \checkmark The e-learning (theory)
- \checkmark The e-training (simulated practice)
- ✓ Training equipment (real practice)
- ✓ The Mobile university
- ✓ The pedagogic e-eclecticism
- ✓ The didactic e-constructivism
- \checkmark The e-content
- \checkmark Alliances that overcome our borders

1.1. Virtual Education equation.

LatinCampus has launched the theory of the three (3) main components required to develop a competitive and integral virtual education. These are the components; the e-learning, the e-training, and the equipment-trainers. This theory has helped us to develop the following equation:

Virtual Education = e-learning + e-training + equipment-trainers

The vast majority of Latin-American universities only promote virtual education based on educability (elearning or theoric learning), without taking into account a fundamental components to attain labor competences: teachability (e-training and equipment-trainers to do real practices).



e-learning: theory







Equipment-trainers: real practice

1.2. The e-learning (the theory).

To produce a pertinent e-content to replace an instructor in its function when he or she teaches a class is not as simple as to generate a plain document (Word or PDF). We require a methodology that is didactical and practical in every sense – not expressed in instructional design - so that we may convert the content into e-content.

The following are some of the techniques used – becoming a part of a corporate image – that we apply to covert the content (presential instruction) into e-content (e-learning within a virtual environment):

- Color pedagogy
- Web usability
- Hypertext oriented towards contents-repository ecosystems
- Hypermedia oriented towards multimedia-repository ecosystems
- Academic iconography
- Dynamic Ideography

Corporate Image techniques allow the student and the instructor to respond and to become compromised with the corporate identity.

The corporate identity it's not a technique created to individualize instructional design; this is as "operative model" which covers the following subjects:

- The e-Content (materials and environments-platforms for virtual education)
- Learning activities (case studies, group discussion, interaction, interactivity)
- Referential systems (support thru the network, virtual libraries, Internet)
- Evaluation system and self-evaluation.

Convert the content (plain text) into e-content (pedagogical mediators) is the difference between having intensive lecture courses that only provides information and having an e-learning systems that promotes a complete formation of the individual.

LatinCampus like Corporate University has developed an e-content within its industrial park (located in Panama City) with the objective to produce e-learning systems (learning measurements) for the universities. The objective is to convert the materials and methodology that teachers use in the classroom into e-content.



An excellent presencial intruction does not guarantee an excellent e-learning

The Latin-American universities must have the capacity to migrate the American or European teacher's content into e-content that would be pertinent to our cultural idiosyncrasy. The Corporate University like LatinCampus can and should assume the technological and scientific role.

1.3. The e-training (the digital practice).

The integral formative process can not only be assumed by the educability component (the theory) but must be complemented by a teachability component (the practice).

If the student can benefit from their own time and their own space for the formation process, then he or she cannot have with a "permanent tutor" that can guarantee the learning process with a safe and secure practice with equipment-trainers, in consequence a digital practice is required (in a safe environment) so that be physical practice be performed (in a real environment). The e-training not only guarantees the security and safety of the student but also the institution's assets security like the equipment-trainers.

 δ Which will be the real problematic of e-training in Latin-America? The answer is that universities do not possess specialized programmers as direct staff to develop the design and programming of digital simulators. This component which we named "engineering problem" affects in great measure the production of virtual educative environments.



The simulators are significant step toward learning

LatinCampus also as Corporate University has implemented an e-content industrial park with the objective of producing e-training systems for universities. Pertinent virtual education requires simulated practices in real equipment-trainer.

1.4. The equipment-trainer (The real practice).

The e-training as well as the e-learning generates mental competences within each individual, but they do not create any manual skills or mental processes that allow the acquirement of integral labor competences.

LatinCampus incorporated the didactic equipment-trainer to be easy to use and related to the field of study and is part of the third and last component to implement a cohesive and logical virtual education. For us and our way of thinking, the equipment-trainer is truly the one factor that guarantees the labor competences, especially in technological and technical programs.

In our vision, all the equipment-trainer should have an e-training system that trains the student with the correct manipulation and operation, and with an e-learning system that teaches the student on the science behind the technology.



The equipment-trainers are the final step to a concrete learning relevant to a real life.

As the Corporate University, LatinCampus signed a strategic Alliance with Korea, Taiwan, Singapore, Hong Kong and China to design a specific equipment-trainer where the e-content industrial park has developed virtual materials (e-learning) and educational environments (e-training) that are used by Latin-American universities.

1.5. The Mobile University

The e-learning and e-training are available over the Web in any place at any time; however the equipmenttrainer because of their physical characteristics cannot be converted into bits or bytes, which in turn "ties" the virtual education to a static university.

LatinCampus has implemented mobile laboratories, whose purpose is to allow laboratories to be available to virtual students ¿what good would it do if there is e-learning and e-training and no equipment for training or if the equipment-trainer is static?



The mobile laboratory takes real practice to a virtual student

The mobile laboratories have web servers incorporated into the virtual campus, and where there is satellite communications it allows videoconferences to any province with e-teachers and e-tutors, thus providing administration to the e-institution.



The tents are converted into virtual classrooms

The tents (up to three) which are incorporated into the mobile laboratory have the function to convert themselves into classrooms for all type of work within the field of study; practices, videoconference classroom, regular classroom, administrative offices and in some cases there are benefits to its students like psychological and medical services.

1.6. The pedagogical e-clecticism

The content cannot be converted into e-content with the only use of methodologies and strategies specific of the digital environments and with the use of media to integrate virtual communities.

The main difference between the content that generates information and an e-content that generates formation are in the use of pedagogical models implemented. However the environment is so dynamic that you cannot talk about a single pedagogical model, is necessary to have a portfolio of several models and adapt them to the virtual environment.

LatinCampus has elaborated an implementation theory of some pedagogical models with the virtual education. First we have redefined and regroup four (4) main areas so that the model can be a part of the globalization process and the cybersociety.

The pedagogical theory: The theory.

The pedagogical practice: The strategy to create the didactical environment to teach the pedagogical theory The educational system: Regulation and accreditation in the quality of the pedagogical practice.

The educational apparatus: Scenarios for the implementation of the theory and the pedagogical practice.

As a second step we have adapted the context of globalization and the cybersociety into four pedagogical models that are traditional to the presence of the students;

The behaviorism The cognitivism The antiauthoritarian pedagogical models The constructivism

In our referential and theory framework, LatinCampus constructed the pedagogical e-clectisism model that propend to adjust all learning activities and the evaluation system to particular styles of learning and the system of evaluating the particularities of each learning style and the social and cultural context of the student.



LatinCampus does not consider that the virtual process of teaching-learning should be concentrated on the student it must be first understood using a pedagogical model that us being used by the Institutional Corporate Identity ¿Can a teacher from MIT offer a class that goes against the American government?

1.7. The didactical e-constructivism.

A pedagogical theory like the e-clecticism that is oriented towards global contexts and the cybersociety, it requires a pedagogical practice in specific context.

To build the e-constructionism, LatinCampus was based on the constructionism (of Seymour Papert), We defined the didactical learning activities that are based on theory in the e-clecticism and from there supported into two concepts; the e-training and the equipment-trainers help build the didactical objectivity of the e-constructivism.

In consequence the e-constructivism is based on two components; the digital simulation (safe and secure practice) and the interaction with the equipment-trainers (real practice).

The e-constructivism supports itself in the concept of remote assisted interaction. This assistance uses a conventional technology; the videoconference, but uses its own instructional design that we have used throughout time; e-ID.

The e-ID is an instructional model design that does not operate to generate content (e-learning or e-training) but exclusively to develop processes in the learning capabilities based on equipment-trainer (dynamic ideography scenario).

There are six (6) processes that cover the e-ID;

- Evaluate the theory fundamentals of each activity (e-learning).
- Interiorizing the activity guide.
- Develop a safe and secure practice (e-training).
- Develop the activities with the equipment-trainer.
- Assisted self-evaluation with the e-tutors.
- Present the institutional Evaluation.

Depending on the activity to realize, some processes can be adjusted. As a minimum we require for e-teachers and e-tutors to be present in at least two (2) processes o that the activity can be accounted onto significant learning in the program.

- Interiorize the guide of each activity
- Develop the activity with the equipment-trainer

LatinCampus has a series of discrepancies with the American as well as the European instructional design model due to the idiosyncrasy in Latin-American education hence these models promote the self-directed approach and in our culture we must promote the self-learning.

1.8. The e-Content

LatinCampus in its day to day task as the Corporate University has designed and generated e-content to develop strategic alliances and to offer a new curriculums such as the following;

Technology Specialization in virtual education. Technology Specialization in security and surveillance. Masters in virtual education. Masters in intelligent building technology. Doctorate in Educatronics.

The development of these academic programs has positioned the Corporate University in the world and at its own risk has launched curricular activities for superior education institutions.

1.9. Alliances (over other countries, defeating frontiers)

LatinCampus has presence in over seventy (70) Universities in eleven (11) Latin-American countries;

Central-America: Panama, El Salvador, Guatemala, Costa Rica, Nicaragua and Honduras. Andean group: Colombia, Ecuador, Venezuela, Peru and Bolivia.

For the development of equipment-trainer LatinCampus has signed agreements with Asian knowledge industries: Korea, Taiwan, Hong Kong and Singapore.

In the period between 2010 and 2012 LatinCampus plans to develop strategic alliances with Spanish and Italian firms to develop equipment-trainers in cybernetic and integration.

Until 31 December 2009, LatinCampus has built four (4) mobile laboratories:

- Mobile telecomunicaciones (1)
- Fishing industry (2)
- Biotechnology (1)

We have currently in the design of two (2) mobile laboratories for the Colombian military armed forces.

2. Case study, Implementations.

2.1. Case study: University Corporate Alliance – Latin-American Universities.

A master's degree in virtual education (MVE) is an e-content that is intellectual property of LatinCampus that was developed between 2001 and 2004. The degree can be achieved by completing four (4) large units, that are fragmented in eighteen (18) modules and a Project that must be handed over before the graduation. The MVE can be done between eighteen (18) and twenty-four (24) months.

As Corporate University, LatinCampus signed a Strategic Alliance with the Dr. Jose Matías Delgado University (UJMD) from El Salvador. The UJMD made official the MVE before governmental authorities (ministry of education) so that the program was accredited before such entity. At the same time, the UJMD (Dr. Jose Matías Delgado University) has realized several strategic alliances in Central America, for example: Universidad Latina de Panamá (ULAT) with the objective to offer the same agreement with dual diplomas under the same program (UJMD-ULAT and others).

Following the same pattern we can assure that the developed e-content by a Corporate University has a qualified registry (governmental authorization) and is being offered by Central American Universities.

The advantages for the universities are several; however we would like to mention a few:

- The university did not do any financial backing for the e-content of the program.
- The university can use the latest platform (LMS/LCMS) and did not have to invest in its purchase
- The university has international e-tutors that are highly trained with vast experience in their area of expertise

The experience of the MEV will be replicated by 2010 in the Andean group (Colombia, Ecuador, Peru, Bolivia and Venezuela) form the Chimborazo polytechnic school.

The responsibilities of the regional strategic alliance are:

- Presents the program before governmental authorities.
- Perform inscriptions and registrations.
- Perform a permanent audit to LatinCampus.
- Participate in the theme/subject update.
- Deliver all certificates and titles.

The LatinCampus responsibilities are:

- Deliver the e-content, the e-learning, and make available equipment-trainer.
- deliver the virtual Campus Virtual (technological platforms).
- Make available e-tutors and e-monitors.
- Daily report of student advancement.

Shared responsibilities

- Validate the pedagogical implementation, methodology and didactical input.
- Revision of contents and strategies.

References of regional strategic allies

Central-America
Dr. José Matías Delgado University
El Salvador
Lic. Ana Ligia Rodríguez
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The same MEV system applies to all e-Content of LatinCampus.

2.2. Case study: EV= e-learning + e-training + equipment-trainer

Our most concrete case that included the three components of the virtual education included in the "Technology Laboratories' which implemented ALL the services in the official schools in the states of Huila and Casanare in Colombia.

The "technology laboratories" integrate four different subjects: 1. Renewable energy 2. Electronics 3. Robotics and 4. Biotechnology. To each one of the laboratories we had to develop the e-learning, e-training and the equipment-trainers.



Educational Robotics Practice Using e-training

Teachers educating themselves

Trainers in the states of Huila and Casanare in Colombia.

References as a Strategic Allied in the Government

Country: Colombia States: Huila and Casanare Educational Secretaries: Huila and Casanare Governor's office Responsible for the implementation: Eng. Iván Eduardo Restrepo Cell phone: +57 310 253 7099

2.3. Case study: Colombian armed forces / Mobile telecommunications Laboratories

Given the mobility required for the officers in the Colombian military armed forces, and the need of decentralized training, the only solution that has worked throughout time and space has been the implementation of mobile laboratories.



Students of virtual programs attending to practice in the mobile laboratory in a military base

References from the military

Country: Colombia Company: Colombian armed forces - army Responsible: Colonel John Restrepo Position: Education and doctrine chief for the Colombian armed forces URL: www.emsub.net Telephone: +57 310 253 7099

3. Conclusion.

LatinCampus supports Latin-American universities in the development and implementation of virtual education which is pertinent to our educational idiosyncrasy, with this in mind, we are prepared to do strategic alliances with universities in developed countries.

A very important note: LatinCampus does not sale, rent or license LMS / LCMS platforms. We realize that we have the only platform in the world that has implemented artificial intelligence, virtual educational and robotics agents.

Kind regards from Bogotá, Colombia.

The MIT LINC 2010 Conference Parallel Presentations

Session #10:

The Transformative Potential of E-Learning in Emerging Nations



Open Education Resources of Anadolu University, Turkey

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Abstract

This paper intends to express the importance of open education resources and to introduce the open education resources of Anadolu University, Turkey. The open education resource movement is especially important in emerging countries where higher education is still considered as a privilege due to shortage of available seats for everyone who would like to get in a university, where knowledge is still been considered as assets of professors, and where there are a few opportunities for people to improve themselves either in their profession or in general. Anadolu University as a dual mode university provides not only open education diploma programs but also open education resources to the Turkish citizens for almost thirty years. Second University, e-certificate, Yunus Emre, ANAPOD, Open Courseware are the major open education resources the University offers. The informal qualitative and quantitative evaluations have shown that a great number of people are benefiting from these resources.

1. Introduction

Although the terms informal, non-formal and formal learning have been around for sometime, they had never grasped an attention that they deserve until the recent developments experienced in the field of lifelong learning. As well stated in the OECD [1] and EU [2] reports, learning is an everyday activity and we all learn more outside the formal learning environments than in schools and training settings. That was why especially EU emphasized strongly on recognition of non-formal and informal learning as well as formal learning.

However, it seems there is not a consensus on non-formal and informal learning. Some experts argue using the term informal and they categorize learning into two groups: formal and non-formal learning [3] [4] while others, such as Beckett and Hager [5], and Stern and Sommerlad [6], focused on informal learning as a workplace learning strategy. After having reviewed the above and more studies on definitions of formal, non-formal and informal learning, Colley, Hodkinson and Malcolm [7] concluded that there is a "... serious doubts about the possibility of establishing an objective way of defining formal,

non-formal and informal learning, that would be relevant in most if not all situations, from most, if not all, value positions, and for most, if not all, purposes" (p. 17). Still we, as the authors of this paper, felt that EU definitions of these terms fit the context of open education resources. According to EU [8]:

Formal learning is typically provided by education or training institutions, with structured learning objectives, learning time and learning support. It is intentional on the part of the learner and leads to certification;

Non-formal learning is not provided by an education or training institution and typically does not lead to certification. However, it is intentional on the part of the learner and has structured objectives, times and support;

Informal learning results from daily activities related to work, family life or leisure. It is not structured and usually does not lead to certification. In most cases, it is unintentional on the part of the learner.

As mentioned above, recognition of non-formal and informal learning is one of the key areas that EU wants to improve the European higher education. In 1999, EU has started a process, entitled as Bologna Process to create European Higher Education Area (EHEA) that intended to facilitate the mobility of EU citizens for learning purposes among European higher education institutions. The main goal of the Bologna Process was to make Europe more attractive for education and work. In 2001, promotion of lifelong learning was accepted as one of the core action lines of this process. The EU Commission sees lifelong learning (non-formal and informal learning) as an important mean for Europe to compete in the information society and to cope with the challenges occurred as a result of technological developments. Thus, recognition of prior learning including non-formal and informal learning was considered as a criterion to follow-up the Bologna Process in each EU country. One of the recent follow-up reports by Stocktaking Working Group [9] reveled that recognition of non-formal and informal learning is still at expected level and improvements are quite slow compare to other action lines.

Measures for the recognition of prior learning (RPL), including non-formal and informal learning, are at different stages of development across the EHEA. In a few countries an enabling legislative framework has been in place for a number of years and the application of RPL is widespread. In others, developments are either still at an early stage or have not yet started. The answers from many countries suggest there is little or no recognition of learning undertaken outside the formal education system (Rauhvargers, Deane & Pauwels, [9]).

The Working Group also stated that in many countries recognition of RPL, including non-formal and informal learning was misinterpreted or kept limited with the skills gained in workplaces. However, developments in information and communication technologies, especially evolution of the Internet, have provided tremendous opportunities for those who look for ways to learn and expand their skills, namely for non-formal and informal learners.

Brown and Adler [10] noted that the most visible impact of the Internet on education to date has been the Open Educational Resources (OER) movement. OER is a movement among educators and professionals to provide free access to course and other educational materials for anyone who would like to use them. Smith and Casserly (2006) reported

that MIT's OpenCourseWare (OCW) initiative, funded by the William and Flora Hewlett and the Andrew W. Mellon foundations was the first milestone of this movement and inspired many higher education institutions and more to contribute the movement by opening their own learning materials to public. The OER movement has especially helped recognition of informal learning by making it more visible as being a part of all learning (OECD, 2007). Recent figures supported this idea. For instance, according to d'Oliveria [11] MIT's OCW site receives 1-1.5 millions visits every month by over 800,000 unique visitors from almost every country on earth. Among these visitors 45% also revisits the site.

On the other hand, some argue the definition of openness. Lane [12], for example, equates openness and freedom but at the same time emphases the variation of the degrees of freedom available within a particular openness and gives the spectrum of Creative Commons licenses as an example for this variation. Schaffert and Geser [13] shared the same idea and have set out four dimensions of openness for OER:

Open access – content (including metadata) is provided free of charge **Open licensed** – liberally licensed for re-use, favorable free from restrictions to modify, combine and repurpose

Open format – produced in open format and designed for easy re-use **Open software** – produced with open source software

MIT's OCW for instance can be classified as open licensed OER according to this classification because users are allowed to re-use, modify, combine and repurpose the resources (in text, video, audio formats).

Although challenges remain, such as language and access, OER are considered a way to cope with learning demand in underdeveloped and emerging countries. For instance, Singh [14] stated that more people in developing countries are using OER then developed countries and in these countries the OER movement can act as stimuli to raise quality and standards. Similarly, Atkins, Seely-Brown, & Hammond [15] use the access figures as evidence for the impact of OER in developing countries as a mean to offer quality and equal education opportunity to all who needs. Also, Kumar [16] considers OER, such as quality tools, content and practice, as a great promise for meeting the challenge of providing access to quality higher education in India. All these resources as well as others show us that various groups in developing countries get different benefits from OER. Students for example use OER as a supplement to their courses; individuals can use them to access the information they needed; and teachers or university professors use them to offer better learning opportunities to the students in their courses. Although there is not any research study, above are the ways of using OER in Turkey.

2. Anadolu University

It might be beneficial to start with a few words about Turkey before introducing Anadolu University and its distance education programs. Turkey is a country linking the continents of Europe and Asia, and has the majority of the land in Southwest Asia. The country has a total area of 780.58 squire km., divided into 80 administrative provinces with a total population of 63 million. About half of Turkey's population lives in rural communities and engages in agricultural occupations, while the other half lives in or near urban areas and is involved in heavy industry, manufacturing, or urban services. The gulf between

rich and poor is noticeable, especially as you travel east. Ninety-nine percent of Turks are Muslims (most of the Sunni tradition). Islam plays a large part in the daily life of any Turk and is particularly evident to the visitor (WorldNet, 2003).

As an emerging country with a relatively young population, education has the utmost priority for Turkey. The schooling rates are 99.7 percent for primary school, 69.3 percent for middle school, 53.4 percent for high school and 22.4 percent for higher education including open education. About 48 percent of the country's higher education population is in the Anadolu University distance education system. The Ministry of National Education is responsible for all educational services in the country, excluding higher education. The Council of Higher Education is the planning, coordinating and policy making body for higher education. Formal education includes pre-school education, basic education, secondary education, and higher education. Basic education, which is extended from 5 to 8-years in 1997, forms the foundation of national education system. Education is compulsory for every Turkish citizen from the age of six to the age of fourteen, regardless of sex, and is free-of-charge in state schools. The secondary education system can be broadly classified as General High Schools and Vocational and Technical High Schools, Higher education is defined as all post-secondary programs with duration of at least two years. The system consists of universities and non-university institutions of higher education (police and military academies and colleges). Each university consists of faculties (four-year colleges or schools) offering bachelor's level programs, and two-year vocational schools offering associate level programs of a strictly vocational nature.

Admission to higher education in Turkey's centralized system is based on nation-wide, yearly examinations administrated by the Student Selection and Placement Centre (OSYM), a government agency. Candidates with scores of at least 145 points are eligible for entering a distance-learning program. Those with scores of at least 160 are qualified to make selections of their preferences of universities and programs. The candidates are placed in higher education institutions according to their score and the allotment of the institution. There is severe competition for university entrance, causing a bottleneck in the initial process of acceptance to higher education institutions. For example, in 2004, 1.902.250 students (high school graduates) applied to take the university entrance exam but only 543.035 (28 percent) were placed in the higher education institutions. Among the placed students, 274.474 (approximately 50 percent) entered Anadolu University's distance programs. Briefly, Anadolu University has been filling quite a large portion of the higher education demand in Turkey since early 1980s.

Anadolu University is actually not an open university. It has a dual mode education system. The on-campus education is offered though its 9 colleges (or faculties, "faculty" is a term used in Turkey instead of "college" or "school"), 10 vocational schools, 18 research centers and the state conservatory (school of music and theatrical acting). The distance education programs are organized under three faculties: Open Education, Business Administration, and Economics.

The University was established in 1981 from an older institution, the Academy of Eskisehir, Economics and Commercial Sciences (EAECS). In accordance with the Higher Education Act of 1981, it was also authorized to provide distance education in Turkey on a national scale. As a result in 1982 the former Faculty of Communication Sciences of the EAECS was transformed to become the Faculty of Open Education, or, as it is called

commonly, the Open Education Faculty (OEF). This faculty was an outgrowth of the newly established Anadolu University because at that time, it was the only institution that had experience in the technical and theoretical aspects of distance education. The first educational television pilot project of Turkey was undertaken here during the 1970's under the auspices of the Educational Television department of the EAECS (McIsaac, Murphy & Demiray, 1988). In the 1982-1983 Academic Year, the OEF started to offer two, four year undergraduate distance education degree programs in Business Administration and Economics. That year 29,478 students enrolled in the programs. By 2004-2005, the number of enrolled distance students at Anadolu University reached approximately 1 million. Today, the OEF, along with other two distance education faculties, is offering 12 different BA and 50 associate degree programs to students in Turkey, the Northern Cyprus Turkish Republic, Azerbaijan and the European countries such as Germany, Netherlands, England and France. The programs vary from Business Administration to Pre-school Teacher Education.

The distance programs of Anadolu University are primarily print-based, correspondence type and require self-study. In other words, students are expected to study their textbooks at their own pace, alone, and to take scheduled centralized exams administered at remote locations. Correspondence study is also supported with several services including broadcast television programs aired by a state channel throughout the country, video and radio programs distributed on cassettes, CDs or DVDs, remote evening classes, and computer-supported learning environments. The rationale behind this sort of an instructional approach is common to all open and distance learning initiatives in emerging countries. These are based on (1) outreach to as many learners as possible in cost effective ways, and (2) providing alternatives for learners' limited access to the other technologies including VCRs, computers and even television broadcasts. Figure 1 reveals that distance learning is a necessity for Turkey rather than a convenience owing to the shortage of higher education institutions and the increasing demand for education. Since printing and mailing do not cost as much as advanced technologies, Anadolu University is able to accept thousands of learners every year into its programs. In addition, recent figures show that the majority of distance students cannot access computers and related technologies, despite the improvements in technology distribution. For instance guite a number (30 percent) of the current distance learners of the University live in rural areas where they have difficulties accessing computers and the Internet. That is mainly why the majority of Anadolu University's distance programs are still correspondence-based. The number of learners in online (only 2 percent of all learners) and hybrid (10 percent) programs is quite limited despite the improvements. Due to the number of students, success in the majority of the programs is still determined by multiple choice achievement tests. Each academic year, a mid-term, a final and a makeup exam are centrally administered to the students to evaluate their performance in the courses through out the country and other countries. The University usually uses around 65.000 classrooms in 5.000 buildings and hires more than 100.000 personnel (local teachers, school staff and administrators, transporters, etc.) to administer the exams. The University also provides administrative support to its distance learners through its 84 offices in 77 provinces of the country. Those offices are run by the University's own staff (total 335 staff) and almost all the properties of the offices are owned by the University. In addition, learners may reach the University via email and phones to receive help for

their administrative and technical problems. In terms of social support, the University encourages the learners to attend graduation ceremonies and local events organized by the administrative offices. Moreover the University has an online weekly newspaper that gives news and recent developments in the University.

Anadolu University is also the major lifelong learning provider in Turkey. The country reports on Bologna Process reveal the role and importance of Anadolu University in providing lifelong learning opportunities. One of the major areas of the report is about lifelong learning opportunities provided in the country and unfortunately (fortunate for Anadolu) the reports include mainly services Anadolu University provides as sustainable informal learning opportunities like OER.

3. Open Education Resources in Anadolu University

Although distance programs of Anadolu University provide learning opportunities to many who cannot get in any formal higher education institutions with minimum entrance requirements, we do not consider these programs as OER. The OER projects Anadolu University offers are entitled as, Second University, e-Certificate Programs, OpenCourseWare (OCW), Yunus Emre, and ANAPOD.

3.1. Second University

The University has been carrying out a project, entitled as Second University, in order to offer open access to a second higher education opportunity. The project, initiated in 2003-2004 academic year, enables the Associate and the Bachelor's degree holders, as well as students in any program of any higher education institution in Turkey to be admitted to the distance programs of Anadolu University without taking the university entrance exam. The Bachelor's degree holders can apply to two or four-year distance programs, while the Associate degree holders can be admitted only to the two-year programs. The total number of students in the programs is around 70,000 and the number of graduates up to now has reached to 10.000 in 2009.

3.2. e-Certificate Programs

e-Certificate programs are designed for those who would like to improve their job-related skills and hold at least a high school diploma. Currently, the University offers 17 different e-certificate programs in the fields of Accounting, Marketing, Entrepreneurship and Finance. Each program is composed of 3 courses and the achievement is tested by face-to-face centralized exams organized in 17 provinces in Turkey and Cologne in Germany. Although all the materials including textbooks and TV Programs are provided, the programs are heavily based on e-learning tools and services. Some of the organizations (e.g. KOSGEB - Small and Medium Sized Industry Development Organization) and corporations (e.g. Migros, a supermarket chain) encourage and provide financial support to the members or employees to attend these programs.

3.3. Yunus Emre

Yunus Emre: New Generation Learning Portal (<u>http://yunusemre.anadolu.edu.tr/</u>) is an OER initiative to disseminate the instructional materials used in the University's distance courses. It launched in 2008 by Open Education Faculty and was named after a historical poet and philosopher, Yunus Emre. The goal has two folds; (a) providing informal learning opportunity to those who needs without any cost, and (b) introducing the University's ODL services and content to the public. All the course materials including video (downloadable video programs originally produced to air), multimedia software (non-downloadable e-learning materials), audio books (downloadable, mp3 format), digitized version of textbooks (non-downloadable text in .pdf format), and trial exams (non-downloadable, randomly generated, timed multiple choice tests). In Yunus Emre portal currently there are materials related to total 153 courses in 20 subject areas. Since January 2008 total 6.792.031 different individuals, 49.054.080 times entered the portal.

No formal feedback system was established. So we are not sure about the impact of the project. But we observed an increase in the number of participants to our e-certificate programs after launching the Yunus Emre portal. We inferred that the project served well to achieve its second goal: introducing our distance programs.

On the other hand, there are several issues concerning Yunus Emre project. First of all, it is mainly an open access OER project. We feel that we should work on transforming these materials to open licensed so that more people can download and modify them to use according to their own purposes. We also found out that we did not do a good job marketing this program —many people still do not aware of this learning opportunity. We should work on our marketing strategies too.

3.4. OpenCourseWare (OCW)

After establishment of OCW national consortium in 2007, Anadolu University initiated a project to support the consortium goals. It was coordinated by the Center for Research and Development in Distance Education (UZ-ARGE). EduCommons infrastructure was used to offer available course materials of the professors in the University (<u>http://adm.anadolu.edu.tr:8080/eduCommons</u>). A support team (2 technical & 1 OER experts) provided structured and one-to-one training to all faculty who voluntarily contribute the project. These experts also offered ongoing technical and instructional support via online tools, by phone and in face-to-face meetings. Due to lack of motivation, shortage of technology and instructional design (knowhow on OCW) skills as well as copyright concerns among faculty members were the main barriers for diffusion of OCW project.

3.5. ANAPOD

The Computing Center of Anadolu University launched ANAPOD project, another open access opportunity, in 2008. It is actually a podcasting system and inspired by Apple's iTunes-U. Unfortunately, Anadolu University could not join the iTunes-U because of lack of adequate copyright laws but worked with Apple's legal distributer in Turkey to create and offer podcasts of the courses to the public. The goal has four folds; (a) supporting face-to-face instruction, (b) sharing faculty experiences with general public, (c) empowering faculty to prepare open learning materials that might help the University

widen its open and distance learning services (alternative production method), and (d) testing the integration of some new technologies into instructional (ODL) processes such as mobile learning. Completely a new infrastructure (hardware and software) established to the faculty chosen according to their willingness and performance in previous projects from all the departments. Several high-tech hardware (a MacBook, HD Video camera with 60 GB hard disk capacity, advance microphone system for recording during F2F lectures, 250 GB portable hard disk, etc.) and software (iWork, iLife, screen capture and video editing, etc.) were also given to each participant faculty. These faculty members are asked to publish their materials in a Wiki site (http://anapod.anadolu.edu.tr/) created specifically for ANAPOD after taking a series of structured training on MacBook Basics (3 hours), Digital Content Generation and Podcast Materials Production (2+4 hours), Video Encoding, Editing and Web Content Development (7 hours). One-to-one training and ongoing support are also being provided by the Computing Center.

Currently, there are complete course materials (text, video, audio) belong to 54 courses created by 36 faculty members. Also production of materials for 93 courses is still in progress. Although we have not done any formal study on this project we observed that in these courses, the students performed better in the exams while their attendance to the class sessions decreased. We also noticed that everyday more and more people form other institutions and the countries are accessing these materials. Moreover we found out in time the quality of the materials and know-how among faculty about use of technology and technology-based learning increased. On the other hand, we think that some materials need improvement to be used as OER. Also, we need to change these materials from being open access to open licensed materials to help more people get benefit out of them. Furthermore, copyright and intellectual property issues, heavy workload, lack of time management, instructional design and technology skills among faculty members as well as negative attitudes against use of technology in instructional processes are major barriers for the success of ANAPOD project.

4. Other Open Education Resources Initiatives in Turkey

OER movement is still in its infancy stage in Turkey. There is only one serious attempt except the ones in Anadolu University-, the Turkish OpenCourseWare Consortium (UADMK). It is a national consortium under the auspice of Turkish Academy of Sciences (TUBA), of 45 Turkish academic institutions, Higher Education Council (YÖK) and Turkish Academic Network and Information Center (ULAKBIM). UADMK was inspired from MIT's OpenCourseWare (OCW) Project and launched in March 2007. The goal of this consortium is to promote OCW among Turkish Universities by encouraging, offering training and support, and providing funding opportunities. The consortium just recently got a grand from government funding agency to offer financial support to those faculty who would like to contribute the OCW movement.

5. Lessons Learned

Above experiences regarding OER reveal that there are serious barriers for widening the OER movement in Turkey. One of the main barriers is the lack of adequate copyright and intellectual property laws. Especially faculty members hesitate to open up their courses

and course materials due to this lack. Another barrier is about shortage of incentives. Anadolu University's OCW project did not last long because there was no incentive for faculty to join the project. However another project, ANAPOD has been successful due to fact that the majority of the professors want to contribute to be able to get MacBook and other equipments. We are hoping that UADMK's grand will fire up the movement a bit more. Another barrier is the shortage of technical and instructional skills of the professors. Our observations shows that training do not meet this shortage. Ongoing support is crucial.

On the light of above experiences we think that OER is one of the significant movements to meet the learning needs in countries like Turkey where there is not enough formal education opportunities for all. So, the policy makers should take all the required legal actions to promote creation of OER. The higher education providers also work on creating incentives, training and support opportunities for their faculty members to contribute the movement.

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Mobile Learning Project

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Abstract

Until now, the options available to those living in Thailand's rural communities (75% of the population) who wish to pursue a university education have been limited. Distance from a university, the need to live on or near a university campus, cost, time limitation and family commitments, such as the need to continue to work within their rural community, are all factors that have inhibited the majority of the population of Thailand from gaining a university education. UBU (Ubon Ratchathani University) has developed the concept for Mobile Learning, primarily aimed at rural residents who have historically been isolated from the opportunity to obtain a university education.

In order to reach the greater student population beyond their main campus location, universities traditionally establish satellite campuses or a learning centre's to provide students with access to information and communications technology. However, these facilities are usually located within larger communities and are, for the most part, not convenient for the majority of the rural population of Thailand to access. At the time of their conception, satellite campuses and remote learning centre's were the only options that universities had available to them. What made the Mobile Learning Project possible was the outcome of two main factors:

- 1. Present day telecommunication is faster, can reach all corners of Thailand and is inexpensive; especially when compared to the cost developing and servicing satellite campuses and learning centre's (and their limited return on investment).
- 2. In 2008, UBU completed an extensive pilot study on 'Teaching without Lectures' and the effect on students' learning outcome ('T5-TwL', Richards, Inprasit, and Wattanataweekul, 2009). The results showed that lecture-based learning actually inhibited students' ability to advance academically.

'Teaching without Lectures', along with technology, opened up a totally new and flexible teaching and learning strategy for UBU. Students can decide where, when, and how their learning occurs. UBU is moving away from the lecture-centred model and all its inherent instructional challenges, to a process that allows students to develop their own learning strategies, are motivated and build confidence in their ability to learn (this approach should not be confused with traditional distance programs; which are lecture-based learning and have the same academic challenges as on-campus programs).

Keywords: T5 model; mobile learning; teaching without lectures
1. Introduction to Mobile Learning

Changes in technology over the past few years have removed a number of physical and economic barriers for those living in Thailand's rural communities wishing to pursue a university education. However, these advancements in technology are not what stimulated a major shift in Ubon Ratchathani University's (UBU) teaching and learning strategies. What changed their pedagogical thinking was the outcome of a pilot study conducted at UBU in 2008 on 'Teaching without Lectures' and the effect on students' learning outcome ('T5-TwL', Richards, Inprasit, and Wattanataweekul). The results showed that lecture-based learning actually inhibited students' ability to advance academically. Teaching *without* lectures opened up a whole new teaching and learning strategy and opportunities that is academically and professionally more rewarding for both the student and their instructor.

This change in strategy enabled UBU to develop Mobile Learning, a flexible teaching and learning strategy that allows students to decide where, when, and how their learning occurs. This change has allowed UBU to begin to implement a 'one course- one instructor' teaching and learning strategy for both remote and on-campus students:

- Students will no longer need to leave their rural communities in order to work towards gaining a university degree. Mobile Learning takes the university to the students, regardless of where they reside, making a university education accessible and convenient for all Thais, especially for those living in the rural communities of Thailand.
- UBU no longer needs to establish satellite classrooms (costly to maintain and service with quality instructors) or; create two separate courses to service both remote and on-campus students (one course one instructor). Courses will consist of both on-campus students and remote students. The student decides to either engage in learning remotely or engage in learning within the campus community or both.
- No limit to class size, plus no need to expand existing 'fixed' classroom space.

2. Mobile Learning Project

Until now, options available to those living in Thailand's rural communities, wishing to pursue a university education, have been limited. Distance from a university, the need to live on or near a university campus, cost, time limitation and family commitments, such as the need to continue to work within their rural community, are all factors that have inhibited the majority of the population of Thailand from gaining a university education. UBU has developed the concept for Mobile Learning, primarily aimed at rural residents who have historically been isolated from the opportunity to obtain a university education.

Historically, to reach the greater student population beyond their main campus, Universities established satellite campuses or remote learning centre's to provide students with access to information and communications technology. However, these facilities were usually located within larger communities, thus requiring those living in rural areas to travel to these centres. They are, for the most part, not convenient for the majority of the population of Thailand to access. At the time of their conception, satellite campuses and remote learning centre's were the only options available to universities.

With Mobile Learning, students will not have to leave their rural communities in order to work towards gaining a university degree. Mobile Learning takes the university to the students,

regardless of where they reside. Mobile Learning makes a university education accessible and convenient for all Thais, especially for those living in the rural communities of Thailand.

With financial support from the National Telecommunications Commission of Thailand, the telecommunications industry of Thailand and Ubon Ratchathani University, Thailand, the following technology support will be available to all students enrolled in the Mobile Learning Project:

- Free online access to their university program for duration of the project (5 years)
- A high speed USB air card (or equivalent) will be provided to any student who does not have remote or mobile internet access
- A special mobile laptop program will be established to accommodate students (oncampus and remote) to have access to a computer.

2.1 Scaffolding Mobile Learning

UBU are moving programs into Mobile Learning in two stages. During the first stage, programs and their courses will be converted to the 'Teaching without Lectures' strategy. This first stage that in effect commenced in November, 2008 with the Pilot Study has a growing number of programs using the TwL strategy – thereby joining stage one. During stage one, Mobile Learning programs are offered to on-campus students only. This allows each program's teams and course instructors to experience the re-design process and essentially pilot this strategy on-campus. Change to an instructor's teaching and learning strategy is understandably a sensitive and difficult change for instructors to accept and to design for. However, once instructors start engaging in the 'Teaching without Lectures' strategy, adaption occurs with little or no backlash.

During the second stage, the Mobile Learning phase will open up courses to allow students the flexibility to decide where, when, and how their learning occurs. This in turn will open up the programs and their courses to the rural areas of Thailand. The first offering of courses in the Mobile Learning Project is will likely begin November 1, 2010.

2.2 Rural and On-Campus Students

A directive from the Ministry of Education, Thailand, requires universities to provide a greater opportunity to Thai's living and working in the rural areas of Thailand. Up until now, penetration into the remote regions of Thailand by universities have been costly for both the learner and university and resulted in limited success. UBU, located in the North-East area of Thailand, is mandated to service both rural and urban communities. The Mobile Learning Project is being implemented to specifically address the rural problem.

UBU will initially target a minimum of 10-20% of students who will remain in their local communities to engage in their selected programs. Overtime, as students recognize the benefits and flexibility of mobile learning this could increase to 50+%.

3. Teaching without Lectures Pilot Study

In 2008, UBU completed an extensive pilot study on 'Teaching without Lectures' and the effect on students' learning outcome ('T5-TwL', Richards, Inprasit, and Wattanataweekul, 2009). They put forward the argument that lecture-centred instruction interferes with students' ability to

advance beyond their university entrance GPA (Grade Point Average). By moving away from the lecture-centred model and all its inherent instructional challenges, to a process that allows students to develop their own learning strategies, students are more motivated and build confidence in their ability to learn. Traditionally, students' university entrance GPA (Grade Point Average) reflects their learning outcome potential as university students. "The GPA (Grade Point Average) is a testament of what you [students who are applying to a university] are capable of" (Jeanette Leach, 2009). A number of universities implement a 'predicted GPA', derived from students' entrance GPA that, although traditionally lower, ultimately equates to their graduation GPA. Therefore, we can only assume that maintaining a student's entrance GPA is the standard that most universities aim for, or are capable of, and no more. Universities with a high (GPA) entrance requirement are virtually assured that their students will have the ability to better succeed in mastering a university lecture-centred teaching and learning system and will graduate with the same (B+ to A) GPA as their entrance GPA.

3.1 The Challenge for Ubon Ratchathani University

Ubon Ratchathani University (UBU), located in the North-East area of Thailand, does not enjoy the same advantage as universities that are able to set a high GPA entrance requirement (B+ to A) to their programs. UBU's combined average for all programs over a four year period (2005-2008), shows no significant difference between students' entrance and graduation GPA (with a standard deviation of -0.4756 GPA on a four point scale). UBU instructors have successfully navigated their lecture-centered education; therefore, it may appear reasonable for them to assume that if they were able to learn within the traditional lecture-centered method, their students should also be able to learn by this method as well. However, the entrance GPA of UBU students is considerably lower than that of their instructors' (when their instructors were undergraduates), therefore, unlike their instructors, the majority of UBU undergraduate students are not absorbing, remembering and recalling the large volume of information being transmitted to them via lectures. Subsequently, if learning does not happen, instructors tend to fault the lack of positive learning outcome on the students.

In an attempt to rectify poor learning outcome, UBU, as well as other universities internationally, will replicate lecture-centred instruction in a variety of media to provide students with additional access to lecture content outside the classroom. Although this generates little or no change in actual learning outcome, it does support traditional teaching and learning methodology. Barr and Tagg (1995) point out that "An instructor is typically evaluated by her peers or dean on the basis of whether her lectures are organized, whether she covers the appropriate material, whether she shows interest in and understanding of her subject matter....They do not raise the issue of whether students are learning, let alone demand evidence of learning...Many institutions construe teaching almost entirely in terms of lecturing."

3.2 Radical Change in Teaching and Learning Methodology

UBU offers excellent academic programs with highly qualified instructors who are dedicated to the improvement of learning and the quality and abilities of the students who graduate from their programs. However, improving or matching the graduation GPA of universities that preselect students based on their high entrance GPA appears to be impossible within the established teaching and learning strategies at UBU. Like other universities, UBU has held the position that

the lecture-centred method is central to learning. If the lecture-centred method of teaching impedes the possibility of improving students' learning outcome, the challenge for UBU is to make a radical change in their teaching and learning methodology. "Contemporary learning theory is based upon the notion that learning is an active process of constructing knowledge rather than acquiring knowledge....rather than a process of knowledge transmission." Duffy & Cunningham (1996).

4. Teaching without Lectures

To begin exploring different teaching and learning strategies at UBU, a new course design method TWL (Teaching *without* Lectures) was introduced to their teaching strategies. The TwL method transfers the responsibility for students gaining knowledge and skills *from* the instructor *to* the student. The TwL method incorporates tasks, tools, tutorials, topics and teamwork to achieve ongoing student engagement, ongoing constructive feedback and ongoing measurement of learning outcome.

UBU took the following steps in assessing the value of Teaching *without* Lectures:

- Establishing a Learning Design Centre to support the deans, program directors, program curriculum teams and instructors, to explore methods of improving learning outcome;
- Conducted TwL awareness sessions for instructors and program curriculum teams to guide their understanding and implementation of the new course design process;
- Announced a Pilot Study for the TwL course design method;
- Developed D4L+P, Designing for Learning plus Portfolio (Sophakan, 2008), an online course development, delivery, monitoring, authenticating and portfolio tool designed specifically to support the TwL method;
- Assessed Pilot Study learning outcomes of Teaching *without* Lectures.

4.1. The UBU TwL Pilot Study

Phase I of the TwL Pilot Study at UBU started in early 2008 with the re-design of a mathematics course, Elementary Linear Algebra. When compared to the previous offering, the TwL method showed an average increase of 8.86% in the midterms and 18.68% in the final exams. These results showed enough promise that the Pilot Study was expanded to twenty two courses (Phase II).

In Phase II, the majority of courses were within the Faculty of Science: Biology, Chemistry, Computer Science, Information Technology, Mathematics and Physics and; three courses were within the Faculty of Engineering. All twenty-two instructors attended the TwL workshop in May, 2008 and completed the re-design of their courses by the end of October 2008. In November 2008, all twenty-two courses were offered with a combined enrollment of 1,742 students (largest class size was 249). At the end of term, March 2009, instructors and students were asked to complete a survey of the TwL method.

4.2 Outcome

Traditionally at UBU, the average entrance GPA of students would be reflected in their midterm and final marks in the majority of their courses. A student entering UBU with a C- average will maintain that average throughout most of her courses and will graduate as a C- student. The big question was: would the TwL method improve students' exam grades? For ten of the twentytwo courses involved in the Pilot Study, we were able to compare the final exam marks between the TwL and these same courses when they were previously offered with the traditional lecturecentred method. The results showed that for 741 students enrolled in courses using the TwL method, their final exam average was 17.31% higher than the 515 students enrolled in the traditional lecture-centred courses. Introduction to Biology II *(235 students),* was taught by different instructors for each of the first and second-half of the course. For the first-half of the course, which was taught using the TwL method, students gave an overall approval rating of 82.97% for this method of learning, with 92.6% indicating they found class-time engaging and motivating. The grade of the first-half mid-term exam was 7.9% higher than the second-half final exam. The instructor for the second half of the course did not implement the TwL method.

4.3 Changes in Attitudes

The students' survey results showed a substantial shift in their attitude towards learning and taking responsibility for their own learning (85.69% indicated that this method of learning was more rewarding than attending lectures). Without this change, we could not anticipate a change in students' learning outcome. The results of the survey completed by thirteen out of the twenty-two instructors showed a marked change in their teaching philosophies and increased confidence in their ability to contribute to their students' learning.

Six of the twenty-two courses involved in the pilot were within service courses in mathematics. Traditionally, the attitude of UBU students enrolled in mathematics service courses has impeded learning outcome. A summation of the students enrolled in the six mathematics courses (161/413) showed a strong shift in students' attitude:

- 88.31% Had a better appreciation for learning;
- 85.16% Felt better prepared for class-time;
- 83.83 % Felt more confident about their abilities to learn;
- 91.14% Developed more critical thinking and problem-solving abilities;
- 86.17% Felt better prepared for writing exams;
- 96.34% Felt time spent with instructors was engaging and rewarding;
- 89.88% Found course motivating.



Image 1. Student engaging remotely (Stage 1)



Image 2. Students working on team task (Stage 1)

5. TwL Design Method

The TwL method of course design is based on Carey's T5 model, developed as an approach to instructional design at the University of Waterloo, Canada. The model emphasizes "*Tasks* (learning tasks with deliverables and feedback), *Tools* (for students to produce the deliverables associated with the tasks), *Tutorials* (online support/feedback for the tasks integrated with the tasks), *Topics* (content resources to support the activities) and *Teamwork* (role definitions and online support for collaborative work)", (Salter, Richards & Carey, 2004).

5.1 Learning Outcome

Defining knowledge and skills students will have mastered (upon graduation) cannot be stated as goals at the program level or objectives at the course level. Determining the learning outcome of students within a program (along with authenticating learning outcome) is the sole responsibility of the "Program Curriculum Team". TwL and the tool D4L+P provide curriculum teams and course instructors with a model and tool to guide, monitor and authenticate learning outcome. UBU's directive to academic programs:

- All students graduating from their program will have mastered (mastery authenticate) the 5 domains of learning (knowledge, cognitive skills, analytical and communication skills, inter-personal and responsibility skills, ethical and moral development.
- Program learning outcomes (5 domains) are mapped to each course in their program to indicate what learning outcomes each course is to address.
- Instructors then map their course to their assigned learning outcomes and specify what outcome their student will master at the end of each week of their course (15weeks).

Authenticating learning outcomes at the program level is derived from:

- 1. Formative: Assessing students' effort towards correctness in mastering learning outcome.
- 2. Summative: Assessing correctness in mastering learning outcomes (mid-term and final exam)

5.2 Learning Activities to Guide Mastery of Learning Outcomes

At the core of TwL is an innovative 'learning activity' that challenges and motivates students to engage in learning that builds confidence and enables the students to independently and collaboratively construct meaning in their learning. This results in higher levels of student participation and learning outcome. To attain the required learning outcome, a series of weekly learning activities allow the students to build towards mastery of program learning outcomes.

Each weekly learning activity consists of:

- A challenging learning task for the students to engage in;
- Criteria (foundational knowledge) or conditions required as part of the students' solution;
- Course materials (which contain, the general foundational knowledge);
- Individual effort;
- Collaboration with peers;
- Ongoing feedback;
- Assessment based on effort towards correctness;
- Culminating in a one hour class-time with the course instructor (face-to-face, virtual or both)

5.3 Learning Task

"Learning tasks pose an open question; students respond by engaging with course material. The single most important factor shaping learning outcomes is the way in which students approach a learning task ..." (Jackson & Anagnostopoulou, 2001).

An open question allows students to express their understanding when:

- They are engaged in applying, analyzing, evaluating or creating
- They are applying specified criteria (foundational knowledge) to their solution.

According to Bloom's Taxonomy (1956), "The traditional learning paradigm implies a fixed order; before a learner can advance to higher order thinking, like applying, analyzing, evaluating or creating; they first need a solid understanding of fundamentals or a solid foundational knowledge." TwL method, foundational knowledge is specified by the instructor as part of the criteria or conditions required in order for students to master a task. The instructor designs weekly tasks that challenge the students in applying, analyzing, evaluating or creating. This introduces entry level students to higher order thinking at an early stage and helps them to maintain their understanding and memory of foundational knowledge. As students move into advanced courses, they are better prepared to move directly into advanced applications. As Brownstein (2001) indicates, "Learners should constantly be challenged with tasks that refer to skills and knowledge just beyond their current level of mastery. This will capture their motivation and build on previous successes in order to enhance the confidence of the learner."

5.4 Primary Components of TwL

The primary components of a TwL course are:

- <u>Learner Engagement</u> (50% of course time): Students engaging in challenging activities towards mastering the required knowledge and skills.
- <u>Constructive Feedback</u> (50% of course time): Students giving and receiving constructive feedback to each other and the instructor giving constructive feedback to students in class-time.
- <u>Learner Collaboration with Peers (2/3 of all learning activity)</u>: "Collaboration is a process by which individuals negotiate and share meanings relevant to the problem-solving task at hand." (Roschelle &Teasley,1993).
- <u>Resources:</u> formal lectures are eliminated and replaced with resources (textbook, etc.) (defined by instructor as criteria to assist students in mastering learning activity).

5.5 Primary Role of Instructor

The most important responsibilities for the instructor are: to monitor students' progress towards mastering the required knowledge and skills and; to guide students towards understanding and correctness through constructive feedback, culminating in a weekly one hour class-time (face-to-face or online). Class-time is an opportunity for the instructor to focus on guiding the quality of learning outcome rather than knowledge transmission. Class-time for the students is an opportunity to engage in learning outcome discussions. Assignments are replaced with weekly tasks that represent 20-40% of the students' marks. Formative assessment, as opposed to summative assessment, is based on *'effort towards correctness'*. This formative assessment is carried out by the student's peers - not the instructor.

A number of UBU instructors indicate that in order for students to learn, especially new information, the instructor needs to "give" this information to their students in the form of a lecture. According to Alan Guskin (1997), "students retain less than 20 percent of what they were taught one week after the lecture" (plus, factor in absent or students with their own agenda).

5.6 How TwL Scaffolds Learning Activity

Within each learning activity, there are five stages in which students, individually and collaboratively, engage in mastering each weeks learning activity. The process builds confidence and enables students to independently discover and collaboratively construct meaning. With students' participation in weekly learning activities, higher levels of learning outcome are achieved. Students provide and receive ongoing feedback; develop and improve their listening and communication skills and; with a higher understanding of the problem, the students can engage in class-time discussion for deeper understanding. Class size and the providing/receiving of ongoing constructive feedback is no longer a concern for instructor or students.

Stage 1 The student is given a task, an open-ended question, requiring her to state what she believe is the correct solution to the problem. Working independently, the student needs to make an effort to master the learning task.

Stage 2 After submission of her task, the student will receive three submissions from her peers (classmates). She will not only see the solutions of her peers, she can re-think the problem by comparing her own submitted solution to that of three peers. The student must: review the three submissions and provide constructive feedback to each of the three peers and; rate the effort each peer made to produce the solution (5 point scale). *The identity of the peers is not disclosed to students*.

Stage 3 In turn, the student receives anonymous feedback from three of her peers on the task she submitted. The student must: review each feedback provided and; rate the effort each peer made in giving her feedback (5 point scale). *The identity of the peers who gave the feedback is not disclosed to the student*.

Stage 4 The student is then placed within a team of four and will know the identity of her team members. The team is assigned either the same task or one that is more challenging to work on collaboratively. Students must: engage with their team members to complete the team task and; rate the effort each team member contributed to the completion of the team task (5 point scale). *Although the identity of team members is known to students, they do not know how they were assessed by individual team members*.

Stage 5 The instructor and students engage in either face-to-face or online discussion of the week's learning activity. The learning environment shifts the role of an instructor away from introducing new information to students in the form of a lecture to: guiding and responding to the students based on their independent and collaborative effort towards mastering a problem (stages 1-4). This instructor: reviews either all or some of the team submissions. The instructor then guides students through any misunderstandings/problems and discusses the challenges that individuals and teams encountered in preparing their tasks.

Typically, if an instructor lectures three hours per week, then two of these hours would be transferred to the students to work on Task 4 as a team, and the third hour would be for students' class-time with the instructor. With the TwL learning environment, an instructor is expected to spend three to four hours per week monitoring and one hour per week facilitating class-time for the duration of the course. The student is expected to spend three to six hours a week engaged in

solving an application and one hour engaged with the instructor in class-time. "The theory [that]...learners learn by becoming involved...seems to explain most of the empirical knowledge gained over the years about environmental influences on the learner's development." (Astin, 1985).

Diagram A: The	five stages within	each weeks learning	activity	
Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Individual effort	Feedback to peers	Feedback from peers	Teamtask	Instructor's time
Due date: Jul 17	Due date: Jul 19	Due date: Jul 20	Due date: Jul 21	Date: Jul 22
1	234	567	8	•

Stage 1: Sample 1 Draw a structure for each of the following compounds and then compare their properties in terms of solubility in water and boiling point. 1.1) propanoic acid, 1.2) pentane, 1.3) 1-butanol, and 1.4) 1-butanamine. Give IUPAC the name of the following structures and then compare their basicity.



Stage 1: Sample 2 The various regions of Thailand have subtle or distinct differences. I want you to analyze the six regions of Thailand and define what these differences are and what contributed to these differences. Criteria: Make sure that you have identified the meaning and importance of national culture and heritage. Plus, there are a number of "World heritage sites" in Thailand that have been recognized by international communities as important contributions to world culture.

5.7 Formative Assessment

Formative Assessment: Encouraging the students to make an effort for which they are subsequently provided feedback is the key to their mastery of learning. Within each learning activity, students are assessed by their peers on the effort they made towards mastering a task. Within each learning activity, the student will be assessed nine times. Two-thirds of the assessment is provided by peers who are anonymous to the student, and one-third provided by known team members. Peer assessment is based on effort towards correctness. Knowing their peers will be reviewing and providing assessment motivates and stimulates students to make their best effort. The criteria for peer assessment are defined by the instructor. "Experiences revealed that peer-assessment, as a formative assessment method and as a part of the learning process, can be valuable because students are more involved both in learning and in the assessment process and because they find it fair and accurate." (Sluijsman, Docky and Moerkerke, 1996).

Disadvantages of peer assessment, such as friendship marking and decibel marking, are resolved by the online tool, D4L+P, which conceals the identity of the peer a student is assessing and flags any discrepancy for the instructor to review. Plus, friendship marking in team-tasks goes from 93% (assessing team members efforts) to 64% after the second week of the course.

5.8 Monitoring and Authenticating Students' Mastery of Learning

Monitoring and authenticating students' mastery of the 5 domains of learning (5.1) is accomplished at three administrative levels by the D4L+P tool:

Program Directors'/Deans' Level: Define learning outcomes for graduating students and; monitor performance and quality of learning outcomes across programs and of individual courses within programs.

Instructors' Level; Define learning outcomes of students within their course; monitor performance and quality of learning outcome across their course and; monitor performance and quality of learning outcome of individual students within their course.

Students' Level: Monitor their performance within a specific course, comparing their performance with the established learning outcomes for that course and; monitor their performance within their program, comparing their performance with the established learning outcomes of their program.

Diagram B: Monitoring and authenticating performance of program, course and student



6. Conclusion

The Directorate for Education, within the Organization for Economic Co-operation and Development (OECD), is carrying out a feasibility study, Assessment of Higher Education Learning Outcomes (AHELO). The AHELO feasibility study explores four complementary strands referred to as 'The Four Strands'. Strand 4, 'The Value-Added Strand' states that "it is no surprise when an A+ student walks out the doors as an A+ graduate. But what about a B student who finishes with an A, his or her programs would have a higher added value than the programs at the top university."

UBU Mobile Learning Project has the potential of offering programs that are academically more successful than similar programs offered at top universities that pre-select their students based on a high entrance GPA. It is possible to change C- GPA entrance students to C+ or B- or possibly a higher GPA upon students' graduation. For any institution with the strength and resolve to change from the traditional lecture-centred method; any students willing to make the effort to be responsible for their own learning, can excel academically and professionally. Without students taking responsibility for their own learning, improvement in their learning outcome will not occur.

The Ubon Ratchathani University Mobile Learning Project came about as a direct result of the 'Teaching *without* Lectures' project. This project encouraged instructors and university administrators to re-think their teaching and learning strategies.

Mobile Learning takes the university to the students, regardless of where they reside, making a university education not just accessible and convenient for all Thai's, especially for those living in the rural communities of Thailand, but also a teaching and learning environment that is academically and professionally more rewarding for both the student and their instructor.

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An Ideal Healthy Environment for Learning Using Technology A case study for Development and Continuous Education Center- Baghdad University

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Abstract

This paper outlines the opportunities of academic programs that Development and Continuous Education Center (DCEC) has put forward for teaching and learning that Focusing on a particular aspect of professional development using Information and Communication Technology (ICT) for education. Several selective programs within the privileges of high quality depending on the use of cutting-edge technologies in the field of modern education like Iraqi virtual Scientific library (IVSL), Open Course Ware OCW-MIT and on-line training courses, has aimed at enhancing academic performance of the faculty members at Baghdad university and other Iraqi universities through participation in sustainable development programs. These training programs require scientific planning and strategy which provides an opportunity to develop their skills and raise the quality of teaching performance, and promote the research skills. The implemented programs has been studied and monitored for the period before and after the war at 2003. An important results show that ICT can play a major role for development Iraqi education svstem.

1. Introduction:

In a world, where knowledge is our main asset and learning becomes the most important process, training programs are

constantly looking for the right practices to rehabilitate and develop the future teachers and students. Teaching enterprises demand graduates to become true experts and to create trainees learning experiences that address the needs of the global marketplace.

The research sheds some light on the trends of the change in the education and training curricula and on the features of the change in the platform for training courses in language education for professors and teachers working in the different sectors at Baghdad University.

This research refers to the analysis of the Platform training and orientation sessions held by the Development and Continuing Education Center at Baghdad University for the period (2000-2009) and to the available curriculum in the field of advanced technology and modern education methods used in methods of teaching courses for teaching staff who are master and PhD holders.

Development and Continuous Education Center at Baghdad University was established in 1983. Its Objectives are:

1.Lifelong learning (on job training).

- 2. Improving the quality and efficiency of education and training.
- 3. Enhancing creativity and innovation, at all levels of education and training.

4. Promoting change in the roles of Technology By:

- Access to new Sources of Information.
- Knowledge transfer.
- Professional Development.
- New Learning Experiences.

In award ceremony at Baghdad University (Jan 2010), the Steering Scientific Committee has described the Development and Continuous Education Center (*DCEC*) as one of the major typical learning environment for technology and activity for continuing professional development.

2. Academic Training Programs

The DCEC with professional excellent teaching is planning for choosing and using effective educational technologies. DCEC Senior Instructional Developer in Blended Learning can advise the participants on how online course environments and the face to face classroom can support one another in teaching methods.

As the DCEC is firmly rooted in a holistic perspective of wide training and lifelong learning, a series of program activities are

carried out to support a platform for educational training courses which offer theories and practices to assist access and use technology in higher education. A carefully selected listing program that includes courses and/or experiences aimed at preparing service providers for practice in the areas of assistive technology and rehabilitation teachers and professors is exhibited in Table 1.

Training of ICT	Initiative Partnerships	Benefits
programs		
Open Sources	Baghdad University &	Teachers experiment
lectures	Massachusetts institute of	with new
2006-2009	Technology & LINC-MIT	instructional
		techniques
E. Libraries and	Iraqi Virtual scientific	Gain resources from
Virtual libraries	Library & Sun	ministries, research
(IVSL)	Microsystems	centers publishers
2006-2009	-	and publications
Mirror Site	Baghdad University &	Subjects locally
Open Course ware	Massachusetts institute of	hosted at Servers
(OCW)	Technology(MIT)	contain More Than
2008-2009		1900 Full Courses
Interactive lab	Baghdad University	Access to real labs
(Ilab) lectures	& Massachusetts institute	directly and share
MIT.Ilab	of Technology(MIT)	components (Online)
2008-2009		
Oregon-Iraq		Teach English
Guided Online	Oregon-Iraq Online	Language by using
English Studies	teachers	new methods
Training		
2008-2009		
Exploring WEB	Baghdad University &	Using Technical
2.0, March 2009	University of Oregon	methods Web
,	2008-2009	
Visiting professors	e-learning technology	Visiting Prof, to
Program	university of Canada,	develop and Educate
2008-2009	Baghdad University,	•
	MIT	
ITP.TOEFL.	Cooperating with	ITP. TOEFL Test for
2009	International Universities	MSc ,PhD Research
		Studies missions

Table 1. DCEC ICT Training programs	s, Initiative Partnerships, Benefits
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The key ingredient of a successful e-learning environment is interaction. Furthermore, the need to create active e-learning environments that involve learners interacting with the interface, the technology, the content, educators and their fellow learners is paramount to successful e-learning. "The vehicle that allows you to bring life into online learning is interactivity" (Iverson, 2005, p.5) [1].

3. Adaptation of New Education Methodology at DCEC Training Courses (Facts and Numbers 2000-2009)

The DCEC Implementation Scheme has elaborated a strategic document focusing on what should be achieved through the learning environment for technology level and under DCEC leadership. It summarizes the goals and objectives of its relationship to other key education movements, and emphasizes the importance of partnership.

On Oct. 27/9/2003, the administration of DCEC adopted basic environment of Education for Sustainable Development designated as the leading center for promotion and coordination. The overall goal of the DCEC is to integrate the principles, values, and practices of sustainable development into all aspects of education and learning in order to encourage changes in behaviors that will create a more sustainable future in terms of environmental integrity, education viability, and a just society for present and future generations. The following is the completion rate.

- 2000-2009 Total graduated= (5910), professors and teachers (MSC, Ph.D.),
- 2003-2009; (4712) professor and teacher (MSC, Ph.D.) were trained on the use of technology methods in education lectures. [DCEC Annual report.2009][2].



Figure 1. Training professors and Teachers Dealing with IT Programs statistics (2000-2009)

It can be notes that number of university professor those having the awareness about educational IT skills like e-learning and e-libraries are increased rabidly after 2003.

4. Online English Training Courses with Oregon University – USA

A Pilot Project with the University of Oregon in the USA: Online English as a Foreign Language Courses and Tandem Teacher Training 2008-2009, these courses were funded by a grant from the cultural office at US embassy at Baghdad.

Online learning can be a very professional experience, a very empowering experience that "*let teachers get what they need when they need it, in away that is accessible to them*". So DCEC presented an Online Infrastructure English language teaching (AEL) Courses (cooperating with University of Oregon) to learn English using webbased tools. These online training courses have the potential of a suitable cost over the long run while providing more uniform professional development experience, and they emphases on the learning language skills of teachers.

 Table 2. Online English as a Foreign Language Courses and Tandem Teacher Training 2008-2009

	5
Course	Expected No. of Participants
Three / ten week/ intermediate English as foreign language courses	(75) participants 2008-2009
Two / ten week/tandem teacher training courses	(50) participants 2008-2009
EFL Classroom 2.0 ; English foreign language Classroom	(25) Participants (2009)

The professors team who graduated from this program with big experiences and technical skills which help them to build work team to form On-line training program

The professors team who graduated from this program with big experience and new technical skills which help to build work team to form an on-line training programs and other new English training programs at DCEC starting from 2009 as shown in figure ...

The participants at (Oregon-Iraq Online teachers) worked for the use of blended learning strategy and the introduction of information

technology in the educational environment of the *DCEC* (ICT for Education) by means of modern electronic communication (Web Classroom) exhibited:

1. The Iraqi culture in English

2. TOEFL Online preparation Course (New)

Table 3 English Language Training Courses, Total Participants (2009),

Courses	Total Training Courses	Total Participants
TOEFL Training	14 Courses	256 Participants
English language Training	14 Courses	187 Participants
ITP.TOEFL	10 Courses	250 Participants

5. Impact of Availability of the Electronic Resources (elibraries) on the Iraqi Research Output (IVSL 2006-2009)

One crucial step toward bringing Iraqi researchers up to date easy and safe access to scientific knowledge and developments has been taken, with the launch of the Iraqi Virtual Science Library (IVSL) in May. A broad public/private partnership led the way in building this digital library for Iraqi researchers, with participants from several U.S. government agencies, private companies, professional scientific associations, technology companies, scientific publishers and information providers. The library is available to Iraqi universities, research institution and the Ministries of Higher Education and Science & Technology. IVSL provides nearly 80% of Iraq's scientists and university students with access to full-text technical articles from major publishers, training, online educational materials, and information on funding opportunities- the same level of scientific content available at top-tier universities in the United States. [3]

The Project Launched in January 2006, Search for sources of electronic information using the (IVSL: Iraqi Virtual Scientific Library) within the Global Partnership, in cooperation with ministries, associations, research centers and the role of international publishing provided by Baghdad University faculty professors and researchers [Bahaa. I. kazem, 2009].[4], about forty for IVSL training workshop has been implemented at Baghdad University and this effect directly on the IVSL usage parameters .

This tool offers Iraqi scientists, researchers, doctors and engineers access to a wide body of scientific research in fields critical to Iraq's reconstruction effort. It can serve as a vital tool for Iraq's economic growth and the betterment of Iraqi's society for many generations to come *According to DCEC statistics (2006-2010)*:

- The Total number of subscribers (users) of IVSL joint (universities & ministries)= [2006(1133) year/user; 2007(2206) year/user]; [2008 (5750) year/user]; [2009 (7933) year/user].
- The number of downloaded articles from IVSL is increased constantly with increasing the number IVSL users as shown in figure 2.

Also, Figure 2 shows that the scientific research output from Iraqi educational and research institutions is increased with increasing the number of downloaded articles from the international journals database available at IVSL for the same period 2006-2009.



IVSL USAGE /year

Figure 2. Number of IVSL Users (2007-2009), Total Number of Download Articles and its effect on the Iraqi research output at international Journals.

6. Open Source Educational Materials from MIT

More than 1900 full courses for undergraduate and graduate subjects locally hosted at local Servers at Baghdad University are available for sharing.

Location of OCW-MIT mirror web site servers at Baghdad University (local server /one IP for each college)

- The Total Number of Distributed OCW.MIT Servers to Colleges & Centers at the : 22
- Baghdad University: 16; [11 Colleges, 5 Centers in Al Jadiria establishment].
- Baghdad University: 6;[2 Colleges in Bagdad city, 4 Iraqi Governorates].

DCEC intended to seek as a part of his scheme to expanding the distribution of OCW.MIT servers for the rest of the faculties and departments of Iraqi universities.



Figure 3. OCW.MIT mirror web site servers for Iraqi Universities

DCEC adopted "Open Course ware" as one of rehabilitation training Courses for teachers:

1. These lectures were used to illustrate the teachers' skills to develop their technical abilities by using the available methods to run and explain the possible techniques in side the classroom.

2. Using lectures to support and achieve school sections in side the Iraqi Colleges and Universities depending on the available techniques found in these usual in OCW terms.

According to the available monthly usage reports for OCW-MIT at Baghdad university the are Some courses recorded highest usage, such as :[Chemistry, Biological Engineering, Mathematics, Mechanical Engineering, Earth, Atmospheric, and Planetary Sciences courses percents according to other courses,, while some of courses didn't get chance to use. Table 4.

	Courses by Departments	Usage percent	The indicators of
1	Aeronautics and Astronautics	30%	
2	Anthropology	20%	_
3	Architecture	55%	
4	Athletics, Physical Education and Recreation	40%	
5	Biological Engineering	80%	
6	Biology	80%	
7	Brain and Cognitive Sciences	40%	
8	Chemical Engineering	40%	
9	Chemistry	90%	
10	Civil and Environmental Engineering	70%	
11	Comparative Media Studies	80%	
12	Earth, Atmospheric, and Planetary Sciences	80%	
13	Engineering Systems Division	40%	
14	Experimental Study Group	40%	
15	Foreign Languages and Literatures	-	-
16	Health Sciences and Technology	40%	
17	History	-	-
18	Linguistics and Philosophy	40%	
19	Literature	60%	
20	Materials Science and Engineering	40%	
21	Mathematics	90%	
22	Mechanical Engineering	70%	
23	Media Arts and Sciences	-	-
24	Music and Theater Arts	30%	
25	Nuclear Science and Engineering	5%	
26	Physics	50%	
27	Political Science	20%	_
28	Science, Technology, and Society	-	-
29	Sloan School of Management	-	-
30	Special Programs	-	-
31	Urban Studies and Planning	-	-
32	Women's and Gender Studies	30%	
33	Writing and Humanistic Studies	-	-

 Table 4. The usage statistics for OCW-MIT Courses by Iraqi Universities

 2008-2009

7. Interactive Lab Experiment 2008-2009 with iLab-MIT

To maintain a sufficient level of expertise in a situation of continuous competition and to ensure the motivation and commitment of their employees, employers in areas suffering from a labor shortage, especially in the IT field, have been forced to create and support education of their employees that takes place while they are working. Especially in Lapland, in the face of negative relocation, the public educational lab system needs to participate in and support this development. Examples of this include various models of reeducation, for technicians and engineers, and various types of EU-financed development projects, like in the new media sector.[EduTeach.Wiki] [5]

Development Center held's workshops to train teachers and students in the use of technical laboratories and apply the experience online and follow-up program.

Table 5. Interactive Lab Experiment 2008-2009

department of Colleges	Partnership in the initiative and Local	Levels
Micro electronics (UOB)	DCEC- UOB , MIT,Massachusetts	2nd level Computer Engineering Department (UoB)

8. ICT Programs Evaluation

The DCEC is studying the levels of development and evaluation of programs offered by the training courses, quality and quality usually through the results achieved after the distribution of questionnaire form at the end of each course.

8.1 Academic accreditation standards in selected programs:

- Activation of areas of cooperation, integration and exchange of experiences between universities in the world
- Prepare periodic reports to assess the effectiveness of the program based on statistical data.
- Study the obstacles in the implementation of programs and ways to address them.
- Provide administrative and technical experience and academic nature of the programs required by the implementing.

9. The Results

DCEC Center at Baghdad University has achieved development education programs, a large proportion of Aides in providing technological environment adopt the approved programs in terms of quality and excellence in the years (2003-2009) and seeks to ensure continuity and sustainability of programs and curricula provided for qualifying courses in teaching methods in high quality.



10. Recommendation

- 1. Develop the infrastructure of Baghdad University and other Iraqi universities to ensure communication with each other to create a healthy electronic learning environment.
- 2. Preparation of the reality of the development budget increased annually for the development of university programs dedicated to e-learning.
- 3. Encourage teachers to develop curricula and educational content in a way and global measurements of modern education.
- 4. Adopt the principle of blended learning (Blended learning) in education in the coming years.
- 5. Preparing lectures suggestions: Cooperation /agreement with the International universities /Institutions in preparing and presenting a periodic basis e- lectures specialized in knowledge fields (once a week, or monthly) at least.
- 6. Exchange teachers using of their experiences in different fields.

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MeLTs; A new approach to delivery of e-learning in remote and unserved rural areas in India

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Abstract

Education system in India has witnessed considerable expansion & development in the last two decades. The benefit of various IT enabled services in education, have, however remained restricted to urban and semi-urban areas.

A Need Assessment Survey (NAS) was conducted in a limited geographical area (within a radius of ~40 kms from our Institution) in Jammu & Kashmir, India recently. In this survey we covered a total of over ~22000 students in 55 institutions. The survey covered students of higher secondary and above and we found that there are too many people without access to ICT enabled education. Limited ICT infrastructure is available but the same is available only to centrally funded institutions which are very few in number.

To address these issues, we have joined hands with IIT Roorkee to deploy V-SAT Enabled Mobile e-Learning Terminals (MeLTs) in this area. This tool shall be used to deliver ICT enabled educational content and services. Under this initiative, IIT Roorkee has been assigned the task of designing, developing and deploying MeLTs to provide data connectivity to underserved educational institutions, particularly in rural areas. In this gigantic task of great national importance, IIT Roorkee has involved a number of institutions of higher learning. This project is funded by Ministry of Human Resource Development, Government of India under "National Mission on Education through Information and Communication Technology". The prime objective of the project is to make available to the students e-lectures and knowledge e-contents of their interest free-of-cost using MeLTs. By providing data connectivity in remote areas through MeLTs, this project is expected to help in reducing the digital divide between the urban and the rural areas.

This paper presents the results and our analysis of NAS. Further, it describes the idea of MeLTs and the technological design aspects and systems of e-content delivery available on MeLT.

1. Introduction

Prior to independence, and thereafter, major contributor to our GDP was agriculture; with further development the contribution of manufacturing sector started increasing. In the early 90s with the opening up of the economy the service sector started booming. The initial boost was based on the fortuitous circumstance of a numerically large educated English knowing population segment in the age group 15 to 40. Over a period of time the service sector has now started moving up into a higher, value added segment. This again is based on the fact that there is a numerically fairly large population segment which is educated, proficient in English and

having fairly sophisticated skills in computers. This segment comes mainly from the educated middle class of the urban and semi urban centers. The total urban population as of now is about 40% and the relevant segment between 15 to 40 years, is about 40%. Thus the total manpower pool on which the service sector and the overall GDP are being driven is numerically large, but still limited. An overall Gross Enrollment Ratio (GER) in higher education of over 12% and we aim to make it 15% by the year 2012. Although we are coming up with new institutions however, this is expected to put a lot of pressure on the available infrastructure. One can see intense competition in urban centers to acquire knowledge and skill sets which can equip them to compete at National and International levels to have access to the global market. This is possible as urban centers are relatively better equipped in terms of information and communication infrastructure and the same is undergoing continuous up-gradation and expansion thereby making this job easier by the day. If India has to continue on the growth path then the large population pool in the rural segment has to be galvanized and readied (equipped with the necessary skill sets) for playing its part in the economic development cycle. This would ensure their effective participation in the market driven economic growth and uplift their living conditions. For a country of the size of India in situ capacity building for these areas would require herculean efforts and vast investments if the traditional modes of education and training are to be followed.

India presently has over 400 universities and close to 17000 colleges and the same are catering to a tiny segment of our youth (10 to 12% GER) compared to the need capacity building as already stated. Faculty shortage is another problem area and, even if available, the differential skill set is another gray area. Since we have to reach out to a large number of students who are spread over in geographically sparse areas, to maintain low operating costs we need to come up with distance e-learning initiatives, and modes of delivery which can bring in data connectivity in such areas.

Whether at the National, the State or the Sub-State level, there is not only vast scope for, but also an urgent need, to quantitatively expand and qualitatively upgrade education and one of ways of achieving this could be by the use ICT. There already have been several efforts made by the state and other agencies to tackle this himalayan task. Some of the schemes initiated by our government include:

1.1. Sarva Shiksha Abhiyan (SSA)

SSA is Government of India's flagship programme to universalize elementary education in a time bound manner. This scheme covers over 192 million children in 1.1 million habitations thereby making education for children in the age group of 6 to 14 years free and a fundamental right. In addition to SSA the mid day meal scheme was initiated to attract the child from such strata where two square meals a day are also a struggle. This scheme has resulted in effective reduction of the drop out rates: 2000-01, 2001-02, 2002-03 and 2003-04 at 40.7%, 39.0%, 34.9% and 31.5% respectively. Apart from this in order to upgrade and disperse quality education government has established Navodiya Vidayalayas/ Sarvodaya Vidayalayas. Apart from this post globalization private sector has been mainly responsible for large scale growth of education in the country although quality assurance is not up to the mark in majority of them.

1.2. Community Information Centre (CIC).

Under the e-governance initiative of Government of India at the block level, interventions like CIC have been initiated in Jammu & Kashmir and North Eastern states, however, these have not been able to make a mark due to lack of adequately trained personnel and awareness among the general public. Although in the area of e-governance some states like Maharashtra, Karnataka, Jharkhand etc are reported to have done well however J&K has remained behind due to lack of awareness and lack of investment in this domain.

1.3. National Mission on Education through Information and Communication Technology (NMEICT) for higher education

This Mission has an ambitious vision of catering to the learning needs of more than 50 crore Indians (working population) and of providing a one stop solution (Sakshat) to all the requirements of the learning community. It aims to support the conventional approach by technological interventions through ICT so as to make available the knowledge resources to every learner as per his / her convenience and just in time. A similar initiative has been launched at the school level by the Ministry of Human Resource Development recently.

These are some of the initiatives being taken by the state and other actors to address this urgent national need. But much more is needed to be done.

2. Our group

Our group is a part of an Institution (Shri Mata Vaishno Devi University: SMVDU) which was conceived in 1999 by the government of Jammu & Kashmir. It is an initiative of a public pilgrimage trust (SMVDSB) to provide higher educational facilities in an area contiguous to the pilgrimage route but which was till then totally un-serviced by educational facilities, particularly, at college and university levels. It seeks to generate awareness and motivate the local population to utilize the educational facilities not only within the University but also outside for economic development. Incidentally, the setting up of this University would and is acting as an economic growth driver for the hinterland. On a personal note, we may add that our University has come up in a backward area similar to the childhood situation of a few members of the group vis-à-vis hinterland area which is surrounded by villages. The group has, very humbly, felt that they have, perhaps unconsciously and fortuitously, become part of an initiative which has far reaching consequences. In this initiative, we are constantly working to have more people/ institutions on board.

2.1. Our Intervention

Most of the members of the group belong to similar strata of the population and came together over a period of time. The authors at their individual levels had been always keen to

contribute to those sections of the society to which they belonged. After deliberation and brainstorming a model was conceived for which SMVDU provided the organizational opportunity and platform for, the objectives of SMVDU include: the development of intellectual faculties, cultivation of discipline, righteous conduct and service to society. This allowed us to use our internal drives to mould our role in the University to some extent to ensure that our ideas could find an outlet for implementation. This was possible by advancement of our own know how and by gaining organizational acceptability. We got involved in building up the institution by executing ICT infrastructural projects within SMVDU. This included establishment of Campus wide LAN, setting up of a telephone exchange, bringing in leased line connectivity for internet for the University community. This also allowed us to make provision for telecom facilities (landline and mobile) in the surrounding villages which were un-served till then. Thus SMVDU & surrounding areas developed a fairly robust ICT infrastructure.

Further over and above the assigned academic and other duties, the authors (SMVDU) took personal initiative in interacting with, and initiating dialogue with the local village populations, in general, and schools and colleges in particular to try and seek their active involvement to enable us to understand the ground situation. We devised an approach which after some initial ground study and deliberations was converted into a model comprising of three stages:

The model thus conceived was initiated in the following manner to evolve a holistic and robust solution in a finite span of time.

Stage I (2 years)

- Gaining credibility
- Local & Institutional acceptability (within the 12 schools in catchment area and our own University)
- Stage II (2 years)
 - Enlarge external activity
 - Include other Institutions from surrounding Districts.
- Stage III (3 years)
 - More people, more resources more tools



Testing of the model at small scale

• Develop/ adapt technological tools to cover this larger canvas

In all the stages care was taken to ensure that all the components work on a constant feedback mechanism so that corrective action could be taken.

2.2. Children in the neighborhood (Stage I)

The idea had to be tested through small experimentation to check if our idea would work or not. In order to formulate a possible strategy we had to begin by learning from the neighborhood. This allowed us to look at the existing situation that could be used to test the model. In the beginning we made use of various virtual learning resources on a trial basis and were encouraged by the response.

Thus stage I was initiated under the banner of this programme. This was primarily meant to understand the situation at the ground level. Under this initiative we identified 12 schools around the University in its catchment area. The overall student population thus covered has been over 1000. Various activities that have been organized under this banner include:

Science talent search programmeLectures by eminent scholarsAccess to the computer labs and other basic sciencelabs within the universityScreening of audiovisuals on scienceScience fairs and fun games etc

Under all the above heads special attention was devoted to female students. We were encouraged by the response of the teachers and the taught; the thirst for knowledge, the innate talent amongst the youngsters being evident. What was also evident however, was the lack of adequate infrastructural resources, awareness and access available to the schools. Nurturing of this potential population segment is very critical and requires right kind of educational opportunities and facilities.

2.3. Expansion (Stage II)

Based on the experience gained in the learn stage particularly the vast difference and access divide, we resolved to organize activities in which we would be able to mix students from the catchment area with the students from towns of this region and the reach of this programme was expanded. It has now increased to over 30 institutions (5th std. to University level). Our University attracts students from over 23 states of India that also helped us in the sense that we could ensure a truly diverse collection, to which the children/ students of the rural segment were exposed.

2.4. Lessons learnt so far:

- There is a gap which needs to be bridged
- Local community showed lot of enthusiasm
- Till date over 1000 children have been reached
- National Science Day became an organizational opportunity and event
- Public lectures by eminent persons are useful to attract the students
- There is a great need for access to information
- Technology (ICT) is the only way to reach out to larger section
- We also need to build a movement (intellectual force) as we alone can not reach out to everyone out there
- Different sections of the society need to be onboard
- A common virtual platform has to be created. For that Government support/ collaboration is essential to have access to various available resources which are not being used effectively
- Socio political dynamics of J&K have to be taken and kept in consideration all along

- There has already been a great deal of destruction in the state not only physically but also in terms of intellectual drain
- We need to divert youth from hatred for each other to opportunities for development
- International organizations working in the field of education do not have appreciable direct presence in J&K
- We envisage to build up a social/ intellectual forum which can act as a vehicle for any such agency to reach out to different sections of the society
- Study larger area to come up to a level which would enable us to design a robust & suitable solution.

2.4. Technology enabled expansion (Stage III)

Based on the above stages and lessons learnt, we resolved to make an attempt to try and provide mobile infrastructure and training to a small segment as a pilot and if the same was successful then it could be replicated at a bigger scale. This required initiation of elearning interventions as otherwise it would be difficult to reach out to the geographically sparse population. Fortunately, ICT as a tool in education has gained both international and national acceptability and we decided to fully utilize it to our advantage. Based on our ground assessment of the CIC initiative we had to devise an approach which would have least direct dependence on the school personnel for maintenance. We therefore decided to develop mobile ICT enabled laboratories (information on wheels) which could go to the field and come back in the evening. Ultimately we could activate the local ICT infrastructure at the block level.

As a fortuitous circumstance Government of India simultaneously decided to launch NMEICT. Under this initiative present authors (IIT Roorkee) came up with a similar idea of mobile e-Learning Terminals, (MeLTs), and Government of India agreed to fund this project.

Under this initiative, IIT Roorkee has been assigned the task of designing, developing and deploying MeLTs to provide data connectivity to under-served educational institutions, particularly in rural areas. In this gigantic task of great national importance, IIT Roorkee has involved a number of institutions of higher learning. Being a logical/ natural fit we (authors from SMVDU) joined hands with IIT Roorkee to develop a strategy and to deploy these V-SAT Enabled Mobile e-Learning Terminals (MeLTs) in this area. This tool shall be used to deliver ICT enabled educational content and services. MeLT is a mobile data delivery unit which is primarily designed to provide data connectivity in remote areas as the same is not satisfactory in

terms of bandwidth and/or reliability. Sparse population (46 persons in a square km in J&K) in many areas does not encourage us to go immediately for stationary elearning terminals. Another area of concern is the lack of awareness among the masses in these areas. *Mobile elearning terminals* using VSAT data connectivity, it is expected, will therefore be more effective and make better utilization of investment. MeLTs are expected to play a vital role in reducing the



digital-divide and educational-divide between urban and rural areas. With the help of these MeLTs we shall now be able to cover over ~5000 students in our state and overall number during the pilot phase is expected to close to over 50,000 to 60,000 students spread over 6 states. Under the pilot of this project (MeLTs) six states of north India are being covered in which eight institutions are involved apart from Indian Institute of Technology Roorkee. Ultimately we hope to use technology to assist the available manpower in these institutions as in any case technological pedagogical model would not be a continuingly motivating mode which a physical teacher can be. So as a part of MeLTs we shall constantly endeavor to enable the trainer.

3. Need Assessment Survey for MeLTs

A need assessment survey was carried out in 515 institutions in the six states covered under the pilot to identify the areas in which the MeLTs need be deployed on the following broader parameters.

Physical access Teacher student ratio Infrastructure availability Availability of the relevant e-content ICT access Computer student ratio Willingness to participate in our initiative

Table 1:	Summary of	the NAS carried	d out by the N	Network intuition	s in 6 states

Network Institution (NI)	Districts	States	Total
	covered		institutions
			covered
National Institute of Technology, Jalandhar	02	Panjab	42
Sant Longiwal Institute of Engineering and Technology	02	Panjab	50
University Institute of Engineering & Technology,	06	Panjab & Haryana	117
Panjab University			
HNB Gharwal University, Srinagar	04	Uttarakhand	64
Birla Institute of Applied Sciences, Bhimtal	02	Uttarakhand	50
Rajasthan Technical University, Kota	03	Rajasthan	66
Panjab Engineering University of Technology,	02	Chandigarh	71
Chandigarh			
SMVDU, J&K	03	Jammu & Kashmir	55
08 Network Intuitions	24	06 States	515

These 515 institutions that have been surveyed by the NIs include various levels as given in the figure 3. All these beneficiary

institutions are supposed to be covered by the corresponding NI.

4. Results & Observations of NAS (J&K)

We shall discuss the survey findings in greater detail for J&K



where present authors (SMVDU) were directly involved.

In Jammu & Kashmir a total of three districts bordering each other have been covered for the pilot under NAS. The selection of three districts was convenience (contiguity) based. However, in the overall developmental/ availability of educational (relevant) infrastructure and other pertinent parameters, these three districts are in the upper half of the total 22 districts in the state. The districts in the lower half are, of course, much more deficient in all surveyed parameters. The districts surveyed are: Jammu [covering 22 institutions], Udhampur [covering 17 institutions] and Reasi [covering 16]



institutions]. The institutions that have been covered include 19 High Schools, 27 Higher Secondary Schools, seven Degree Colleges & two Polytechnics. While conducting this survey a GPS device was utilized to create a track map (Figure 4) of the area under consideration and this map shall be made available in the MeLTs so that they are able to reach the intended destination with ease.

District/ Institution type	High Schools	Hr. Sec. Schools	Degree Colleges	Total
Jammu	3	13	4+2	22
Udhampur	6	9	2	17
Reasi	10	5	1	16
	19	27	7+2	55

Tuble 1. Summar , of the 1015 currica out by 511 (D C in gumma a Rasimin	Table 2: Summar	y of the NAS carried	out by SMVDU in	Jammu & Kashmir
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Table 3: District wise student teacher ratio

Level/ District	Jammu	Udhampur	Reasi
High	16:1	14:1	18:1
Higher	13:1	19:1	22:1
Secondary			
College	12:1	52:1	20:1
Overall	12:1	22:1	20:1

In the three districts covered in J&K, the average distance from SMVDU is \sim 30 km; the average travel time is 75 min in Reasi district, 58 min in Jammu and 62 min in Udhampur, with an overall average travel time of 65 minutes. Nearly 75% of the target institutions covered lie in the hilly areas. Two schools were located at such a place that we had to walk 2 kms each to cover them.

Table 4: District wise availability of computer faculty and overall student computer teacher ratio

Level/ District	Jammu	Udhampur	Reasi
High	77%	33%	10%
Higher	77%	69%	20%
Secondary			
College	Nil	Nil	23%
Overall	357:1	558:1	237:1

Out of 55 institutions, only three require alternate locations for deployment of MeLTs as they do not have adequate road access. A total of ~22000 (5000 would actually be covered by MeLTs) students are being covered under pilot.

Leve	el/ District	Jammu	Udhampur	Reasi
High	1	23:1 (67%)	14:1 (17%)	84:1 (30%)
Hr. S	Sec.	31:1 (100%)	35:1 (89%)	103:1 (100%)
Colle	ege	74:1 (100%)	129:1 (100%)	29:1 (100%)
Over	rall	43:1 (88%)	59:1 (65%)	72:1 (56.25%)

Table 5: District wise Student computer ratio and (on paper) percentage schools having access to computers



Out of 55 institutions, eight schools are funded by the central government. All of them have basic ICT infrastructure with some Internet connectivity. All of them have computer teachers however the ratio is not very encouraging. If these eight institutions are not considered then the ICT scenario in the other schools is extremely poor.



In most of the schools having computers, either the PCs have not been fully utilized or some of them are not working. In one case, the PCs are yet to be used as they do not have offline UPS since last one year. Power scenario adds to the woes.

Overall student teacher ratio is good and stands at 18:1. However student computer teacher ratio is very poor and stands at 384:1. On paper, 70% students

have access to computers. However student computer ratio stands at 58:1. Twenty institutions have computer faculty however eig





institutions have computer faculty however, eight out of them do not have computers.

To summarize, there was high appreciation and interest, but low ICT availability. ICT enabled education is supposed to be part of the curriculum in schools but there is lack of qualified teachers. Some schools did have ICT infrastructure but lack of educational resources and e-content is a serious concern.

Considering the ground reality it was felt that versus stationary infrastructure, MeLTs would be a realistic solution. Resources on it can be delivered and retrieved synchronously or asynchronously, and in spite of the fact that the resource provider and the user are separated physically. Moreover, the same resource can be used as many times as required.

5. VSAT Enabled Mobile e-Learning Terminals

The prime objective of the MeLTs is to make available to the students, e-lectures and knowledge e-contents of their interest free-of-cost. By providing data connectivity in remote areas MeLTs are expected to help in reducing the digital divide between the urban and the rural areas. It is evident that data connectivity in several remote areas is not satisfactory (as is verified by NAS) in terms of bandwidth and/or reliability. Sparse population in many areas also motivated us to go for mobile rather than stationary e-learning terminals, as the same would remain under-utilized and would invite higher initial and maintenance costs. MeLT based data connectivity will be more effective and make better utilization of the investment. MeLTs shall be physically present at the destination side so thereby providing of physical presence feeling while undergoing e-Learning experience. MeLTs can provide access to e-learning to anyone, anytime and anywhere. This would ensure standardization of quality of the contents which is pre tested/ verified and it is no longer a static closed door student teacher interaction. MeLTs shall have two technical assistants on board to provide local assistance to students and teachers.

5.1 Types of MeLT

- A. Van-Based MeLT
 - 1. Class in conventional class-room
 - 3. Wireless LAN

B. Bus-Based MeLT

1. Class inside the bus

2. Class in open space / room





5.2 Equipment on board MeLT

Content Server	01	Laptops	20
WiFi Router/ Ethernet Switch	01	VSAT Antena & ODU	01
VSAT IDU	01	DTH Antenna & LNB	01
DTH Receiver	01	LCD Monitor	01
SIT Computer	01	Video Cammera	01
Cordless Microphone	01	GPS	01
UPS	01	Battery Bank	01
Alternator	01	-	

5.3. Technologies on board MeLT

Edusat (Educational Satellite launched by India) and VSAT connectivity,			
Direct to Home connectivity	Multi-Media Drive (MMD)		
Local Server and LAN	Local Server and WLAN		
CD/DVD	Internet and Mobile Modem/ WLL/ WiMax		

6. Future directions

The immediate future scope is to assess the viability of this approach full scale for the entire country and to come up with a Detailed Project Report for the purpose. As a part of this project we would be assessing the impact of the delivery of the e-content on the students and teachers and to suitably amend the same to suit the local needs through an Impact Assessment Survey which is an important dimension of this project. Behavioral response among the students to check if MeLTs are able to fulfill the learning needs would be an important area of study. MeLTs could become mobile study centers for distance learning and provide certifications at door step. Based on our initial survey we have found that there is a great dearth of e-content. We would like to access best practices being used in delivery and standardization of e-learning in other parts of the world and we consider LINC as an opportune platform. We may in future be setting up of e content development centre. Another possibility could be to verify the feasibility of mobile community FM based e-learning platforms. It is felt that there would be a need to add virtual laboratory tools on MeLTs for the purpose of extending the reach and availability.

7. Conclusion:

This paper has presented the responses and our analysis of the Need Assessment Survey for deployment of MeLT's. Further, it has described the idea of MeLTs and the technological design aspects and systems of e-content delivery available on MeLT. It can be seen that MeLTs are expected to be a universal platform for delivery of e-contents through 11 different modes. We are in the process of deploying these MeLTs (12 to begin with) shortly in 6 states of north India. MeLTs are expected to make effective use and delivery of the educational content via the TV channels that have been launched by the government. Ultimately we hope to use technology to assist the available manpower in these institutions as in any case technological pedagogical model would not be a continuingly motivating mode which a physical teacher can be. So as a part of MeLTs we shall constantly endeavor to enable the trainer. By providing a platform we may be able to gain expertise/ help the experts to build better linkages for better, e-contents and delivery modes.
The MIT LINC 2010 Conference Parallel Presentations

Session #11:

Research Studies Examining the Nature of Online Learning



Measuring User Satisfaction in an Integrated E-Learning Environment

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Abstract

E-Learning is a dynamically-evolving process that thrives on enhanced advances in ITbased systems of relevance. In turn, it becomes important for higher education institutions to employ such systems in an integrated manner. The need is perhaps even more so for institutions adopting blended learning as a mode of delivery of the learning process. In this paper, we describe the main components of need to mount an efficiently functional Learning Management System which constitutes the backbone of an E-Learning system. We also propose performance indicators for measuring the efficiency of such a system. The case is then illustrated via application to institutional practice at the Arab Open University-Kingdom of Saudi Arabia (AOU-KSA) as the Branch is the largest AOU institutional Branch.

Introduction

In developing a functional Learning Management System (LMS), it is inherently important to keep the interests of three particular groups of users in mind: students, faculty, and the institution's management/administration. In a university environment, the LMS is obviously intended to serve academic as well as administrative goals and objectives.

E-Learning, on the other hand, is a catch-all term that covers a wide range of IT and technology-based resources, especially electronic ones that are inherently intended to support and/or enhance learning. These may include CD-ROMs, DVDs, multimedia facilities, a local area network (LAN) as an Intranet service carrier, or the Internet itself. E-Learning is presumed to provide a learning process that is free from time and place constraints.

LMS is the infrastructure on which e-learning can be built and delivered [1]. It is all about integrating teaching and learning. In general, specific functions desired in an LMS include: course development, content management, course/curriculum management, course delivery, assessment skills, communication (individual and group), tracking /reporting, tutor support; etc.

Establishing a Learning Management System

In designing an efficient LMS, it is usually useful to recall the desired typical features [2] of an LMS that enable it to accomplish a number of tasks, including:

- Course management; list of courses, registration, credit info and syllabus, prerequisites
- Teaching material; courseware
- Self-assessment quizzes
- Lessons tools
- Asynchronous communication: email, forums
- · Synchronous communication: chat, whiteboard, teleconferencing
- Student tools: Home page, self tests, bookmarks, etc.
- Student management tools: progress tracking, online homework submission, etc.

A Learning Management System (LMS) refers, in essence, to a suite of functionalities designed to deliver, track, report on and manage learning content, learner progress and learner interactions.

Fortunately, many open source software application packages are available to support the implementation of LMS. They include Moodle, A Tutor, etc. At the AOU, Moodle was chosen as the platform upon which the erection of the LMS stands, maily due to the fact that it is an efficient open source. This latter platform permits the use of Web 2.0 rather easily. Web 2.0, it should be mentioned, is applications-oriented, in contrast to Web 1.0 which is rather static. Subsequently, the AOU LMS was designed using the Moodle platform. It is currently in operation at the AOU-KSA. All the functionalities of the system described herein are also operational as parts of the integrated LMS. They are thus referred to in our evaluation of the system by the different constituents of users.

When embarking on the design of the LMS, one of the begging questions is whether it is more economical and more efficient to design each sub-system as a stand-alone system. At the Arab Open University-Kingdom of Saudi Arabia (AOU-KSA), it was decided that the design of an integrated system would be more practical for user access.

The main goals of the LMS should be to make more efficient and more effective the delivery of the learning process, the management of institutional operations, the offering of student services, and the linkage to external communities of interest.

The AOU-KSA Learning Management System

The Learning Management System (LMS) employed at the Arab Open University-Kingdom of Saudi Arabia (AOU-KSA) is an integrated platform of four main subsystems. It is therefore collectively called an Integrated LMS (ILMS).

The AOU e-Learning Platform is meant to serve core user segments including the students, the academic staff, as well as the other types of users who are considered stakeholders in the mission of the institution such as parents, quality assurance staff, teaching staff, accreditation bodies as well as other types of external users.

The e-Learning Platform consists of four main systems. These are the Student Information System (SIS), Learning Management System (LMS), Content Management System (CMS), and the Student Support System (SSS). All are based on open source technologies. They are designed utilizing the Moodle platform.

Student Information System (SIS)

The first system in the e-Learning ILMS platform is a necessary tool that facilitates student admission, profiling, curriculum management, enrollment and billing, posting grades and procuring transcripts, notification services, course packages inventory as well as many other services.

Base LMS

The second system in the e-Learning Platform, the LMS, will include a wide spectrum of services ranging from learning community management to courses and learning content creation, management of learning activities (exams, workshops, lessons, exercises, etc.), and computer-mediated communication (chat, dialogue, forums, short messages, etc.).

Base CMS

The third system in the e-Learning Platform is a full-featured CMS to be used for managing various contents and particularly the university website, bulletin boards, online newsletters, electronic content repositories, and so on. The system allows advertising management, content display scheduling and syndication, search engine as well as other services including polls, voting, rating, user profiles, forums, media galleries, document managers, and events calendar.

Student Support System (SSS)

The SSS is a customer relation management system based on the well-known SugarCRM. The system is used mainly to track student inquires. Via this facility, students also can lodge complaints or make suggestions for improving institutional operational aspects.

Copy Catch for combating plagiarism

With the expanding resources of the Internet and technology, in general, plagiarism has become a serious issue for all types of academic institutions, traditional, open, or distance. Plagiarism is a very serious issue when it occurs. In order to combat this issue, the AOU-KSA has recently taken certain concrete steps in this regard that are aimed at combating the issue of plagiarism. An innovative Student Honor Code, together with prescribed sanctions for a misconduct of committing plagiarism has been adopted as part of the academic rules and regulations of operation. Sanctions range from an assignment of a grade of zero for the concerned Tutor Marked Assignment (TMA) to as far as assigning a failing grade in the course; the latter action may come as a consequence of multiple occurrences of such misconduct. In addition, the institution has introduced a proprietary software package, called 'Copy Catch'' which is designed to help tutors detect such unfortunate acts of dishonesty. It is hoped that these actions combined will serve as

deterrents that bring the problem under control. This latter software package operates as an integral part of the LMS.

Establishing System Evaluation Measures

In designing a set of criteria for the evaluation of LMS performance, it is important to reiterate system use as a main tool of support for the delivery of the learning process, especially in an e-learning environment. Depending on the breadth of design of the LMS, it may even be viewed as synonymous with the E-Learning platform itself. In turn, we review certain measures that are used in the evaluation of E-Learning systems in general and other measures directed at LMS in particular. We then propose a set of criteria that is suitable for application in a blended e-learning environment such as the one prevailing at the Arab Open University (AOU).

It is perhaps instructive to point out that E-Learning was originally conceptualized for employment in the realm of training of human resources in the business environment. However, the concept made its way slowly into the platforms of learning processes as part of higher education. In general, these systems are typically dynamically changing systems, partly due to internal changes in rules and regulations of institutional operation, and partly due to changes in the technology, including the software technology.

When applying E-Learning for training, the traditional method of evaluation of system effectiveness has been based on the concept of returns on investment (ROI) [3] since E-Learning was, in its early stages, limited to training rather than employment in higher education. This method depends essentially on identifying data collection instruments, and subsequently invokes five levels of investigation that deal with the probing of trainee's reaction to the program of training, what they have learnt, whether the learning has caused a shift in behavior, and whether the results have cast themselves into positive effects on the company. The fifth level of investigation is the most serious as it deals with return on investment in the sense of accrued financial benefits to the company as a result of the training program. In an educational environment, one obviously has to recast these methodologies in lines of investigation that are applicable to and meaningful in this latter environment. In our search for meaningful LMS evaluation criteria, we deliberated over this method, and concluded that its utilization would be of limited benefit in an academic environment.

Instead, we opted for measuring the user satisfaction in order to gain insight into the effectiveness of the employed LMS.

Measuring User Satisfaction at the AOU

A. Evaluation criteria for LMS

In invoking a meaningful set of criteria for evaluating and measuring user satisfaction, it seems that the following indicators provide helpful measures for said purpose [1].

- 1. Instructional competence; system should be built on a strong pedagogical foundation
- 2. Ease of access and use; system should user-friendly
- 3. Scalability; system should meet growth in increased instruction capacity/bandwidth and user volume
- 4. Administrative capability; system should include certain primary functions such as registration, tracking, curriculum management and feedback mechanism
- 5. Compatibility and interoperability; system can be integrated well with third party content providers and multiple vendors; and complies with open industry standards (SCORM, IEEE; etc.); and, has the capability to integrate future trends such as reusable learning objects
- 6. High availability and product stability/reliability; to run 24x7 reliably
- 7. Security; system selectively controls access

B. Survey results

Our surveys focused on four primary entities of users: students, tutors, the IT Group, and the IT System Administrator. In this section, we reflect their opinions as system users. The posed questions contained in the surveys reflect the seven items of criteria described in part (A) of this section. The questions posed to the IT team were presented to them as both designers and daily user of the system.

The IT Administrator and his IT Group think, and perhaps rightly so, that an integrated system may suffer with regard to system security and reliability as one malfunction may end up affecting other components of the system. On the other hand, the integrated system supports the generation of comprehensive, holistic reports more easily. Furthermore, web content authoring needs to be added to the system as another important function.

The proprietary software, Copy Catch, intended for screening and combating plagiarism has been incorporated into the LMS as an integral part. Though experience with this software is still brief, it is, nevertheless, hoped that it will work effectively both as a screening mechanism and as a deterrent.

In order to assess user satisfaction on a rather large scale, we designed a special survey form that we posted online for students and tutors. By design, we used the same form for both groups of targeted users. We used a five-point scale for rating the responses; five being highest (excellent situation), and one being lowest (poor situation). We realize that it is hard to decide what the acceptable rate should be. We also recognize that the acceptable rate should be tied to the question posed. Keeping this in mind, we thus make a brief presentation of the results emanating from said survey. On average, ratings made by the tutors were higher than those made by students. Ease of system access and navigation ranked highest with both groups, at about 3.9 by the tutors, and 3.4 by students. System reliability (i.e., continuity of availability) also ranked reasonably high,

at 3.6 by tutors and at 3.3 by students. Regarding system security, the question was posed to the tutors, and not the students. Tutors ranked this feature at 3.7. In responding to another question, both groups see it useful to include practice tests for the courses. This is one of the next initiatives in the plans for system upgrading.

Obviously, a valid question ensues. If we were to assign a grade for the system performance with users, we would put it at B- (B minus). We believe that the LMS has many useful and pleasant features of application, but it seems to require further improvement

Moving ahead; the arrival of learning objects

The next phase of major development includes the introduction of <u>reusable learning</u> objects [4] as part of the LMS.

- A learning objects is defined as "any digital resource that can be used to support learning."
- A learning object is thus a small unit of material, usually prepared in a digital form for use on the Internet. As reusable objects, these units may be reused in a variety of courses as applicable. Thus, providing the units of material online makes it easier for learners and course designers to tap into them.
- Reusable learning resource design can, in turn, be thought of in terms of context, pedagogy, structure and presentation.

With these thoughts in mind, our next mission is underway for building a repository of reusable learning objects to the benefit of a variety of courses and programs of study. We think of the use of learning objects as an interdisciplinary approach to the sharing of knowledge.

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What Happens as Learning during Asynchronous Text-based Discussions In an Online Learning System ?

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Abstract

The purpose of this instrumental case study is to provide further understanding of what happens as learning through the use of asynchronous text-based discussions in an online learning system as one component of a graduate seminar on qualitative research. Synchronous and asynchronous communication has become an essential component in many online learning environments. The correspondence between the students' approaches to learning and their perceptions of the contribution of the online learning system to the quality of their verbal interchanges can provide a better understanding of what happens as learning in the online learning environment. Three sources of data were collected from ten graduate students; a) electronic logs of the students' written interactions in the discussions section of the online learning system, b) student responses to a 60 item survey eliciting judgments and written responses to open-ended questions about their learning experiences in the online learning system, and c) comparisons of student pairs and their perceptions of how they approached their own learning. The results show that the number of messages generated by pairs is not markedly different. All the students agreed that classroom face to face verbal interactions led by the teacher were more important to their content learning than asynchronous online verbal interactions with a peer through the online learning system. Pairs of students with more evidence of engaging in dialogue and discourse had one person in the pair who had deep learning motives and strategies. Although students rated many aspects of the online learning system environment as positive, the actual proportion of academic dialogue and discourse produced by at least two of the five pairs did not correspond to the positive stance of all students toward the online learning system's contribution to learning.

Purpose.

The purpose of this study is to understand how the quality of students' verbal interchanges corresponds to their perceptions of the contribution of an asynchronous communication (messaging) system (which is part of an online course management system and learning environment) to their learning and their approaches to learning? The online course management system and learning environment used in this study is the commercial Blackboard Learning System, which is informally referred to as (WebCT) by faculty, staff and students, probably due to the popularity of (WebCT) as an online system used by the university before the purchase its purchase by Blackboard. The Blackboard learning system offers different course tools for the students as well as instructor tools to manage the course. Among the tools offered to students there are tools for checking announcements, checking the course calendar, following a threadeddiscussion or communicating through email. This instrumental case study [1] attempts to provide further understanding of what happens as learning through the use of the online asynchronous communication (messaging) offered as a tool in the online learning environment as one component of a graduate seminar on qualitative research. It is noteworthy to mention that the course management system and learning environment are offered by the university to all students as the online platform for all undergraduate and graduate courses.

Perspectives.

Web-based courses are numerous and allow students to perform various learning activities in a virtual classroom [2], including reading, messaging, conferencing, accessing documents, and participating in interactive activities [3]. Synchronous and asynchronous communication has become an essential component in many online learning environments. In these environments, language is used to communicate messages. Language serves as a psychological tool to mediate

higher order thinking through social interaction [4-6], and knowledge evolves through a process of negotiation within a discourse community [7, 8]. Asynchronous online discussions are now widely used as a substitute for, or complement to, courses designed to promote students' active learning[9]. In asynchronous electronic discussion groups, the "interaction in the group is very task-oriented, stays task-oriented and reflects high phases in knowledge construction" [10].

Merrill [11] identified 4 major principles for the design of technology learning environments which enable active learning to occur: (a) learners are solving real world problems; (b) existing knowledge is activated as a foundation for new knowledge; (c) new knowledge is applied by the learner; and (d) new knowledge is integrated into the learner's world. For active learning to occur during asynchronous on line discussions, students must engage in dialogue which in turn leads to the production of academic discourse. Discourse is both oral and written [12, 13]. It is oral and written conversation of text quality [14]. It is this text quality which represents evidence of relating concepts and ideas in a cohesive manner. In the threaded discussion component used for exchanging messages in the form of a discussion in the online learning system, discourse is generated across many messages rather than in one message during all the weeks of a course. Dialogue is embedded in discourses and represents the turn taking of participants in elaborating on a single dominant topic [15]. Sequences of dialogue arise from interactive events where one party initiates a topic and the other responds often with a comment on the initiators' elaborations of the general topic. Strings of interactive events with multiple topics, which are related to each other, create discourse of many forms. Both forms of dialogue and discourse shape the opportunity to learn by creating a social and genre context that differentially mediates content encoding, and creates a climate of cooperative learning that enables progressive thinking about the content which goes beyond each individual's social and academic contributions. Researchers need to first describe how threaded discussion component of the online learning system enables consistent academic dialogue and discourse to arise throughout a course before they can draw reliable inferences about the contributions of their written interactions to types of learning like those described in [11]. In [16], Doig argued that what makes scientific dialogue possible is the nature of the social conditions from which it arises: respect for the point of view of others during conversations, the provision of supporting evidence or reasons for evidence as well as claims, arguments, speculations, predictions, and hypotheses, and the presence of problems that promote uncertainty and have no trite answer. Doig also stipulates that a teacher is needed who plays the role of a weaver of ideas and concepts in order to guide students' verbal interactions as a process into meaningful texts. This raises the question of whether students and researchers perceive what happens as communication on threaded discussion component of the online learning system achieve the ends that Doig portrays as scientific dialogue.

Methods.

This instrumental, single case study [17] seeks to study the issue of how the activity of asynchronous online communication arising during threaded discussions within an online learning system as one component of a graduate seminar promotes students active and deep learning . The boundaries of this case study a graduate seminar course taking place over 13 weeks using the online learning system as one means of promoting student learning in combination with face to face classroom instruction. The reliability and internal validity of case studies largely depend upon the triangulation of multiple sources of data to describe the same phenomenon. The unit of analysis in this study is the quality of the academic verbal interchanges arising among five pairs of graduate students in online discussions within the online learning system. Dialogue is formed by initiation of a message by a member of the pair, response by the other in the form of a message and a comment on a topic raised in the original message. Comments are believed to be different than responses because they elaborate on the sender's major topic and offer the opportunity to generate discourse as defined earlier. Responses without comment may center on the sender's rather than the receiver's problems,

issues, and proposals and preclude the opportunity for discourse to emerge. Survey data was collected to triangulate patterns of dialogue and discourse to students' perceptions of the online learning system's facilitation of student learning through dialogue. Since students worked in pairs to construct dialogue and discourse focused on qualitative research, the assessment of the compatibility of the learning approaches of members of a pair served as an alternative window into what was happening as verbal interchanges and what students perceived to happen during their use of the online learning system to promote their own learning.

Participants.

This study took place in a course where the teacher ratings were significantly above the departmental mean for items assessing the instructional effectiveness. Ten graduate students were enrolled in the course. Of the 10 students, 2 were males and the remainder were women. All students had previously attained a Master's degree in Education, Psychology, Social Work or Health Sciences. Three students were Asian, and 7 were Caucasian. Student academic majors were in psychiatry, social work, learning sciences, special education and general educational psychology. Students engaged in the online learning system discussion tool as a medium for asynchronous online interactions beginning in the fourth week of the course through the 12th week. Participants were required to send each other written messages via the discussion tool provided through the online learning system each week, but were also allowed to seek other alternatives if they found this more efficient. Assignments structured the goals for interchanges between pairs of students. Assignments were of two types: a) to answer a set of questions about the assigned reading material and then post them online (on the online learning system) and discuss those questions deemed to further promote their understanding of the content of the seminar, and b) to share preliminary and polished proposals for a qualitative research study which was the end product for the seminar.

Data Collection.

In this study, we collected three major sources of data: a) electronic logs of the students' written interactions in the discussions section of the online learning system, b) student responses to a 60 item survey eliciting judgments and written responses to open-ended questions about their learning experiences in the online learning system, and c) comparisons of student pairs and their perceptions of how they approached their own learning based on [18].

Data Analysis.

Codes were used to analyze electronic messages of students during the course as dialogues, and sequences of dialogues making up discourse. To determine when discourse occurred in segments of the transcript, it was necessary to initially be identified as a sequence of dialogues. First, the subsuming topic of each dialogue made up of an initiation, response and comment on the response was identified. Then the coder continued to read the message until a new topic arose, or until the dialogue event ended and was followed by a new dialogue or message with a different topic. Each tentatively identified discourse unit was then analyzed to confirm its status as a text, by using the criteria for text cohesion in [19].

Results.

Table 1 shows the codes describing students' verbal interactions on the online learning system in each student pair for the 13-week course. Especially noteworthy are the large differences between pairs in number of academic dialogues produced and in number of discourse quality interactions arising during the course. On the other hand, the number of messages generated by pairs is not markedly different. **Table 2** shows the participation of pairs in the online learning system each week. All pairs participated more actively in the course when they were required to

present their partner's research proposal in the 5th and 6th week of the course. This emphasizes the fact that the nature of the academic assignments influenced the rate of participation in generating messages. The online learning system survey assessing students' perceptions of its contributions to their learning was generally positive. However, all the students agreed that classroom face-to-face verbal interactions led by the teacher were more important to their content learning than asynchronous online verbal interactions with a peer on the online learning system. *Appendix A* provides the voices of students regarding the positive and negative contributions of WebCT to their learning. *Table 3* shows that pairs which participated least and had lower rates of dialogue and discourse were prone to approach learning in terms of motive and strategies at a surface level. Pairs of students with more evidence of engaging in dialogue and discourse had one person in the pair who had deep learning motives and strategies.

Discussion.

In [15], Burbules and Bruce claim that the usefulness of forms of discourse will depend upon: (a) the form of interaction and its relation to context, (b) the activities and relations among participants, (c) differences among the participants themselves, and (d) the subject matter being discussed. The results of this study support the first three claims. Students rated the instruction in the course to be an average of 4.7 on a 5-point Likert scale based on 22 items used to evaluate instruction throughout the university. Therefore, what happened during the verbal interchanges through the online discussion in the online learning system was not based on students being unmotivated by the quality of the course, and this was also reflected in the agreement by all students that classroom face to face discourse contributed more to their academic learning than their verbal interactions with a peer. Although students rated many aspects of the asynchronous discussion component of the online learning system environment as positive, the actual proportion of academic dialogue and discourse produced did not mostly correspond to the positive stance of all students toward the asynchronous discussion's contribution to learning. One reason why student pairs may have varied substantively in their production of academic discourse is that at least one of the pairs did not have a deep approach to learning [20-27]. The teacher's presence as a facilitator of academic verbal interactions appears to be advocated by both deep and surface learners.

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Appendix 1 Student Open Ended Responses to the questionnaire about their experience through the online learning system and their discussion

I find it difficult to focus on the topics and dialogue with my discussion partner.

5- Although we have a different level of experience, the exchange of information was very useful.

5- My partner and I are at the same level in most cases we complemented each others understanding on given topics

5- It is not difficult to focus on the topic, but sometimes to really have a dialogue, because of time, and depth of the topics we are studying.

5- Since we are taking a face 2 face class together, I find it easier and less time consuming to talk to him f-2-f.

5- I understand my partner -the dialogue is clear

5- The lag time between responses is too great to feel like a discussion (there was minimal dialogue).

5- We checked each other's messages regurlarly. Also, we both tried to explain our ideas as clearly as possible it worked.

I find writing down my ideas to prepare for online discussion facilitates my thinking to a higher level.

8- It forces me to reflect upon my ideas. Also, my partner's input to what I have witten provides insights.

8- Preparing answer to the prepared questions was helpful but management and engaging in dialogue was challenging

8- I agree this is true in both the discussion and the exercises from the book.

8- I hope so.

8- I think that for me it was the main help: clarify ideas for someone else to understand, so that I would be more ready for the class discussion.

8- I used them to write my proposal and engage in discussion.

8- I am mostly paraphrasing information I find in books, not applying it much.

8- It helps me to think more about the information than just reading alone

How at the end of the course I value on line discussion.

15- It asks me to be ready for the course as much as possible and then to make the most of the course

15- It is a tool that aids in my understanding and learning.

15- I prefer a face 2 face discussion.

15- It helped me to clarify ideas and concepts

15- It is more relaxed way of getting through the material. I appreciate being with someone I know well and comfortable with.

15- It forces me to be more organized. Also, it resulted in several useful insights. Negative

15-I found that often, it was a perfunctory process, i.e., answer the question for the sake of doing so.

15- It felt superficial. I did not find the exchanges yielded a lot of feedback. It was difficult to

engage in dialogue. I found it frustrating at times.

My discussion partner and I co-regulate our learning in on line discussion.

13- Each of us had areas where we had more knowledge and we are able to correct each others' thinking when we couldn't we looked things up on the net.

13- We can expand on each other's ideas; feedback is an excellent means of co-regulating our learning.

13- For sure, to be obliged to synthesize, clarifies one's ideas for the partner, is helpful in learning.

13- We shared ideas.

13- We always provided each other with valuable insights

On line discussion causes me to verify my thinking more than in class discussion.

18- Online discussion is interesting but in-class discussion and teaching is more important.

18- I do not have the impression it is more than in class.

18- I think the in-class is more stimulating for me because it is with more people, more diverse ideas, and it is in real time.

18- It is impersonal

18- My partner, at least in the beginning, asked questions. In the last weeks, WebCT became a chore. In the weeks prior to the last class, we e-mailed each other outside WebCT because it was a pain to always check the site to see if there was a message

18- In-class discussion is more personal, and ideas can be exchanged more easily. Also, in-class discussion involves the input of more than just two people (and it includes the professor).

18- I think that both are highly useful an in my understanding of learning and learning.

18- Sometimes. (yes, but there is a time constraint).

On line discussion helps me organize ideas for my thesis.

23- I got input from my partner, which was very useful. It forced me to think more about my thesis.

23- The questions we were given to answer in the course.

23- I am able to reflect on the material by writing it down and I appreciate the feedback

23- Only at the beginning of the course where we initiated our proposal draft..

23- It helped me cut my proposal into small parts to be worked at. But this is more due to the course organization

23- It is always a challenging way to manage and understand the subject matter. It is a good way.

23- I have changed ideas so often things sometimes get a little cloudy.

23- I have made several changes already.

23- The questions were not applicable

23- From the perspective of my partner rather than me.

23- I often posted up-dates on my project and the answers I prepared for the questions. Occasionally we would find the same questions confusing and plan to discuss them in class. It definitively felt more like "show and tell" than higher level learning.

On line discussion helps to modify my thinking as I design the research methods for my study Research proposal.

27- Reflecting upon my ideas and getting input helps me come to new realizations.

27-It is difficult to answer because i do find participation in class motivating; however, i do not find the discussions on line very motivating.

27- My partner asks for reasons and clarifications that doesn't come to my mind at first. At least as a beginning researcher.

27- You work in an active way to cope with the subject matter.

27- I find the in-class discussion more helpful

27- When I misunderstand elements and they are clarified then my ideas about my research change.

27- I see where I need to clarify certain points that maybe obvious to me but not to others (such as my research partner).

27- It was the questions we were given to discuss.

27- The dialogue was lacking in my experience.

My discussion partner's inputs are helpful to my design of my research.

38- Because my partner did not know my approach, she asked good questions. However, i could not say that it motivated me to greater heights since I already do my work and always prepare for class.

38- I really learnt a lot for the initial questions of my partner.

38- I want to emphasize that the teaching in the classroom is necessary, but WebCT is a useful tool to cope with all issues discussed in class.

38- I think it is the way the course and questions are designed.

38- Our interests are far away apart . This is the perfect opportunity to work through it.

38- It offers insight or an alternative viewpoint that is refreshing from my own. It is a "constructive feedback" voice.

38- We are the same level of knowledge, this is helpful. We did not use WebCT because mine was not allowing me

to post, but we used email to discuss.

38- I found reading Creswell and writing responses to the exercises facilitated my learning.

(Why not using WebCT)- We used MSN a few times because it occurs in "real-time" which is a bit more satisfying and time efficient; I think time and stress management was a challenge to posting info in time for dialogue; I suspect English as a second language was a perceived barrier to candid discussion.

Information initiated by students

- I wished that WebCT had been used for the partner to come up with a joint project instead of me answering her questions which sometimes were redundant.

- I also found the part about talking about my partner's research difficult and at the end it was seldom requested.

- WebCT is not conducive to a conversation. The formatting of the documents is difficult (e.g., i had to enter my comments in caps to differentiate them from my partner's answers).

-What I would have enjoyed would have been a weekly chat online about the chapter/topic. Then, this is a conversation with back and forth answers.

-I did enjoy the pairing and welcomed my partner's questions. I just did not enjoy the format.

Table 1

	Number of	Number of	Number of	Number of	Number of	Number of
	WebCT	messages	participations	academic	academic	words
	log ins*	for course	in dialogue	dialogues	discourses	generated
Pair 1: A	198	22	15			-
В	166	19	14			
Total			29	7	6	6,331
Pair 2: C	202	18	4			
D	202	8	2			
Total		26	6	2	1	8,493
Pair 3: E						
F	161	10	8			
Total	104	13	20			
		23	28	5	3	7,361
Pair 4: G	251	16	37			
н	254	18	33			
Total		34	70	18	10	30,520
Pair 5: I	155	20	7			
J	170	15	9			
Total		35	16	5	1	6,462

Comparison of Individual and Pairs Quality of Verbai Participation during the Course

Table 2	2
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Participation* from week 4-11 of the course	2
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_	Week	Participation	Participation	Participation	Participation	Participation	Mean
		for Pair 1	for Pair 2	for Pair 3	for Pair 4	for Pair 5	Participation
	4 and 5	0	6	17	42	13	15.6
	6	0	0	1	13	4	3.6
	7	8	0	1	0	0	1.8
	8	17	0	0	8	0	5
	9 and 10	4	0	9	6	0	3.8
	11	0	0	Ó	1	1	0.4
Total		29	6	28	70	18	5.0
* Partic weeks o discuss philoso	ipation refer of the 13 we ion of 4 qual phical and th	is to the frequence ek course. Each litative research beoretical framew	cy of contributio week is devoted approaches and works, week 7 to	ons to on-line di to a different to the developmen o focus the study	scussion by the opic. Weeks 4 ar at of a student re y. week 8 to dat	5 pairs of studer nd 5 were devote search proposal a collection. 9 ar	its for 11 ed to and week 6 to nd10 were
devoted	to ways of	representing and	analyzing qual	itative data and	week 11 to crea	ting a narrative :	report. The
remains	ier of the co	urse was devote	d to off line indi	vidual preparati	ion of the final (qualitative resea	rch proposal

Table 3

	Deep	Deep	Surface	Surface	Achieving	Achieving
	Motive	Strategy	Motive	Strategy	Motive	Strategy
Pair 1: A	÷	+	-	~	0	
в	÷	0¥c	0	+	-	+
Pair 2: C	0	141	-		141	+
D	0	0	-	-	0	
Pair 3: E	÷	0		0		÷.
F	+	- A -	0	+	0	+
Pair 4: G	0	0	-		-	4
н	0	0			1.4	+
Pair 5: I	.0		0	-		+
I	0		0	+	+	

A comparison of the pairs of students approaches to learning on the $\mathrm{SP}\mathcal{Q}^*$

* Note. The Study Process Questionnaire scores are based on the norms provided in Biggs J. (1987) Study Process Questionnaire Manual. Student Approaches to Learning and Studying. Hawthorn, Australia: Australian Council for Educational Research. Scores reflect a normative value of --Well below average, -Below average, 0 Average, - Above average, and +-Well above average. Pairs are judged as incompatible in approach to learning when their scores fall in opposite normative values for 3 of the six categories. Mahwish Waheed International Islamic University <u>mah.wish9@yahoo.com</u>

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Abstract

The expeditious headway in the information and communication technologies has given rise to a new dimension of education, that is, E-Learning. Survey was conducted to find out the impact of "Student", "Instructor", "Course", "Design" and "Technical" factors on student satisfaction. The result of the survey showed that the learner's and instructor's attitude towards EL, their computer efficacy, interface of learning portal, quality of course content and administrative support were main aspects which affected student EL satisfaction.

Empirical Study of Learner Contentment Towards E-Learning: Influential Role of Key Factors

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1. Introduction

The use of information technology these days is considered as a solution for multinational organizations or educational institutions' for their quality issues. The new technology has transformed the learning and instructing method in universities. Online education is a kind of fascinating approach for higher education universities and also for colleges. Both levels can gain competitive advantages from this educational method (Poehlein, 1996). The incredible development of Internet as a prospective course deliverance dais, along with the escalating attention in quality learning and financial limitations, has formed a noteworthy inducement for universities to build up online educational programs. The user-friendly nature of new technology and its availability at wide area has enabled the universities to implement and use the new technology for the growth of educational industry. The universities which are not utilizing technological resource will be left behind in globalization race. Identification and clarification of factors that are main cause of user acceptance towards new technology are very important. It is not the case of implementing same conventional educational paradigm for new technological learning interface. The use of old and passive delivering methodology in universities is not acceptable anymore. In the presence of new technology, the use of old methods for delivering lectures will just escalate financial budgets of institutions (Volery & Lord, 2000). It can be possible that with the use of new technology in courses raises questions of pedagogical content aptness,

¹ My hearty gratitude for my parents, Waheed and Naseem, my sisters, Faiqa and Kokab, my brothers, Waseem and Kaleem, and to my friend Ghazala.

technical facility, student dissatisfaction and craze. On the other hand, proper implementation of new technology can lead towards succeeding uptake of implemented technology. In the era of 80s the use of website, online chat session and shared white boards for educational purposes were considered as the helping tools for successful acceptance of web-based learning (WBL) environment. But now it is proved that proper implementation of these and many other media tools for web-based education will increase its acceptance rate among students and teachers (Weller, Pegler, & Mason, 2005).

1980 was the era when the internet boom came; it was also the time when universities were considering developing web-based educational programs. With the passage of time student's perspective about using computers for educational purpose is changing drastically. The new innovations in networks and software have raised the questions of effectiveness and use of these innovations for educational purpose. The storm of technology has changed the educational landscape with the use of WBL (Willging & Johnson, 2004). The concept of distance education is very old and famous concept. The target audience of this concept was the students living in distant areas and unable to reach the campus due to geographical remoteness problem (Volery & Lord, 2000).

1.1. Electronic Learning

The concept of Electronic learning (EL) has changed the student's learning and teacher's instructing methods. This is the information age and EL has emerged as a new interactive environment. The efforts in the field of EL are receiving colossal interest around the globe. Use of new interactive technology for delivering lectures and training sessions relate with the notion of EL. The expeditious headway in the information and communication technologies has born a new way of education that is EL. The EL paradigm in current era is very essential for educational institutions. Students and instructors; who are using this interactive Electronic Learning environment (ELE), have the advantage of all time interaction with each other. Moreover, they have the flexibility of time and space in using this online environment (Katz, 2000; Katz, 2002; Trentin, 1997). The characteristics of EL are enough to compete with the modern educational society and that is the reason of EL demand from higher educational institutions and multinational organizations. The major example of EL implementation is Massachusetts Institute of Technology (MIT) well known university in USA. MIT is offering its programs both in face to face (F-F) and in online mode, and trying to convince other institutions about strategic significance of EL (Wu, Tsai,Chen, & Wu, 2006).

The concept of EL is not a new thing; it has been in use for decades. The development of EL technology is the most momentous evolvement of information and communication technologies (ICT) (Wang, 2003). In this information age EL has emerged as a new learning environment. Due to the tremendous growth in ICT, EL is growing as a new pattern to deliver information in the educational area and is receiving enormous attention around the globe.

The term EL is referred to methodology using any electronic media either intranet or hyper media documents. The term EL is not only well-known in developing countries but also very trendy in developed countries (Anderson, 2005). If we enter the word E Learning in search engine, there would be millions of hits against this word. The EL concept is depicted with several tantamount, like flexible internet environment, distributed computing, virtual learning environment and general distance learning etc. The use of different words is according to the context in which they are used (Davoud, 2006). Literature explains and defines the word of EL in many different ways. There are so many synonymous of EL like, open-courseware, advanced distributed learning (ADL), internet based learning (IBL), webbased learning (WBL), e-education (E-E), open-learning (OL), virtual education (VE), virtual learning environment (VLE) (Govindasamy, 2002). Implementing new paradigm for any sector is a very difficult and challenging, but with the use of Web Technologies and efficient utilization of ICT these challenges can be handled.

In educational scenario EL is for improving learning and instructing experiences and used as a tool to instruct learners without any instructor using any form of new digital medium or via taking advantage of any ICT source (Laurillard, 2004). For the purpose of enriching educational system higher education sector is seriously considering towards the implementation of online education (Arabasz & Baker, 2003).

The use of online education is now essential for higher education institutions and they are considering and accepting this fact in order to compete with other organizations and for meeting financial stability. The other reason of implementing this new learning paradigm in educational institutions by higher education officials is for enhancing

students learning experiences and for the improved learning outcomes and abilities. All the conventional universities should have a flexible institutional structure to integrate new technology in their setup for the better and improved learning outcomes (Al-Doub, Goodwin, & Al-Hunaiyyan, 2008).

There are two aspects of EL that are important for the strengthening of EL concept. The first aspect is total reliance on availability of technological resources and the other is personal learning thirst. These aspects can uptake EL effectiveness in a better form. The second aspect infers that the learner surmises responsibility for stipulating personal erudition desires, aims and upshot, arranging and systematizing the educational task, assessing its value and construct meaning from it. In online educational mode internet is the essential part. The availability of learning resources for students every time and at every place is very effective thing. The facilitation of exchange of information and mutual working between learners and academicians, the evaluation of single student or group of students, and the provision of directorial and learner support all of these are the positive advantages of EL. The anytime, anyplace, anywhere concept of online education is very useful for students in far away areas who can easily access course material (Volery & Lord, 2000).

1.2 Distance Education Vs Online Education

ICT is emerging as a new challenge for higher education institutions. The globalization trends, higher management and economy are strongly influenced by new technologies, and they have the potential to change the nature of learning environment, both in traditional and distance education institutions. The ICT has changed the educational trends in distance education system and emerged with new source of information delivery named EL. ICT as such can be referred to the new generation of distance education.

We cannot say that distance education is the same as ELearning or online education. According to Guri-Rosenblit (2005) there are three generations of distance education explained in his classic analysis. The correspondence teaching comes in first generation when students are able to interact with teachers directly without using any new technology. With the advancement in technology the concept of multimedia teaching emerged and it is referred as second generation. In this generation use of video tapes, audio recording and broadcast media is used for delivering lectures. The third generation is based on interactive EL methodology. These methodologies are used with different words, I-Camp, Tele-Matrics Environment, Computer Mediated Communication, Borderless Education, Interactive Communication, and Distributed Learning.

Most people confuse distance education with EL or online education. We can say that online education is the generation of distance education or this is the advanced technological form of distance education. There is a clear difference among distance education and EL. In distance education students are provided with study material and they have to study them self, there is not regular one-to one interaction with teacher; this can be referred as asynchronous medium. While in online case, there is online interactive session between learner and instructor, either regularly or on periodical basis. This medium is referred to synchronous way of delivery.

The enhanced form of distance education i.e EL; provides the facility of interactive online lectures and complete interaction between learner and instructor. Mostly users are resistant in using new technology like multimedia presentations, interactive sessions because of lack of computer efficacy and internet knowledge. This case is applied on developing countries where inadequate resource availability creates hurdles in using new technology. On the other hand, in developed countries like United States of America, where there is enough resources availability and mostly education is delivered via internet (Guri-Rosenblit, 2005).

2. Literature Review

In 1980s the need was felt to explore the factors that are important for the success and growth of organizations. It was the time when significance of influencing factors in the EL area was first considered by the organizations and included in the body of literature. Organizations were keen to know about the key areas which could be enhanced and would provide competitive achievement, comparing with other organizations (Ingram, Biermann, Cannon, Neil, & Waddle, 2000).

2.1. Prior Studies of EL

A study was conducted in West Texas A&M university on 15 MBA graduate courses offered in a span of three years. The courses were offered, both in face to face and in online environment. The same teachers were teaching in both environments. It was noticed that student enrollment in online education system was high as compared to the conventional face to face system. However, the attrition was also high in online system (Willging & Johnson, 2004).

Being based on an empiric study involving university students Volery (2000) had suggested a framework which appeared in outlines for the critical success factors in the on-line education, concentrating on three aspects in the EL. You connect technology (comfort of use and navigation, design and height of the dealings); the teacher (setting towards students, teacher technological capability and classroom dealings); and the prior use of the technology or student earlier computer familiarity (Volery, 2000).

Soong, Chan, Chua and Loah (2001) had conducted several case studies and at last established that the EL vital success agents were: human factor, technological ability of both teacher and learner, EL approach of the student as well as teacher, echelon of the relationship, teamwork and communication. Seven important success factors for the successful implementation of EL environment were discussed by Govindasamy (2002) those were: institutional support, course improvement, instructing method & learning, course formation, learner support, faculty support, assessment and consideration. Selim (2007) had conducted a study and proved that there were eight agents that were responsible for the success of EL environment. Selim concluded that according to the student's perspective there were three areas required for successful web-based learning: trainer factor (approach towards and command of technology and instructing style), learner characteristics (computer proficiency, interactive teamwork, EL course material and interface) technology (alleviation of access and technical facilities) and support.

Theoretical Framework

To accomplish this study, a theoretical model is designed based on the previous research. In total, six variables are discussed; five are independent variables, namely, student factor, instructor factor, course factor, design and technical factor. The student satisfaction is discussed as a dependent variable. In later section hypotheses for testing each variable relationship with dependent variable is also proposed and supported via literature.



2.2. Variable and Hypothesis

As shown in the theoretical model, there are five independent variables and one dependent variable. Each variable is considered as a separate factor that is influencing student's EL satisfaction which is my dependent variable. There are five factors which are responsible for student satisfaction towards online education. Each factor has its own sub attributes or qualities that are collectively affecting dependent variable. Each variable's sub-attribute is discussed. In total five hypotheses are proposed to prove the relationship of each variable separately with dependent variable.

Student Factor. The first factor is the student himself. Satisfaction of student from EL or online education is based on the student's attitude towards information and communication technologies (Arbaugh, 2002; Arbaugh & Duray, 2002). If the student has positive perspective about EL, then he would definitely participate in an online course environment effectively. EL needs student proficiency in computers. The results will be quite effective when student shows positive attitude towards computers (Piccoli et al., 2001).

For scheming successful EL surroundings, Liaw (2003) indicated three considerations: Student's individuality, instructor's way of coaching and dealings. Considering the target population in establishing ELE is very important. It is obvious that the target population in ELE is the learners. First, beginner's qualities, like settings, motivation, faith, and trust must be identified. As for educational structure, the multimedia coaching method allows students to build up multifaceted perceptive skills, such as comprehending essential fundamentals of conceptual intricacy, capability to use obtained thoughts for analysis and presumption and capability to implement conceptual understanding to novel circumstances with suppleness. Finally, EL surroundings offer group communication, like beginner to beginners, or beginners to teachers. Group communication is a sort of mutual wisdom that facilitates learners to step forward through their region of proximal progress by the actions in which they are employed. When students boost their relations with coach and other students, they in turn lift up their probability of constructing their own understanding for the reason that much of learning certainly takes place inside a societal circumstance, and the course consists of the shared building of understanding (Liaw, Huang, & Chen, 2007).

We can't refer computer efficacy as simple efficacy, because it is a different type of efficacy. To define computer self- efficacy, wood and Bandura (1989) had explained the meaning in one simple sentence, belief in one's ability to ''mobilize the motivation, cognitive resources, and courses of action needed to meet given situational demands''. So it is clear from previous definition that it is thinking and ability of a person to use the computer in his own manner. Bandura (1986) said that this thinking leaves strong impact on the selection of behaviors, the amount of endeavor used for that purpose and the determination to fulfill that job. As a result the individuals who are less confident about their computer efficacy and determination to seek the work goal are not able to perform the task in a proper manner.

Satisfaction of student from EL is very much influenced from computer anxiety (Piccoli et al., 2001). In ELE, computer is the main part and the student who is reluctant in using computer and feels anxiety will definitely negatively influence student satisfaction. The term computer anxiety mostly refers to the fear of computer, when individual keeps thinking that he can not work on computer and the probability of accomplishing the task on computer is less (Chua, Chen, & Wong, 1999). Computer anxiety is not the same as computer attitude towards computer. One must not confuse this concept that an individual's personal's emotional reaction towards using computer and attitude towards computer is the same. According to Kanfer and Heggestad (1997), when a participant has negative feeling along with the high computer anxiety then the result of task performance must be very poor. When a person is feeling anxiety to work in particular IT environment then obviously his satisfaction with that environment will be less. The computer self-efficacy is comprised of four main beliefs: the prior experience in the field of computers, general observation on the basis of other's experience, the know-how of terminologies used in IT industry and at last the positive arousal to use and understand the computer system. Therefore, these four main factors are the cause of increasing or decreasing computer anxiety. According to the context explained above about computer anxiety and computer efficacy, there is a strong association between computer self-efficacy and computer anxiety and the behaviors related with computers (Barbeite & Weiss, 2004). All of the above discussed attributes i.e. student's attitude towards EL, learner computer efficacy and anxiety and interaction among students are included in student factor variable. On the basis of these attributes hypothesis 1 is proposed which says,

Hypothesis 1. Student factor is positively related to students' Electronic Learning satisfaction.

Instructor Factors. The instructor is the second factor that is contributing towards students' satisfaction of EL. The successful implementation of online education is purely based on the teacher's attitude towards EL. Attitude towards Information and communication technologies is not the only factor that is influencing successful EL implementation. It's the teacher who plays a vital role; his way of instruction affects the student's attitude towards course and readings (Collis, 1995; Willis, 1994). Mostly, the students' satisfaction and acceptance of online education is influenced by the teacher's teaching style, his attitude towards delivering lectures in friendly manner, and providing quality content (Webster & Hackley, 1997). The behavior of instructor is shown through his dealings and approach and these attitudes can have significant impact on the learner's attitude towards EL environment (Piccoli et al., 2001).

In a study by Volery and Lord (2000) it has been shown that instructor friendly behavior with students, understandability of students' problems, proper understanding of IT, and persuasion of interaction between students is the factors that lead towards students' satisfaction. Liaw, Huang, and Chen (2007) explains that when teachers are more interested in the use of new EL technology then it is obvious that they have more constructive behavioral intent to use that. If the individuals have positive attitude towards using new technology then the implementation and success of new technology is not a big issue.

It's not the issue of technology implementation, it's the teacher instruction method that plays a vital role in the successful implementation of EL technology and also affects learners' satisfaction in this new environment (Collis, 1995; Volery & Lord, 2000). The effectiveness of online system is strongly based on the instructor's attitude, dealings with students and perception about new technology and all of these attributes are tapped in one instructor variable.

Hypothesis 2: Instructor factor influence positively on students' Electronic Learning satisfaction.

Course Factors. Course is the third factor affecting student's satisfaction. EL has removed the barrier of physical class attendance. The most attractive feature of EL according to students and teachers, both is its flexibility of location and time. Commuting was the main problem for students in traditional classes. EL came with new virtual (any where, any time, any place) class concept (Arbaugh, 2000). This is more attractive for the people who are on job and want to continue their education. The flexible nature of ELE increases learner's satisfaction (Arbaugh & Duray, 2002).

The flexible nature of the course helps the group of students to interact with each other from different and distant parts of the country. The relational intimacy becomes more in online environment as compared to face to face learning. Time independence and flexibility in the course helps the students to communicate according to their flexible time and place. It is also noted that the range of the faculty, speakers and students is becoming vast day by day due to avoiding the time and place barriers. The major advantage of the flexibility of the course is for the students who want to get higher education but in previous times, was not able to pursue. Now the course flexibility has made the impossible dream of competent students a real happening (Arbaugh, 2002).

When considering implementation of any new environment, the level of quality comes first. Quality of course content is the most important attribute that leads towards student's satisfaction and successful implementation of EL. The quality of well-made EL course contents is the most important and essential factor especially for the students who want to learn something from the course instead of getting degree only. Quality of course content makes a very strong influence on the satisfaction level of students who are studying in EL environment and also for the students who are encouraged to take this mode of study. The multimedia presentations, the new advancement of information and communication technologies make a constructive learning model for the students. The uniqueness of virtual learning environment includes, the online discussion forums, chat sessions among learners and instructors, presentations of course material and other useful material from the universities covering that particular topic, all of these characteristics motivate the students to continue using this learning environment (Piccoli et al., 2001). The course flexibility and content quality are the two attributes of course factor and thus hypothesized as,

Hypothesis 3: Course factor is positively related to students' Electronic Learning satisfaction.

Design Factors. The fifth factor is the design or interface of web-portal. Interface of the EL system

significantly influences student's satisfaction of EL. Students' adoption of EL system is influenced by PU and PEOU. The user friendly interface of the online course will affect student's satisfaction. The easy going interface of online course will attract the student to take class via internet, when he already has the time and place flexibility. The student's positive attitude towards interface of the online environment will automatically increase the chances of taking classes via internet in future. The result of user friendly interface will directly influence student's satisfaction of EL. Apart from all other factors in EL environment, interface quality or design of the online portal is very decisive factor. Moving back in the literature shows that the interface design is related with two aspects for which highly technical and creative skills are needed. There is a strong fusion between these two extremes and these skills have the important scopes like user-friendly navigations; look and feel of interface and functionality of portal (Volery & Lord, 2000). There are students who want to use online mode for their studies but they report that the quality and interface of the online portal is not very easy to use and efficient, like a sample response from respondent; I want to take the classes in online mode but the interface of the online portal was very unproductive and ineffective. Moreover, the online course material was not that much useful. Another response from a student; in my opinion, class was very useful and knowledge seeking but the navigations was not user-friendly (Lord, 2000).

Davis (1989) had also perceived in his study that the efficient utilization of technology made the attitude of learner or individual more positive. The thinking of an individual that a particular technology use could give him benefit at some level, then his performance regarding using that technology were enhanced. If a new technology is easy to use and gives positive results then obviously the probability of success is more. The PU and PEOU are two behavioral intentions of an individual that have strong influence on the satisfaction level and student's attitude towards EL. Design and interface of EL system, PU and PEOU are the attributes included in design factor and hypothesis is proposed.

Hypothesis 4: Electronic Learning satisfaction of students is positively influenced by design factor.

Technical Factors. Quality of the system that includes proper maintenance of software and hardware recourses plays an essential role in the satisfaction of students of EL. The worth of the system settles excellence of information and system, these concepts are essential for the victory of information system in this global world (DeLone & McLean, 1992). The important technical aspects that need to be considered for successful EL environment are the quality, media richness and reliability of technology. The quality of internet is essential for both the synchronous and asynchronous delivery system along with the access of material any time with any server problem. The students with unavailability of computer or internet access feel reluctance, like a response from student that's; it's hard for me to find computer for taking classes, therefore I feel that I can't study on computer. The irritation with technological problems may also be disguising more basic foundation of frustration. When proper assistance is available for the use of ELE, the reluctance level will become low. Proper availability of technical resource and administrative support positively influence student's satisfaction towards ELE (Liaw, Huang, & Chen, 2007).

Attributes of technical factor are better quality of internet, proper availability of technical assistance and quality of online program; on the basis of these attributes hypothesis is proposed,

Hypothesis 5: Technical factor is positively related to students' EL satisfaction.

3. Research Methodology

The procedure of collecting data, the targeted population and focused sample is discussed. To find the results of hypotheses multiple linear regression is applied.

3.1. Data Collection and Sample

Quantitative research technique has been used in this study. Survey was conducted to collect primary data and to prove the hypotheses. Questioner was used as an instrument for data collection.

Population. The population of this study was the students, but specifically the students who were enrolled in the online learning courses. As this study was measuring the graduate and master level student's satisfaction that was enrolled in online learning environment, so only the specific online students were contacted to fill the questionnaires.

The sample was taken from the students of three semesters; who were enrolled in spring 2008, autumn, 2008 and spring 2009 sessions. The targeted area for conducting research was Allama Iqbal Open University. The completed received questionnaires were 350, but from 350, 276 questionnaires were filled correctly. There were four departments (Management science department, English department, Computer department, French, PGD (Post Graduate Diploma)) in university that were completely utilizing the online learning facility, while a program of PGD was also offered by computer department in online mode. The final N=276 sample size comprise of the students who had filled the forms voluntarily. The web survey in the form of questioner is available in Appendix for reference and giving the idea of questions asked from students.

Instrument. Questioner was used as a survey instrument. All the respondents were asked to mark only one option from Likert scales. The female respondents of the survey sample was 30 % (N=83) from the total sample, while the male respondents from the total sample was 70 % (N= 193). For each variable there was different number of items, and all were measured on 5 point Likert scale.

Measures

All the items were measured on five-point likert scale. The 1 is referring to strongly agree, 2 is used for agree, 3 is showing neutral response, disagreement of students was measured at 4 scale and at last strong disagreement was measured at 5. All the measures were extracted from reliable source and reliability of each variable item is also measured and explained in Table 1.

Variables	Cronbach's Alpha	N of Items	Scale Extracted From
Student satisfaction	.705	3	Arbaugh (2000)
Student factor	.807	10	Webster and Hackley (1997)
Instructor factor	.710	5	Volery and Lord (2000)
Design Factor	.731	4	Arbaugh (2000).
Course factor	.743	5	Soong, Chan, Chua, and Loh (2001)
Technical Factors	.684	4	Amoroso and Cheney (1991)

Table 1. Reliability Statistics scale Extraction

3.2. Control variables

To check the impact of demographic variables on dependent variable one-way ANOVA was applied. There were five demographic variables. Table 2 is showing their significance level.

Table 2. Significance value of Demographic variable

Demographic Variables	Sig.
Gender	.966
Age	.798
Program Enrolled	.709
Student Initial Computer Skills	.000
Student experience of E-Learning environment	.000

After applying one-way ANOVA the variable with P value less or more then .05 or .01 was showing its significance level. Dummy variables are created for student initial computer skills and Student experience of ELE. At the stage of data analysis, these dummy variables were used with independent variables. In this study SPSS version 15 was used for the arithmetic analysis of data. (SPSS) is well-known and authenticated software used for testing the collected

data from different scenarios by statistician and researchers. Data is examined using proper regression analysis steps. Total of 11 variables were used, Student EL satisfaction as dependent and all the other were used as independent variable.

4. Results

4.1. Descriptive Statistics and Bivariate Correlation

The Table 3 in Appendix shows the descriptive statistics of all the demographic and interaction variables. The descriptive statistics shows the mean, Standard deviation for each variable. Table is also showing the correlation between independent and dependent variable separately. The correlation result shows the accepting or rejecting of hypothesis.

4.2 Regression Analysis

In order to find the effects mentioned in each hypothesis concerning the student EL satisfaction, multiple linear regression was applied via using the interaction and dummy variables. Table4. Regression Analysis in Appendix

Hypothesis 1. Student factor is positively related to students' Electronic Learning satisfaction.

The results of the regression analysis revealed that student factor was significantly associated with the student EL satisfaction (β = .41, p<.001) and shows the high significance level. Student factor was accounted for 4.7% variance ($\Delta R2 = .047$) in student EL satisfaction. The results of regression for student factor was strongly supporting the first hypothesis, in which the strong positive influence of computer efficacy, interaction among students, their level of anxiety and attitude towards EL on student's EL satisfaction was found.

Hypothesis 2: Instructor factor influence positively on students' Electronic Learning satisfaction.

The combine effect shows the positive relationship between instructor factor and student EL satisfaction (β = .31, p<.001). The significant level was also high in this relation and 4% ($\Delta R^2 = .04$) variance was found in student EL satisfaction. Hence it was proved that the relation among instructor factor/independent variable (attitude towards EL, timely response) and student EL satisfaction was very strong and positive as it was hypothesized.

Hypothesis 3: Course factor is positively related to students' Electronic Learning satisfaction.

The favorable association was found between course factors and EL satisfaction of student (β =.32, p<.001), moreover the significance level was also high. Course factor explained 4% ($\Delta R^2 = .04$) variance in student EL satisfaction. Hence the course factors that includes, content quality and course flexible nature were positively related to the dependent variable (EL satisfaction of student) and providing a solid support to hypothesis.

Hypothesis 4: Electronic Learning satisfaction of students is positively influenced by design factor.

The positive relationship among dependent and independent variable (β = .35, p<.001) was encountered in regression results. Course factor had incremental 5% (Δ R2 = .05) variance in student EL satisfaction. Hence the design factor with user friendly, perceived ease of use and perceived usefulness attributes were showing the significant impact on student EL satisfaction. The results were fully supporting the hypothesis.

Hypothesis 5: Technical factor is positively related to students' EL satisfaction.

There was positive relation between technical factor and student EL satisfaction (β = .113, p<.01) with the 0% (Δ R2 = .006) incremental variance in student EL satisfaction. The significance level was at moderate level.

4.3. Theoretical Model after Regression

The theoretical model after applying multiple linear regression showing the results.



The regression results were supporting the hypothesis but in comparison with the student, course, design, instructor factor, technical factor results were less significant.

Implications and Limitations

Though a vigilant and systematic endeavor has been made to integrate essentials of EL, but we cannot deny the presence of limitations. I tried my best to tap all the main factors that were influencing student satisfaction and proposed an incorporated research model, but it, possibly not be the inclusive due to the time and recourses limitation. The major limitation was about the population who was using EL for their education.

Conclusion

The implementation of web-based learning environment is very useful for students and teachers. Both, the time and money, can be saved by implementing new technologies. The implementation cost for once is not comparable with the student's learning demands. The implementation of virtual learning environment can provide many benefits to students. Students can learn more from new environment and without restrictions of class boundaries.

The results of this study are highly significant and all hypotheses are supportive. Five independent variables have been measured i.e student factor, instructor factor, design factor, course factor and technical factor and the results show that all of these factors are strongly influencing on the dependent variable (student satisfaction towards EL)

The results of this study can be useful for the educational institutions before implementing EL environment. Administration should consider the factors that have been pointed out in this study, for successful implementation.

Appendix

Table 3. Correlation Matrix

		Mean	SD	1	2	3	4	5	6	7	8	9	10	11
1	Gender	.70	.459	1										
2	Age	1.62	.707	.035	1									
3	Program Enrolled	2.01	.928	.14*	06	1								
4	Student Initial Computer Skills	1.89	.733	.06	.006	025	1							
5	E-L Experience	1.56	.753	.035	129*	.038	.225**	1						
6	Student Factor	2.03	.598	029	.059	064	382**	459**	(.807)					
7	Instructor Factor	1.84	.697	01	.048	093	445**	525**	.763**	(.710)				
8	Course Factor	1.84	.697	01	.048	093	45**	53**	.762**	1.00**	(.743)			
9	Design Factor	1.76	.670	002	.004	127*	341**	473**	.678**	.85**	.85**	(.731)		
10	Technical Factor	1.77	.594	022	.069	069	328**	464**	.841**	.709**	.709**	.601**	(.684)	
11	Student EL Satisfaction	1.83	.729	003	.025	042	124*	403**	.787**	.682**	.685**	.743**	.627**	(.705)

* Correlation is significant at the 0.05 level (2-tailed), ** Correlation is significant at the 0.01 level (2-tailed).

Reliabilities (Cronbach's α depicted in parenthesis)

Table 4. Regression Analysis

	В	\mathbb{R}^2	$\Delta \mathbf{R}^2$
Step 1:			
Controls		.71	
Step 2:			
Student Factor	.41 ***	.76	.05
Instructor Factor	.31***	.75	.04
Course Factor	.32***	.76	.04
Design Factor	.35***	.77	.05
Technical Factor	.113**	.7	.006

QUESTIONNAIRE

The purpose of this survey is to find the factors affecting student satisfaction towards E-Learning in Allama Iqbal Open University. Please take a moment to fill-out the relevant fields.

Gender		Male		Female						
Age		20-30		31-40	41-50					
Program Enrolled				Roll #:	R	leg #	#:			
Student Initial Computer Skills		Reginner		Intermediate	Expert					
Student experience of E-	-	Deginner				1				
Learning environment		0		1	2	3		Aore then 4		
					S4 1 4				D:	Strongly
Student factor					Strongly Agree	e	Agree	Neutral	Disagree	Disagree
1. Working with computers is not very c	omplic	cated and diff	icult.		1		2	3	4	5
2. There is no need of extra technical abi	lity wi	hen doing wo	rk or	n computer	1		2	3	4	5
4 I get nervous when I am working on cor	nnuter	productive.			1		2	3	4 4	5
5. I can easily run any internet program	iputer.	•			1		2	3	4	5
6. I can download any material from intern	et easi	ly			1		2	3	4	5
7. I can use any search engine (yahoo, Goo	gle, Al	ltaVista) effici	ently	and can search for	1		2	3	4	5
any topic easily.		-			I		2	5	-	5
8. Student-to-student interaction was easy	n onlir	ne course envi	ronm	ent.	1		2	3	4	5
9. I learned more from my fellow students	In this	online class.	t tha	0.01180.0	1		2	3	4	5
10. I feit that the quality of class discussions	was n	ligh unoughou	t the	course	1		Z	3	4	3
Teacher Factor					Strongly Agree	e	Agree	Neutral	Disagree	Strongly
11 I received comments on assignments or	examir	nations for cou	rse ii	n a timely manner	1		2.	3	4	5
12. Instructor was enthusiastic about teachir	g the c	online class			1		2	3	4	5
13. Instructor handled the Web technology of	effectiv	/ely			1		2	3	4	5
14. Instructor explained how to use the Web	site				1		2	3	4	5
15. We were encouraged to participate in cla	ISS				1		2	3	4	5
Course Freedom					St			Nastaal	D:	Strongly
Course Factor					Strongly Agree	e	Agree	Neutral	Disagree	Disagree
16. I can give time to other activities also, w	hen I a	im taking class	s via	internet.	1		2	3	4	5
17. I can take class anywhere, without going	to the c	class that save	s a lo	t of time.	1		2	3	4	5
18. Conducting the course via the internet in other courses	provec	a the quality of	the	course compared to	1		2	3	4	5
19. I feel the quality of the course I took was	not lar									
Internet		gely affected	by co	nducting it via the	1		2	2	4	6
miternet.	.iot iui	gely affected	by co	nducting it via the	1		2	3	4	5
20. The e-learning system provides up-to-dat	e and u	gely affected	by co	nducting it via the	1		2 2	3	4	5
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 20. The e-learning system provides up-to-dat 21. The e-learning system provides sufficien <i>Technical Factor</i> 22. Technology used in E-Learning is easy to 	e and u it conte	gely affected seful content	by co	nducting it via the	1 1 Strongly Agree	e	2 2 2 Agree 2	3 3 3 Neutral 3	4 4 4 Disagree 4	5 5 Strongly Disagree 5
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Hybrid Technologies for Teaching and Learning in Higher Education: Access and Prior Experience

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Abstract

Educational Psychology classes currently emphasize and model constructivist teaching practices in addition to integrating the notion of connectivity and Web 2.0 into educational theory. This study examines the role of access and prior experience with technologies to enhance participation and performance in addition to the regularly used 'semiotic tools' and social-dialogical activities found in a teacher education program. How can a program of learning be assisted with structuring the delivery and organization of knowledge?

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Hybrid Technologies for Teaching and Learning in Higher Education: Access and Prior Experience

1. Introduction

The implementation of constructivist notions of theory into practice has been attempted in many learning environments, and most recently in technology and higher education. Vygotsky's cultural-historical theory of psychological development informed the foundation of sociocultural theory and constructivist practices of teaching and learning [7, 11,12, 26, 29].

Educational Psychology is compulsory for all teacher education candidates. Teacher education programs currently emphasize and model constructivist teaching practices, in addition to integrating the notion of connectivity and Web 2.0 into educational theory. Teacher candidates today are required to teach in the public school system that has a preponderance of Web. 2.0 learners. It is necessary that they understand and adapt their teaching methods to address these students [14, 21].

1.2. Web 2.0 Learners

Prensky was one of the first to identify the change in thinking patterns of today's students – kindergarten through university – who represent the first generations to grow up with new digital technologies [19]. They have spent their entire lives surrounded by and using computers, videogames, digital music players, video cams, cell phones, and all the other tools of the digital age including computer games, Email, the Internet, texting, and instant messaging-- all of which are integral parts of their lives. These students can be called Digital Natives, that is native speakers of the digital language of computers, video games and the Internet. Digital immigrants are those who were not born into this era, who may have adopted these technologies but are not native speakers. This has led to one the most talked about problems with education today, that is our Digital Immigrant instructors, "who speak an outdated language (that of the pre-digital age), are struggling to teach a population that speaks an entirely new language" [19]. In order to address this, Digital Native methodologies need to be constructed for all subjects, at all levels, using our students to guide us.

All this exposure and previous experience, Prensky surmises, has caused Digital Natives' brains to develop to a physiologically different degree [19]. As a result of repeated experiences some areas of the brain are larger and more highly developed, and others are less so.

For example, thinking skills enhanced by repeated exposure to computer games and other digital media include reading visual images as representations of threedimensional space (representational competence), multidimensional visual-spatial skills, mental maps, "mental paper folding" (i.e. picturing the results of various origami-like folds in your mind without actually doing them), "inductive discovery" (i.e. making observations, formulating hypotheses and figuring out the rules governing the behavior of a dynamic representation), "attentional deployment" (such as monitoring multiple locations simultaneously), and responding faster to expected and unexpected stimuli [19].

These notions of 'pruning' and 'brain plasticity' are also supported by researchers [10, 22]. Moreover, Small & Vorgan surmise that youth are predominantly using their temporal lobes while interacting with digital media and may not be establishing vital connections in their frontal lobes, where reasoning and social abilities are established [23]. Nevertheless, the intensity and combination of these cognitive skills have caused the old educational paradigm to be obsolete. Twenty-first century teachers have developed into the role of challenger, observer, guide, and coach to their students. In doing so, they maintain intellectual rigor but with the collaboration of their students in defining the goals that are worthwhile, allowing them to arrive at the destination at their own speed and choice of 'vehicle' [20].

Continuing with the philosophy of teach less- learn more, Tapscott advocates for similar teaching strategies to address the Millennials' unique learning needs [24]. These include: a) a learning environment that is student focused, customized, and collaborative, b) learning experiences that emphasize student co-creation and reduced lecturing, c) student empowerment and choice, d) a focus on life long learning, not teaching to the test, e)

technology as a tool to get to know each student, f) educational programs designed according to the eight norms of the "Net Generation" [24]. Moreover, he describes the Net Generation as the children of the Boomer generation aged 11-31who have grown-up digital. Tapscott posits that there are eight norms, or clusters of attitudes and behaviors, that define this generation and are central to understanding how their needs are changing the process of education and work environments. These norms include: freedom, customization, scrutinizers of information, integrity, collaboration/relationships, entertainment/motivation, speed, and innovation [24]. The Net Generation adapts technology to suit their individual needs, while other generations are considered 'users' of the technology that is presented to them.

1.3 Web 1.0/Web 2.0 Continuum

The term 'Web 2.0' reflects a shift in leading-edge applications on the World Wide Web, a shift from the presentation of material by website providers [Web 1.0] to the active co-construction of resources by communities of contributors with interactive media. Whereas the twentieth-century web revolved around developer-created material (e.g., informational websites) generated mainly by a small fraction of the Internet's users, Web 2.0 tools (e.g., Wikipedia) help large numbers of people build online communities for creativity, collaboration, and sharing. And with web application programming interfaces, community-builders do not need specialized technical expertise to create new media/information [5].

Students raised in a Web 2.0-world view knowledge and its acquisition differently. It is thought that many schools and parents do not address their preferences for learning and are proponents of emphasizing 20th century learning epistemologies [3,16]. Some researchers, who are digital immigrants, question whether we should be adapting school time to Web 2.0 learning environments since students are already immersed in so much screentime [4, 15, 18]? What long-term implications does this have for learning, development, and schooling? Moreover, how many students in Canadian public schools and universities are really digital natives? What factors affect this distinction?

Interestingly, precise distinctions are difficult to ascertain between Web 1.0 and Web 2.0 because in reality these technologies develop overtime, with hybrid versions in place, a 'work in progress' as they are used and adapted by users--in multiple contexts, schooling being just one.

2. Technology as a Tool for Learning

The following are assumptions for designing constructivist practices in technologybased classrooms that view: (1) learning as a process of construction so there will be multiple constructions/perspectives, (2) learning in contexts that are relevant to the learner, (3) learning mediated by tools [technology] and signs [semiotic tools], and (4) learning as a social-dialogical activity. As well, "it seems typical of apprenticeship that apprentices learn mostly in relation with other apprentices" [12]. This is in keeping with Digital Natives' philosophy of learning, that is "search for meaning through discussion" [20]. New taxonomies should inform the development of instructional strategies that encourage many 'types [styles] of learners' such as active, strategic, intentional, conversational, reflective, and 'ampliative' that is, learners who generate assumptions, attributes, and implications of what they learn. Therefore, learners are multidimensional participants in a sociocultural process of making 'knowing how we know' the ultimate accomplishment.

3. Conceptual Framework: A Sociocultural Approach

Vygotsky's cultural historical theory of psychological development informed the foundation of sociocultural theory and constructivist practices of teaching and learning. Major contributions of Vygotsky's theory include the "role of culture in learning and development, recognition of the psychological functions, and the importance of social action during learning" [8]. More specifically, this theory establishes the sociocultural setting as the basis for development and learning. Therefore, learner characteristics, cognitive processes, and the context for learning are all viewed from the same perspective [8].

3.1 Methodology

Where is it more appropriate than the Educational Psychology course to examine access, attitude, and prior experience related to technology and learning. Within the post-graduate B.Ed. program, technology is embedded in classes and expected in activities and assignments. Moodle¹ was used as a platform to deliver and organize learning activities and resources, a space to meet virtually, to collaborate on assignments, and to enhance participation and familiarity with the material and readings. To bridge the digital divide, Moodle allowed those students who needed speed and collaboration to work at their own pace. In addition, reading on the computer screen, manipulating data/text on wiki-spaces and discussion-boards can be orchestrated remotely at the student's convenience. Moreover, those who prefer or who do not have broadband access at home can download and print readings and can choose to meet in person to work collaboratively with their classmates. How can a program of learning be assisted with structuring the delivery and organizing of knowledge? The following research questions guided this study:

- 1. To what extent are teacher education students Web 2.0 learners?
- 2. How do they use technology; are they users or adapters?
- 3. What is their attitude toward technology as a learning tool?
- 4. How effective is Moodle, as way to structure a course, in comparison to my regular constructivist teaching practices with integrated technology?

3.2 Participants and Procedures

Sixteen semi open-ended questions were asked relating to the B.Ed. students' technology use to ascertain the usefulness of technology literacy taught in the program and the effectiveness of Moodle as a platform for learning. During the analysis phase, the data was constantly compared to uncover emerging themes and patterns. A beginning list of factors was created to tie research questions directly to the data. Factors were redefined and added when they did not fit. Computer assisted reading, highlighting, grouping of data, and frequency counts were used to analyze themes that emerged, to verify the researcher's semantic analysis, and to initiate the interpretation of the students' perceptions.

4. Key Findings

The data related to students' perceptions of technology use yielded many interesting findings. This section will highlight key findings related to the four research questions.

1. To what extent are teacher education students Web 2.0 learners?

The response rate for participation was 69%. As described previously, the students were asked a series of questions related to technology use and how they learn. From this data, they were then described as a digital native or digital immigrant. Only nine out of the sixty participants could be characterized as digital natives (see table 1). While many of the other participants used some aspect of digital technology/media daily, only these nine were to-tally immersed in the digital world since public school.

Participant Number	Sex	Undergradu- ate Degree	Age
4	Female	Eng- lish/French	22
6	Female	English	23
10	Female	Mathematics	22
15	Male	Mathematics	21
17	Female	English	27
18	Female	History	23
24	Female	English	24
39	Male	Mathematics	32
55	Female	Physical Education	23

Table 1

Digital Natives:

Fifteen per cent of the participants were considered digital natives. Interestingly only two were male. Regarding the age of the participants, the mean was 24 years. This certainly is in keeping with Prensky and Tapscott's notion of Digital natives' age range [11-31], but this is only part of the story [19, 24]. Fifty-three of the sixty participants were within this Digital Native age range (11-31) but only nine (or 15%) were actually categorized as Digital Natives. What factors have led to this disparity? Further examination of the data will help illuminate many of these influences.

2. How do the participants use technology; are they users or adapters? Of the nine Digital Natives, five could be considered adapters-- that is, they adapt technology to suit their individual needs. Only two of the sixty participants stated they were nonusers of technology; the other 89% reported being users in varying degrees. Moreover, prior to their participation in the B.Ed. program, 28% of the participants described embracing technology.

One of the 'adapters' stated when asked if peers used technology the same way: "Simply put, they do not. I am a technophile and it shows. Having worked for Compaq/HP for a few years, friends and family call me for technical support on a regular basis" (no. 39). On the other end of the continuum, this non-user explained:

I am sure there are peers who use technology more than me but I am just as sure that there are those who don't use it either. I would bet that almost all of my children's peers use technology as that is the age they are growing up in. If I need something on the computer and I am stuck, my children will find it or fix it for me. My children are much more comfortable on the computer than I am (no. 23).

In the middle of the 'pack' there are students who have recognized there has been a change in learning. He posited:

I believe that at 32 years of age I am very close to the transition to our technologybased world. My friends who are slightly older than me tend to be a little less comfortable with new technologies, while those that are younger seem to be more at ease. Now being back in university with fellow students only a few years removed from High School, I can clearly see how much more comfortable they are with the gadgets and programs. I really didn't feel old until I came to STU (no. 36).

Finally, a digital native describes her computer usage:

I use my computer for pretty much everything, more specifically, information, creation, and communication. It is not unusual to find my husband and I at home in the same room quietly on our separate computers. I call it 'dueling laptops' and it is very strange to our families, but very normal to us. The internet is our great oracle that decides what to wear in the morning. It tells me whether or not those boots I want are actually as cute and as water resistant as they say they are. It allows me to make decisions based on many factors. It informs me of possible opportunities and allows me to be an anonymous voyeur and exhibitionist from the privacy of my home. The Internet is my main source of entertainment, research, news, correspondence, gossip, trends—you name it. I can find anything on the Internet. I grew up in a family and a group of friends who are really engaged with technology (no. 24).

3. What are the participants' attitudes toward technology as a learning tool? Only two of the participants reported being non-users and were critical of technology as a learning tool. The other 97% of participants identified technology as very positive learning tools if used appropriately. One participant explained:
Students benefit from information that is conveyed using visuals, connections, repetitions, discussion, choice, applicability. The use of technological tools such as SMART Boards benefits the teacher and students. It's visual, it provided access to so many amazing resources, and it's interactive. However, the use of technology is no substitute for good teaching and critical thinking (no. 1).

Every participant, even the two non-users spoke of wanting to learn how to use the SMART Boards more effectively. SMART Boards were seen as resource for both teachers and students.

This digital immigrant explicates how her learning experiences have changed:

Certainly, the accessibility of information due to high-speed Internet has had a drastic impact on my learning experience since high school. Because of the readiness of information, I feel that I am spending much less time finding my research material, and also less time with an individual piece of research. I also find that today my learning comes from a multiplicity of sources, rather than from a few, because of the accessibility of information. This quick and fragmented approach to accessing information also contributes to my learning that occurs outside of the classroom. Throughout my teenage years, I feel that my learning was more focused, coming from one or a few sources. Today, I have so many areas of interest and know a little bit about each area. I believe this is because I have acquired a thirst to know about everything, but it is also a result of the accessibility of information. I now feel that it is possible to learn almost anything, anytime, and independently (no. 31).

Structuring course information that can be accessible at any time and allows students to work on their own and collaboratively is challenging. Learning is increasingly individualistic, that is students want it personalized to their needs, desires, schedules with one to one flexible learning.

4. How effective is Moodle, as way to structure a course, in comparison to my regular constructivist teaching practices with integrated technology?

Only a small percentage (23%) of participants thought Moodle was a great way to structure a course in reality. While many thought it was a great idea, as many public schools are beginning to implement its use at the high school level, its use was fraught with many logistical problems. My Educational Psychology courses were the first at the university to use Moodle as a main platform with 87 students, in addition to the high extent of user traffic--as the only way to access readings, virtual space to meet, and collaborative assignments. All of this usage caused server crashes when many students and groups attempted to complete assignments the 'night before' a due date. In addition, students chose their own groups and did not consider the range of technological abilities, the attitudes towards technology use, the work ethic, schedules of members, and members' access to computer/internet equipment at home. As it turned out, many students living 20 minutes outside of the city limits did not have access to broadband internet. This hindered their participation and learning.

4.1. Broadband Internet

Lack of access to reliable broadband internet [BBI] was an emergent factor discussed by many students as a constraint. When BBI was available consistently, it was considered an affordance, a benefit to learning. One digital native spoke of her earlier experiences with computers and internet as positively contributing to her learning. She explained:

Technology, especially the use of computers, has greatly enhanced my learning. I experienced a slightly different approach to learning than most while I was progressing through school as I was exposed to the use of computer technology early in my education. I attended Harry Miller Middle School, an 'early adopters' school that began integrating technology when I was in grade 6. We were taught how and given the opportunity to use computers in all subjects for various projects and assignments. It was a very hands-on approach. I consider myself very lucky to have had this experience. The use of computer technology has been a huge help through university as I am able to create presentations, conduct research and edit assignments in a timely fashion. It has helped foster my overall learning in general. I strongly believe that computers are a technology that is a wonderful tool in education today (no. 4).

Very few participants were this lucky, to be an early adopter. Not only was the next participant disadvantaged during her public school experience, she was still disadvantage during the B.Ed. program and Moodle use. She stated:

The biggest change has been the internet access. At home, there is still no highspeed access available and therefore that was quite limiting on what you could do on the Internet. Furthermore, when I was in public school, there was no such thing as a SMART board and generally overhead projectors were as exciting as it got. We did have a technology class but it was also quite limited compared to all the technology that I am learning in Educational Technology (no. 34).

Another Digital Immigrant commented on his learning experiences related to technology. He posited:

I wouldn't have thought that technology had affected my learning so much from public school, but looking back, when I graduated from high school ten years ago, I didn't even have an Email account, or even a home computer that could access the Internet. It wasn't until I was at [university] as an undergrad that I really spent much time online at all. Along with email, came Internet research, both academic and otherwise. I would say that this had probably the greatest impact on my learning because I didn't have to spend hours searching through hardbound texts, skimming indexes, flipping pages, and reading paragraph after paragraph (if not page after page) just to determine whether the material was relevant or not. Technology has made learning more time-efficient and less frustrating, but at the same time, technology has made me lazy and dependent on the technology (no. 40).

To summarize this preliminary study, 88% of the participants in this study were of the Net Generation age group (11-31) but only 15% could be categorized as Digital Natives or having Net Generation behaviors and attitudes. Access to technology and BBI appears to be related to urban vs. rural schools, funding of school districts, and to some extent socioeconomic status and privilege. Therefore, Moodle as a platform for learning appears not to have been effective in this particular program/institution, at this time.

5. Conclusion

As a cautionary point, especially related to the theoretical underpinnings of constructivist approaches to teaching and learning, is to examine the contexts of participants' prior experiences, as well as to examine the assumptions of the literature reviewed before implementing program change. Not all students 11-31 years of age are digital natives. In fact, only a small percentage could be considered 'full-members' of this category in my very competitive B.Ed. Program. Students who are 'very good' at 20th century school are admitted to the program. It should be no surprise that Web 2.0 epistemologies would for the most part be considered foreign and unwelcome.

Secondly, both Prensky's Digital natives/immigrants, and Tapscott's Net Generation present Web 1.0 and Web 2.0 as polar opposites. In reality, it is a process of negotiating the tension between philosophy and reality—of bridging the learning needs and preferences of digital natives and immigrants—where few learners are purely one or the other, in all circumstances.

Leu, O'Bryne, Zawiliniski, McVerry, and Everet suggest that this divide could be better addressed by first viewing the issue as one of technology as literacy, that is another symbol system to be mastered, instead of technology being taught as a stand-alone subject or add on—one that can be seen as an 'extra' to be 'covered' when there is adequate time [13]. More specifically the learning challenges of today can be addressed by promoting the following: a) Technology standards could become integrated with subject area standards, b) Instruction in 'Internet' use could be integrated into each subject area, c) Every classroom teacher/professor could be responsible for teaching online information and communication use, and d) Online information and communication skills could be included in subject area assessments. While all these recommendations would not be that difficult to implement, it must be remembered that institutions of learning often have a traditional resistance to technological change [6,15,25].

In Canada where the preponderance of its population exists along the US/Canada border, there are many provinces that have rural areas lacking in educational services and opportunities, the foremost being access to broadband internet. There is a lack of equitable integration of technology and internet in schools, households, communities, and work places. This lack of opportunity and prior experience hinders the cognitive development of students from grade school to the workplace as explicated by the participants. Extending BBI to rural schools and communities is a concrete and essential objective for provinces, one that is supported frequently in research literature [1, 2, 9, 30]. Further research is warranted to tease out the essential educational services in both public and higher education,

and how lack of access to technology exacerbates all the other 'isms' to further entrench the rich/poor divide.

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Notes:

1. Moodle is a software program for electronic or "e-learning," a category of programs that are variously identified as "Course Management Systems" (CMS), "Learning Management Systems" (LMS), or "Virtual Learning Environments" (VLE). Many of the mechanics of classroom operation—such as assignments, scheduling, and quizzes—can be easily set up through simple resource-based "courses." Moodle also has a broad variety of additional modular features and a relatively quick learning curve, helping educators easily and effectively develop full online classes, either in advance or as the course is being taught. This versatility allows Moodle to be used in a variety of ways depending on the needs and capabilities of the classroom and program of study: from simple classroom management to pure e-learning--or a "blended" combination of the two, with e-learning content and utilities extending on-site classroom learning (Pieri & Diamantini, 2009).

Evaluation of Course Design and Student Comprehension in the International Learning Environment: A Panel Data Analysis

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Current research focuses on the econometric analysis of factors promoting Japanese broadband and economic evaluation of eHealth.

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Abstract

We evaluated the effectiveness of learning and teaching processes by focusing on the course design and students' learning performance. The case study analyzed here was a distance learning project, in which Thai and Japanese grade 10 students studied how to use MX Flash, a software application used for the creation of animations, from the introductory use to the ability to make a short animation. In designing the course prior to implementation, the theoretical frameworks such as Constructivism theory and Bloom's taxonomy were examined and discussed. From these perspectives, effective learning-teaching methods were determined by course content, conditions of teaching and learning processes, and media usage. The whole course was divided into learning processes and the pedagogical goals in the learning processes were classified, with the following three learning processes determined: (1) a traditional lecture; (2) self-learning; and (3) collaborative learning. At the end of each class, the students were asked to evaluate the course with regard to the three domains of (1) comprehension, (2) cognitive load, and (3) motivation, using a 4-point Likert scale. Based on their responses, a panel data analysis was adopted to verify the appropriateness of the course design and to examine factors promoting or obstructing students' learning performance.

Key words: learning effectiveness, course design, Constructivism theory, Bloom's taxonomy, panel data analysis.

1. Introduction

Thanks to the broad development of Information and Communication Technologies (ICT) related to distance learning for higher education, efforts to improve learning and teaching quality using ICT support have been reshaping traditional learning environments for school education.

It is commonly believed that distance learning using ICT enhances learning quality and lowers the costs of education. Computers are the most common ICT tool for distance learning. As part of global strategies to cope with increasing competition, many prominent universities in the U.S. and Europe have already established campuses in Asian countries and offer the same lectures though the Internet and some countries have promoted the transfer educational know-how to developing countries. Developing countries, on the other hand, are looking for ways to overcome insufficient educational infrastructure and teaching staff as a means of coping with growing demand for higher education. International distance learning thus meets the desires of both developing and developed counties, and clearly enhances international exchange not only in education but also in other areas such as in the sciences and engineering.

1.1. Previous studies

Distance learning offers a range of research topics. With regard to technological development, [5] attempted to develop a lecture environment at the university level by designing the technological support system with a focus on reliability, stability and interactivity. He found that restrictions in technology, such as in image and sound quality, as well as network delays, greatly affected learning difficulty. Adapting the limitations of distance learning technology to actual classroom environments requires further studies, particularly with regard to variations in learner characteristics.

In case of international distance learning, students usually have different backgrounds, in terms of in culture and language. Many innovative educators have investigated practical implementations to raise teaching and learning quality to the level of face-to-face traditional classroom learning. [2], for example, studied communication using e-mail in a social studies class between Japan and Korea, with a focus on course design and problems such as the imbalance in communications among students, the language abilities and student ICT knowledge.

[12] used various ICT media such as a video conference system, school homepage, and web board in teaching Japanese to foreigners. ICT media were used as supplementary sources to traditional teaching, but few students used them. This problem is common in case studies, hampering efforts to identify the determinants of successful usage of ICT.

Most distance learning projects, therefore, seem designed according to the experiences of individual teachers or technology-related experts, rather than based on any vigorous analysis of the effective combination of ICT media aimed at improving student learning performance. Obtaining substantial results of learning effectiveness in case studies is difficult, however; rather, learning effectiveness should be analyzed with due regard to educational concepts and theories.

1.2. Objectives of this paper

These studies have mainly reported on how advanced technologies can be coherently organized with educational purposes or contexts. Nevertheless, a few studies have investigated educational effects by focusing on learners, such as studies of the possibilities and appropriateness of learners receiving knowledge effectively within the limits of technology, variations in learning acquisition methods, students' knowledge background, cultural differences, etc.

From the discussion above, this paper attempts to evaluate the effectiveness of course design by focusing on students' learning performance. In designing the actual course prior to the implementation, the theoretical framework was examined and the Constructivism theory and Bloom's taxonomy were adopted. This paper examines how the original aims of course design were achieved during implementation, or in other words how deeply students acquired knowledge; how smoothly they perceive course contents, instructional methods and media usage; and how they nurtured their creativity in the making an animation. Instead, a rigorous analytical methodology was utilized, namely a panel data analysis, which is now a commonly used methodology in social sciences.

2. Framwork of distance learning

2.1. Distance Learning Project

An experimental course was conducted during October - December 2005, with participation from 201 grade 10 students of Kyoto University of Education Affiliated High School in Kyoto, Japan and 211 grade 10 Thai students of Chulalongkorn University Demonstration School in Bangkok, Thailand. The course was conducted once a week for about 50 minutes for 3 months, and both Thai and Japanese students shared the same curriculum and learning contents. English was chosen as a common language. Students learned how to use MX Flash, a software application they had not previously used for the creation of original animations. Prior to implementing the distance learning project, special care was taken with regard to teaching software not only by improving the quality of education through the use of technology, namely the computer-based learning system, but also by constructing a proper course design which effectively contributes to students' learning performance. Students were expected to be able to create a short animation (in more detail, see [6] and [7]). In addition, an international distance learning project is a good research object to examine how the different backgrounds of two countries affect their learning performance ([9], [10], and [11]).

2.2. Course Design

The following two theories have become the foundations of this experimental course.

(1) Constructivism

We applied the concept of Constructivism theory suggested by Jonassen et al [1994]. The Constructivism concept emphasizes that knowledge is constructed by learners themselves through two processes, namely (i) connecting new and old information, and (ii) interrelating the learning style and the students' learning

achievements. Based on this concept, the whole course was designed to have three instructional styles, consistent with the content itself and the students' achievements, as shown in Figure 1 and Table 1. (2) Bloom's Taxonomy

Effective learning requires a clear understanding how well students access desirable knowledge. Bloom's taxonomy offers a promising approach to achieving learning objectives in each step of designing course experiences that promote constructivist understanding to learning. Bloom identified four levels of learning objectives: (i) the first provides students the ability to acquire facts and information, and then to recall them (Recognition); (ii) following this, students should understand the basic use of the acquired knowledge (Understanding); (iii) in the third, they then should apply this knowledge in other situations; that is, students can break down knowledge into its integrated pieces and apply it to other thing (Application); and (iv) at the final stage, students can construct their own new knowledge based on the knowledge and information obtained so far (Analysis).

(3) The course design based theories

Based on the theories discussed above, the course was deivided into segments, depending not only on students' achievements but also teaching and learning technologies, since software is digital content, and ICT technology is easily applied. In the initial stage of the course, students learn what MX Flash is. In the final stage, however, they fully utilize the software and create an animation. The first stage of the course thus aimed to make them understand the software, corresponding to "Recognition" and "Understanding" of Bloom's taxonomy, and the final stage to "Analysis". An important limitation was the length of the course, which was six classes for Thai students and ten for Japanese. Because of this limitation, another stage was added, which we considered to correspond to Bloom's "Application". We set the aim of this second stage as fostering the students' ability to use the software and prepare to create their own animations. These three stages of cources can also be interpreted as Constructivism.

Based on the two theories discussed previously, the following three teaching stages were pedagogically adopted, referred to as: (a) a traditional lecture; (b) self-learning; and (c) collaborative learning. The relationship of these teaching styles to those of Constructivism and Bloom's taxonomy is indicated in Figure 1, and Table 1.

Constructivism	Lea	eriencing	
learning	Learning basic knowledge	Leaning by experiencing and being advised	Learning by experiencing at the more explicit level
Bloom's taxonomy	Recognition-Understanding	Application	Analysis
	₽ ₽	Ċ	$\overline{\nabla}$
Teaching style	Traditional lecture	Self-learning	Collaborative learning
Learning objectives	Understand basic concept of MX Flash	Learn to use MX Flash to create animation by themselves	Exchange ideas and create a short animation story for presentation.

Figure 1 Teaching styles and learning objectives based on educational theories

2.3. Three Styles of Learning and Teaching Processes

(1) Traditional lecture

This course was begun using class room style which is the most familiar to the students. The aim of this style was to provide an overview and basic knowledge of the MX Flash animation software. Students were taught by a teacher in a traditional way. To familiarize students with ICT media in the first stage, ICT media such as hyper text on the school's homepage was utilized to supplement lecture.

(2) Self-learning

Students were expected to apply their basic knowledge in practice. Students were told the objective of the module, namely the production of a motion animation, and then studied using WBT (Web-based Training) on the school's homepage. Students were explained about the guidelines required to complete their assignments for about 10 minutes at the beginning of the class, and then had to complete the assignment in the class period by applying the basic knowledge gained from the traditional lecture and the additional knowledge gained from the provided homepage or elsewhere by themselves. The teachers and teaching assistants assisted students individually during the class. Students had to show the achievement of the learning objective by sending their tasks via the school intranet at the end of the class. In this stage, the students were taught how to use ICT media, such as the WBT, and about related information and computer literacy. Students were asked to form teams of about 4 or 5 persons to create short cartoon animations. In preparation, they were informed about collaborative learning which would be conducted later with the foreign students in another school.

(3) Collaborative learning

Students developed their knowledge by learning in a collaborative way. Students were required to exchange their ideas with students' in the same group in their own class but also with the group in the other country. Students formed teams within the class, which were then matched with foreign student teams as team partners.

They had to help one another create an animation under the condition that their completed animation must contain at least one of the techniques for MX Flash software or related idea exchanged with the partner team. Students were required to communicate with one another via a BBS (Bulletin Board System). During the class, students spent their time mainly on creating an animation with their team members. They also had to access the BBS to find comments from the partner teams and undertake a discussion. Students reported their posting of comments to the teacher at the end of each class. In this stage, a TV phone (NTT Phoenix) was also used to support real time communication among students and teachers in the two countries, while in the previous two stages, only asynchronous communications took place.

2.4 Other Factors in Course Design

(1) Learning content and corresponding ICT media

Learning content was arranged to match the learning goals in each process. However, learning content is not only about academic knowledge or content coverage, but also the acquisition of related skill such as mastering ICT media such as hypertext, WBT (Web-based Training), BBS (Bulletin Board System), etc.

(2) Role of teachers

In the self-learning style, students are required to take an active role in the learning process, and teacher help is limited to helping the students to develop their own understanding of the content. Practically, however, class-room learning discipline and time limitations in the class-room causes teachers to rush to finish their lecture in passive way. It is therefore necessary to remind both teachers and students to be aware of maintaining an appropriate teaching role, consistent with the characteristic of the particular learning style. Moreover, with regard to the role of the in-class ICT-based learning, a limited time period (50 minutes), variation in teaching style, and the ICT skill of the teacher and the student's familiarity with ICT media were also major quality issues in many case studies. To control these variations, the Thai and Japanese students used the same curriculum and teaching contents, and the courses were conducted in the same time range. (3) Communication direction

Management of effective communication, such as the volume or balancing of passive and active direction, is associated with the topic above concerning the role of the teacher. Another key component in generating higher achievement of learning is to identify the direction of communication, and to remind all participants to balance the proportion of communication in each learning style.

(4) Learning media.

It is important to provide media which suit the learning contents and communication context and assist students to achieve the intended learning outcome. However, students with a lack of ICT skill and unfamiliarity with new learning environment may feel that the utilization of ICT media is inefficient or inadequate. Besides adding ICT usage to learning content, as mentioned above, traditional media such as paper print-outs and oral presentations were utilized simultaneously with ICT media.

Learning style	Learning style Traditional lecture Self-learning		Collaborative learning	
Class time Thailand	1st - 2nd lesson	3rd - 4th lesson	5th - 6th lesson	
Japan	1st - 3rd lesson	4th - 6th lesson	8th - 10th lesson	
Learning content and activity	-Baasic usage of MX Flash -ICT media used as online text posted on the school website	-Workshop in making a simple animation using MX Flash -Introduction on how to use WBT/BBS	-Grouping to create a animation -Inter-group communication via BBS	
Role of teacher	Role of teacher Instructor		Advisor	
Communication direction Teacher to students		Students in the same classroom	Students in the same classroom and in a different classroom	
ICT Media	On-line Text	WBT	BBS and TV phone	
Type of Distance learning	Asynchronous	Asynchronous	Asynchronous and synchronous	
Other media	Oral, Print-out	Oral, Print-out	Oral, Print-out	

Table 1 Course design - three stages of the learning process

2.4 Preparation to undertake international cooperative and collaborative learning

The different in their background is a great advantage and enabled them to produce better work and assignments. All students, however, included mental and learning skill preparation before embaking on new learning style of self learning and collaborative learning. It is important for both Thai and Japanese classroom to engage each stage of learning style in propriate timely manner. This will ensure that both countries carry on their learning at the same pace. After the learning styles were determined, Thai and Japanese teacher brainstroms to arrange details of suitable content for each class. This content and activities was not only matched to students' characteristic, but it also possibly conducts appropriately to timing of school activities. In Thailand, during this semester students has many school activites such a sport day and exchange academic activities with other schools. It caused classtime decrease about 4 times comparing to Japanese. Due to a fewer class time, the class of this computer subject was move to the last period of the day, so students have some more extra time to use computer and consult with teacher.

3. Learning feedback and evaluation

3.1. Evaluation of the Course

The purpose of this study is to identify the effect of the course design on the learning performance of students. According to Chandler and Sweller ([3]), high cognitive performance which promotes effective learning outcomes is related to the following three factors: (i) comprehension; (ii) cognitive load; and (iii) motivation. We adopted these three factors to evaluate the course.

(1) Comprehension

Comprehension is the capacity and quality of an individual student in identifying how much they have developed their knowledge, which corresponds to Question 1 in the questionnaire (from 1: not at all, to 4: understand quite well).

(2) Cognitive load

Cognitive load refers to the load placed on working memory during the learning process. It is natural that people learn items better and faster if they have been previously exposed to them. On the other hand, the more unfamiliar the item, the longer the time they need to understanding them. A low cognitive load can therefore enhance student understanding.

Our present survey consisted of the two factors for cognitive load: (1) cognitive load in the learning content; and (2) cognitive load in the learning method. The first, cognitive load in the learning content is related to the difficulty in learning the subject contents, which in the present study was a software application for creating MX Flash animations. Question 2 below is related to this factor. The second, cognitive load in the learning method is concerened with the perceived difficulty of the teaching and learning process for each period of the class, which is asked in Question 3(from 1: quite difficult to 4: not difficult at all).

(3) Motivation

"Motivation" is another important factor in achieving learning outcomes. In ICT-based distance learning environments, it is necessary to ensure that students exert sufficient effort to sharing what they are learning and pass on their knowledge to other participants. Students were therefore asked their motivation in "learning contents" and "the media and information literacy," as asked in Question 4 and 5 (from 1: not at all to 4: actually want to do more).

3.2. Propriety of Questions

Referring to the principle of instructional design by [8], improvement in "Comprehension" in learning requires that "Cognitive load" be diminished and "Motivation" be maximized. We adopted this concept as a main hypothesis of this study. The reasons why only five questions were used in the evaluation of the course design and students' learning performance is as follow. (i) As already mentioned, students were asked to fill the questions right after each class in short time. We were afraid the reliability of their replies, since lengthy and many questions made them to rush to answer in an ambiguous way. (ii) There is another rationale behind simple questions for the course evaluation, which is referred to as "Classroom-Assessment-Techniques (CATs)" and "Minute Paper Test," which has been implementing at numerous educational institutions in many countries (see [4], for example). (iii) A rigorous analytical methodology is adopted in this study to evaluate course design and students' comprehension, approximately 1,700 responses, which will be extensively discussed in the next chapter. The students were asked to respond to the questionnaire at the end of each class.

4. Results of regression analysis

In this section, we present multiple regression models to evaluate how "Comprehension" was affected by the two concepts of "Cognitive load" and "Motivation" under the different learning styles: traditional, self-learning and collaborative. Specifically, comprehension was set as a dependant variable, while cognitive load with regard to learning contents, cognitive load with regard to learning methods, motivation towards learning contents, and motivation literacy were independent variables.

4.1. Simple Observations

The mean of Comprehension scores for each stage is more than 2.50 (mean value), which shows both groups of students in general have understood well, althought those points were higher for Japanese students than Thai students. It is also interesting to note that mean values decrease from the traditional face-to-face to self-learning and to collaborative learning style. This trend appears consistent with realty, since comprehension becomes more difficult in collabotive learning than in a traditional lecture. Means of variables are more diverse in Japanese than Thai students.

4.2. Estimation Results by OLS

Let us briefly summarize the results of the estimation presented by [7], which utilized OLS (Ordinal Least Squares) in order to estimate the relationship between dependent and independent variables at each learning style separately. In most of learning stages, four dependent variables (Q2, Q3, Q4 and Q5) contributed significantly to students' comprehension.

In particular, two concepts of cognitive load have significant positive confidence, which is more than those for motivations. The only exception is the comprehension of Japanese students in the self-learning style; Q5 "Motivation towards media and information literacy" has a significant negative coefficient that Japanese students showed less interest in related technology for learning, such as computer skills in this learning style, and this led to a decrease in comprehension for this lesson.

According to the above results, OLS estimation seems to have shown that almost all variables promote student comprehension in each stage; that is, the efficiency of course contents, teaching method, media selection, etc. on student's comprehension, but it failes to identify which variables are essential. Moreover, this estimation does not prove the appropriateness of the three styles of course design at all. A more rigorous analysis is required to explore these issues.

4.3. Eastimation Method

(1) Equation for estimation

In this distance learning course, each Japanese student participated in ten classes and submitted responses to the questions, while Thai students participated in six classes. This difference is due to the class schedules of two high schools. At each stage, their responses form cross-section data, while for each student, they constitute time-series data. Panel data analysis is an estimation method which integrates two kinds of data in estimation. This analysis has become popular in social sciences and has extensively expanded the scope of analysis, but few studies have used this method in educational evaluation.

At first, to verify the appropriateness of course design in terms of comprehension, we add comprehension variable of the previous learning stage as independent variables. More concretely, in estimating comprehension in the self-learning stage in addition to cognitive load and motivation, the average value of comprehension with the traditional lecture of each student is used. The estimation equation of the self-learning style can be expressed in the following way:

$$Comprehensioni = {}_{0} + {}_{1}x_{i1} + {}_{2}x_{2i} + {}_{3}x_{i3} + {}_{4}x_{i4} + {}_{5}x_{i5} + u_{i}$$
(1)

where *i* denotes a particular student and x_{ij} s are variables at the self-learning style:

 x_{i1} : Cognitive load with regard to learning contents, x_{i2} : Cognitive load with regard to learning methods,

 x_{i3} : Motivation towards learning contents, x_{i4} : Motivation towards media and information literacy

In addition, x_{i5} denotes the average value of comprehension of *i* student in the traditional lecture style. If _5 is positively significant, then we can conclude that course design is appropriate and effective, since comprehension at the last stage promotes that at the current stage. The estimation equation of the collaborative learning stage can be expressed in a similar manner.

 $Comprehensioni = __0 + __1x_{i1} + __2x_{i2} + __3x_{i3} + __4x_{i4} + __5x_{i5} + __6x_{i6} + u_i (2)$

All variables except x_{i5} and x_{i6} are those of the collaborative learning stage similarly to equation (1), and x_{i5} and x_{i6} are the average values of the traditional lecture and self-learning stages of *i* student, respectively. (2) Results of estimation by OLS

As for the results of estimation at the traditional lecture stage, this stage does not have a prior stage, and the estimation is exactly the same as [7].

Thai students reported a relatively high socre in Q2 "Cognitive load in learning contents," which indicates that Thai students understand better when learning contents are easy to understand. This in turn suggests that courses aimed at Thai students should be designed with close attention to the level and volume of contents of each session.

With regard to the Q2 of Japanese students, this factor is not significant; this implies that the difficulty of contents was irrelevant to their "Comprehension". For these students, the teacher's lecturing and communication skills were more important in the traditional lecture style teaching.

Motivation asked in Q5 is not significant for both Janapese and Thai students, and this means that students were less motivated to study computer skills further using this stage.

(3) Verification of course design by panel data analysis

(a) Self-learning

Let us examine the results of estimation according to equation (1), in which comprehension in the traditional lecture stage is included as an independent variable. The results show an interesting contrast between Japanese and Thai students, as for Japanese students, comprehension at the previous stage affect that of the self-learning

stage at the 1% significance level, whereas for Thai students this is not significant. In the traditional and self-learning styles, it can be said that the course was more properly designed for Japanese than Thai students.

As for variables (Q2, Q3, Q4, and Q5) at the same self-learning stage, Q2 "Cognitive load of the learning contents" is not significant for Japanese students, while both cognitive load items are significant for Thai students. This implies again that learning contents and teaching methods are more suitable to Thai students. Motivation towards media and information literacy is not significant for either group of students, which is similar to the results in the previous traditional lecture stage.

(b) Collaborative learning

Collaborative learning is estimated by equation (2), in which comprehension at not only the previous self-learning stage but also two stages prior, (i.e. traditional lecture stage) are included in the right hand side of the equation. For Japanese students, only comprehension at the previous self-learning stage affects that of the collaborative learning stage at the 10% level; while for Thai students, that of the traditional lecture stage is at the 1% significance level.

Thai students' comprehension at the first traditional lecture stage provided a positive effect at the 1% significant level, which indicates that course contents at the traditional lecture stage are better suited to Thai students' comprehension in the final collaborative learning stage. From these results, it shows that course design divided into three stages from introductory use to the advanced use to make a short animation is better suited to Japanese than Thai students.

Regarding the four factors (Q2, Q3, Q4 and Q5) at the collaborative learning stage contributing to comprehension at the same stage, Thai students' cognitive load in learning contents and Japanese students' cognitive load in teaching method are found to be significantly different.

4.4. Effect of cognitive load and motivation

In the previous section, we examined how effectively the distance learning course is designed by introducing the variable of comprehension at the previous learning stages into the estimation equation. Since comprehension in this model is defined as the mean value of comprehension scores of classes at the same learning stage, this provides no information on how the four factors of cognitive load (Q2 and Q3) and motivation (Q4 and Q5) of the same or different learning stages promote comprehension in the particular learning stage. In order to examine this issue, an additional estimation model is prepared.

(1) Equation for estimation

The objective of this estimation is to examine how four factors namely cognitive load and motivation of not only the same learning stage but also different leaning stages affect comprehension in the particular learning style. The equation takes the following form:

$$Comprehension_{i} = __{0} + __{1}x_{i1} + __{2}x_{2i} + __{3}x_{i3} + __{4}x_{i4} + __{5}y_{i1} + __{6}y_{2i} + __{7}y_{i3} + __{8}y_{i4} + u_{i} \quad (3)$$

where x_{ij} s are the same as the previous section and y_{ij} s are cognitive load and motivation of the previous stage; in the case of the self-learning stage, these are variables in the traditional stage, and in the case of the collaborative learning stage, these are the variables of the self-learning stage as well as those of the traditional stage. In this model, we attempted to identify which cognitive load or motivation contributes to student comprehension of the same and different learning stages.

(2) Estimation results by panel data analysis

(a) Self-learning

The results show that for Japanese students, among variables at the previous traditional lecture style, only Q4 "Motivation towards teaching contents" is significant at the 5% level, but has a negative sign, indicating that this variable is an obstacle and reduces Japanese students' comprehension at the self-learning stage. For Thai students, there is no significant variable in the previous learning style, and this estimation thus cannot identify any factors in promoting comprehension of the self-learning style.

As for variables in the same self-learning style, Q2 "Cognitive load of learning contents" and Q3 "Cognitive load of teaching method" of Thai students are significant at the 1% and 5% significant level, respectively. For Japanese students, although Q3 and Q4 are significant at the 1% level, again Q5 "Motivation towards media and information literacy" has a negative sign at the 5% significance level, which shows that this motivation reduces the level of comprehension. For Thai students, on the other hand, motivations (Q4 and Q5) are not significant at all, which is the same result in the previous section.

(b) Collaborative learning

The collaborative learning stage has two prior stages and thus there are 12 independent variables in the equation. For Thai students, among variables in the traditional lecture style, none is significant, while in the self-learning style, there are two significant variables at the 5% level, namely Q2 "Cognitive load of learning contents" and Q4 "Motivation towards learning contents". The latter, however, has a negative sign, which implies that it is an obstacle promoting comprehension of the collaborative learning stage.

For Japanese students, on the other hand, there are two negative factors, namely Q4 in the traditional learning stage and Q2 in the self-learning stage, both at the 10% significance level. These are obstacles in comprehension at the collaborative learning stage. Q3 in the self-learning and coefficients of Q2 and Q4 at the collaborative learning stage are positively significant.

Based on rigorous panel data analyses, we examine the appropriateness of course design and identify factors that play significantly positive or negative roles in this distance learning project. In the next section, we will summarize the results obtained in these analyses.

4.5. Appropriateness of Course Design

In order to discuss the appropriateness of course design indicated in Figure 1 and Table 1, let us begin with the three styles of course design. The results are summarized in Table 2. As mentioned earlier, in estimating the effect of comprehension of the previous stage(s), Thai students' comprehension at the collaborative learning stage is affected only by that of the two prior stages, while in the self-learning stage, comprehension at the previous learning stage is not significant. For Japanese students, at the self-learning stage as well as collaborative learning stage, comprehension of the previous style is positively significant; while that of two prior stages is not significant. These findings indicate that course designs which consist of three learning stages are better suited to Japanese students.

Table 2: Appropriateness of	of course design co	mparing to the pri	ior learning stage
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	I hai si	tudents	Japanese students		
	Self-learning	Traditional	Self-learning	Traditional	
Self-learning				***	
Collaborative learning		***	*		

Note: ***, ** and * indicate 1%, 5% and 10% significance level, respectively

4.6. Factors Promoting or Obstructing Comprehension

Factors (Q2, Q3, Q4 and Q5) which promote or obstruct student comprehension are summarized in Table 3, which shows interesting contrasts between Japanese and Thai students. In the table, "direct effect" implies how factors at each learning stage provide a significant effect on comprehension at the same stage, while "indirect effect" refers to those from different learning stage. Regarding the direct effect, for Thai students, two kinds of cognitive load are found significant commonly at all three stages, while two motivations are not significant except Q4 at the traditional learning stage. Thai students gain their understanding better through lecture contents and teaching methods throughout the course, but that motivation had less influence.

		Direct effect	t		Indire	ct effect
				From	n one	From two
				previou	is stage	previous stage
Japanese students	T: N	S: N	C: N	Т	S	Т
Q2 Cognitive load in teaching contents		***	***		[*]	
Q3 Cognitive load in teaching method	***	**	*		*	
Q4 Motivation towards teaching contents	***	***	***	[**]		[*]
Q5 Motivation towards media and information literacy		[**]				
Thai students	T: N	S: N	C: N	Т	S	Т
Q2 Cognitive load in teaching contents	***	***	***		**	
Q3 Cognitive load in teaching method	***	***	***			
Q4 Motivation towards teaching contents	**	***			[**]	
05 Mativation towards madia and information literatu	**			1		

Table 3: Factors promoting or obstructing comprehension

Note 1: ***, ** and * indicate 1%, 5% and 10% significance level, respectively

Note 2: T, S and C stand for Traditional lecture, Self learning and Collaborative learning, respectively.

Note 3: [] indicates negatively significant

Note 4: N indicates tables shown Tables 2 and 3 in Natcha [7].

For Japanese students, Q3 are found to be significant at three learning stages, Q4 at the traditional and the self-learning stages, and Q2 only at the collaborative stage. From these, it can be said that the particular teaching method and motivation to learn more about contents promotes their comprehension. However, Q5 is negatively related to comprehension in self-learning, which should have been taken care at the beginning.

Regarding the indirect effect, however, the course design does not promote students' comprehension at three stages for both groups of students, since there are only few significant factors, but also they have negative signs. In particular, Q4 "Motivation towards learning contents" is found to be an obstacle for understanding for both groups of students, although it contributes to comprehension at the same learning stage. Care should be taken for designing courses and selecting contents which are underrated at the next learning stages.

5. Conclusions

In course design, Constructivism theory provided a learning architecture which promoted a more interactive acquisition of knowledge through experiences such as self-learning or collaborative learning. The obstacles to international distance education included timing, language, learning background, knowledge of ICT media accumulated to date, etc. Bloom taxonomy was therefore adopted not only to manage appropriate learning targets and intended learning outcome, but in actual practice, it also helped teachers to estimate student readiness at each step of the new ICT international teaching and learning environment and to rapidly validate the appropriateness of the teaching methods, such as subject content arrangement and instructional strategies.

By utilizing panel data analyses, this study successfully identified not only which parts of course design are appropriate for students' comprehension and which parts are not, but also which factors of cognitive load and motivation enhance or obstruct students' understanding. From the results, we realized complex relashionships of learning perception and respective learning stages. These empirical results indicate that in the same learning environment, Thai and Japanese students had different perceptions of the effect of learning processes and contents on their comprehension. The variation is strengthened in a more complex setting, such as self-learning and collaborative learning.

For Thai students, in contrast, cognitive load (difficulty) was more important than motivation. To decrease cognitive load for Thai students, knowledge checking or controlling the volume of contents in each class during the course should thus be undertaken. In contrast, Japanese students should be provided with teaching content which will promote their eagerness, such as new ideas or challenging activities.

In terms of comprehension among Thai students, cognitive load or difficulty had the strongest influence on comprehension, whereas motivation had the least influence in the same teaching styles with Japanese students. Closer investigation of this interesting result should identify whether the lack of motivation among Thai students is derived from the variation in learning cultures, or from a failure in teaching methods.

Our present results will be of benefit in the development of guidelines for prioritizing learning factors such as contents, processes, materials and ICT media in international learning.

In-school classroom discipline is also one of the important to take more attentention. A class period of 50 minutes seems enough for traditional lecturing classes, but not for self-learning and collaborative learning. Class observation showed that all students experienced difficulty in completing their assignments in time. On several occasions, the teachers of both countries found it difficult to maintain advisory roles in the limited class time and this forced them to return to the traditional style of teaching. Moreover, both Thai and Japanese students lost about 10-15 minutes in transferring to the computer classroom, leaving only 35-40 minutes for the class itself. We therefore recommend the adjustment of times to better match actual in-school classroom conditions, such as by providing a shorter period for each class session and longer term for the whole course.

The combination of various learning methods supported by technology reveals the possibilities of enhancing effective learning in school education. This study found that course design should place a greater emphasis on two-way interactive communication and more real-time. This will assist when teacher manpower in the advisor role is insufficient.

Most students used the WBT and BBS only in the classroom, and only students who were their group representative participated in the BBS. Moreover, the number of teacher as advisors was insufficient, because many of the students required direct advice from teachers. We therefore offer several suggestions which may enhance interaction communication.

- Discussion via the BBS should be made compulsory when interactive communication is considered to be essential, particularly in collaborative learning.
- The interaction of both student-student and teacher-student with technology support in the classroom environment should be more real-time. This will assist when teacher manpower in the advisor role is insufficient.

As an international distance learning, English language for non-native English speaker is one of communication problem. This requirement was to provide students with a good opportunity to integrate their knowledge of English with computer skills. In practice, however, it increased the difficulty in learning. Although an on-line English dictionary or translation software was available, students rarely used it. Observation showed that students of both countries had problems in composing sentences for communication, rather than vocabulary problems. They relied more on the assistance of the teacher assistants in actual classes. Lack of communication skills seemed a more serious impediment to learning than their actual English level. Promotion of communication skills would therefore be the key to lowering the language barrier.

In addition, An unfamiliarity with teaching methods was a learning obstacle. Although the Japanese students had some experience with technology-enabled distance education, the present study was the first time for the Thai students to experience such a teaching or learning environment. Although the subject

contents were new to all students and their background knowledge level at the beginning of the class was the same, Thai students required the contents with a much lower cognitive load (easier understanding). This in turn suggests that the lower level of experience with ICT teaching or learning environments tended to discourage the adoption of a positive learning attitude. The readiness of students to utilize an ICT-based teaching or learning environment should therefore be considered. Students should be provided with sufficient experience or information by showing a video clip, for instance, of a former class or conducting a trial mock-up.

Regarding to readiness of high school students to self-learning and collaborative learning, Observation showed that if students do not have sufficient self-organization, then self-learning and even collaborative learning may fail in the traditional face-to-face lecture style. Students failed to perform their assigned roles of communication, particularly in the self-learning and collaborative learning styles. They made no effort to confront problems by themselves, but rather waited for the teacher to solve unclear points. Adaptability to self-learning is required. Moreover, in the collaborative learning style, knowledge is acquired through the process of social participation, which is generally experienced in higher education. It appears more difficult for high school students to improve their attitude to learning than for college students, for example. It is thus necessary to acclimate them to collaborative learning methods by using clear assignments and easily understood activities among classmates, such as interactive games or role-play discussion, for example.

Finally, this study attempted to analyze the major potential promoters of learning in practical and consistent manner. However, learning impact is subject the particular characteristics of each country and understanding the actual effects of course design require further studies.

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The MIT LINC 2010 Conference Parallel Presentations

Session #12:

The Promising Potential of Collaborative Learning Via the Internet



Leveraging Technology for a New Science Learning Paradigm

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Abstract

The Global Lab Project, the first full-year, online, interdisciplinary, high-school science course, pioneered a learning paradigm called telecollaborative inquiry. Piloted worldwide in the mid-1990s, the project engaged students in a virtual learning community that conducted synchronized, collaborative investigations. Despite its effectiveness, Global Lab was far ahead of the available technologies of the day, and was relaunched in 2005 as a pilot in Russia <www.globallab.ru/>. The Global Lab Project 2.0 uniquely capitalized on cloud computing and social networking to advance the project's telecollaborative inquiry model. Its model, however, by its very nature, conflicts with the traditional practices of science classrooms. To more effectively position the curriculum in the core of science instruction, Global Lab 3.0 tightly integrates content and curriculum at the granularity necessitated by daily instruction. Future innovations will further build on cloud computing to advance Global Lab's telecollaborative inquiry science education.

Today in Russia, the International Laboratory for Advanced Education Technologies (ILAET), in collaboration with the Moscow Institute of New Technologies, is piloting a new learning paradigm called telecollaborative inquiry in the Global Lab Project. An upper elementary-school integrated Earth and physical science curriculum, Global Lab harnesses social networking, cloud computing, and new technologies to engage students in distributed, synchronized, hands-on investigations that uniquely build content mastery and foundational skills. The current Global Lab Project is version 3.0, reflecting its past and future scope and its leveraging of twenty years of evolving computer technologies and pedagogical strategies that, when integrated, afford secondary schools entirely new ways of inquiry learning.

Inquiry is a pedagogical strategy that focuses students on constructing their own knowledge through handson investigative projects. When done by an individual classroom, however, inquiry can be limited if not parochial. For example, to explore a topic as simple as the relationship between latitude and the angle of the sun, a single classroom has to take measurements throughout the school year, which conflicts with a teacher's need to ensure each class period meets its objectives and outcomes. As a result, such inquiry projects can stop abruptly halfway before students become aware of the discoveries afforded by the investigation. When many classrooms that are geographically-distributed worldwide measure the angle of the sun on the same day and share their findings, students then have a body of data that they can analyze immediately. They can explore the data's statistical validity and obtain meaningful results.

We use the word "telecollaborative" because Internet connectivity changes the nature of inquiries, multiplying the power of individual inquiries [1]. Telecollaborative inquiry enables students to leverage the community of inquiry's findings to make the data more meaningful and the learning deeper, more immediate, and more efficient. Students conduct one experiment or collect one set measurements, but in return they then have everyone's data to study. In addition, immersing students in a distributed community of learners better deploys the social aspect of learning: students feel needed and valued as they begin to appreciate the importance of their data to the entire community.

Telecollaborative inquiry also teaches the processes of science. When a teacher tells students to make measurements in a specific location following a strict protocol, students can conclude that these instructions are arbitrary and irrelevant. But when they understand that many other classes are making the same measurements and they will then compare their findings, the need for rigorous protocols and common standards becomes almost intuitive. Students also can begin to grasp that the essence of science is collaborative knowledge construction. Telecollaborative communities of inquiry, for example, provide a critical audience and rationale for peer review.

Global Lab 1.0: launching telecollaborative inquiry

Launched in 1990, the Global Lab Project was an eight-year effort at TERC and the Concord Consortium, funded by several grants from the National Science Foundation, that explored the use of new technologies for engaging students in authentic, collaborative scientific investigations. The project culminated in the first yearlong, middle-school, interdisciplinary science curriculum that implemented online collaborations for student inquiries. The curriculum used the Internet, affordable tools, and scaffolding to link teachers, students, and scientists into an international community united by common goals, curriculum, and technologies and engaged in real-world, openended investigations. Four hundred schools in almost 30 countries on five continents participated in the project [1].

Global Lab was one of the first classroom communities of practice to deploy a curricular structure and community-building techniques. Students communicated with their peers worldwide, engaged in building their own community, and learned both science skills and content. Rather than individual classes trying to understand natural phenomena using a single set of locally-collected data, Global Lab classes examined datasets from the entire community, accelerating and deepening students' understanding of key science concepts. This model of telecollaborative inquiry delivered on the promise of Internet connectivity to enhance education and justify the enormous costs of wiring classrooms for computers.

Structurally and metaphorically, Global Lab was organized as an international networked science laboratory with every participating class having its own presence. All interactions between schools were computerbased, and each school was a fully-functional node on the network. The community was supported by a virtual library where project data and background resources were kept, a project-wide electronic bulletin board for announcements, and online discussion groups for students and teachers. Students teleforums allowed classes to post their findings, ideas for further investigations, and research plans. In their own online discussions groups, teachers reflected upon their practices and shared tips and advice.

Pioneering networked science

The Global Lab Project advanced the networking learning projects of the day, which began with the 1983 Kids Network Acid Rain unit [2, 3]. By 1986, TERC, working with the U.S. National Geographic Society, developed NGS Kids Network, the first telecommunications-based curriculum material and the first curriculum to use student data sharing over the Internet. Students participated in large-scale, cooperative experiments, shared their data on a computer network, and consulted with scientists. Each Kids Network unit involved making a measurement that students shared with other students performing the unit simultaneously. Worldwide, thousands of elementary-school teachers inserted Kids Network modules into their classroom instruction [4].

Global Lab adopted the Kids Network model, such as the clustering of schools into work units to facilitate collaborative investigations. Each Global Lab cluster had 20-25 schools that featured geographical diversity and were moderated by teachers, giving students a sense that they belonged to an electronic neighborhood. Global Lab also sought to improve upon Kids Network by delivering more content, but its seminal innovation was the use of study sites.

The study site is the object of focus during the Global Lab year. It is usually a piece of land or a body of water in proximity to the school, and students study its physical, chemical, biological, cultural, and historical characteristics. The use of study sites impacted student learning in vital ways.

The study site engendered in students a sense of ownership in their work. Too often, they are told what they must study. Instead, Global Lab allowed them to choose what to study. By focusing on a student-selected object of study from the world outside the classroom, the project made learning hands-on, relevant, and motivational. Early on in the Global Lab school year, students knew that their studies would be rooted in the real world.

The study site also provides an almost Hegelian dialectic of similarities and dissimilarities [5] that exemplifies the pedagogical value of telecollaborative inquiry. Global Lab emphasized uniformity; students used the same tools and strict protocols at the same time to collect data on their study sites. This uniformity enabled them to study their local environments in precisely the same way, thus allowing for comparisons and analyses. Yet, while sharing common methodologies, the Global Lab community was geographically, ecologically, and culturally diverse, and represented many unique social and historical perspectives. When students, therefore, placed their findings into regional, national, and global contexts [1], they inevitably discovered that their data differed from each other. Why, for example, did one study site have higher levels of particulates in its air than others?

When students explored the causes of these differences, the interplay of uniformity and diversity yielded a dynamic and stimulating learning environment. Students learned about statistical variations, the reproducibility of

data, and metadata. They experienced how science operates, which, by its nature, is collaborative. And as they sought to account for the differences in their data, they learned to separate facts from inferences, and how some phenomena must be reproduced by distributed peers.

Building a collaborative learning community

The project was structured, in effect, as an educational funnel, guiding learners from qualitative descriptions to quantitative data collections, and then to investigations bound by genuine rigor. The Global Lab year was divided into three progressively sequential phases, each with its own objectives and goals. The first phase, *Meeting Your Global Lab Community*, focused on building a virtual international learning community and developing in students local, regional and global perspectives. It instilled in them a sense of community and built the skills, familiarity, and trust they would need for telecollaborative inquiries. Students gradually gained the ability to compare and contrast their findings and place them into regional and global perspectives.

The second phase, *Building Investigative Skills*, prepared students to conduct investigations by carefully scaffolding the acquisition of basic inquiry skills. Students began by making drawings, maps, and qualitative observations of their study sites. Then, with guidance from instructional materials, students worldwide used similar tools and instruments and followed the same schedule, protocols, and standards to make environmental measurements of their study sites. They then reported their findings via the Internet to a community-wide database. Soon, every class collected a rich set of data on the soil, water, and air of its study site and sent its findings to the Global Lab database for comparison and analysis with peers. Students placed their local environments into a global context.

After introductory data-gathering activities, the community participated in a series of synchronized skillbuilding procedures called Global Lab Snapshots, which were inspired by the International Geophysical Year of 1957. Snapshots are the quintessential telecollaborative inquiry events over the Global Lab year. At the same hour on prearranged days, all schools made identical measurements on their study sites. These and other directed research procedures prepared students with invaluable skills in collaborative techniques and data-collection, and added to the growing functionality of the community.

Global Lab's final phase, *Extended Investigations*, engaged students in open-ended, telecollaborative investigations. The curriculum supported fields of study that were drawn from the students' own observations of environmental phenomenon on their study sites. Each class was asked to select one of these fields in which to perform an investigation. The community then reconfigured itself from one that was curriculum-directed to one that was student-directed. Research topics included air and water quality, tracking pesticides, nitrate studies, butterfly migrations, lichens and other bioindicator plants, and UV and stratospheric ozone.

Students were called upon to pose a research question, identify the data they would need to answer it, develop a research strategy with which to acquire this data, and then perform investigations collaboratively. Throughout the process, classes were asked to peer review each other's work for accuracy to ensure scientific vigor.

Similarities & dissimilarities

The duality of similarities and differences in data offered learning opportunities that sometimes impacted students' lives. A Global Lab class in San Antonio that was part of a cluster studying CO_2 levels, for example, determined that its classroom had relatively high levels of CO_2 . Its students assumed that the CO_2 had caused observed classroom illnesses, but the moderator explained that a correlation does not necessarily mean causality. The real cause was inadequate ventilation in the classroom. Pressured by the students, the school's administrators called in environmental professionals to take their own CO_2 measurements. Indeed, their findings correlated to the data that the students obtained using the project's tools and protocols. For these Global Lab students, it was, in the words of their teacher, "a moment of glory" [6]. In a reflection of how science is generally taught in secondary schools, the same teacher, in a personal communication, noted that her students assumed science was just memorizing content from textbooks and eagerly engaged in Global Lab activities to avoid doing "real science."

When performed by a single classroom, hands-on science inquiries deliver limited experiences. But when performed simultaneously by a hundred of networked schools, they provide a rich set of data that can be the source of many interesting discoveries and conclusions. Global Lab demonstrated that distributed, synchronized investigations in virtual communities offer more powerful learning opportunities than small or individual inquiries.

The Global Lab Project's innovations were effective and widely praised by teachers and the education community. Based on surveys, classroom observations, and teacher and student interviews, Global Lab enabled

student inquiry. Students demonstrated increased abilities to design, execute, and interpret experiments. Networkbased peer review was particularly effective. Learners enhanced their abilities to evaluate experimental design and benefit from criticism. They better appreciated science and ethics, and became more aware of their accountability to their peers. Significantly, they also acquired science process skills like the abilities to articulate research problems, create procedures, and analyze data. Teachers also reported that the project motivated at-risk students and other typically under-served groups. In all participating classes, students' attitude towards science improved and their curiosity of world problems related to science appeared to increase. [1, 7].

Thanks to these accomplishments, Global Lab was featured in *Science* [8], *Wired* [9], and *Fortune* [10] magazines, National Public Radio. The White House's National Information Infrastructure 1994 Agenda for Action report cited Global Lab as an exemplar of online K-12 education in America [11].

Ahead of its time

Upon completion of its developmental stage, Global Lab and all of its materials and resources were handed over to textbook publisher Kendall-Hunt for publication. Yet despite its many innovations, successes, and accolades, the curriculum languished. Why?

One key reason was the limited technologies of the mid-1990s were insufficiently robust to support such an advanced learning endeavour. Classroom connectivity was limited to modem dial-up access and computers were still pokey, impeding data sharing and communications across the Global Lab community. When the project's evaluator asked teachers why their classes communicated with other project classes, 29 percent said to ask for help in addressing technology-related problems, indicating the limitations of the period's computer-mediated communications [7]. Moreover, with the World Wide Web still in its infancy, the project lacked easy-to-use, graphical, function-rich, interactive user interfaces to facilitate students' work.

Additionally, network-based inquiry curriculum was still a novelty then and many teachers were illprepared for delivering inquiry-based pedagogy and using computer-based communications. They struggled to integrate Global Lab into their classroom practices, which was evidenced by the project's various implementations [7]. Some classes used Global Lab as intended—a full-year science curriculum—but most teachers inserted the project's curriculum units into their regular Earth science, biology, physics, chemistry, and environmental science courses [12], generally one day a week on a part-time basis. They still based their assessments on what their students learned from standard textbooks, making the project, in effect, an extracurricular activity.

Finally, Kendall-Hunt, like virtually all other textbook publishers of the day, was ill-prepared to market Global Lab to school districts. It was a new kind of curriculum that demanded new ways of teaching, highly unlike traditional textbook products. Moreover, the publisher was not in the business of providing the hosted infrastructure that Global Lab demanded.

Although Global Lab 1.0 withered, it influenced then-emerging educational projects. Global Learning and Observations to Benefit the Environment (GLOBE), for example, initiated by the office of then Vice President of the United States Al Gore, built upon its innovations, including the use of study sites, to forge a networked partnership between students worldwide and leading scientists to monitor key environmental parameters. But Global Lab's bottom line is it was an entirely new learning paradigm that fell victim to convention and its own farsightedness.

Global Lab 2.0: relaunched with new technologies

By 2005, Web 2.0 technologies and social networking sites were emerging, and many schools had reasonably powerful computers and broadband Internet access. Dr. Boris Berenfeld, the principal developer of Global Lab 1.0, and his colleagues at the Concord Consortium decided that the project's time had finally arrived. With support from the Russian National Training Foundation, they developed Global Lab Project 2.0. They targeted upper-elementary students (grade 5) with interdisciplinary, introductory Earth science learning, and piloted the project in 30 schools across Russia from its cities to its villages. Russia was chosen as a testbed because of its broad environmental diversity, ranging from deserts in the south to tundra in the north and all manner of terrain and climates in between, and for its traditional use of synchronized curriculum.

The Global Lab Project 2.0 <www.globallab.ru/> used the pedagogy and strategies of 1.0, but with major upgrades. The Concord Consortium remotely hosts the project's curriculum, content, applications, and many of its resources, and the developers built an innovative web portal along with support for project coordinators and teacher trainers. Refining the original project's structure, Global Lab 2.0 is divided into seven month-long modules: Building a Global Community; Selecting and Exploring Life at our Study Site; Signaling Seeds: from Dormancy to Germination; Down the Scales to Molecules; Earth History Recorded in Rock; The Global Lab Snapshot: Sun, Light

and Heat; and Our Study Site in Time. They are sequenced like chapters in a book to provide an overall narrative to the Global Lab year.

The core Global Lab paradigm remains, but with advances often driven by the availability of new technologies. Now, during community-building, for example, when a class joins the project, a star at its geographical location on a map of Russia automatically appears, giving students a view of the location and distribution of project classes throughout the country. Every class uses tools embedded on the web site to construct a multimedia presentation to introduce itself, its school, its community, and its region. Each class has a public space in the portal dedicated to its presentation, and with video, audio recordings, and images, each introduction is far richer and engaging than the plain text messages of Global Lab 1.0.

The project developed a tool called the Annotator that enables students to very easily annotate their photos and images with text captions. This functionality is useful for communicating with images, particularly when describing the characteristics of study sites.

Classes also work with a much more advanced, project-wide database. Students can search the database using such environmental and geographical parameters as latitude, region, elevation, average air temperature, and average precipitation. For example, they can identify the data from schools within certain ranges, such as +/-10 degrees of latitude, which facilitates both data analysis and finding collaborators within the community. Moreover, once they identify the desired data, they can visualize the information in a variety of ways to identify trends and bolster analysis.

Additionally, Global Lab 2.0 enhances the delivery and availability of project-focused content by providing a digital primer. With a Russian name that basically translates to "verbal portraits," the primer provides the scaffolding to describe study sites and qualitatively and quantitatively identify its flora, fauna, and terrain. It includes terms to build students' vocabularies and annotated images of the flora and fauna students might find on their sites. For example, the resource features illustrations of birds that identify all of their defining characteristics. It empowers students to more accurately describe birds by the size and shapes of their beaks, the colors of their features, and characteristics of their tails. Or describe rocks by their lustre and hardness, or seeds by their size, shapes, and defining characteristics. They learn that science, as in many endeavors in life, begins with careful observations.

While Global Lab 2.0 has yet to be formally evaluated, the response from teachers was very positive, just as with version 1.0. Many said that their students looked forward to their Global Lab work because they liked its authentic, hands-on investigations in a distributed community of peers [13]. When asked for his opinions of the project, one student inadvertently summed up the project's educational success by declaring that he disliked Global Lab because it made him "think all the time" (a video of this comment and Global Lab students in the field is available at <<u>http://www.globallab.ru/en.htm</u>>). The project is scaling its efforts to meet growing demand for participation among Russian teachers, even though awareness of the project has been spread only through word of mouth.

Yet, the project continues to grow and innovate.

Global Lab 3.0: going to the heart of classroom instruction

In 2009, ILAET launched the Global Lab Project 3.0 as a pilot project in 100 Russian schools (schools can apply at <htp://www.globallab.ru/join/en.htm>. This version further refines 2.0 with additional technologies and functionalities to support science learning. Students, for example, will be able to directly upload data from a wide range of inexpensive, commercially-available digital probes, streamlining data collection and enabling realtime graphing and visualizations of phenomena. Such a capability further reinforces the project's portal and web-based tools as an entire ecosystem for learning and teaching.

One of the developers' primary objectives was to structure Global Lab's telecollaborative inquiry model so teachers could use it in the core of their daily instruction. The pedagogy of telecollaborative inquiry conflicts with the structure of science classrooms, which tend to be insular, textbook-centered, and demand definitive answers in accordance with course scheduling. Typical science classrooms function with daily granularity; each class is predictable with its activities and outcomes, a characteristic that true collaborative investigations often fail to produce. Global Lab 1.0 and 2.0, like Kids Network, GLOBE, and other similar projects, ran into this contradiction. As a result, they remained as ancillary instruction to mainstream science classes, used after school or with motivated students.

Accordingly, Global Lab 3.0 adapted its telecollaborative inquiry model and open-ended investigations to the realities of classroom practices. The project offered a new framework, which functioned at the granularity of daily instruction, that addressed teachers' needs to present designated content areas and build specific science

process skills. Key to this effort was the delivery of content. There have been widespread demands for schools to adopt digital textbooks to avoid the costs of print textbooks and ensure students always work with up-to-date information. Indeed, the primer of Global Lab 2.0 was an example of digitally-delivered content in scrollable and searchable book form. Version 3.0, however, took another approach for presenting content.

Granular teaching & learning

Global Lab 3.0's main innovation is its conversion of traditional instruction, content, and scaffolding into granular telecollaborative units. Although it uses the same overall eleven-stage structure of its predecessor, it breaks down each stage into Global Learning Units (GLUsTM). The project does so to tightly integrate content with curriculum and activities.



Figure 1. Global Learning Units (GLUsTM) are performed synchronously by a worldwide community. Every star on the map represents one of 100 participating schools.

Every GLU is a set of dedicated, web pages linked by onscreen icons and all share the same eight components (see the figure below for the components and the student interface). Each offers several days of classroom investigations on a primary topic within the module's domain.

The first component, "Introduction," introduces students to the GLU's topic and inquiries. "Glossary," the second, borrows from 2.0's a primer to provide the vocabulary and concepts that the GLU addresses. Unlike 2.0's primer, this component offers interactivity; students can add to it as needed to support their learning.

"Resources" provides the GLU's content and concepts. Students click on this icon to access all relevant content. Content is no longer elsewhere in another chapter, book, or web site; it is always one click away. Content and curriculum are now seamless. Additionally, Global Lab takes advantage of Internet advances, such as Web 2.0 technologies, hyperlinks, wikis, and multimedia, to present traditional content digitally.

The "Work with data" component engages students in observations and data collection. They upload their findings into the project database and visualize their data. To make investigations as rich and engaging as possible,

students post video, photos, artwork, metadata, and anything else about themselves and their investigations in "Our gallery," which all other schools can freely access. Classes can exchange visual data and maintain a true presence within the community.

In "On the map," students place their data on a global map of the Global Lab community and view the findings of other project schools. The map emerges as both an investigative and community-building tool. Clicking on any star on it brings up an image of that site's students and basic metadata of its environmental circumstances.

Once they work with their own data, classes then compare their findings with other schools in the "Compare data" component. They still select data from schools by using parameters and ranges, enabling a reasonable level of data mining, and they visualize how their local environmental characteristics compare with any single school, any group of schools, or all schools.



"Students' forum" allows students to discuss their work and investigations. A ninth component for teachers only, "Teachers' forum," permits instructors to share ideas and practices, offering needed support and professional development.

Thanks to GLUs, Global Lab 3.0 consolidates content, curriculum, tools, and resources within a synchronized community using a remotely-hosted student-friendly interface. It calls into question the need for packaging content into textbooks, even when they are digital. The project delivers a complete learning ecosystem with which teachers can ensure their students master content and gain skills through authentic collaborative investigations.

Leveraging the cloud

Always intrinsic to Global Lab's pedagogical approach is networking among students and the fact that learning is a social endeavor. Even before the term "social networking" was coined, version 1.0 was relying on networked interactions among peers for science learning. As evidenced by the popularity of Twitter and Facebook, today's children are even more able and eager to communicate with each other. Yet, although their classrooms may be wired, students themselves are not connected.

Global Lab channels how they interact via online social networks to build virtual learning communities. When a class enrolls in the project, its students immediately see who is in the community they just joined. In every Global Lab class period, they are scaffolded by the structure of that day's GLU to conduct collaborative investigations into the GLU's topic. As they do the activities, they know that their peers throughout the community are doing the same work and will depend on them for data, ideas, and partnerships. As a result, students in Global Lab are truly connected and do not have to "power down" as they do for other classes. They now learn inside the classroom just like they learn outside the classroom.

Just as importantly, Global Lab 3.0 takes advantage of the economies, scalability, and functionalities offered by cloud computing. The project has always been dependent on remotely-hosted services and resources, even in the 1990s. It now demonstrates that clouds have many applications in education besides IT applications like remote data storage [14].

Schools certainly can use clouds as many business do. They can keep their curricula, applications, and data on clouds, obviating the need for in-house IT resources and robust but costly classroom computers. Because the cloud provider does all the computation-intensive processing, teachers and students can use thin clients or even iPhones to access resources. Schools, as a result, can gain productivity and much needed cost-savings, especially when content is digitally delivered.

Clouds, however, can do more for education than delivering software-, content-, or even infrastructure-asa-service. They can change the very ways that teachers teach and students learn. Cloud computing enables telecollaborative inquiry in the form of synchronized virtual learning communities. The same curriculum is done synchronously by all schools worldwide, allowing for stimulating interactivity and discoveries. With such *cloud pedagogy*, students can become, in effect, learning entrepreneurs who actively construct and apply knowledge. They can build their knowledge of content while gaining skills vital to 21st century industries like critical-thinking, collaboration, communication, data assessment and analysis, and lifelong learning.

Global Lab 4.0?

The Global Lab Project 3.0 will continue to evolve, perhaps one day becoming version 4.0. It already is a laboratory that illustrates how advanced pedagogical approaches can leverage emerging technologies. Its developers are considering building into the portal voice and video IP conferencing to make collaborations easier and more vivid. Thus, within the globally-distributed learning community will be productive, globally-distributed student laboratories. Students thousands of miles apart will be able to collaborate on realtime experiments, viewing each others' classrooms, speaking to each other, and immediately accessing each other's data. Many professional science enterprises lack such functionality. To support cross-cultural investigations, the portal will also feature embedded translation tools to surmount language barriers.

The project will easily update content and provide curricula and on-demand learning and teacher training services. It will add an advanced molecular modeling application and other resources that teach new fields like nanoscience, biotechnology, and sustainable development, enabling schools to better prepare the next generation of workers.

Global Lab will embed assessments tools that allow instructors to determine if students grasp and can apply concepts and skills as well as if they have learned facts. Teachers will have additional professional development resources like webinars and just-in-time teacher training. They will be able to view a video of a master teacher delivering the next day's lessons, enhancing the curriculum's integration into daily practices and its educational impact on learners.

The project will even use cloud computing to better engage parents in their children's education. Developers envision enabling parents to access the project's portal to access a student's assignments, portfolio, and performance measures.

These and other future innovations are harbingers of how clouds and social networking can impact learning [14]. Dr. Berenfeld and his team at ILAET are globalizing Global Lab, making its resources available in English

<http://www.globallab.ru/en.htm> and, later, other languages. They also are scaling the project's capacity to many thousands of schools, permitting a truly global learning community of practice. While the project and its participating schools are presently supported by grants from the Russian Dynasty Foundation and Intel Education, the developers will build a sustainable model using school fees and grants. Moreover, the Global Lab's pedagogical framework can be applied to nearly all secondary-school curriculum. For several centuries, K-12 schools have prepared students for the Industrial Revolution and then for the Information Age. the Global Lab Project presents a new paradigm for educating students for the 21st century.

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WE WRITE BETTER TOGETHER: E-MENTORING TO INDUCT DEVELOPING COUNTRY RESEARCHERS INTO SCIENTIFIC LITERACY PRACTICES

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ABSTRACT

This paper describes the design and implementation of an e-mentoring programme to support early career and less experienced researchers from developing countries improve their scientific abstracts prior to submission for the International HIV/AIDS Conferences. An evaluation study was conducted on the impact of this programme over two conferences. Results from the evaluation show that distance learners improved their motivation, knowledge and skills of abstract writing, with the support of a template for scaffolding, mentor feedback, and an open access toolkit for self-study. They also overcame barriers such as lack of access to opportunities to learn an essential skill for scientific professional development. Based on this innovation, I consider the implications for reimagining universities, workshops and conferences as collaborative capacity-building spaces, via the use of Web 2.0 technologies.

KEYWORDS: Online mentoring, scientific literacy, learning as participation, learning technology, technology in education, research capacity building, university faculty, professional development, writing, online learning

1. ONLINE MENTORING FOR IMPROVING SCIENTIFIC WRITING

There is an urgent need for more and better research from the places where the issues and challenges of scaling-up health treatment, prevention, and care are being tackled currently, as they can impact the strengthening of health systems (Zewdie et. al, 2008). However, junior scientific, clinical, and social researchers who work in resource-limited settings often lack both 'hard' resources, such as basic laboratory equipment, and 'soft' resources, such as rigorous mentoring in research design and writing. They thus find it challenging to disseminate their research at international, peer-reviewed conferences and in journals. This group of professionals comprises not only scientists and clinicians, but also advocates, activists, community workers and social counsellors working in various disciplines. The situation is complicated by the lack of investment in improving national research systems (Kirigia and Wambebe, 2006), which inhibits the emergence of a research culture. In addition, training workshops on scientific writing in developing countries are not effective in producing writers because instructors focus more on the product rather than the process of writing, a cause of the limited understanding of learning as the mere transmission of procedural knowledge. Plagiarism and a lack of awareness of the ethics of research are rife in scientific writing from developing countries. Given these obstacles, many early career researchers are left low in morale, wondering when and if they would ever experience success in the 'publish or perish' academic culture.

As the custodian and convenor of the International AIDS Conference, the International AIDS Society (IAS) is tasked with enhancing access, widening participation, and increasing the quality of HIV research carried out by researchers from resource-limited settings. I was working at the IAS as Professional Development Coordinator, when this challenge to the potential scale and impact of my education programmes arose. I conducted a small-scale action research to find out past experiences and lessons learnt, gather perspectives from various stakeholders, and reviewed the literature on teaching scientific writing effectively to large cohorts with huge unmet needs, and with limited funding.

To this end, I led a project team to create an e-mentoring programme during the abstract submission period (Nov 1 '08 - Feb 25 '09) of the IAS 2009 conference (July 19-22 '09). This project is an expansion of a programme from the AIDS 2008 conference. The programme's aim is to help diverse types of researchers from around the world prepare abstracts of their work. These researchers submit draft abstracts online by filling in a form that provides step-by-step guidance on the format and content of an abstract. In addition, self-help tools are provided online to increase the researchers' understanding of the processes of abstract writing, submission, and selection. The mentoring is provided by experienced abstract writers, who give structured feedback on draft abstracts. The online platform is incorporated into the IAS 2009 conference website (www.ias2009.org/mentor), which all delegates visit as the one-stop portal for the conference programme and services. The site is also marketed to networks of HIV professionals and researchers, including IAS members, and previous conference delegates.

Incorporating this online abstract mentoring platform into the conference programme can potentially improve the secretariat's capacity to mentor early career researchers from a distance. This is a response to the need to improve access among under-represented groups, and reduce the rejection rate due to poorly conceived abstracts. Before online mentoring was provided, previous abstract reviewers were surveyed to find out their reasons for rejecting abstracts. In addition, a set of FAQs and examples of good/bad abstracts was developed. A pool of mentors was then recruited for each track in the conference.

This innovative and creative use of technology, informed by research into learning as participation in a community of practice rather than the transmission of functional skills, offers new possibilities for inducting novice researchers into a global scientific learning community. It takes into account that reading and writing science is a literacy practice that is socially situated, so that learning to participate is about acquiring desirable literacy practices.

2. E-MENTORING TO INDUCT NOVICES INTO A LEARNING COMMUNITY

As the global HIV epidemic enters its third decade, medical, social-behavioural and policy developments worldwide need to be shared. Historically, developed-country researchers have dominated international dialogue on infectious diseases, thanks to intensive scientific mentoring in university-based programmes that tend to be longer in duration and allow greater scope for nurturing relationships. In contrast, the level of mentoring available for early career researchers in developing countries has been insufficient. In recent years, the practice of e-mentoring for professional development and distance graduate education has increased, whether for nurses (Melrose 2006), teachers (Brady and Schuck, 2005; Thomas, 2005), or librarians (Hines, 2007). In fact, the use of e-learning for inducting early career professionals has also expanded to professions such as scientists and engineers (Malchow, 2001), managers, and entrepreneurs (APESMA, 2003). All of these are examples of e-mentoring networks with dedicated resources and systematic programming. The imperative is very clear: that more e-mentoring, which directly targets young and early career researchers in developing countries is urgently needed to rapidly and cost-effectively socialize them into global communities of practice, supported by collaboration between professional experts and peers, and newcomers to improve their performance through contextually relevant practice.

The IAS began a limited e-mentoring service directed at early career abstract submitters for the AIDS 2004 conference. Initially, it intended to provide abstract submitters an opportunity to improve their abstracts by asking questions to mentors through email. Over the years, it gradually expanded to include providing a downloadable abstract writing toolkit in a number of languages. The toolkit was prepared by John Miller from the Coalition for Children affected by AIDS, (CCABA), to support community-based organisations prepare abstracts to present and share their work with international audiences. It walks abstract writers through a process with the help of a conceptual checklist, a writing guide, probing questions, and oral and poster presentation drafting templates. Figure 1 shows Page 6 of the toolkit, which explores the notion of 'interesting' from the point of view of abstract reviewers and potential audiences at conferences.





For AIDS 2008, this service was expanded to include other resources, such as a list of FAQs, a list of the 'Top 5 reasons why abstracts are rejected', and samples of good and bad abstracts for the purpose of comparison. While these self-study resources are enabling, submitters desired an opportunity for actual review and inquiry of their ideas with peers and experts that they were not able to access at home. Based on the evaluation of the 2008 programme, an online submission system was then developed in-house for 2009, with the collaboration of the Conference Programme, Professional Development, and IT departments. The project team also felt that such a process, linked to delegates' profiles, would strengthen relationships by providing a valueadded service to the community we serve. With this in mind, the team designed and implemented a system leveraging online technologies to scaffold learning, rather than the informal Q&A approach used hitherto, thereby instituting a conceptual leap forward. Through this system, submitters were guided to develop their draft abstract according to its sub-sections – background, methods, results and conclusion – as well as upload accompanying figures or tables, and ask questions on specific issues they might have. Figures 2 and 3 show screenshots, from the conference website, of the online form through which abstract submitters are guided to submit their work for mentoring:





It is anticipated that through such scaffolding, abstract submitters will learn how to compose an abstract sequentially, while being exposed to a rich online learning environment before actually submitting a completed abstract for review. Importantly, the abstract scoring guidelines were also published. This helped to familiarize submitters with the peer-review process for their abstracts, and enhance their understanding of what can be perceived as a confusing and opaque process. Mentors are recruited from the group of expert HIV researchers on the IAS Governing Council, as well as from the pool of high-scoring abstract submitters who had won scholarships and prizes at the previous conference. Mentors are provided with a feedback form to guide their responses, although some mentors prefer to use the 'track changes' and 'insert comments' function in Microsoft Word to edit the abstracts directly. The feedback is intended to: a) clarify confusion over research design (such as hypothesis testing) and the appropriateness of the methods used, b) provide suggestions on grammar, structure, and the choice of track and 'category', and c) clarify the maturity of the study, that is whether the data was too preliminary, or if the research would be a useful contribution to research on HIV. Figure 4 shows an example of feedback provided by a mentor who used the guidelines provided.

Track and Title

 Is the track chosen appropriate? Yes Does the title reflect the content of the abstract? Yes though on the topic sessions "health" they did not say what is included.
 <u>Structure</u> 1. Does the abstract follow scientific and formal criteria? Yes 2. Do the ideas cohere together? Yes 3. Does each section provide relevant information? Yes though nothing has been mentioned what they do rather than skills sessions are which are held two -three days in a month.
SCIENTIFIC DESIGN:
Background 1. Are the objectives clear and well-presented? Yes 2. Is the research design sound? Yes
Materials/methods
 Is the methodology used appropriate for the study? Yes but they should also involve caregivers and guardians who look after the infected and affected children. Is it easy to understand what methods the authors have used and why? Yes they are involving the infected & affected. Is the data analysis and interpretation appropriate? Not sure according with current data in India of affected children.
Results/Conclusions
 Are the conclusions clearly explained and appropriate to the study? Yes though short (I know because of limited words). Is the study innovative? Does it provide new insights? Yes, more will be encouraged to attend these sessions if they see other children have increased their self esteems. Are the results analyzed in a broader context? Yes Are the future implications of this study discussed? No

Figure 4: Example of feedback provided by a mentor

Online resources on scientific writing are also provided, such as linking to the AuthorAid self-learning resources and e-mentoring system (<u>www.authoraid.info</u>). This provides practical ways to stimulate the interest and understanding of early career researchers on the various genres of scientific writing.

The project is unique as it aims to induct researchers into scientific literacy practices, moving away from teaching them disembodied writing skills. This is in line

with current thinking that literacy is a social practice (Street, 2001), situated and mediated through our connections with the world around us; the meaning of writing an abstract is thus produced and enacted in a particular social context. The International AIDS conferences provide such a context for young and early career researchers. Enabling and equipping them with e-mentoring exposes them to the norms and practices of abstract preparation and submission, thus facilitating their gradual participation in a community of practice (Lave and Wenger, 1991; Wenger, 1998), even before the actual physical conference experience. Learning is now conceptualized as a process of "apprenticeship", where apprentices collaborate in social practices with mentors to acquire and construct new forms of interaction and thinking (Vygotsky, 1978). Through such apprenticeship, abstract submitters (novices/apprentices) take on tasks, explore artefacts, and 'learn to be' through a process that has been described as 'legitimate peripheral participation' (Seely, Brown and Adler, 2008), consequently developing a sense of belonging and constructing their identity as they learn quite new ways to use and value their literacy.

3. THE IMPACT OF ONLINE ABSTRACT MENTORING

There are promising results from the e-mentoring programmes conducted prior to AIDS 2008 and IAS 2009 conferences. Impact can be assessed in two ways: the quantifiable outcome of the number of mentored abstracts that were successfully accepted for the two conferences; and the perceptions of mentors and submitters about the programme itself. The number of successfully accepted abstracts was obtained from the organization handling abstract submissions, while the perceptions of participants were gathered through online surveys sent immediately after the programme closed.

The total number of mentors and abstract authors, and the number of abstracts received, mentored, submitted and accepted for AIDS 2008 and IAS 2009 is summarized in Table 1 below.

T 1. (
Indicators	AIDS 2008	IAS 2009	
Number of Mentors	42 signed up: 26 received	63 signed up.	
	an abstract out of which 18	of which 43 reviewed at least	
	reviewed at least one	one abstract	
	abstract		
Number of Abstract			
Submitters	66	95	
(some submitted several			
abstracts for mentoring)			
Number of abstracts	80	118	
received for mentoring			
Number of abstracts	78	118	
reviewed by mentors			
Number of mentored			
abstracts	59	73	
submitted for the			
conference			
Number of mentored	47	46	

Table 1: Snapshot of the online Abstract Mentor Programme

abstracts eventually accepted for the conference	(30 Poster Exhibition, 13 CD-ROM, 2 Oral Abstract sessions, 1 Poster Discussion and 1 poster back up). Note: 6 authors had more than 1 abstract accepted.	(2 poster Exhibition, 25 CD- ROM, 1 Oral Abstract session, 18 Poster Discussion sessions) Note: 3 authors had more than 1 abstract accepted; 2 authors from non scientific background had an abstract
		accepted
Number of successful		
mentored		
abstracts from low- and	42	43
middle-income countries		
(based on World Bank		
classification)		

The above table shows that for AIDS 2008, among e-mentored abstracts, 76% were finally submitted for the conference programme, out of which 80% were accepted. Therefore, the programme helped about 40 conference delegates successfully submit an abstract for AIDS 2008. For IAS 2009, the data reveals an increase in the number of abstracts submitted and e-mentored, and an almost similar number of successful abstracts. For both, a large majority of the successfully mentored abstracts (89% and 93%) came from low- and middle-income countries, demonstrating the effectiveness of distance learning. This can be attributed to better promotion of the programme, at workshops, and through the Internet.

As part of the continuous evaluation process, abstract submitters who used the programme were surveyed for both conferences. The vast majority of respondents (n=35, n=66) reported to have used the self-help tools available on the conference website and rated them as useful. The most commonly used tool was the "Top 5 reasons why abstracts are rejected" (71% and 70% of respondents). The three other tools, namely the online toolkit, FAQs and prize-winning abstracts from previous conferences were used by more than 40% of respondents. As for support from mentors, most submitters who responded (97%) indicated that their answers were "useful" or "very useful" and 73.5% reported it was quick. For IAS 2009, 45% of the 66 respondents perceived the feedback they received from mentors to be either 'easy' or 'very easy' to interpret. One positive indicator of the quality of mentoring was the decline in the use of the online self-help tools among surveyed abstract submitters to complement the feedback they received from mentors. While 95% of them accessed these tools at registration time, only 57% did so after e-mentoring.

As an indicator of the added value of such a programme, more than 90% of respondents for AIDS 2008, and almost all for IAS 2009, would recommend the programme to other abstract authors and would use it again. As one author commented,

"As a junior researcher, I valued the opportunity provided by participating in the abstract mentoring, to get into print and present at AIDS conferences. It extended my sense of the worth of my contributions from Argentina, studying issues that are not discussed elsewhere as cryptococcal meningits and Chagas' disease. This programme allows fellows physicians to improve their writing skills and gain confidence for submitting abstracts to leading events such as IAS conferences." The opportunities to get into print and present at conferences enabled a professional valuing of the experience and extended the sense of the worth of early career researchers' contributions. Learning to write and argue for a wider readership was significant in repositioning them as more than data collectors who fit their bit into developed country university researchers' work. Showing their own research to the wider profession impacted their self-esteem, promotion opportunities and professional credibility.

The six mentors who shared their opinions on the AIDS 2008 programme indicated their willingness to offer their services again for the IAS 2009 conference. Of the 31 mentors who completed the online survey for IAS 2009, 83% perceived the guidelines provided for mentors had allowed them to save time, and were a good way to provide abstract writers with structured feedback.

However, the small size of the mentor team (18 for AIDS 2008 and 43 for IAS 2009 respectively) and their considerable existing workload precluded significant expansion of e-mentoring beyond the short abstract submission period, without allocating dedicated funding. Other suggestions for programme improvement include giving more attention to abstract writers for whom English is not a first language, and those from non-scientific backgrounds. Thus, in order to facilitate continuous collaboration between mentors and abstract writers, more investment in developing online forums and tailored e-mentoring would also be necessary, given the great unmet needs.

4. THE PROMISE OF E-MENTORING FOR PROFESSIONAL INDUCTION IN DEVELOPING COUNTRIES

Beyond the measurable outputs, there are also other factors that enable mentoring-ata-distance to be successful in inducting novices into literacy practices. First of all, with online scaffolding, and exposure to relevant artefacts, writing becomes a social, visual and collaborative process, rather than a solitary one. Technology connects a learner in a 'resource-poor' setting to improve her learning engagement, thereby developing her expertise in a crucial literacy practice for success in the scientific community. Second, an online space contributes and builds on the social aspects of learning, which this pilot project can develop further. Third, while there is a strong history of North-South research capacity building projects for health workers and scientists, IAS understands that such projects often marginalize participants who do not come from a scientific background, but still have compelling evidence to share and need support to do so. Such research, from community-based NGOs, faith-based groups, and vulnerable populations, is crucial because it can provide alternative perspectives from those who have the experience of living with HIV, and how they translate such experience into programmes in community settings. As one mentor, who is also an editor for three international health and HIV journals, wrote, in response to the survey question 'Would you be interested in becoming a dedicated mentor helping early career HIV researchers from resource-limited settings publish their research?".

"Yes I would. But there are obstacles. Mentoring after the event is more difficult than a process of preparation well in advance. Often it is not the writing or presentation per se, but the fact that the analysis or design is limited...Enhancing these aspects as well as mentoring would be a real boost and capacity contribution...In fact, there could be a selection process for promising endeavours with a good chance of publishability that could be allocated such assistance. I would be really interested in this process." This project allowed a conference secretariat to connect with and engage potential abstract submitters online, to raise awareness of the scientific standards, and help improve the quality of abstracts. More attention needs to be given to online social learning strategies aimed at developing country researchers and students preparing research and programme findings for conference and journal submissions on a more ongoing basis. Such a development is made possible thanks to the rise of Web 2.0 technologies, such as social networking sites, wikis, blogs and microblogs, which support and expand the possibilities of social learning by inducting newcomers faraway into the norms and practices of a particular community.

Web 2.0 also raises new challenges for organizers of scientific conferences and workshops by questioning a model of practice derived from behaviouralist education. It opens up the debate on how technology can facilitate 'participation' and engagement actively, beyond normative rhetorical claims, as precursors to stimulating the behaviour change required to improve professional practices. With the rise of digital technologies, what is pedagogically possible changes; digital technologies could change our instructionist, factory model of education into a constructivist model focused on the creation of knowledge, as McClintock (1999) argues. He contends that this can be accomplished through the creation of virtual learning communities that "engage a diversity of people with challenging learning activities, providing each with appropriate resources and useful intellectual tools." (1999:136)

In addition, e-mentoring for scientific writing is one of the practical ways in which the Internet can enhance the economic and pedagogic value of informal learning (Cross, 2006). As compared to the current reified but ineffective practice of training workshops in scientific writing, informal learning is characterised by features such as self-directed, self-paced, situation-dependent task performance, to fulfill a present need. These features increase learners' affective engagement, relevance of the learning opportunity, and overcome the ineffectiveness of formal instruction for a diverse group of students brought together for a one-off short, intensive course with little or no follow-up. In today's lifelong learning (Longworth, 2003) context, educators thus need to think about redesigning their pedagogy such that participating in scientific conferences becomes the experience of networking, and connecting, an intentional dialogue for actionable knowledge to solve practice problems, rather than a transaction between an 'expert' paid to impart facts and figures to passive audiences. More research is thus needed to assess the pedagogic effectiveness of ementoring vis-à-vis training workshops, to develop a connectivist (Siemens, 2004) and networked learning (Steeples and Jones, 2002) framework that enhances and accelerates knowledge sharing and skills development, especially in a more challenging financial environment for HIV and health research capacity building.

Looking at transferability, universities in developing countries partnering with institutes in developed countries to accelerate knowledge transfer could easily replicate this model. Theories of e-learning now point to the emergence of Pedagogy 2.0 (McLoughlin, 2009) that repositions universities for the net-gen learner. A feasible approach would be to offer professional development to university faculty in developing e-mentoring programmes by adapting their current writing workshops and programmes into modular web-based self-paced courses, and then gradually linking into a wider global knowledge network step-by-step. Research design mentoring to reduce wastage and churn. Faculties in developing countries could build their capacities in e-learning through action research during the design, adaptation and implementation stages.
5. CONCLUSION

Given the need to scale up access to learning to complement the scaling up of access to HIV prevention, treatment, care and support, and improve Universal Access to health and education as human rights, it is imperative that developing country universities seize the opportunity to leverage online technologies by reconceptualising onsite courses as ongoing learning spaces where what counts as literacy is developed and utilized. Otherwise, a 'top-down' approach to what counts as knowledge determines who succeeds and who is labelled as 'lacking'. With platforms such as WikiEducator for collaborative authoring, and through synchronous communication tools, peers can rehearse presentations, provide instant feedback, clarify misunderstandings, and share perspectives - globally. They would not have to wait for a single teacher to find the time to address their pressing needs in the face of a large class of equally demanding students. Instead, they could access any number of mentors anywhere in the world any time. Experts from developed country research centres have a significant amount to offer based on their lengthy careers about what really supports early career researchers to learn and make successful careers as published scientists and practitioners. In turn, novices on the frontline have vast experiential knowledge that can be captured by expanding their scientific literacy repertoire to reduce the knowledge gap. Thus, instead of separate disjointed initiatives around teaching the writing of science in face-to-face workshops, and the submission of abstracts and journal manuscripts online for grading and assessment akin to the traditional school system, this online mentoring case study enables us to propose a new paradigm for integrated research capacity building that sustains workshops and conferences into ongoing learning experiences. For organizations involved in research capacity building policy and programmes, this paradigm can overcome the barriers to access to learning, improve the flow of knowledge, and solve the deficiencies shown in the lack of transferable skills in current capacity building models based on limited learning theories (Nunes and McPherson, 2002).

Achieving the vision of widening access to and improving the participation of early career researchers, so that they become legitimate professionals in a 'scientific learning community', is possible through knowledge sharing around a virtual global university. However, more research is required on the conditions for supportive online social learning, the struggles developing country professionals encounter, and the systems of power in which science is conducted. This will happen as the distance education field develops models of online and ongoing research capacity building that can be extended to universities and professional societies, thus enriching the induction of novices into the global scientific learning community. After all, as Dewey observed, a quality learning experience "lives on in further experiences" (1938:27).

In the 21st century, managing the ecology of learning, its interactions and activities, and the related epistemologies to create a rich space conducive for scientific apprenticeship is the next challenge for university programmers, capacity builders, and learning facilitators - onsite, online and ongoing.

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Snowblog CTnet city Project Report

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Abstract

"Snowblog CTnet city" Project is the missing corner stone in technology-enabled education in emerging countries. It offers a mutually empowering new model for collaboration among American university students participating in an academic course on integrating Web 2.0 technologies and university students from China, Ukraine, Gaza and Israel. It is an intercultural collaborative web-based gated social community of learners. Its model is a modern version of apprenticeship based on emergent pedagogy, facilitating tutor guided and peer-assisted creative learning/teaching process overcoming constraints originating from gaps and divides, helping all participants acquire 21st century competences. The project model can be duplicated horizontally - to other universities and vertically - participants tutoring local high- school and life-long learners.

Introduction

The current Snowblog CTnet city Project is based on gained insights from several Snowblog projects implemented in the last seven years among high-school and university students from different cultural communities, across literacy gaps and access and affordability divides. Our first implementations were "bottom up" projects, connecting Israelis (both Jewish and Muslim) and Palestinians using "primitive" communication tools, such as teachers home fax machines and disposable cameras. Along the way, we upgraded our tools, built web-based environments and developed a dialogue model combined with a related pedagogical methodology. Students from a high-achieving country such as Finland, Chinese students from the Chinese Academy of Sciences and others, joined our Snowblog projects. It became a vivid intercultural, gated web-based community of learners. Yet, in order to address some of the challenges of today's education, and expand with larger-scale implementations, there was a need to remodel the project.

Some misconceptions found along the way: In 2003 when Snowblog model was first presented at UNESCO international conference in Finland, our goal was fostering multicultural awareness and empathic dialogs. We were sure that enabling a webbased closed environment, facilitating tutor-assisted social interactions, between elementary school students belonging to different social/cultural backgrounds (then Israeli and Palestinian) engaged in common themes, was enough. In 2007 when presenting our upgraded Snowblog project at MIT LINC conference in Amman, with Israeli, Palestinian and Finnish high school students, we emphasized two core elements that complement the social intercultural aspect: creative higher order thinking and digital literacies – composing what we referred to as the 21st century skills and competences.

In 2010, we would like to present Snowblog CTnet city project, a more "mature" version of the Snowblog series, implemented among university students from the

USA, Ukraine, China, Israel and Gaza. From more than seven years of Snowblog various implementations, we have gained two major insights:

a. Diversity, though acknowledged as the main characteristic trait of nowadays' societies, causes a much more complex dynamics inside functional social communities of learners such as Snowblog, than expected.

b. The development of the 21st century competences is a lab-like process, nurtured in especially designed environments.

Along the years we have learned, as well, that:

1. Top down knowledge delivery by leading experts, integrated in local curriculum by trained local teachers - is not enough for effective learning in intercultural settings, with unprepared students.

2. Authentic real life context for better (intuitive) learning of concepts– is not enough in diverse groups of learners.

3. Access to and mastery of Web.2.0 tools and applications and the integration of participatory technologies in classes - are not enough to ensure the production of better content products.

4. Building social networks and communities of learners – is neither enough to facilitate meaningful intra-group and inter-group interactions, nor the production of collective peer-generated content.

We hope that our current Snowblog CTnet city project, has become the missing cornerstone in technology-enabled education, involving both developed and emerging countries.

Snowblog Ctnet city – a new learning environment addressing some of the main challenges in today's education

* A New Context for Learning:

1. Today's kids have a new digital vernacular. They learn in ways that are different from the ways their parents and teachers had learned.

2. In the 21st century, most students will probably follow a working trajectory that encompasses multiple careers. Therefore, much of what they had learned at school will not be needed. They will have to be able to pick up new skills, outside today's traditional educational institution.

3. Today's students will need to feel comfortable working in cross-disciplinary and intercultural teams, that encompass multiple ways of knowing.

4. The growing disillusion from the effectiveness of new technology for enhancing education, recognizing that technology by itself is seldom the solution.

* Multimedia Literacy

1. Being literate today, means to be able to communicate effectively using image, text, nonlinear narratives, sound, movement, sequence, and interactivity, all in combination. Such skills are more important today than ever before. The catch is that to be literate today means not only that you can operate and be exposed to new media. Digital youth can hardly express themselves or create meaning, nor can they make a compelling visual argument.

2. Formal education does not pay attention to the fact that part of being digital literate includes the skill of navigation, intuitively finding information on the web. A necessary skill in the context of productive inquiry and facilitating rapid

explorations of the vast resources of the web. [2] [3].

In the 2010 Horizon report [9], experts in education emphasize the following crucial challenges:

* to adapt teaching and learning practices to meet the needs of today's learners, to emphasize critical inquiry and mental flexibility.

* Despite the widespread agreement on its importance, training in digital literacy skills and techniques is rare in any discipline, and especially rare in teacher education programs. This reality is exacerbated by the fact that as technology continues to evolve, digital literacy must necessarily be less about tools and more about ways of thinking and seeing, and of crafting narrative.

* The connection between scholastic achievement and computerization is insignificant, and sometimes the influence of computers is even negative. Prof. Gabi Salomon adds that the use of computers is too often seen as a solution for all the problems of the educational system: It is an illusion. [13].

* Students are writing more than ever before, but the focus of today's writing is more about instantaneous communication. Today's understanding of writing is usually operational as opposed to epistemic, more a declaration rather than an exploration.[15].

* The movement towards open content reflects a growing challenge: the need for skills related to finding, evaluating, interpreting resources, repurpose them in support of a learning or specific research objective.[9]. This is especially challenging students from emerging countries.

Snowblog Ctnet city – implementing some of the experts' recommendations, aimed to meet the challenges

* The need for new learning models:

We must find a way to reconceptualize parts of the educational system and at the same time, find ways to reinforce learning outside formal schooling, so that these challenges can be met in a cost-effective way.[2] [3].

* As opposed to the traditional concept of knowledge delivery, there is a need to recognize the importance of the social construction of understanding, where experience and information are internalized into actionable knowledge through conversations and social negotiations.[3].

* Fostering studio-based learning environments [3] and all cognitive apprenticeship methodology.[5].

* Highlighting creativity as the most important competence and the notion of diversity as a crucial factor, for strengthening creativity. Striving towards a creative mix of individual talents and experiences among students and staff in higher education.[12]. * Moving from traditional pedagogy to one which asks students to master intellectual and practical skills. Prof. Darling - Hammond recommends to design new models of education, to allow in-depth learning, based on cooperative learning and inquirybased teaching, involving social and emotional learning. [6].

* More than ever before scientific literacy in the 21st century calls for deep understanding of science topics and for the ability to think about scientific issues in a critical manner. Research findings, however, consistently show that students encounter considerable difficulties in scientific thinking. This raises the need to search for effective instructional means that would assist students in developing their ability of scientific thinking. Prof. Zohar claims that explicit higher order thinking teaching strategies help both low and high achievers in class.[17] [18]. Prof. Aharoni emphasizes the importance of revealing to students the common core characteristics shared by mathematics and poetics thinking [1].

* A model of learning based on niche communities of practice and co-creation, with core curriculum fostering thinking and competences and minimal knowledge-based curriculum.[3].

Snowblog CTnet city model

The project embraces emergent pedagogy. The environment becomes a place for discovery, not only by the students but by tutors, as well. Interaction and dialog are key factors. True understanding as a goal of the educational process is frequently equated with analytic processing. In Snowblog CT net City it is the outcome of a dialogue in a shared effort to generate a common story.[4]. The students, their peers and the tutors are intimately involved in common reflective practice.[4].

Snowblog CTnet city, is based on free web 2.0 tools: for communication, maintaining co-presence through social gatherings, voice threads, etc., for posting texts, photos and videos filmed with mobile phones, enabling each end-user full access and affordability.[14].

It is a modern version of cognitive apprenticeship.[5]. As opposed to the traditional apprenticeship, the tutors identify the processes and explicitly refer to knowledge contexts, helping students form new conceptual understanding and higher order thinking. Teaching becomes reciprocal.(tutor-student, student – other students).

The project is conceptually designed as action research, as well: a form of collective self-reflective enquiry working through three basic phases:

a) building a picture (hypothesis) and gathering information.

b)defining research question(s).

c) interpreting and evaluating.

In the project practice, action research becomes a collaborative group work.[11].

Another important characteristics echoes difficulties Prof. Grobstein and his colleagues faced when implementing the new emergent pedagogy with teachers / students in a two-week project.: some of them did not cooperate, did not participate in the collective or individual assignments, were afraid to fail, etc.[7] In our project, we acknowledge that it is a process that takes time. We support participants with social interactions, practice remedial interventions in real-time, and encourage mutual reflective feedback – all in a friendly environment. The current project is different from previous Snowblog projects in its balance of power among participants. It has a group of participants with technological knowhow, American students in an academic course on web technologies and education. They act as a pillar and their contribution strengthens other participants from emerging countries, less familiar with the technology and the English language. That internal synergy helps build a robust cooperation. The American students in return are exposed to intercultural diverse environment. It is mutually empowering.

That project model can be duplicated horizontally (to other universities) and vertically (participants tutoring local high- school and life-long learners). It might be the missing cornerstone, facilitating productive collaboration while overcoming expected constraints with embedded gaps and divides in intercultural settings.

Final remark: In order to allow the participation of every end-user, we are using only free web 2.0 applications and programs. For inquiry based documentation we recommend the use of simple mobile phone cameras or basic digital cameras.

Selective snapshots and citations from Snowblog CT net city site.



Snowblog CT net city front page

Part of a page of a student form Gaza



Part of a page of V., a student from Ukraine



I wish it were the street I live in)")"

Page of C., a student from Shanghai, China



"today is the first time I try to write diary in English.

It's a little bit hard for me to express my idea clearly and smoothly in English, while anyway, I will try my best to do that. Maybe my English is some kind of Chinglish, I will appreciate very much if someone can point them out." C. from China

"That's really cool. You did a good job! I know I couldn't write in another language!" T. from USA

"Great job! Thank you so much for sharing with us Chen:)" S., a student from USA

A comment of one of the tutors:

"Dear Chinese students and friends,

We are happy to see you have joined this wonderful project. It's always a pleasure to have you on board of the educational vessel which opens new horizons for international collaborations and intercultural communication as well as sharing beautiful ideas around the world. Feel at home here and share your pictures with interesting ideas.

Warmly,

N. Associate Professor at National University, Ukraine"

Snowblog Ct net city featured videos documenting urban life



Citations taken from the Forum of Snowblog CT net city site -- answers to the following questions:

1) Do you think that neighborhoods and communities are important elements in life in the city?

2) Did you experience "a sense of community identity" in an urban environment (or in a rural environment) ? If yes, please write some examples of its nature. If not, did you miss it?

3) Some people say that current planning of urban areas destroy "neighborhoods" and do not facilitate "the sense of community identity ". Do you agree? If yes, please try to explain why? Please suggest some ways to remedy the situation

S. from USA: "I absolutely agree that neighborhoods and communities are important elements in city life. Although I have never actually lived in a very large city I have spent a great deal of time commuting from my home to New York City. It is very obvious that when people live in a city as large as NYC they do not always have the chances to make meaningful connections with others. Life is so fast paced and there are so many people that pass you by on a regular basis that it is difficult to bond. Neighborhoods and communities are so important because it gives people the opportunity to be a part of something meaningful.

I personally do not feel as though I experienced a real sense of community. Although I grew up in a fairly small city and town of Newburgh I feel as though I missed out on a real community lifestyle. In the city and town of Newburgh there is a variety of different types of communities. There is the usual "city" atmosphere with homes and apartment buildings built close to one another. There is also more of a town atmosphere in which houses are built further apart. The street I grew up on was very secluded and houses are quite a distance from one another, even to this day I don't know all of my neighbors so I unfortunately don't feel as though I had much of a community life.

I disagree that the current planning of urban areas destroys "the sense of community identity". I personally think that the emphasis on work and other focuses of our society has ruined community life. People are not as worried about being friendly with their neighbors and establishing meaningful connections with those around them because they are more worried about other things. Nowadays time has become such a difficult thing to come by. I think that it would be important for people to be reminded about the value of "community" bonds and the many wonderful things that can come from it."

A. from USA: 'I do think neighborhoods and communities are important elements in life in the city. Cities are usually occupied with tons of people. It may be harder to establish a community in these cities because people are always very busy and don't take time out to get to know one another. However, if these people are part of a community they can take a break from their busy lives and get to know each other, whether it be working on the PTO or joining a committee that is important to them. This way these people will know more people than just the people in their inner circles.

A. I do experience a sense of community in my city. My city isn't that large but it is big enough where everyone doesn't know each other. However, people come together in many different ways. One way I know some people get together is by playing bingo at a local place like the YMCA or a church. We also have certain celebrations in the my city where people come together. We have a tree lighting in December in downtown Middletown. We also have certain parades throughout the year. One of the parades is a firefighter parade, where we celebrate and appreciate all the hard work that they do for us.

I don't think urban areas destroy neighborhoods. If anything I think it creates neighborhoods. It may not be very open, like a cul de sac of houses, but houses close together can still have a sense of community. People can still be close to each other and get to know each other and create a community whether they live in a huge city like NYC or if they live in a small town. I think it all depends on the people and how willing they are to create a community and belong to one."

L. from China: "I think neighborhoods and communities are important elements in life in the city. If you live in the city for many years while do not know the family which live in front of you, do you think it is ridiculous? The communication makes the human to be a human.

If we live together we will have the chance to do many things together. We are to feel happy either we success or fail. When we success, they applaud together and if we fail we will encourage each other and enjoy the time. We are happy because we are together.

I don't agree with the opinion that current planning of urban areas destroy "neighborhoods" and do not facilitate "the sense of community identity. There are about 7 billion people live on the earth. We need tall buildings and great mansions to hold so many people. That current planning of urban areas makes that we have more neighborhoods, is that true? The only problem is the communication."

C from China:" I do think that neighborhoods and communities are important elements in life in the city. Because people will not feel alone when we live in the neighborhood and know each neighbor. And the city will more safe and comfortable to live in that case. And communities will help the government to administrate and provide the public services.

I'm very regretted that I missed "the sense of community identity". Because I was too young when I was living in the country, whereas the community where I moved to later was a new one so that I needed very much time which I couldn't afford to make friends with my neighbors. And when I was familiar with them, I went to the college. As to the current planning of urban areas, I don't think that it is the reason of the loss of "the sense of community identity". I think that the problem is the government's public services. The community officials should take actions to improve the relationship between us. For example, they can hold more public parties or activities in order to improve the communications among the neighbors."

From a reflective journal of B., an American student:

"There are so many interesting and inspiring people involved in this project! I can't wait to learn even more about them and their communities. It will be interesting when we get to compare and contrast the different issues that face our communities. I have a feeling there may be many similar issues facing our cities despite being in different parts of the world!"

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Technology Assisted Contextualized Collaborative Learning Environment (TACCLE)

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Abstract. This paper proposes an augmented mode of student centered self learning framework; a contextualized virtual collaborative learning environment using various Web2.0 technologies. The current study focuses on investigating students' achievement in the context of gender, linguistic and socio-cultural differences. Empirical observations proved that the proposed framework improved collaborative learning and the academic performance of students significantly.

1. Introduction

The association between technology and learning environment has drawn much attention [5-9]. Web2.0 technologies based virtual environment has become an integral part of current teaching and learning processes. Association of technology and learning environment in the context of socio-cultural and linguistic diversity is an interesting problem to explore. Current study focuses on such differences in the Gulf Region of the Middle East and enhancement of collaborative learning in the context of these differences.

One of the main issues in this region is the constrained communication due to gender differences. Motivating students

to communicate and discuss among themselves is a serious concern of instructors. Collaborative learning enhances learning experience of groups of students with mixed learning abilities to achieve a common goal. Many researchers across the world have investigated different strategies required to enhance this form of learning [1].

The socio-cultural customs of the Gulf Region are unique compared to the rest of the world. Students in this region are acutely aware of gender differences during class room and group discussions. They give importance to their cultural and traditional principles/practices while forming discussion groups. It is observed that students normally do not volunteer for a face to face discussion with opposite gender. Therefore, to effectively achieve the real objectives of learning, it is important to form collaborative learning groups with sensitivity to this factor.

Collaborative learning accommodates the tenets of the theories of cognitive-developmental, behavioral and social interdependence [2]. It has been already proved by many researchers that group learning can lead to academic success of students [3]. In our current study, small virtual groups were formed to enable students' to actively participate in collaborative work. One of the aims of our experimental technology mediated framework was to find out the degree of 'freedom to communicate'. We compared the results of the groups in conventional class room setting with the groups using our experimental framework.

With regard to the impediments to learning caused by linguistic differences between the language of instruction which is English and the students' first language which is Arabic the impact of first language writing orientation was also observed in the study with limited scope. Organization of the paper is as follows. Methodology is presented in Section 2. Experimental framework is presented in Section 3. Section 4 deals with analysis of experimental results. Limitations and future research are presented in Section 5. Finally, conclusions are drawn in Section 6.

2. Methodology

Any form of pedagogical framework applied would be considered successful if it inculcated the three core forms of learning i.e. learning through thinking, learning through experience and learning through interaction. Technology by itself cannot enhance student learning [10]. We have based our framework on sound constructivist practices that focus on both teaching and technology. In our experimental framework we have blended together the classic style of class room teaching with contextualized collaborative virtual learning. This blend helps to optimize student engagement in collaborative effort and negate the impact of socio-cultural issues on group work. The new services implemented complement the already existing class room based teaching.

In this pedagogical framework students are given an opportunity to be a part of a virtual group which includes a mentor and a senior/ alumni for each of the module (subject) he/she registers. Anonymity of student is maintained by providing each participating student an 'Avatar' of his or her choice. Avatar names are neutral with respect to gender. Identity and role of participants are not disclosed. Use of avatar advocates our proposition of 'freedom to communicate'. Our framework promotes active student involvement by increasing the channels of communication using various synchronous and asynchronous e-learning services spawning an interactive learning environment. This helps them to learn, tutor their peers, receive support and feedback, and continually refine their understanding. Guidance and help from a senior learner (or alumni) enables a student to understand and solve problems which otherwise would be beyond his/her competence. Knowledge sharing is virtually contextualized by giving the student provision to customize various aspects of their group communication like language, anonymous group leader etc. Pedagogical interventions are based on socio-cultural factors relevant to this study to improve learning outcomes.

Since web 2.0 technologies emphasize user generated content, a culturally sensitive and appropriate monitoring and reporting feature is provided. Guidance through bilingual communication provides a mechanism to build a knowledge base in native language that would be a beneficial resource to the student community. In this pedagogical framework the role of a teacher is to be a facilitator or mentor and the entire process of learning rests on the student. Mentors are required to apply the strategy of immediate acknowledgement and measured response providing students opportunity to solve problems using various communication channels open to them in the framework. Importantly the framework is conducive to carry out assessments that help the mentor to gauge the student performance continuously.

2.1. Technology support

Web 2.0 technologies emphasize on user generated content, data and content sharing, collaborative effort and innovative ways of interacting with various web-based applications [6]. The technologies focus on the use of web as a social platform for generating, repositioning and consuming content. In our framework a number of tools have been provided to enhance student learning experience. The choice of e-learning tools incorporated, aligns with the pedagogy applied. We have observed that students here have readily embraced technology for group interaction. They have shown an inclination to chat and post using their native language while discussing and defining major module topics. Each tool activated in the framework promotes an appropriate approach to learning. For example chatting was limited within each virtual group while discussion forums were configured for intergroup communication, this promoted collaborative learning and also learning by teaching as we noticed that students approached common forums when a particular problem could not be solved within the group. Mentors progressively provided relevant exercises to engage students in the use of each tool.

2.2. First language writing orientation

The spatial orientation of Arabic which is the language of the Gulf Region is right to left. The medium of instruction in primary and secondary schools is Arabic. It is observed that students from this region find it difficult to decode the left to right spatially oriented English script. Interestingly, spatial orientation has an impact on reading, writing and other cognitive functions [11]. Hence, it was pertinent in the context of this study to observe the effect on students when they were given an English text in Arabic writing orientation. The aim was to consider the possibility of using the language code known to the students to decipher the new code ie. left to right oriented script.

3. Experimental Framework

The framework was implemented using the popular open source Learning Management System (LMS) for e-learning namely, Moodle and an in-house virtual College Information System (CIS). Students of six different modules with comparable mixed learning abilities from both genders were given access to Moodle using Arabic avatar names. The instructor maintained the mapping of students' avatar names. These were also distributed to alumni and moderators. Students were allowed to choose the language of communication for their discussions. All contents posted by students were monitored and approved by the moderators. The archived content was used as knowledge base by the students. In all, 35% male students and 65% female students participated in this study.

In order to test the effect of deciphering new code using known code deciphering technique, two pieces of text with similar complexity were prepared; one in normal left to right English writing orientation and the other a mirror image of the English text. The time taken by every student to read each text was observed.

4. Experimental Analysis

Student interaction was analyzed by collecting data from Moodle. In all two hundred and fifty students participated in this study.



Figure 1. Student activity graph.

Figure 1 shows seven week statistics of student activities excluding chats across modules considered in the framework. It can be seen from the graph that student participation in the first week starting March 12, was low and improved during the subsequent weeks till the fourth week. However, participation decreased in the fifth week due to commencement of course work assessments particularly in the other modules (subjects) not included in the framework. It remained consistent at the decreased level in the sixth and seventh weeks. It is observed from the graph that students participated actively in the virtual environment.

4.1. Student Performance

Correlation and t-tests were conducted on student performance in the modules. Performance of cohorts of students with similar profile exposed only to conventional delivery method has been compared with the performance of similar profile students using the new framework. One module corresponding to each undergraduate course level [12-13] was chosen to represent students at various levels. It is pertinent to note that of the six modules selected, modules 5 and 6 had a skewed gender distribution. There were significantly more female students in both cohorts using the framework and the compared cohorts where the delivery method was conventional.

Average percentage mark and t-test results are given in Table 1. The average percentage mark was computed by evaluating students' academic performance in their respective modules. A positive correlation (0.86) is observed between the academic performances of the groups compared. This shows that improvement in academic performance across all the modules considered is consistent.

The hypothesis for t-test analysis is defined as 'there is no difference between the scores of the two compared groups.'

It is evident from Table 1 that t-test values of module 1, module 2, module 3 and module 4 are greater than their

respective critical values. Hence, the hypothesis is false for these modules. However, in the case of modules 5 and 6 the t-test values are less than their critical values and hence the hypothesis holds true for modules 5 and 6. In the case of these two modules improvements have been marginal. This can be attributed to the fact that the gender distribution within the cohorts was skewed.

Table 1. Student academic performances in six modules of different complexity levels. Average percentage mark is shown in the table.

		Module 1	Module 2	Module 3	Module 4	Module 5	Module 6
Without Frame- work		47.01	60.32	57.64	68.5	55.66	67.55
With Framework		60.39	74.85	70.46	75.53	69.75	71.58
t -test Result	t Stat	2.23	2.82	1.91	1.90	1.50	0.49
	t Critical value	1.67	1.68	1.72	1.72	1.83	1.80
	p-value	0.015	0.004	0.035	0.036	0.084	0.32

Since the gender details were concealed using avatar names, students collaborated and interacted freely. Thus avatar names are the fundamental reason for 'Freedom to communicate' in this framework. It is found from student feedback that they favor the current framework primarily due to its anonymity factor.

4.2. Script Orientation

It was observed that 16% of the students could read the mirror image of English text faster than they read the normal left to right oriented English text. This confirms the findings of similar preliminary experiments conducted on Arabic students [4]. However, the impact of this on learning needs to be explored further in future studies, taking into account past exposure of students both to English and Arabic language.

5. Limitations and Future Research

Feedback from this study will be used to enhance the framework. Findings suggest a very positive attitude of students towards the initiative. While the right to left orientation of Arabic does influence the pace of reading a text in English, it requires further detailed scientific investigation to determine its impact on learning and comprehension.

6. Conclusions

Since student participation in mixed gender group activity cannot be enforced in traditional class room setting it is evident that student collaborative learning and academic performance can be optimized by technology assisted contextualized collaborative learning environment. This paper describes such a framework developed at the Middle East College of Information Technology (MECIT), Sultanate of Oman. The paper concludes with some future research directions about effective contextualized technology mediation that could be implemented in the Gulf Region.

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The MIT LINC 2010 Conference Parallel Presentations

Session #13:

The Enhancement of Students' Learning through Technology-Enabled Education



Enhancing Students Performance with E- Learning at the Papua New Guinea University of Technology, a Papua New Guinea Experience.

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Abstract

This paper discusses how E-learning, which is computer technology and the Internet that is used in teaching life skills, learning and research at the Papua New Guinea University of Technology. It presents preliminary results on the experiences and performances of third year accounting students in the last six years. E-learning strategies taught to third year accounting students have enabled them to perform better academically than those in the same department studying different courses and other departments of the university not involved in e-learning. From a survey questionnaire given to students to evaluate the unit at the end of semester one, on average, an overwhelming 80% of students responded that the unit helped them to thinking critically, exposed them to a variety of information sources and formats, developed better understanding and thinking, and developed information literacy skills.

1. INTRODUCTION

The current buzzword for educational activities using the Internet is e-learning. At the Papua New Guinea University of Technology (PNGUT) library, e-learning is used to support units in third year accounting by providing: information about the units, easy access to resources in the library and the internet, class and individual communication on the campus wide network, and online assignments and tests with feedback. It is described as a learning process [¹]. Through e-learning, learners can communicate with their facilitators and peers, and access learning materials over the Internet or other computer network [²] similar to the student network and the e-mail system here at the PNGUT. The network and the internet provide a means through which the powerful and pervasive computing and communication technologies [³] can be applied to tertiary education in teaching and learning such as a unit taught to third year accounting students (BA 391 Problem Solving & Self-Reliance in Learning). E-learning enables the lecturer and students to exchange ideas, lecture notes and exercises through the student network and e-mail system. Multi-media are used for Internet presentations and other power-point presentations. The Internet and the library online database are used as teaching and learning tools and as primary

¹ Chris Curran. Strategies for e-learning in universities. <u>http://repositories.cdlib.org/cgi/viewcontent.cgi?article</u> (18/12/2009)

² Ron Kurtus, *What is eLearning?* <u>http://www.school-for-champions.com/elearning/whatis.htm</u> (24/11/09)

³ J.Bourne (ed.), On-line Education: Learning Effectiveness and Faculty Satisfaction. *Proceedings of the 1999 Sloan Summer Workshop*. Nashville, ALN Center, Vanderbilt 2000. <u>http://books.google.com/books</u>? 12/01/2010

sources of information. However, students have to master certain critical thinking, information and communication technology skills in order to communicate and make sound decisions in solving their academic problems and other problems in life.

2. WHY INTRODUCE PROBLEM SOLVING & SELF-RELIANCE IN LEARNING?

After some discussions between the Business Studies Department and the University Library in 1994, it was identified that students lack basic problem solving, critical thinking and information literacy skills in solving academic problems. As a result, the university library introduced a unit to third year accounting students titled - Problem Solving & Self-Reliance in Learning. The objective of this unit is:

To foster the abilities of course participants to efficiently compile and utilize information in order to make and communicate sound managerial decisions.

- On completion of this subject the students will be able to:
- 1. Evaluate business problems on an analytically and rigorous basis.
- 2. Compile information such that will facilitate good business decisions.

The unit focuses on critical thinking, information literacy, time management, problem solving or decision-making skills, which are important for students. Students need to make timely decisions when searching for information, as the source of information depends on its availability and the means and type of legal access. The unit attempts to foster these skills and prepare students for the work environment. They have to interpret and analyze the academic problem, identify and evaluate the sources of information in order to make quality decisions, which can lead to attaining better grades in their unit assessments. Further more, if they can develop and make excellent academic decisions as students, this could prepare them to become effective decisions makers in the work place in order to meet the demands of modern business organizations.

3. REASONS FOR USING E-LEARNING IN A DEVELOPING COUNTRY

E-learning situation at the PNGUT is still a new era for learners and instructors. The Internet was established in the university in June 1994 mainly for e-mail service. This service was offered to staff and some other research organisations within Papua New Guinea. On March 12th 1997 Internet access was introduced and launched to the public in June 1997. The arrival of the Internet has given the University Library broader opportunities to access information sources from around the world that are available online. One of the opportunities is to subscribe to online databases that are available internationally. The advantage of this is that it gives the students and staff the option to search for more information elsewhere if the information they need is not available in the Library. This option cuts down the amount of time (and cost) that is taken up using the traditional inter-library loan. Inter-Library Loan takes a week to a month or even longer than a month. The Library catalogue has web page linkages to other information sources around the world. The introduction of Information Literacy Education aims to enable students to become information literate which includes having convenient access to electronic sources of information nationally and globally.

However, most lecture halls in the university don't have Internet access and ninety percent of lectures are chalk and talk. The library was in a better position to introduce e-learning as most rooms had internet connection and also the newly established APEC Digital Opportunity Centre (ADOC) setup in the library in 1996 provided a viable option for teaching the unit electronically. Students are taught electronic databases and the internet search by every word or single character indexed. This means that it will take a while to find the appropriate information. It is important that students have to master certain information searching skills. They have to be smart learners, and analyze the subject they are studying in relation to its objectives. The students are taught to identify from the objectives of their other third year accounting units the main keywords for searching and focus in their learning.

Using participatory observation over a six-year period, on average, an alarming eighty percent (80%) of students did not focus their learning programs around the unit objectives and the university's course hand book. For an assignment on defining learning and how they have learnt how to learn here at the university in their last two years, seventy-five percent (75%) didn't really know the definition of learning and what learning is about. Further more, eighty-percentage (80%) did not have a good set of strategies that they had mastered in the learning process.

The objectives of the units should guide students in their learning and studying either by searching on the internet, using the library online public access catalogue or other sources to search for information. Student's study habits and other decisions should be objective driven.

To demonstrate the importance of unit objectives, an electronic copy of the university's course hand book is used to show the objectives of BA 391(Problem Solving & Self-Reliance in Learning) and other third year accounting units. As an exercise, students discuss, analyze and interpret the unit objectives. This exercise enables them to search for information on the Internet and on the library database. In an accounting unit – BA341- Business Organizations in Papua New Guinea, the objectives are:

To provide students with an understanding of the various statutory and common law as they apply to corporations and businesses of Papua New Guinea, and to familiarize them with the operative and clinical aspects of the corporate/business laws with which they will have to deal in their professional careers.

On completion of the subject, the students will be able to:

1. Demonstrate knowledge of the legal requirements of the Partnership Act, and with the case laws developed by the courts, in such a way as to be able to advise clients of the essential provisions of those requirements.

2. Demonstrate knowledge of the provisions of the Lands Groups Act and the Business Groups Act to such an extent as to be able to render independent professional advice to those seeking such assistance.

3. Demonstrate understanding of the statutory provisions of the laws relating to incorporated and unincorporated associations, savings and loans societies, charitable organizations, and co-operative societies, their aims and objectives, and the legislative purpose underlying their formations.

4. Apply provisions of the Companies Act in the commercial/business sector of Papua

New Guinea.

In analyzing the objectives of BA 341 unit, students are taught that the unit is intended to help them understand the various statutory and common law as they apply to corporations and business of Papua New Guinea. Students are further asked to demonstrate understanding and knowledge and are taught that what they read (published work) or what they hear, (oral work), relate to data, information, knowledge, understanding and wisdom. And what are these words? Using them as keywords to search the internet return a link that gave the meaning to data, information, knowledge, understanding and wisdom[⁴]. According to Russell Ackoff [⁵], a systems theorist and professor of organizational change, the content of the human mind can be classified into five categories:

- 1. Data: symbols
- 2. **Information**: data that are processed to be useful; provides answers to "who", "what", "where", and "when" questions
- 3. Knowledge: application of data and information; answers "how" questions
- 4. Understanding: appreciation of "why"
- 5. Wisdom: evaluated understanding.

The above clarification by Ackoff on what the mind perceive as data and information, and how students can apply them to knowledge and understanding would enable them to come up with well informed decisions in their learning process. For example, understanding as defined above is appreciation of "why" and this should be important to the student as they analyze and interpret the objectives of the unit. The students must search sources in the library and the Internet for information that is asking and answering "why" questions. This is a critical thinking question. Moreover, as the outcome is on knowledge and understanding which are about rational thinking, the application of Russell Ackoff's definition of terms above is important as stated previously. The Internet was used again as an instruction and demonstration tool to help students find sources on how they can condition their mind to think rationally, think smarter and not harder. Following the demonstration, students are given an exercise question to find sources on the Internet on how they can stimulate their brain to learn and think smarter. Firstly, they have to understand the question and identify keywords. Following a discussion on the topic, students come up with the following keywords: stimulate, brain, learn, think, smarter. This exercise led to a site at the James Cook University in Australia $[^{6}]$ as shown on the diagram below. This is perhaps a good demonstration site for students in order to enable them to have some clear basic

⁴ Gener Bellinger and Durval Castro. Data, Information, Knowledge, Wisdom.

http://www.systems-thinking.org/dikw/dikw.htm (16/02/2004)

⁵ R. L. Ackoff. "From Data to Wisdom", Journal of Applies Systems Analysis, Vol.16 (1989), pp. 3-9.

⁶ James Cook University Study. Skills Online: *Energise your brain*.

http://www.jcu.edu.au/office/tld/learningskills/studysmart/energise (16/12/2009)

idea of how their brain functions and learns in order to enable them to think and focus better academically.



According to the brain anatomy diagram above, somewhere in the brain is the lower part, which controls instincts, basic survival and is dominated by petty trivial things. It has a natural tendency to behave in a certain way without much of reasoning. Reasoning is an important academic tool and is the basis of much of human thinking, according to Mathew Allan $[^7]$. Mathew Allan further points out that 'reasoning is often described simply as the process of thinking through and communicating our reasons for holding certain views or conclusions'. Reasoning has also been describe as a 'complex wave of abilities that help you get someone else's point, explain a complicated idea, generate reasons for your viewpoints, evaluate the reason given by others, decide what information to accept or reject, see the pros as well as the cons and so fort'^{[8}]. In academic life, reasoning and thinking are inter-connected. According to the James Cook University Study Skills Online site, when trivial things and emotional matters are dominating thinking in the academic environment, a person is unable to have access to the brain which controls the ability to reason, set goals, develop language and conceive abstract ideas. Ninety percent (90%) of students acknowledged that they don't really know much about how their brain thinks and learns. Perhaps a major reason why they don't do well academically is because they don't devote enough time to think and reason through what they are learning or other personal experiences are dominating their thinking.

Michael E. McCullough and others offer an explanation in relation to the ability to think rationally. Regarding brain and forgiveness in relation to some personal experience by a person named John, John could not forgive his father for some childhood experience that lasted through his entire life. Un-forgiveness was dominating his thinking. Perhaps this can happen in the academic environment and students need to be made aware of this kind of thinking behavior and attempt to avoid it. Michael E. McCullough and others discussion on brain and forgiveness supports the brain anatomy illustration and explanation by James Cook University Study Skills site on how to get the best out of ones brain. They assert that 'the brain is made up of three parts: the brain stem, which govern basic survival; the midbrain limbic system, a web of structures that govern emotions, motivation and much of the memory; and the cortex (of two hemispheres), which directs sensation, motor behavior and higher order thinking. The differing physical structure of the different parts of the brain is responsible for rational thought, images and

⁷ Mathew Allen. Smart thinking: skills for critical understanding and writing. Oxford University Press, Melbourne, 1997, p. 2.

⁸ Stephen Toulmin, Richard Rieke, & Allan Jack. An Introduction to reasoning. Macmillan, New York, 1984, p.6.

emotions'. Students must know and make sure that to get the most out of their brain, the special cells and structures that connect the different parts of the brain must allow free communication $[{}^{9},{}^{10}]$. The students must energize their brain to think smartly, access and evaluate the information they have before them to make sound academic decisions. On average, eighty percent (80%) of the students responded that the unit helped them to focus better and improve in their thinking ability. These are skills that an information literate student must possess.

"4. E-LEARNING AND INFORMATION LITERACY FOR SELF-RELIANCE IN LEARNING"

To be information literate, the unit offers exercises and notes on effective searching of the internet and the library database. The notes are presented using multi-media power-point presentation and later sent through the student network. As stated earlier, the ADOC, the digital opportunity centre in the library, offers great potential for the unit to be taught electronically. There are twenty working computers connected to the Internet and staff network. Students are instructed to do practical hands-on exercises using the computers in the ADOC for Internet searching. Students are asked to search the Internet for information and links on competencies of information literate students and study them. This is about self-evaluation. At the end of three weeks practice exercise on effective searching of the Internet, they are given an exercise for assessment on how they have developed effective searching skills and information literacy skills. To test their competency skills, an exercise on this unit is given to students on a topic to search on and e-mail the result to the lecturer for assessment. Below is a sample e-mail exercise.

Information Literacy - CRITICAL THINKING & SMART THINKING EXERCISE TOPIC: Do a cross-cultural study on financial accounting issues in commercial lending institutions.

Instruction: E-mail your answers to the questions below to: rtopagur@lib.unitech.ac.pg 1. What are your search strategies?

-My search strategies are; - cross culture + study + financial issues + institution

- cross culture AND study AND financial institution

- cross culture AND study AND financial lending institution

2. Which search engine or directory on the Internet did you use? -Search engine is **Google**

3. What is the best search strategy that led you to the correct search result or article on the topic?

cross culture + study + financial issues + institution 4. What is the best search result

Financial Accounting Issues in Commercial Lending Institutions: A ...

FileFormat:PDF/AdobeAcrobat-ViewasHTMLFinancialAccountingIssuesinCommercialLendingInstitutions:A.Cross-CulturalStudy.NasrollahAhadiat.CaliforniaStatePolytechnicUniversitySubmittedBy:StudentName

⁹ James Cook University Study. Skills Online: *Energise your brain*.

http://www.jcu.edu.au/office/tld/learningskills/studysmart/energise (16/12/2009)

¹⁰ See also. Michael E. McCullough and Stevens J. Sandage. *To forgive is human: how to put your past in the past.* InterVarsity Press, Illinois, 1997.

ID#: Student Number Course: BCAC/3

The best search strategy and link are verified. Search strategy exercises using keywords and Boolean searching are necessary to access the right information quickly. The search results on the first page should have all the valuable information and links in relation to the question and the search strategy. Marks gained from the exercise given showed how well the students had interpreted the topic and formulated search strategies. In 2009, out of eighty-five students, thirty-one got full mark (36.4%) and nineteen students scored the second highest. A semester project on a major essay was poorly done. Out of a total mark of 40%, forty-nine students (57.6%) scored twenty-six percent and below. They may have found the right information but were unable to communicate effectively in writing. However, academic performance at the end of the year by final year students in 2005 that had studied the unit showed that thirty-two students out of forty-two (76%) had a weighted average of seventy points and above.

"5. E-LEARNING AND ACADEMIC PERFORMANCE"

E-learning as a teaching and learning strategy has provided a lot more opportunities for students in the learning process and may have contributed to their academic performance. Timothy Rodgers [¹¹] confirms that research demonstrates that e-learning can be used to boost academic performance, but it must be well geared to student abilities. How students have become familiar with this mode of teaching and learning here at the PNGUT has not been ascertained. More indepth research may reveal the relationship between e-learning and student's performance in the various units in the second semester of third year and final year semesters. It is interesting to note that among forty-one students who had taken this unit in 2007, eight students (19.5%) graduated with merit on the 26th of March 2009 as compared to other academic departments. In 2009, thirty-one students out of fifty-five (56.3%) scored a weighted average of seventy points and above whilst in their final year. It is too early to speculate that e-learning has contributed to student's success. However, e-learning shows merit for the future. The university should start to plan for e-learning and if feasible and affordable, adopt it campus wide. Rodgers also confirms that some studies suggest that online teaching methods have a positive impact on performance, for example, through the promotion of greater student centered learning. However, he also points our that other studies suggest that a high level of online teaching can have a negative impact on performance, as it can result in students becoming alienated from the subject matter.

Conclusion

This is an attempt to introduce e-learning to the teaching and learning environment here at the PNGUT. Students need the right information and expect it at the speediest and shortest time possible. However, they have to know exactly what they are looking for by analyzing the unit objectives and choosing the appropriate keywords they can use in searching for additional information to enable them to get a better understanding of the subject matter. The Internet and

¹¹ Timothy Rodgers. *A question of style and substance: early learning age, Mar 2009* <u>http://findarticles.com/p/articles/mi_qa5402/is_200903/</u> (18/04/2009)

the library online catalogue offer students a variety of information sources and formats. However, without mastering certain information literacy, information technology, critical thinking and decision making skills, searching is futile. This is what BA391(Problem Solving & Self Reliance) unit is offering to the students. They have to master a variety of skills in order to be smart learners and be successful. Further research needs to be undertaken to ascertain whether e-learning contributes to student performance. However, on average, 80% of students over the six year period have responded that the unit has helped them to think better and enhance them with information literacy skills.

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Training and Measuring Creativity Using Computer-Based Morphological Analysis Method

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Abstract

The growing interest and concern in tapping creativity has prompted many research on creativity to be undertaken in a number of countries, particularly Malaysia. This paper explores the use of Information and Communication Technology (ICT) as educational technology tool for fostering and assessing the creative potentials of a person. A group of 97 university undergraduates, who are teacher trainees, took part in the study. In what way can a computer train and measure the creative potentials of a person? The assessment of creativity traits such as fluency, flexibility, elaboration and originality are based on definitions and algorithms adapted from Torrance's Test of Creative Thinking (TTCT) and Guilford's Alternative Task (Torrance & Ball, 1984 [43]; Guilford, 1977 [13]). Findings revealed that 85 out of the 97 subjects managed to improve their respective fluency, flexibility, elaboration and originality scores in the creativity exercise. The improvement of their creative potentials is credited to the effective implementation of the Morphological Analysis Method in the brainstorming activities. Findings also showed that there was an increase of 123 (or 48.8%) additional ideas as a result of the use of morphological matrix employed by this creativity technique. The study recommends the adoption of the Morphological Analysis Method for repeated uses on any academic curriculums in schools or universities/colleges to improve the creative potentials of a person on long term basis.

KEYWORDS: creativity, morphological analysis, fluency, elaboration, flexibility, originality, multimedia

Introduction

A lot of people tend to think of a "creative person" as eccentric or may be "insane" (of the ways he handles things unusually). The communities perceive such people as creative due to the outcomes of their hard work; solving problems in a novel, yet appropriate way. These anomalies have prompted the author to be motivated to examine the causes of creativity and how creativity can be fostered, nurtured or improved by using the latest all important tool of productivity, multimedia.

The paper examines the crucial question of whether Information and Communication Technology (ICT) can help making the job of creativity assessment easier and faster and at the same time plays its role in fostering creativity. Conventional methods using manually drawn graphics are time-consuming process in term of assignment of scores to the tests (if it is not in objective format).

This research is designed to investigate the possibility of training and assessing creativity using multimedia and a computer-based assessment system. The proposed integrated system is carefully planned, designed, developed and tested on a group of university undergraduates for its effectiveness and reliability in evaluating creative potentials of a person.

Research Questions

This research is designed to examine and answer the following research questions:

- 1. In what ways can ICT (multimedia) help to improve creativity?
- 2. What components of creativity are used to indicate creativity improvement?
- 3. How do the creative potentials of a person improve?

Review of Literature

The use of multimedia for training creativity

Creativity is often known as a characteristic that a person possesses, a product or outcome that is regarded as original, and a process by which an unusual, novel or suitable outcome or solution is obtained. Creativity involves the exercise of *imagination*. Creativity can be examined in a form of:

- product or behaviour (Besemer & Treffinger, 1981 [3])
- personality (Gardner, 1983 [11])
- thinking and learning styles (Sternberg, 1985 [40])
- environmental and social psychological settings such as motivation and work place (Amabile, 1982 [2]) and social-economic factors
- creativity processes were such as thinking processes (cognition and meta-cognition)
- stages of creativity (Csikszentmihalyi, 1996 [8]; Loveless, 2002 [16]; Mansfield & Busse, 1981 [18]; Shneiderman, 2000 [37]; 2002a [38]; 2002b [39])
 For example: Shneiderman's Model: Collect, Relate, Create, Donate

Numerous researchers argue that creativity can be taught and increased (Cropley, 2001 [7]; Davis, 1999 [9]; Houtz, 2003 [14]; Treffinger & Isaksen, 2001 [46]; Onda, 1994 [27]; Torrance & Safter, 1999 [44]). In this research, multimedia courseware that upholds the principles of multimedia of self-access, self-directed and self-paced is used in creativity training. According to Schwier and Misanchuk (1993) [35], multimedia courseware must have interactive learning components and practices that come with responses and suitable feedbacks. Carefully designed multimedia courseware that are consistent with how people learn, can aid learner greatly (Liou, 1994 [15];

Mayer, 1997 [19]; 1999a [20]; 1999b [21]).

Incorporation of video sequences and animations into multimedia courseware help teachers to tackle many misconceptions that students have and which are difficult to address within the limitations of chalk, textbook and overhead projector. The development of quality computer graphics is also essential to presenting visual ideas clearly to explain concepts. Voice, which is narrated audio, and music are types of audio that can aid learning in multimedia courseware (Mayer, 2003 [22]).

Animation is also a highly effective tool for illustrating a concept (Roblyer, 2003 [31]). The purposelycreated motion can also illustrate processes and real-life or virtual environment. Animations are processed in the visual or pictorial channel (Mayer, 2003 [22]). But, unfortunately, learners can only able to mentally activate for about ten seconds of the animation at any one time.

The Training and Assessment of Creativity

This research uses brainstorming and the Morphological Analysis (MA) Method in fostering creativity. Brainstorming is an activity that encourages lateral thinking and a great contributor to creativity and innovations because it gathers all ideas (without pre-judging any of them) into a solution-bank for the next stages of the creativity process (Muttagi, 1981 [25]; Rawlinson, 2004 [30]; Vidal *et al.*, 2004 [47]). The running of brainstorming is usually based on the following principles:

- Criticism is ruled out
- Freewheeling is welcomed
- Quantity is wanted
- Combination and improvement are sought

The creation of a relaxed and judgement-free atmosphere encourages the flow of ideas which will be severely impeded if participants are allowed to convey their judgement on each idea (Majaro, 1988 [17]). To ensure all ideas are accepted, the power of imagination is highly encouraged. In other words, the brainstorming session may produce any idea that can solve the problem, be it wild, insane, practical or even impractical idea.

With the growth of online services, brainstorming activities has gone online with a new term known as brainlining (combines the words 'brainstorming' and 'online') (Proctor, 1999) [29]. In this research, an 'asynchronous' (offline) type of brainstorming is created (Binder & Binder, 2007 [4]) to be used together with the MA Method. The morphological box or morphological matrix was created by Dr Fritz Zwicky, a Swiss astrophysicist based at the California Institute of Technology (Michalko, 1991 [23]) and it can generate a very large number of solution concepts for a problem under investigation (Roy, 2004 [34]).

It works through the processes of *breakdown* and *association* (Roy, 2004 [34]). For example, a problem on "Future transportation" can be *broken down* into two variables; type and power. The "type" variable has "ground, air, space" components while the "power" variable has "petrol, electric, solar, battery" components. The *association* of "ground" and "solar" sub-variables can result in the new idea of "solar-powered robot transport machine". Theoretically, this MA matrix is capable of producing 3 x 4 or 12 ideas (two-dimensional analysis). However, multi-dimensional MA will produce unlimited ideas, possibly millions of ideas of which Aleinikov (2002) [1] terms as the "mega-creativity" stage.

Presently, there are over 200 techniques used for the fostering of the creative potentials of a person (Rawlinson, 2004 [30]). Some of these techniques are attribute listing, mind-mapping, check lists, forced relationships, 5 W's and H, lateral thinking and PO, metaphorical thinking and etc. The MA Method is chosen because it encourages the breakdown of a problem into easily approachable components and thereby increases the possibilities of getting more solutions and hence increases the fluency of ideas production (Aleinikov, 2002 [1]; Rawlinson, 2004 [30]).

Methodology, Sampling and Procedure

This research uses program evaluation approach. Program evaluation is the systematic collection of information about the activities and outcomes of programs to improve effectiveness and make decisions with regard to what those programs are doing and affecting (Patton, 1994 [28]; Clarke and Dawson, 1999 [6]). The formative – summative evaluation approach is suitable for evaluating training programs (Scriven, 1967 [36]; Robson, 2000 [32]; Morrow et al., 2006 [24]; O'Sullivan, 2004 [26]). According to Scriven (1967) [36], formative evaluation is evaluation done to provide feedbacks for program improvement. Its primary objective is to support the process of improvement.

It is also known as "developmental evaluation" by Patton (1994) [28]. In summative evaluation, Scriven said that the principal aim of the exercise is to determine the overall effectiveness or impact of a program with a view to recommending whether or not it should continue to run. According to Clarke and Dawson (1999) [6], the formative – summative approach is appropriate because formative evaluation is "process-oriented" which focuses on improving program development while summative evaluation is "conclusion-oriented" which usually indicates whether or not the program needs to continue at the end of the training session.

The population of this research is all final year undergraduates (N = 172) of the education faculty of a public university in the state of Sabah, Malaysia. A total of 110 subjects are selected and ticked randomly from the name list supplied by the faculty. Finally, only 97 subjects from two academic disciplines (TESL and Science) managed to participate in the program.

Before the training, the 97 subjects are required to do Practice 1 (formative evaluation of the program) which is a brainstorming activity. They are allowed to access the multimedia training for knowledge on the brainstorming strategy. After completing Practice 1, they are requested to go through the multimedia presentation again to learn another creativity technique known as Morphology Matrix (Morphology Analysis) Method. When they are satisfied with what they learn, they do Practice 2 (summative evaluation).

Instrument

The focus of this research is to measure the creativity traits of the subjects in term of fluency, elaboration, flexibility and originality. Measurement of creativity is based on the derived formula adapted from Torrance's Test of Creative Thinking (TTCT). For the record, the Torrance's TTCT is the most popular creativity test battery and also has the most complete scoring guides, norms and longitudinal validity (Torrance, 1990 [41]; Torrance & Wu, 1981 [45]). Its reliability coefficient ranges from .78 to 1.00, at different grade levels (Torrance, 2000 [42]). The criterion for the assessment of the creative potentials of a person is shown on Table 1.

(adapted and adopted for use in this research from rollance & Dan, 1984 [43], Outfold, 1977 [13])							
Creativity components	Scoring criteria	Score awarded					
Fluency (F)	The number of different ideas that one	1 point for each idea					
	can produce	-					
Elaboration (E)	Richness of detail in the ideas that one	1 point for each creative					
	produces	elaboration					
Flexibility (FX)	The number of categories of ideas that	1 point for each category					
	one produces						
Originality (O)	The uniqueness of the ideas that one	Between 1% and $5\% = 1$ point					
	produces as compared to the whole	If $1\% = 2$ points					
	sample						

Table 1: Scoring criteria for creativity constructs and Creativity Index (adapted and adopted for use in this research from Torrance & Ball, 1984 [43]; Guilford, 1977 [13])

The chosen brainstorming topic for the Practice 1 and Practice 2 is "Future Transportation in Malaysia". The test-retest reliability for the topic is r = .497 and it is significant at 99% confidence level. The principle of creativity measurement purely lies with divergent thinking and hence 'the number of ideas produced' contributed to the fluency component. For example, 10 ideas contributed brought 10 points for a person's creativity indicator (fluency). There is no right or wrong answers for the topic. The principle of creativity states that there is no such thing as 'wrong idea' because all ideas are accepted. An illustration of the measurement of creativity into the four components of creativity is shown in Figure 1.



Figure 1: Assessment of creativity components: fluency, elaboration, flexibility and originality

A pilot run of the integrated system showed that the anticipated results tallied 100% correctly with manually calculated results. An interview is also used to gauge the respondents' opinions on the MA Method in term of its implementation, effectiveness and problems. The interview has 6 open-ended items.

Findings and Discussion

Improving creative potentials via multimedia

The training modules used in this research contains all the five multimedia components. They are text, graphics, audio, video and animation. The multimedia modules used in this research are complete with definitions, explanations, examples (in multimedia format especially animations) related to the creativity techniques employed. Besides that, practices with guided solutions are also included in the system. This is to enforce scaffolding or knowledge enhancement that acts as support and guidance to problem solving that can be beyond the possession of the current knowledge (the MA Method) (Rogoff, 1990 [33]).

The training modules are designed and presented in a form of video because it is accepted as a highly effective tool for illustrating concepts (Roblyer, 2003 [31]; Brooks *et al.*, 2001 [5]). This view is also supported by William and Abraham (1995) (in Brooks *et al.*, 2001 [5]). Although video is considered effective in delivering instruction but unfortunately, learners can only able to mentally activate for about ten seconds of the animation only at any one time (Mayer, 2003 [22]). To tackle this problem, option for *replaying* video is made available and is activated at all time so that slower learner can replay it at any time without any limit or condition. The research findings showed that 85 out of 97 subjects (87.6%) managed to improve their respective creativity scores in Practice 2 (summative evaluation) after going through the training modules. This indicated to a certain extent that the training is successful.

The improvement of creative potentials

Many researchers believe and to a certain extent prove that the creative potentials of a person can improve (Cropley, 2001 [7]; Davis, 1999 [9]; Houtz, 2003 [14]; Treffinger & Isaksen, 2001 [46]; Onda, 1994 [27]; Torrance & Safter, 1999 [44]). The research findings on the creativity achievement for the 97 subjects is summarised in Table 2.

Tuble 2 Summary of eleanticity achievement. Comparisons of means									
Creativity	Practice 1	Practice 2	Difference	T-test Result at 95% confidence					
Components	(SD)	(SD)		level					
Fluency	3.87 (1.68)	6.46 (2.71)	2.59	Significant (t = -10.94, p < .05)					
Elaboration	3.82 (1.70)	6.42 (2.68)	2.60	Significant (t = -10.90, p < .05)					
Flexibility	3.22 (1.42)	4.49 (1.28)	1.27	Significant (t = -8.61 , p $< .05$)					
Originality	7.00 (3.27)	12.03 (5.23)	5.03	Significant (t = -10.30 , p < $.05$)					

Table 2 Summary of creativity achievement: Comparisons of means

From Table 2, we can see that there is an increase in means in every creativity component. The differences in the means are all tested with t-test and the result also indicated significance for all the components at 95% confidence level. This proved that the subjects had improved their creativity scores in Practice 2. The improvement of creativity scores in Practice 2 can be traced back to the increased number of ideas the subjects posted to the system. There is an increase of 252 ideas in Practice 2's ideas bank from 375 ideas (Practice 1) to 627 ideas (Practice 2).

The MA Method succeeded in improving the skills of the subjects to enhance ideas generations in Practice 2. As creativity experts put it, the more ideas a person can generate meant that the more innovations can to be accomplished as suggested by the divergent thinking process as explained in the Structure of Intelligence Model (Guilford, 1967 [12]; 1977 [13]). This view is also supported by DeBono (1990) [10] who reiterates that lateral thinking (divergent thinking) is an effective method for enhancing creativity and problem solving.

The MA technique is successful because the brainstorming topic "Future Transportation in Malaysia" is broken into 2 variables namely; "type of transport" (y-axis) and "source of power for transport" (x-axis). This
creates a 6 by 6 Morphological Matrix that can generate up to 36 ideas for each subject. The matrix makes the subjects more organised when they brainstorm for ideas.

The interview which was administered after the completion of Practice 2 shows the following results:

- Can MA Method help you to contribute more ideas? (97.9% subjects said 'Yes')
- Morphology Analysis organised my thoughts on ideas (74.2% subjects said 'Yes')
- Morphology Analysis is systematic and easy to use (63.9% subjects said 'Yes')
- The MA's matrix item intersections kept me in focus on ideas (75.3% subjects said 'Yes')

In examining the opinions of the subjects on whether the MA Method helps them in contributing more ideas, 95 subjects or 97.9% agreed so. As explained earlier, the MA Method is a matrix bordered by the x-axis and y-axis. The intersection of two sub-variables of the matrix helps the subjects to think of the ideas.

For example, the intersection between "ground' sub-variable on the y-axis and "soul" sub-variable on the x-axis results with the idea; "bed transport" (refer Figure 2). This idea sounds crazy, mad and illogical but in the 'suspend judgement' principle practised in brainstorming technique, it is allowed and accepted by the system. Who knows that in the future, some geniuses may take up this idea seriously and go on to design and invent it, so that when we wake up from our sleep we have reached our desired destination. Although the idea sounds crazy but this is just what is meant by creativity.

ease contribu STRUCTION: (ideas). This is ea(s) only.	ite your ideas [5 Nick on any IDEA b idea No: 10. You c	minutes only] utton to start (Max an contribute ano	imum ther 5 STUD' PRC	Y THIS I DBLEM:	What type of transport do y will be available in the fi	ou think nure?		
MODE OF	POWERED BY:							
TRANSPORT	ELECTRICITY	DIESEL	SOLAR	PETROL	ATOMIC	SOUL.		
NDERGROUND		IDEA 7	IDEA 13	IDEA 19	IDEA 25	CAR-BOT		
ROUND	IDEA 2	IDEA 8	BED MOVERS	IDEA 20	MOTOR-TOM	BED TRANSPORT		
IB	IDEA 3	IDEA 9	FLYING CHAIR	IDEA 21	IDEA 27	IDEA 33		
EA	IDEA 4	IDEA 10	CHAIR BOAT	IDEA 22	IDEA 28	IDEA 34		
NDERWATER	IDEA 5	IDEA 11	SOLAR POWERED SUBMARINE	IDEA 23	SUB MOTORBIKE	IDEA 35		
IME	TIME SHIFTER.	IDEA 12	IDEA 18	IDEA 24	IDEA 30	TIME SHIFTER'S WATCH		

Figure 2: Screen shot of the morphology matrix in Practice 2

The interfaces shown on Figure 2 also demonstrate that they are easy to use (63.9% or 62 subjects agreed to this view). When a subject needs to contribute idea for a particular selected intersection, he will just click on that particular idea button. 75.3% or 73 subjects are also of the opinion that MA is not only easy to use but also helps the user to keep focus on only thinking of the required type of idea only. When the subjects are focus in thoughts, thinking is quite systematic and organised. This opinion is again supported by 74.2% of them (72 subjects). In other words, when thoughts are not organized (as in Practice 1) they are forced to search for ideas randomly at all possible

places mentally and the MA Method does a great favour by helping them to keep focused and concentrated via the respective intersections of the matrix.

Recommendation

The study is able to prove the effectiveness of the morphological matrix in the MA Method in promoting creative problem solving. It is therefore recommended that this method can be adapted to suit academic activities (in schools or universities/colleges) that require brainstorming for ideas. The repeated uses of this technique will definitely improve the creative potentials of a person in the long term.

Conclusion

The conclusion for this research is that the creativity technique, MA Method is able to stimulate brainstorming and proved to be able to produce more ideas than before. However, it must be noted that this achievement will only be successful if judgement of ideas is delayed or suspended as recommended by brainstorming experts (DeBono, 1990 [10]; Rawlinson, 2004 [30]). The multimedia training is also successful in departing precise and useful information on the correct use of the MA Method. I will conclude that the improvement of creativity of the subjects is due to the combinations of right learning attitude of the subjects towards learning the MA Method, the effective roles of the MA matrix and the successful completion of both Practice 1 and Practice 2 by the sample subjects.

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Using appropriate new technolgies to enhance distance students' learning at Universitas Terbuka, Indonesia

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Abstract

This paper presents a case study on the use of appropriate new technologies to enhance distance students' learning at Universitas Terbuka (UT), a large scale open and distance learning (ODL) system in Indonesia. The use of new technologies in an emerging nation's context poses challenges in terms of culture, cost, accessibility, resources and other barriers relating to innovation to serve diverse groups of students. Along with the use of the traditional printed materials and face-to-face tutorial supports, various kinds of technolgies have been used to enhance students' learning at a distance, including online tutorials, web-based materials, online examination, and other online services. Approriate new technologies can be used wisely and effectively to support distance learning in an emerging nation's context. UT needs to adopt and adapt new technologies to suit the diverse needs of its students and keep exploring innovations in using new technologies to support distance students' learning. This paper is extracted from an official document entitled: *Universitas Terbuka 25 years of making higher education open for all Indonesians* with permission of the Rector of Universitas Terbuka.

Country and institutional context

Indonesia is the largest archipelago and fourth largest nation in the world with a total of over 224 million people living in about 4,000 of total 17,000 islands located along the equatorial line in South-East Asia. According to the UNDP Human Development Report 2008, the country ranks 111th or medium in the 2009 human development index, with a GDP per capita of US\$ 3,712 (PPP), and an education index of 0.84. The Indonesian higher education system has for a long time included state and private institutions. The state higher education system comprises 82 institutions and one state national open university, i.e., Universitas Terbuka (UT). The private higher education system includes 2,545 institutions. The national higher education system accommodates more than 4.5 million students, comprising about 1.67 million students in the state higher education system, 2.27 million students in the private higher education system, and 0.6 million students in state higher education institutions operated by the government outside the Ministry of National Education jurisdiction. The national participation rate in higher education is about 15 per cent. Since 2009, legal reform has been introduced to change legal status of higher education institutions to become autonomous state-owned institutions as separate legal entities through the new Law of Educational Institutions as Legal Entities 2009 which has required the institutions to transform themselves as legal entities within a maximum of four years, or by 2012.

Despite the high demand for access to higher education, UT serves as a sole national open university, to cater for the nation's needs for quality ODL at the university level. Established on the 4th of September 1984 as the 45th state university in Indonesia, UT is a single-mode distance teaching university with its main missions have been to upgrade the qualifications of in-service teachers and to provide improved access to quality higher education to working adults and recent high school graduates.

During the first 25 years of its life, UT has developed to become a substantially large open university, or mega-university, enrolling significant number of adult students residing within the country as well as Indonesian nationals living throughout the world. In 2009, UT has an enrolment of over 640,000 students, and so far it has produced over 750,000 alumni, working in various fields of the profession. UT has four Faculties and a Graduate School, i.e., Faculty of Teacher Training and Educational Science, Faculty of mathematics and Natural Science, Faculty of Social and Political Science, and Faculty of Economics. The Graduate School has increasingly growing number of graduate students, currently offering Masters Programs in Management, Public Administration, and Fishery Management. UT operations involve internal and external networking arrangement. Internally, UT has 37 Regional Offices located in every province of the country, with planning, control and operational management from its headquarter in Jakarta. The UT human resources include a total of over 1,800 staff, distributed almost evenly in Head Office and its 37 Regional Offices. UT further employs course authors, test item writers, tutors, and supervisors on contractual basis in partnership with local public and private universities as well other institutions. Externally, it has networking with various organisations, including with state and private universities for course and test item development, the Post Office and cargo companies for the delivery of learning materials, with television and radio network for broadcasting its programs, local governments and offices for securing students' sponsorship, and other organisation for various purposes.

Use of new technologies at Universitas Terbuka

The 2005-2020 Strategic Plan and 2005-2010 Operational Plan of UT focus on continuous improvement in academic quality and relevance, access to services, and internal management (UT, 2004; 2004a). Provision of learning support services is essential, and this will be achieved through increased number of access points to services, improved quality of service and network of partnership, image building, and quality assurance.

Access to a variety of learning support services by distance students has to be improved to ensure quality learning process so that students have the motivation to develop independent learning capacity through self-direction. The institution responsibility is to design effective learning support system which encourages students to initiate learning and develop independent learning culture using a variety of methods and appropriate technologies involving capacity building of students, study groups, provision of various kinds of learning and support services for students, and use of new technologies. Enhancing access to services by students is conducted through improving the human resource competencies, enhancing roles of Regional Offices, increasing the number of access points, and establishing partnership with local resources. Widening accessibility and improving quality of services can be enhanced through the use of new technologies. Educating distance learners on the use of new technologies becomes critical, and it must involve stakeholders.

UT has been at the forefront of innovation in the use of internet-based teaching and learning, as a pioneer in the Indonesian higher education sector, in which a substantial student segment still does not have easy access to the internet. However, UT's experience in developing the use of internet in distance education might well illustrate the case wherein the use of the internet for teaching and learning at a distance has been continuously enhanced and improved to note student benefit and also with an increasing trend of using online learning services by UT students. UT has implemented and continuously improved its online services, including those designed for tutorials, web-based supplementary materials, self-exercise, examination results dissemination, online counseling, information dissemination, and online examination. Other online services are being developed to improve teaching and learning as well as administrative services for students.

Students' characteristics

Students of UT are categorised into *Pendas* and *Non-Pendas* Programs. *Non-Pendas* programs are program offered by faculties other than Faculty of Teacher Training & Educational Science while *Pendas* program is offered by Faculty of Teacher Training & Educational Science which manages programs for primary school teachers (known as S1 PGSD) and early childhood education teachers (known as S1 PGPAUD). In 2009, over 600,000 students, residing in different parts of the country and some overseas locations enrolled in UT. Over 95% of these students are working adults. UT has major roles to play in developing high-calibre human resources needed for the nation's sustainable development. Since its foundation, UT has enrolled over 1.5 million students and has produced over 1 million alumni, working in various professional fields. The following figure shows the trend of students enrolment from 1984 up to 2009.



Table 1. Trends of Student Enrolment

The number of students in the *Pendas* program is much higher than the *Non-Pendas* program due to the provision of scholarships from both the central and district governments. The active students in 2009.2 are 622,957, of which 536,974 students are those of *Pendas* Program. Active student is defined as student who registers at least one course in four semesters consecutively. The figure below shows that out of those 622,957 active students, only 477,989 (76.73%) students are actually taking courses (register) in the Semester of 2009.2. The registered students consist of 66,829 *Non-Pendas* and 411,160 from *Pendas* students.



Figure 1. Number of Active and Registered Students

The large number of alumni reflects that UT has successfully carried out its three main missions namely: (1) to widen access to higher education, especially for recent graduates of senior high schools, (2) to train increasing numbers of students in areas demanded by the economic and cultural development of the country, and (3) to upgrade primary and secondary school teachers who graduated from short-term programs to enable them to obtain the full-teaching degree. Total number of UT alumni is 996,728 in 2009.2. In line with the students' occupational status, UT alumni also occupy various important positions either in government institutions or in private sectors.

In order to maintain and modernise alumni database, UT conducts a tracer study which the objectives are: (1) distribution of alumni, (2) activities of alumni, (3) position and role of alumni in the society, and (4) stakeholders' opinions of UT alumni. The data, furthermore, can be used to fulfill the National Accreditation Board of Higher Education (BAN-PT) requirements that each higher education institution has to possess the newest information about the alumni.

Based on the experience of carrying out tracer studies for 3 years, then in 2009 UT began conducting exit survey. In the survey, questionnaires are distributed to newly graduates to directly capture information on: 1) the current address and occupation, 2) the reason for studying in UT, 3) the initial interest of becoming UT student, 4) the reason for choosing study programs, and 5) the satisfaction of the whole UT service. In the short future, the exit survey will be offered online and the alumni will be able to update their profiles independently so that the UT alumni will be always up to date.

Enhancing distance students' learning through the use of new technologies

Teaching and learning by distance mode at UT has been designed in such a way to enable the development of students' independent learning. Printed materials supplemented with non-print media and broadcast are the usual media for many open universities including UT. More recently teaching and learning at a distance has been enhanced with various kinds of online and asynchronous media using the internet, such as online tutorials, web-based materials, online counseling, online independent assignments, online examination, and online programs.

Multimedia learning packages. To enhance the quality of learning process, UT has developed multimedia learning packages, integrating printed and non-printed (audio, visual, and/or computer-assisted) materials for students' independent learning. The learning package is self-instructional, and so far more than 240 courses have been developed in multimedia package formats. A course team approach has been used in developing the materials to ensure quality. Revision is done to ensure that the content is updated, and life span of the courses must be less than seven years.

Broadcast programs. Broadcast programs include television and radio programs that are still widely used in Indonesia. TV programs have been used to deliver content to a very large number of students residing in various locations throughout the country. Television programs have been produced with a normal duration of 30 minutes in various formats, including features, talk shows, single presentations, and interviews. Radio programs can reach remote students to enhance learning process. Partnerships are developed to broadcast programs with national and local, or community and private television and radio networks throughout the country.

Online tutorials. Provision of online tutorial support for UT distance students is one way of enhancing learning process. During the year 2009, 516 undergraduate courses are supported with online tutorials to facilitate learning for students who have access to new technologies. The number of courses supported with online tutorials grow from year to year, and so is the number of participating students in online tutorials. Participation in online tutorial for undergraduate courses are voluntary. In the meantime, all of UT graduate level courses are supported with compulsory participation in online tutorials.

To enhance distance learning process, online tutorial is designed for a period of 8 weeks in one semester, in which online initiation materials is presented to students every week by the tutor. Students are given three assignments during one semester, on week 3, 5 and 7 respectively, to be submitted to tutor for feedback and scoring. The assignment and participation score s contribute up to 30 % to the final semester grade of the course. Online tutorial is compulsory requirement for all post-graduate courses, and it is integrated with the face-to-face tutorial mode, and is voluntary for undergraduate courses. The students' constraints to actively engage in online tutorials are attributed to factors relating to the cost of internet access and the limited accessibility to internet due to the poor quality of information and technology infrastructure in Indonesia.

Cost is one of the main constraints of students in using UT online facility, even though online learning support can be used to overcome the constraints of distance and time. There has been increasing trend of participation in online tutorial. The number of courses and students who participate in the online tutorial from 2005 to 2008 increased significantly. Meanwhile, the rate of online tutorial participation from students has fluctuated. In 2007, courses offered in online tutorials increased 23.1%, and increased 12.6% in 2008. In other words, the courses increased 15% in 4 years. In 2009, there was a decrease because online tutorials for some practical courses were not offered through online but in the form of face-to-face tutorials. The number of students who participate in online tutorials raised 500.1% in 2006, but in 2007, decreased 40%. Finally, in 2008, it increased 162.8%. During the second semester of 2008, there were 547 courses supported by online tutorials, and 33,091 students accessed the online tutorials (UT, 2009).

Web Supplements. Web supplements are used to enrich and update existing printed materials, and are accessible to students through the website. Some courses in social sciences, such as tax administration, public policy and finance, need to be revised in a short period of time because of the changing needs of users and government polices. Web supplements are developed to keep the course materials up-to-date and bypass the long process of course revision. Web-based learning materials can also be linked with other relevant online learning resources, discussion groups, or mailing lists.

Online examination. To provide students with a more flexible and secured examination process, in 2009.1, UT has developed an internet-based examination system, referred to as online examination, which is an improvement over the Computer Based Examination (CBE). The main difference between CBE and the online examination lies on the item retrieval process. For the CBE, the item retrieval and test construction process are carried out at the Examination Centre and then the digital files of these item sets are sent and stored in the Regional Office computer server awaiting use.

For the online examination, a certain subset of items is uploaded to a different server that serves as a mirror of the item bank. Retrieval of items and construction of tests are directly processed through the server which can be directly accessed by the Regional Offices. Pilot testing of the online examination system was carried out in 2009.2 in 6 Regional Offices. By 2010.1 the online examination with approximately 600 available courses should be offered at 12 Regional Offices. To increase the efficiency and accuracy of assessing student's ability, especially for the fully online courses, the online examination should be geared towards the use of adaptive testing or tailor-made testing that suits the specific needs of students accessibility. Adaptive testing will enable students to receive test items that are suited to their ability and thus will result in a much shorter test.

Other online learning support services. UT also provides other learning support services that complement and enrich the process of student learning. Several other websites have been developed and integrated into UT's portal, such as *Portal Guru Pintar Online* (Online Smart Teacher Portal) and *Portal E-Humaniora* (Portal E-Humanities), which contain features and facilities to strengthen the learning process through clinical counselling based on real cases in some aspects of courses. In addition, the online learning services also include provision of supplementary learning materials, open courseware as well as links to various open educational resources available in the internet.

Online programs to widen access to quality higher education

Delivering programs online is an option to widen access to quality higher education. Diverse groups of students can be met to suit their needs for flexible learning. Within the past two years, UT has been working on selecting and developing two programs to be delivered entirely online, i.e., the Master of Management (MM) and Bahasa Indonesia for non-native speakers (BIPA).

Master of Management (MM) Online Program. The MM Online Program has been designed to respond to the needs of students residing throughout Indonesia, overcoming the barriers of attendance in face-to-face tutorials. These typical students may be living in remote areas, or working overseas. The MM Online Program is intended to transform the regular MM program into a hybrid multimodal learning system. In this way, UT can offer alternatives to prospective students to choose the most suitable program mode.

The MM Online instructional system has been developed by a team involving lecturers, curriculum and instructional designers, web designers and multimedia developers. The program has been constructed in several phases, and a resulting prototype, a full-fledged elearning module for Business Research Methods, will later be used as a model for the development of other courses. The program follows the general pattern of the MM traditional distance learning program, which requires independent learning by self-study of the printed and non-printed material, four (4) face-to-face tutorials, eight (8) online tutorials, and assessments. In the MM Online Program, face-to-face tutorials will be replaced by more online tutorials, in the form of more intensive discussion of material, and more in-depth assignments, and other forms of online communication, such as the use of blogs, synchronous communication, and video conference.

The development process of the course began by mapping the overall strategy and content of the learning process, then by breaking down the course into lessons. The course contains eight lessons, each lesson contains introduction of the lecturer in charge of the lesson, learning 'triggers' in the form UT online learning centre website of key issues for discussion, supplementary references (articles or multimedia programs), assignments and wrap-up sessions. Printed material, as the main learning material, will be provided to the students, studied in tandem with the online program.

The MM Online Program employs online communication for academic services, beginning at registration, online tutorials and online assessment. By design, program student activities can be implemented anytime and anywhere, as long as students have access to the internet. In the later part of the program, i.e. thesis writing, some residential, face-to-face components will be included. In order to provide students with optimal references and support to learn effectively, there are links to digital sources of journals, ebooks and relevant open source material, and to the existing *JARDIKNAS* (National Education Network) and IMHERE (Indonesia Managing Higher Education Resources), all for extending reach and building resource capacity.

Bahasa Indonesia for Non-native Speakers (BIPA). Bahasa Indonesia for Non-native Speakers of Bahasa Indonesia (*Bahasa Indonesia untuk Penutur Asing Universitas Terbuka* or *BIPA-UT*) was launched in June 2009. This language program is designed for non-native speakers of Bahasa Indonesia through the online system at *Universitas Terbuka* (UT) and offers systematic and comprehensive online courses that will enable the participants to learn Indonesian (*Bahasa Indonesia*) effectively and efficiently at their convenience. The program is delivered through the E-learning platform including multimedia learning materials, assignments and learning activities which stimulate

language competence in listening, reading, writing, and speaking in Indonesian. The competent and professional tutors of BIPA-UT assist the participants in learning the material in a meaningful and enjoyable atmosphere.

This certificate program is designed to give opportunities for non-native speakers of Indonesian to learn *Bahasa Indonesia* through the online system. The competencies expected from the participants are (a) pronouncing the Indonesian vowels and consonants, words and understanding the basic form of sentences, (b) communicating using *Bahasa Indonesia* in informal communication for daily interaction, (c) using *Bahasa Indonesia* in formal communications, and (d) using *Bahasa Indonesia* for academic purposes and presenting papers and proposals in formal interactions or business interaction. This program is designed for foreigners who wish to learn Indonesian, are at least 17 years old, and understand English.

The BIPA-UT Certificate Program employs an open and distance learning system in which participants are required to implement self-directed learning. The open and distance learning system enables the participants to proceed at their own pace. Various media, such as web materials, audio, and video, permit the participants to enhance their knowledge and skills using various modes of learning. To gain optimum results from the learning process, the program provides online tutorials in a six or nine week period. Each week the participants are to learn a topic initiated by the tutor and then they do some assignments and read other supporting/learning materials. It is recommended to remain active and engaged with course materials every week. The participants are expected to be online several times every week for an hour or more each time.

The learning system for a BIPA-UT Program is implemented based on scheduled online tutorials. The participants are encouraged and motivated to learn the material by themselves through self-learning, facilitated by supplementary materials, additional practice, and other supporting materials such as downloadable dictionaries and software for learning BIPA online. The number of online tutorials differs from each course depending on the competency requirements of the course as indicated by the number of credits in each course. The online tutorial in BIPA-UT applies a team of tutors in a course. It means that one course in BIPA-UT will be delivered and managed by a team consisting of one course manager and some tutors. A course manager is the leader in the implementation of tutorials in one course. The course manager's duties are to coordinate tutors in planning the scenario for online tutorials; developing assignments and determining evaluation; developing assessment of student learning, marking and correcting; sending online tutorial grades based on content, participation and overall result; and writing reports for the implementation of the online tutorial for certain courses. A tutor's duties are conducting the online tutorial, designing and giving assignments, designing and correcting assignments, managing discussion forums and chatting for teaching and learning, providing academic and administrative services for the participants, reporting all grades to the course manager.

Preparing online tutorials consists of planning the implementation of the online tutorial as coordinated by the Institute of Research and Community Services (*Lembaga Penelitian dan Pengabdian kepada Masyarakat* or LPPM), gathering together the team of tutors and course manager, giving orientation to the tutors and course manager, preparing the online tutorial system in BIPA-UT, trying out and finalising the online tutorial system in BIPA-UT, deciding on the schedule for the online tutorial, and finally activating the online tutorial for BIPA-UT.

The participants who have been accepted into the BIPA-UT program can access the full course by entering through their personal usernames and passwords to login and access all enrolled courses. Evaluation is conducted to measure the learner's achievement through the learning processes of the language course objectives. There are two kinds of learning assessment: namely content assessment and final assessment, in form of an objective test and/or essay test.

The content assessment is conducted on a weekly basis to assess the learners' learning achievement of a specific module's objectives. The number of these tests depends on the number of course credits. The final assessment is conducted once every semester at the end of the course tutorials. The final grade for each course will be based on a percentage. The final grades will be announced to every student through email. The final grades are based on the cumulative of test scores. The assessment results will be announced to the students so that they can monitor their own achievement and motivate themselves to study independently. Any feedback obtained is evaluated against module objectives.

Prospects and future development in using new technologies

The major challenge for UT is to provide quality university education at a distance, accessible to students from different economic backgrounds, to maintain access to resources through the information and communication technology (ICT) facilities, and to decrease a low ICT literacy. Since

2002 UT has launched UT Online services, aiming at introducing web-based academic and administrative services for students. UT has conducted socialisation and training in online learning services to improve ICT literacy of the students. In the future, UT distance services will very much depend on the development and enhanced uses of ICT. Educating distance students and the society at large to use new technology for lifelong learning is one major challenge for UT.

UT has continued to improve the capacity of its online programs and services, and has developed and applied an intranet to be used in teaching and learning, management, and other services. The intranet covers both Head Office and Regional Offices. To enhance its online services, UT has also launched mobile learning services (mlearning) to accommodate students' needs for flexibility and online customer relationship management (CRM) to ensure customer expectations can be effectively met. Upgrading of ICT infrastruture and facilities as well capacity building of all staff is the UT's main priority so that the institution and its staff can anticipate changing needs of students and stakeholders and advances in new technologies.

Target audiences for CRM service application are students, staff, and others who are willing to have their problems solved by UT through an online application system. Through this application, students can ask for help to solve their problems in many aspects such as in registration, tutorials, and student examinations. To start this service, the customers can login to the program and write their problem on the New Ticket Gate. The program will automatically give the customers a complaint ticket number which functions for checking responses via the same webpage of the application. Responses are also sent through email directly to the customers. As a pilot project, the application will only be implemented for UT staff. This will help the staff become accustomed to the program.

In the future, new technologies will be used more intensively to enhance teaching and learning as well as to ensure effective and efficient management of a large Open University system. New technologies that have developed and utilised include such things as virtual laboratory for science courses, more extensive uses of online examination system, online registration, and further possibilities that new technologies allow for an ODL system to operate effectively. Some future developments of UT can be described as the following.

Academic programs. In terms of academic areas, UT has focused its future plans on the following programs. UT is considering to digitise its learning materials accessible by students online, to respond to the global movement for the use of Open Educational Resources (OER). There are issues to take into account relating to copyright, access rights, and the cost impacts of opening up access to learning materials in digital formats. Continuing education programs are also on UT priority lists, as there seem to be increasing demands for such programs in response to the needs for lifelong learning. These continuing education programs focus on certificate or non-degree programs. Graduate programs will also be the future direction for UT academic program development. In the near future up to 10 masters programs and a number of doctoral programs will be offered within the next three years. To ensure credibility of UT's academic programs, accreditation of all study programs will be sought from the National Accreditation Board for Higher Education, as well as other independent international accreditation body.

Enhancing examination system. Online examination has become the future target to achieve by UT to provide quality and secure examination that allows for flexibility for the students in taking the examination. The preparation and production process of the examination papers is undergoing modernisation through the use of digital printing that allows the printing of individualised examination papers for students. The Examination Centre is also preparing the database of cases for examination results in which problems or cases can be identified, categorised and followed up accordingly to respond to students' queries satisfactorily. A management information system for examination papers (*Sistem Informasi Bahan Ujian* or *SIMBU*) is currently under construction. Following the format that has been developed for management information system for learning materials, *SIMBU* will be used as effective information database of test items, life cycle, usage, writers, and so forth for use in decision making for the development and use of examination papers for specific semester examination.

Information technology uses. The future IT uses in UT is aimed at improving teaching and learning services and supporting efficient management for a large open university. The UT uses of IT-based database and networking will be enhanced. The UT will establish a live back-up of database unit in HO outside the Computer Centre Building. Another important plan is to develop data centre for HO to ensure that all data is maintained by the Computer Centre. To enhance effectiveness of IT services, UT will also develop IT Help Desk services under the management of the Computer Centre. In the near future, an electronic billing system for payment of students' fees in cooperation with partner banks will be developed to facilitate electronic and online payment of fees by students. The use of IP-telephone utilising the existing VPN (Virtual Private Network) will be applied with the aim to minimise operational cost of the institution and optimise the use of VPN. The IVR (Interactive Voice Response)

will be further developed to enhance student support services and thus minimise costs on the part of the students. The LAN capacity will be enhanced to control transactions and networking in HO. Online registration will be implemented to improve services to students with internet access.

Conclusions

Despite the fact that Indonesia still suffers from the limited ICT infrastructure within easy access by the public, including UT students, it is obvious that there have been increasing trends in uses of new technologies in various fields, including in open and distance learning. UT responsds to the increasing uses of technology to enhance teaching and learning at distance through various online courses and services. In the future, new open and distance learning will depends upon greater uses of technology, and UT has to continuously innovate and improve its learning and teaching technology uses. Any open and distance learning institution, including UT, should anticipate advances in new technologies, and wisely use appropriate new technologies for teaching and learning that meet the needs and requirements of the students which it serves.

The Editors

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The Role of E Learning in Integration of Basic & Clinical Medical Sciences, Complete Blood Count (CBC) E Learning Course, A Case Study From Kasr Alainy School of Medicine, Cairo University

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Abstract:

There is a great interest for integration of medical curricula because without conceptualization & unification of the separate subfields in medical education, further steps to apply medical knowledge to real life health problems are difficult. The use of e learning technology as a mode for delivery could be very effective to apply such integration. In this article, the development & implementation of complete blood count (CBC) e course is demonstrated as an integrated e learning course for first year medical students at Kasr Alainy school of Medicine.

Introduction:

Integration in modern medical curricula means abandoning the traditional discipline based discreet segmentation and isolation of teaching and learning activities within "concrete" silos. Integration seeks to break down the barriers between subject areas in order to provide students with better learning opportunities that will facilitate the development of knowledge that is relevant and meaningful to clinical practice, is deep and retrievable and which is amenable to alteration, updating and development as a part of an ongoing process of lifelong learning [1].

Integration is described as both horizontal and vertical [2]. Horizontal integration refers to the provision of learning within the structure where individual departments/subject areas contribute to the development and delivery of learning in a meaningful, holistic manner. Vertical integration refers to combination of basic and clinical sciences in such a way that the traditional divide between preclinical and clinical studies is broken down. Therefore, basic science is represented explicitly in the curriculum within the clinical environments during all the years of undergraduate education and beyond into postgraduate training and continuing professional development.

Integrated curricula have been widely adopted, fuelled by dissatisfaction with the way basic sciences have been taught as individual disciplines with no clinical application and by growing recognition that traditional instructional modes no longer meet current demands for interdisciplinary inquiry and practice in medicine [3,4]. Cognitive theories of learning suggest that an integrated approach to education may have important benefits for learning and retention because it facilitates contextual and applied learning, and can promote development of the well organized knowledge structures that underlie effective clinical reasoning [5,6,7]. At the same time, integrating a curriculum is a complex process. It is differentially understood and experienced by students and faculty, and can refer to instructional method, content, faculty work or synthesis of knowledge in the minds of learners [8].

Although interest in integrated curricula is growing, reviewing literature has revealed that little attention has been paid to the potential role of e learning in the application of such integration. The aim of this study is to explore the experience of Kasr Alainy medical school in the adoption of e learning as a mode of delivery for integrated medical curriculum & dissertation of Complete Blood Count (CBC) e learning course as an example of such application.

National strategy &needs analysis:

After its official launch during the world economic forum in Sharm el Sheikh in May 2006, the Egyptian Education Initiative (EEI) was established as a public-private partnership between the Government of Egypt and the World Economic Forum's ICT community as a progressive model for reforming Egypt's education system. The EEI seeks to add value to the national education process in new and innovative ways, directly improving the quality of education. A major component of the EEI is increasing access to technology. Alongside equipping educational establishments with computers and related technology, the adoption of innovative teaching methods and employment of relevant ICT applications and digital content guarantee real and lasting results [9].

Online learning has gained popularity in the past decade; however, its use is highly variable among medical schools and appears to be more common in basic science courses than in the clinical clerkships [10,11]. The application of e-learning into existing medical curricula should be the result of a well-devised plan that begins with a needs assessment and concludes with the decision to use e-learning [12]. On the other hand, the use of technology in support of education is not a causal or engineered set of practices; rather, it requires creativity and adaptability in response to the specific and changing contexts in which it is used. While education, not technology, is the prime goal, outcomes can not be always predicted & risks have to be taken [13].

Kasr Alainy Medical School is one of the largest & oldest medical schools in Africa and Middle East. Established in 1827, it accepts about 1600 students annually. It provides a 6 year combined premedical-medical program leading to a Bachelor of Medicine and Surgery which is usually followed by a 1 year internship at the university hospital [14].

Based on the EEI, the policy of Kasr Alainy medical school was to integrate basic & clinical medical sciences & to get best use of technology for medical education. The medical curriculum is divided into two parts; academic (first three years) & clinical (second three years). The academic years are concentrating on the basic medical sciences like anatomy, histology, physiology & microbiology. The clinical years include all clinical specialities, e.g. general surgery, paediatrics & internal medicine. Complete Blood Count (CBC) course is an example for such integration between basic & clinical sciences. It provides both the knowledge & the clinical application of blood elements. The students will know the different types of blood cells including their structure & function. Then they will know how to apply this knowledge in their medical practice to be able to interpret a CBC report & to predict a possible diagnosis from the findings of CBC.

Why is the course relevant for the target group? What is the motivation of the learners to take part in this course?

The course is targeting first year medical students. During first year, the students have a course about blood cells structure in histology & blood cells functions in physiology. The frequently asked question by students is "Why am I taking all this information about blood cells & how can I apply this knowledge in my practice as a medical doctor?? So, CBC course will be the way of integrating knowledge gained in histology & physiology by correlating the structure & function of each blood cell (horizontal integration) & then applying this knowledge to gain a clinical skill by interpretation of CBC report (vertical integration). First year medical students are curious to apply basic medical sciences they learn in the academic years into a clinical practice manner. Based on students' feedback, it has been the most interesting & motivating part of blood course in histology & physiology. It has increased students' motivation & retention for blood course.

The overall goals of CBC eLearning project:

The overall goal of the e learning project is to provide first year medical students the knowledge & skills of interpretation of complete blood count (CBC) report which is a commonly used laboratory investigation in the routine daily work of physician.

The project has been started in June 2008 & ends in January 2010. The project is divided into three stages:

- Planning for 4 months (June-September 2008)
- Implementation for 14 months divided as follows:
 - a) Development for 9 months (October 2008-June 2009)
 - b) Testing of beta version of the course for 2 months (July-August 2009)
 - c) Running of the course for 3 months (September 2009-November 2009)
- Assessment for 2 months (December 2009-January 2010)

The main learning objectives for the course:

By the end of this course, each student is able to:

1- Recognize the parameters of CBC with the normal range values for each parameter.

2- Interpret the numerical values and write a conclusive comment.

3- Predict a provisional diagnosis

The mode of delivery:

CBC course is a blended learning course. It is a combination of face to face initial meeting for orientation with web based on line learning (WBT). This blended learning course is based mainly on e-learning with feedback & follow up through the traditional practical sections of Histology & Physiology courses. WBT was chosen as the main course format so we can ensure bidirectional interactivity, and can keep the content up to date. The learners have been supported by tutors during both face to face & online course.

The actual added value of digital learning material over traditional course material:

Actually this course is not present in the routine face to face lectures. The online course is a new course which integrates the knowledge of two separate subjects & then applying it as a clinical skill. The interactivities & communication tools are motivating for the students & help them increase perception & retention of this subject. The target group showed interest in both the mode of delivery & content. They are eager to have an e learning course as a new experience & they are motivated to learn a clinical skill in their first year of medical education. Dealing with a CBC report is a very common situation in a daily work of a medical doctor. In addition, the digital content of this course can be used as a reusable learning object (RLO) which can be used in other courses related to blood in different subjects taught during the different levels of medical education, e.g. internal medicine, surgery, paediatrics, clinical pathology, haematology, etc. The same can be applied for teaching content related courses in other health related medical faculties, e.g. oral & dental medicine, pharmacy, physiotherapy & nursing.

Interactive elements & communication tools:

The content of the course has a moderate degree of interactivity. There are animations, interactive graphics, video & automated self tests (Fig. 1, 2, 3). There are different types of communication tools in the form of forum, chat & e mail. The learners are supported by tutors during the whole online phase. They act as mentors & facilitators to support students in their in e learning experience. Then they are subject matter experts who support students with content related information. They are also moderators for the communicative & collaborative activities.

How progress is checked within the course?

• The students are supported by tutors who guide them & give feedback for the tasks & assignments.

- Self assessment questions are placed inside the lessons (embedded questions) & at the end of lessons to check progress.
- At the end of each module, a final quiz "official" assesses student's competence with the module.
- Individual participation & activities of students will be monitored through their tutors.

Challenges & opportunities:

Being a public institution & due to limited financial resources, most of softwares used to develop CBC e learning course were free & open source ones (FOSS) which included, exe learning authoring tool, Hotpotato for self assessment questions, Wink for animation, Photofilter for image editing & Moodle as LMS. FOSS was user friendly & the course content has been developed by medical staff who has some IT experience.

The integration of IT-Department in eLearning activities:

The IT department is responsible for the technical implementation process. After development of the course, IT technicians uploaded it in LMS (Moodle). They were also responsible for students' & tutors' enrolment, maintenance & technical trouble shooting during implementation process.

Evaluation & feedback:

Based on the evaluation of the course the following positive results were concluded:

- 1- Higher students' satisfaction & retention of subjects. They enjoyed the experience of new mode of delivery through e learning & the integration of district basic medical subjects as one course presented in the form of a clinical skill. Most of them asked for more e learning courses during different grades.
- 2- Higher level of interactivity has been achieved either between students & content, students & tutors, & students

& other students through collaborative work; hence the national problem of high population is reflected on the traditional face to face education in Egypt which represents a barrier of communication & interactivity especially between students & teaching staff.

- 3- Integration between different medical courses is easier & more applicable through e learning.
- 4- The tutors were satisfied with the experience as it allowed them to create & develop innovative teaching approaches. Time management as a teacher was more controlled than that of face to face learning. They got closer to their students & they could remedy their teaching skills based on students' feedback.

The following recommendations have been revealed:

- 1- Hiring of well trained IT specialists to develop more advanced tools & applications like simulations.
- 2- Training of a larger number of tutors to be compatible with the high student number.
- 3- Practical steps towards legal applications of e learning curricula as an official mode of delivery & assessment.
- 4- Sponsorship of research initiatives through collection of internal information about e learning, sharing ideas & innovations through internal & external forums, formation of committees with other institutions at the national, regional & global level.
- 5- Capacity building, professional development & training through offering diverse training workshops which explore interactive tools & the solutions they provide. Sharing of other case studies & success stories as consulting partners.

Conclusion:

E learning can play a major role for horizontal & vertical integration of medical curriculum but a proper needs analysis & planning is required to assure proper pedagogical use of such technology.

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Fig. 1: A screen shot from CBC course showing a short video demonstrating how to spread blood film



Fig. 2: A screen shot from CBC course showing interactive magnifying lens used to explore the different cell types of blood film.

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Fig. 3: A screen shot from CBC course showing interactive calculator used to calculate blood indices & then to diagnose the type of anaemia.

The MIT LINC 2010 Conference Parallel Presentations

Session #14:

Educational Reports with Implications for Technology-Enabled Learning



The Role of Education On Economic Growth in Pakistan

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Abstract

The role of improved schooling, a central part of most development strategies, has become controversial because expansion of school attainment has not guaranteed improved economic conditions. This paper reviews the role of education in promoting economic well-being focusing on the role of educational quality. Much evidence from developing countries suggests that education has strong influence on economic growth. The main purpose of this study was to examine the effects of some of the key macroeconomic variables on Pakistan's economic growth during 1980-2007 taking four different education levels including Primary school enrollment, Middle school enrollment, High school enrollment and other school enrollment as a ratio to total employed labour force. Other variables include exports, Basic health unit (BHUs), as main macroeconomic variables. It concludes that there is strong evidence that the cognitive skills of the population-rather than mere school attainment-are powerfully related to individual earnings, to the distribution of income, and to economic growth. Primary education is considered to be an important prerequisite for accelerating growth. The magnitude of change needed makes it clear that closing the economic gap with industrial countries will require major structural changes in schooling institutions. The integration of information technology in teaching is a central matter in ensuring quality in the educational system. There are two equally important reasons for integrating information technology in teaching. Pupils must become familiar with the use of information technology, since all jobs in the society of the future will be dependent on it, and information technology must be used in teaching in order to improve its quality and make it more effective.

INTRODUCTION

Education is key to the socio-economic development of a country. It plays a vital role in building human capabilities and accelerates economic growth through knowledge, skills and creative strength of a society. The positive outcomes of education include reduction in poverty and inequality, improvement in health status and good governance in implementation of socio-economic policies. The multifaceted impact of education makes it an essential element for policy framework. Developing countries, where majority of the world's population resides, need to redesign educational policies for promoting productivity in different sectors of the economy by developing highly skilled manpower and addressing their development needs for rapid industrialization. The government is making earnest efforts to improve the quantity and quality of education by enhancing educational facilities within the minimum possible time. The overall literacy rate for the years 10 and above was 55 percent during 2006-07 compared with 45 percent in 2001-02), indicating a 10 percentage points increase over a period of only six years. [Source: Pakistan Integrated Household Survey PIHS (various issues)].

To achieve sustainable growth and development in Pakistan, it is imperative to continue assistance in poverty reduction and develop social and economic infrastructure more importantly education. Since many years the unsustainable economic growth is worrisome in Pakistan. The factors responsible for this situation were unfavorable economic growth, political instability, negligence in education sector, worse law and order situation and poor attraction for the foreign investors. The unsustainable economic growth can be related with high inflation rate, a mounting fiscal deficit, increasing foreign debt and debt servicing, weak foreign demand for Pakistani products, low level of physical and human capital, unfavorable weather, and political instability and among other factors, a deteriorating law and order situation in the country. It is beyond doubt that education is a significant contributor to economic prosperity. To achieve a strong growth, education should be given top priority more particularly in developing countries. The most important impact of the education can be witnessed into two ways in developing countries. Firstly, education will provide people with power of decision-making which could instill gender equality. Secondly, educating the people of developing countries mean to make more sustainable choices which will create a better world to live in.

Primarily, the links between education and economic growth, income distribution and poverty reduction were well established. Education equipped people with the knowledge and skills they needed to increase their income and expanded opportunities for employment. This is true for households and for

national economies. Levels for productivity, economic growth and patterns of income distribution are intimately linked to the state of education and the distribution of educational opportunity. Increasing global economic interdependence and the growing importance of knowledge-based process in economic growth have raised both the premium on education and the cost associated with education deficits.

Economic growth and education are intertwined. Greater access to education has certainly contributed to higher rates of economic growth. The extent of the contribution of education to economic growth depends not only on building skills, but also on their application. There is evidence that state led development models and rigid labour markets do not favor rapid economic growth, even when the state offers broad access to schooling and high education quality (for example, in Eastern European countries under socialist rule). In the words of Hannum and Buchmann (2006) education is organized as a basic human right, and better education fosters and enhances work skills and life skills such as confidence and sociability. These skills in individuals promote economic growth on a societal level via increased productivity and potentially better governance.

In conclusion, it is observed all over the world that not a single country has achieved sustained economic development without substantially investing in education sector. Education by itself does not guarantee successful development, as history has shown in the former Soviet Block, Sri Lanka, the Philippines, and the Indian states of Kerala and West Bengal. Unequal distribution of education tends to have a negative impact on per capita income in most countries. There is a strong causal link between education and economic growth. If more education leads to faster economic growth, then investments in education could pay for themselves in the long run, and could also play a role in reducing poverty. Education is the most important determinant for economic growth. Some prominent economists have analyzed the relationship between education and economic growth. In the same context, we will analyze the relationship between education and economic growth for Pakistan during last twenty seven years (1980-2007).

Objectives of the study

The objectives of the study are to establish a relationship between education and economic growth in Pakistan during (1980-2007). The overview of the previous researches in most parts of the world proved that education has significant impact on economic growth. The programmes launched in developing countries for the uplift of education have shown that education is major source for the economic development in their countries. Furthermore, it is also aimed to provide a comprehensive and critical overview of the impact of education on economic growth in Pakistan during which would be a source to provide a base for decision maker for future planning.

EDUCATION IN PAKISTAN

Education encompasses both the teaching and learning of knowledge, proper conduct, and technical competency. It thus focuses on the cultivation of skills, trades or professions, as well as mental, moral and aesthetic development.

Historical background

When Pakistan gained independence in 1947, West Pakistan had only one institution of higher education, the University of the Punjab; East Pakistan had the University of Dhaka. Over the next 20 years, many private and public schools and higher education institutions were established to help fuel the country's socio-economic development.

In the early 1970's all of Pakistan's educational institutions were nationalized government of Zulfikar Ali Bhutto, who was committed to the idea of Islamic Socialism. For the next decade, Pakistan's entire system of education was staterun. However, the growing demand for higher education fast outpaced the establishment of new public universities. During that period, the system could accommodate only 25 percent of the

High school graduates who applied to higher education institutions. The overcrowding Prompted many wealthy Pakistanis to seek university degrees abroad in the United States, Great Britain and Australia, while others sought out private tutors at home or entered the job market without a degree.

In 1979 a government commission reviewed the consequences of nationalization and concluded that in view of the poor participation rates at all levels of education, the public sector could no longer be the country's sole provider of education. By the mid-1980s, private educational institutions were allowed to operate on the condition that they comply with government- recognized standards.

Until 1991, there were only two recognized private universities in Pakistan: Aga Khan University established in 1983; and Lahore University of Management Sciences established in 1985. By 1997, however, there were 10 private universities and in 2001-2002, this number had doubled to 20. In 2003-2004 Pakistan had a total of 53 private degree granting institutions. The rapid expansion of private higher education is even more remarkable if we look at the number of institutions established on a year-by-year basis. In 1997, for instance,

three private institutions were established; in 2001 eleven new private institutions were opened; and in 2002 a total of 29 private sector institutions sprung up.

The government has decided to introduce 'English Medium Education' on a phased basis and to substantially end the right to 'Mother Tongue Education'. This new policy which is termed 'Education Sector Reforms (Policy decisions)', states that "English language has been made compulsory from Class-1 onwards." and the "Introduction of English as medium of instruction for Science, Mathematics, Computer Science and other selected subjects like Economics and Geography in all schools in a graduated manner.

Role of Technology in Education for Enhancing Economic Growth in Pakistan

Technology has found its way into every aspect of our culture today. It's in medicine, it's in social work, and no even more than it use to be, it's in our education systems¹. Teachers are continually being encouraged to take technology classes so that their students can benefit from their knowledge. In Education, technology plays are role in the classroom, in assistive technology products, and software that is brought into the school. So what exactly is the role of technology in education? Technology is making it possible for teachers to reach more students, allowing students the time they need to succeed, and providing our future workforce with competent, knowledgeable employees. It is so true that technology is embedded in our culture, and that we are immersed and dependent on it, as well. Technology changes so rapidly and has such a pervasive impact that it is actually determining our culture. Children and adolescents are prime users and beneficiaries. Admininistrators and educators need to keep pace with life outside the classroom in order to integrate and access the wonderful learning opportunities the Internet, iPods, cell phones, podcasting, and even social networking sites and video game play offer. Today's youth spend half their leisure time in front of screens - it is a huge part of their life. Teaching in a dydactic/lecture format no longer works, and it is not utilizing the power of technological advances. Teachers need to invite students to learn by using what they know best-technology gadgets.

¹ Dr. Michael Osit, Psychologist/Author of Generation Text: Raising Well Adjusted Kids In An Age Of Instant Everything

Spending on science & technology in the Pakistan is far below the global average. According to reputable organizations such as UNESCO and the World Bank data on science spending in most OIC (Organization of the Islamic Conference) countries including Pakistan is average annual spending on R&D as 0.34% of GDP, much lower than the global average over the same period of 2.36%. Therefore countries in the Islamic world including Pakistan are finding it hard to improve the current status of science & technology education in the country. Pakistan continues to fall behind not only the developed countries in the West but also emerging nations in east Asia like Taiwan and South Korea. In the past decade, Taiwan and South Korea have shown a ground breaking performance in science and technology coupled with rapid economic growth. The importance of science & technology in contributing to the overall welfare of Pakistani society needs to be recognized with serious ambitions. Scientific progress in academia in Pakistan is often hampered by relatively immature university system. Promotions and appointments in most institutions are often more in peer-reviewed journals; thousands of PhDs and Postdocs are getting training at home and as well abroad; a free digital library for all educational institutions in the country is already established where thousands of research journal and books available around the clock; scheme to attract researchers from abroad to work in Pakistan under the foreign faculty hiring program and tenure track system for highly qualified researcher, is working relatively well but still we have to do more, to stand Pakistan in the row of highly developed nations of the world. Till now HEC has done excellent job and I must also acknowledge and appreciate HEC and professor Dr. Atta-ur-Rehman for that.

In this new millennium, the quality of Pakistani citizens' lives is intertwined with the calibre of its national education system. The Ministry of Education (MoE) has identified opportunities to enhance the quality and accessibility of this system, and, indeed, the MoE has stressed these areas of focus within all of its recent policy documents. These include the National Education Policy 1998–2010, the Education for All-National Plan of Action (NPA) (2001–2015) and the Education Sector Reforms (ESR) (2002-2006). The MoE's policies based on loyalties rather than merit. The competition in other parts of the world, including our neighbor India and China is progressing fast. A huge jump in development is needed to compete. Although HEC annual budget for science and technology's has increased hundreds of fold compared with 1999; researchers have an opportunity to more than triple their earnings if they publish also strongly emphasize the promise of public-private partnerships, the potential impact of Educational Management Information Systems (EMIS), and devolution of education administration. The MoE recognizes all of these approaches as key means of attaining the goal of universal education. Pakistan's current education system faces, however, a myriad of challenges in making good on this commitment. The system must extend the reach of education to all children of school going age. Simultaneously, the MoE needs to upgrade the skills of Pakistani citizens to respond to the demands of a global and exceedingly competitive world. Lack of access to education continues to hamper improvements in our country's literacy rate. Current figures indicate that only 50 percent of the population is literate, with a disproportionate percentage being male. There are not enough schools, especially in rural areas and particularly for girls. Thus, a modest few continue beyond the primary-school stage, and the number of students decreases drastically between the upper primary, secondary, and tertiary levels. The dearth of human resources within the broader education system presents another-and multi-faceted-barrier to excellence. First, there is a shortage of qualified administrators and teachers. Second, in parts of Pakistan, schools often report a high rate of teacher absenteeism. Third, in rural schools, it is difficult to employ and retain female teachers. Fourth, there is a lack of meaningful professional development opportunities that improve administrative oversight and teaching practice, enhance morale, and sustain change at the classroom level. Taken as a whole, and, at times, exacerbated by economic and social issues, these concerns have a negative impact on educational quality. Further, the present system offers only minimal curricular resources for students, and in most primary schools these are restricted to textbooks alone. The majority of schools' pedagogical focus is on lower-level cognitive skills-such as memorisation of material-and the standards of secondary and tertiary education fall below current international standards. Given these facts, it is unsurprising that secondary school programmes produce too few students in disciplines such as science and technology. Pakistan is making good progress in tackling these challenges. Yet, our country is in competition with nations that have formed "knowledge societies". These countries have infused their education systems with information and communications technology (ICT). In China, Estonia, India, Ireland, Macedonia, and Malaysia, the return on investment in ICT is significant. All are moving from a poor, marginalised status to accelerated economic growth and higher standards of living. It is time for Pakistan to join these global ranks and form our own "knowledge society." Thus, in 2004, the MoE took the initiative to explore mainstreaming ICT in education. Its efforts culminated in the development of the NICT Strategy.

It has been argued that high rates of education are essential for countries to be able to achieve high levels of economic growth. In theory poor countries should grow faster than rich countries because they can adopt cutting edge technologies already tried and tested by rich countries. But economist argued that if the gap in education between a rich and a poor nation is too large, as is the case between the poorest and the richest nations in the world, the transfer of these technologies that drive economic growth become difficult, thus the economies of the world's poorest nation stagnate.

Information Technology in Education

Education is a life long process therefore anytime anywhere access to it is the need, Information explosion is an ever increasing phenomena therefore there is need to get access to this information. Education should meet the needs of variety of learners and therefore IT is important in meeting this need, It is a requirement of the society that the individuals should posses technological literacy. We need to increase access and bring down the cost of education to meet the challenges of illiteracy and poverty-IT is the answer. The pace of change brought about by new technologies has had a significant effect on the way people live, work, and play worldwide. New and emerging technologies challenge the traditional process of teaching and learning, and the way education is managed. Information technology, while an important area of study in its own right, is having a major impact across all curriculum areas. Easy worldwide communication provides instant access to a vast array of data, challenging assimilation and assessment skills. Rapid communication, plus increased access to IT in the home, at work, and in educational establishments, could mean that learning becomes a truly lifelong activity-an activity in which the pace of technological change forces constant evaluation of the learning process itself.

Advantages to having technology in Education

There has been substantial evidence around the world that technology has become one of the most important and vital components to the success of a child's education. Here are some of the advantages that technology helps provide for children today:

- 1. **Meeting Students' Targets**. Technology has been proven to help students achieve in reading, writing, and arithmetic. Each year teachers are instructed and challenged to meet AYP's (Adequate Yearly Progress). Technology gives educators one more tool to help them reach those goals. Students become engaged and can often times facilitate parent involvement at home.
- 2. **Strengthen Professional Career**. Not only does technology benefit students in the education system, it also benefits the educator. There are so many opportunities for teachers to learn and acquire new skills over the internet, keep up with credentials and in return help them improve their teaching abilities.

- 3. **Fulfilling Demands**. Technology, more specifically with assistive technology special needs students, and student with disabilities have been able to achieve in areas and ways that would not have been possible. Technology creates individualized learning environments for students and really can play a major role in special needs ones.
- 4. Learning Rights at any Stage. Technology has also made it possible for those who didn't finish college or high school to get back into things without having to even leave the comfort of their own home. And technology has made it possible for continued education; those wanting to reach a little higher and gain more knowledge in something new or old. Technology brings the learning right to your students; wherever they may be.
- 5. **Market Value**. And last, but certainly not least, technology has served students well because it has provided them with the skill and knowledge they need to enter the workforce.

Brief overview of four levels of education

Education in Pakistan is divided into four levels: primary (grades one through fives), middle (grades six through eight), high (grades nine and ten, leading to the Secondary School Certificate), other (arts, science and vocational schools). Different categories of these four levels of education can be shown in a diagram in which comparison of Madras and Modern school system is given.



LEVEL

OVERSEAS



Relationship between Education and Economic Growth

Education is a key for economic growth all over the world whereas, in developing countries in particular. The relationship between education and economic growth is positive and this relation is consistent in most parts of the universe. The developments in the economic theory, the role that education can play in generating economic growth and implications likely to be proposed for education will be discussed in other chapter of thesis. If we shed light on the previous Pakistan economic performance we may say that the performance was not satisfactory due to some inevitable factors such as droughts, unsustainable debt, and the macroeconomic instability and unsatisfactory situation of law and order.

Years	1980	1985	1990	1995	2000	2005
Indicators						
Primary schooling enrollment (%)	32.1	35.8	47.5	57.3	60.5	68.1
Secondary schooling enrollment (%)	6.4	7.3	9.6	12.2	11.6	12.0
Literacy rate (%)	26.1	28.8	33.8	39.6	47.1	52.5
Public spending on education(as % GDP)	2.0	2.7	2.7	2.2	2.0	2.5
Public spending on health (as % GDP)	0.6	0.8	1.0	0.7	0.7	0.6
Life expectancy (at birth)	55.1	57.4	59.1	60.9	63.0	66.0
Computer used						

Table 1: Human Capital Measures for Pakistan, 1980-2005

Years	Growth Rate of	Literacy R
1000.01	GDP (%)	(%)
1980-81	6.4	26.2
1981-82	7.6	28.6
1982-83	6.8	34.3
1983-84	3.9	34.3
1984-85	8.7	28.8
1985-86	6.4	35.3
1986-87	5.8	37.9
1987-88	6.4	37.1
1988-89	4.8	32.7
1989-90	4.6	33.8
1990-91	5.6	34.9
1991-92	7.7	36.0
1992-93	2.2	37.2
1993-94	4.5	38.4
1994-95	5.2	39.6
1995-96	5.1	40.9
1996-97	1.3	42.2
1997-98	5.4	43.6
1998-99	4.2	45.0
1999-00	3.9	47.1
2000-01	2.0	49.0
2001-02	3.1	50.5
2002-03	4.7	51.6
2003-04	7.5	53.0
2004-05	9.0	53.0
2005-06	5.8	54.0
2006-07	6.8	55.0

Source: State Bank of Pakistan 2006), UNESCO Yearbook, World Bank (various ssues).

able 1 show at the human capital measures, hich is grown sitively in kistan during period e 80- 2005. hereas public ending on lucation and alth are poorly administered. is time to ink policy aker to locate more nding for lucation and ealth so that rgets can be achieved within ecified time riod.

Table 2: GDPGrowthRateandLiteracy

Rate in Pakistan during 1980-2007 (%).

Source: 50 Years of Pakistan Economic Survey (various issues).



It is evident from the Figure 1, that relationship between education and GDP is positively correlated. As the level of education rises, the GDP shows gradual but consistent growth between years 1980 to 2007. Moreover, graphs indicate that there is hardly any decline in GDP during this period of time.

Relationship between four Indicators of Education and Growth Rate of GDP (%)

(a): Primary Ratio as Total Employed Labour Force and Growth Rate of GDP



In Figure 2 we can see a positive relationship between primary school enrollment as a ratio to total employed labour force and GDP growth rate. After examining the trend of both the variables it is more likely to say that in general there is an upward trend.





Growth rate of GDP and Middle School ratio are shown in figure 3. We can easily say that middle school ratio has also positively related to the growth rate of GDP but the gap between these two variables are wide than primary education and GDP growth rate.



(c): High Ratio as Total Employed Labour Force and Growth Rate of GDP

In figure 4 shows the gradual increase in higher education measured as the ratio to total employed labour force also wide gap between higher education level and GDP growth rate. As an indicator of educational attainment this measure is obviously unsatisfactory.

(d): Other Ratio as Total Employed Labour Force and Growth Rate of GDP



As to a link between education and economic performance, in figure 5 we plot growth rate of GDP and other educational institutions. This picture is very clear, that the other educational institutions are not strongly associated with the growth rate of GDP.

During the thirty seven years 1980-2007, other level of education does not show any growth and very close to zero through out the study period.

In conclusion, comparing Figure 1 through Figure 5, as the education level rises, gap between the corresponding education level and GDP growth rate is widening, which also indicates two important points. Education level other than
primary are not improving overtime and government investment to higher level is not very promising.

Secondly, even education level are not very improving overtime but growth rate with same fluctuation are getting improve which means that variables other than education are also very important which may not be the time of discussion in this study.

LITERATURE REVIEW

Sawada (1997) explored a distinct gender difference in education in rural households of Pakistan using household panel data for the period of (1986-87 to 1990-91). He estimated regression model using variables entrants and dropouts etc, implied that households in Pakistani villages might be credit constrained. Investment in the education of daughters may not yield much economic returns for parents, due to various customs and traits of the society.

Temple (2000) examined the importance of education on economic growth. He viewed that there are greater benefit of education resulting high productivity, reflecting positive influence on economic growth. Moreover, he emphasized that the education has central role in the developments of different sectors of economy.

Kerr (2001) explained the importance or the education in generating economic growth in his paper. This conference will be a source for bringing together different views on education policy designs. In designing education policy, the issue is not through which this policy will implemented, the issue is the policies should be a reflection of best advances the country's economic and social goals.

Lattimore (2002) revealed a strong link between education and economic growth for New Zealand during (1952-2002). Before the introduction of "Knowledge Wave²" in New Zealand the economic progress was falling down and living standards were also declined. By adopting the education policies and making more investment in education sector has increased the GDP growth rate by six percent in New Zealand.

Stevens and Weale (2003) determined a relationship between education and economic growth through the parameters of the inefficiency model. They used micro and macro level data. At micro level if individuals get higher education they he will also receive higher income. However at macro level study showed the similar percentage of returns ranged from 6-12 percent per annum.

Teles and P. Andrade (2004) developed the relation between public investment in basic education and economic growth. In their paper, they used five

² Try to increase the quantity of economic resources, reallocate our resources to more valuable uses and to increase the skills of the workforce.

complementary theoretical models³. They conclude that basic education affects agents' decisions over their lifetime, and that the significance of the relation between public spending on education and economic growth is altered by changes in the composition of government spending with regard to basic and higher education.

Babatunde and Adefabi (2005) explained the long run relationship between education and economic growth for Nigeria during 1970 to 2003. The Johansen co integration technique and the vector error correction were applied. The results of the co integrating technique suggested that there is a long run relationship between enrolments in primary and tertiary level as well the average years of schooling with output per worker. They also established long run relations among the other series in the model. Results through vector error correction revealed that a well educated labor force significantly influenced on economic growth both as a factor in the production function and through total factor productivity.

Afza and Nazir (2007) focused on the role of human resource management as a tool to improve the economic competitiveness particularly in Pakistan. Pakistan has not positioned itself to benefit substantially from the opportunities to integrate with the world markets. To make it strong on basic education for all (rural and urban) is the key for securing long-run competitiveness of human resources and for sustainable growth is the main requirement in Pakistan.

Abbas and Peck (2007) investigated the relationship between human capital and economic growth. They have used time series data for Pakistan during 1960 to 2003. They revealed that human capital have accounted for about 40 percent of the increase in GDP per head. Moreover, they expected large value of elasticity of education endowment in Pakistan. Therefore, they suggested that poor quality education, stemming from underinvestment, may erect smaller impact than expected.

Papademos (2007) argued that education played a significant role for the development of financial market in Europe. He viewed that education can further contribute with the implementation of necessary measures to enhance the quantity and quality of education in Europe.

Obradovic in his study established a relationship among education, human capital and economic growth. Education itself represents one of the primary components in human capital, which is an important factor in modeling the economic growth. The role of education is not only to educate people but also create and develop person's capability for innovations, in order to provide effective support to the processes of economic development. Moreover, he

³ Decreasing marginal returns to the human capital stock in the production function, to hours spent in accumulating human capital, and to public spending on basic education

added that education yield can be defined as a discrepancy between the increase in wage that one worker receives and the bases of one year of schooling compared to others.

METHODOLOGY AND DATA

This section presents a simple growth model that attempts to capture the impact of some of the key macroeconomic variables including education at different levels on output growth in Pakistan. The model is specified as:

 $Y = {}_{0} X_{i}^{i} U_{i}$ (1)

Taking log of equation (1) on both sides, we obtain

 $\begin{array}{l} Log \; Y = \; log__{0\;+\;_1} \; log \; X_1 + __2 \; log \; X_2 + __3 \; log \; X_3 + __4 \; log \; X_4 + __5 \; log \; X_5 + __6 \; log \; X_6 + __7 \; log \; X_7 + __8 \; log \; X_8 + \mu_i \end{array}$

After taking log we get,

 $y = __0 + __1x_1 + __2x_2 + __3x_3 + __4x_4 + __5x_5 + __6x_6 + __7x_7 + __8x_8 + \mu_i$ Denoting, Log Y = y, Log __0 = __0, Log X₁ = x₁, Log __1 = __1 Where,

y is log of real gross domestic product

x₁ is log of primary school enrollment as a ratio to total employed labour

x₂ is log of middle school enrolment as a ratio to total employed labour

 x_3 is log of high school enrollment as a ratio to total employed labour

x₄ is log of other school enrollment as a ratio to total employed labour

x₅ is log of exports as a percentage of GDP

 x_6 is log of basic health unit

x₇ is log of literacy rate

 x_8 is log of labour force participation

 μ_i is error term

Many researchers argued that the quality of schooling is more important than the quantity measured, for example, by years of attainment. The most commonly used indicators for education are school enrollment as ratio to total employed labour force, adult literacy rate, exports as a percentage of GDP, labour force participation and health indicator. In this study, we have used enrolments in primary schools (x_1) , middle schools (x_2) , high schools (x_3) , and other educational institutions (x_4) as ratios of total employed labour. The main dependent variable GDP is normalized by inflation, the main advantage of normalizing this variable is to eliminate certain econometric problems⁴. Foreign trade variable used in this study namely, exports as percentage of GDP (x_5) of goods. It may be caused openness of Pakistan's economy. Health (x_6), literacy (x_7) and overall labour force participation (x_8) indicators are also included in the model to reach at a decision that which variable has strong effect on the GDP growth rate in Pakistan.

Variable Constructions

In this study, we construct the variables for our estimation based on the study (1980-2007); as follows

(a): Gross Domestic Product

Gross domestic product (GDP) as the market value of final goods and services newly produced with in a nation during fixed period of time.

(b): Education Indicators

Education as a macro determinant of the economic growth is an important variable for each research. Contribution of education to the economic growth can be measured by primary school enrollment, middle school enrollment, high school enrollment, and other school enrollment. In this study, we used primary school enrollment as a ratio to total employed labour force (PSE/LF), middle school enrollment as a ratio to total employed labour force (MSE/LF), high school enrollment as a ratio to total employed labour force (MSE/LF), and also used other school enrollment as a ratio to total employed labour force (OSE/LF).

(c): Exports

Exports of goods are taken as a percentage of gross domestic product at current market price.

(d): Health

Good health is considered as a driving force for the development of economy. In this study, we have included a basic health units (BHUs) in the categories of registered doctors, nurses etc.

(e): Literacy Rate

Literacy rate is taken as a percentage from the Pakistan Household Integrated Survey PIHS (various issue).

(f): Labour Force Participation

There are two types of labour, highly skilled labour force and low educated workers. High-educated workers face lower unemployment risk, earn higher wages, are presumably better in formed and make wider decisions than low-educated workers. Moreover, a high skilled labour force may also foster economic growth through more productivity enhancing innovations and a better adoption of new technology.

⁴ To eliminate the effects of change in base year

Number of studies for example, Denison (1984), Schultz (1981), Psacharopoulos (1973), Becker and Lewis (1992) and barro (2001) found that higher education is more important than other types of education level.

Code	Variables	Definition	Units of
			Measurement
Y	Real GDP	Gross domestic product is divided	Million Rs.
		by inflation.	
X_1	PSE/LF	Primary school enrollment as a ratio	Percentage
		to total employed labour force.	
X_2	MSE/LF	Middle school enrollment as a ratio	Percentage
		to total employed labour force.	
X_3	HSE/LF	High school enrollment as a ratio to	Percentage
		total employed labour force.	
X_4	OSE/LF	Other school enrollment as a ratio to	Percentage
		total employed labour force.	
X_5	Exports	Exports of goods as a percentage of	Percentage
		gross domestic product.	
X_6	BHUs		Number
		Basic health unit.	
X_7	Literacy		Percentage
	rate	Literacy rate.	
X_8	LFP		Percentage
		Labour force participation rate.	

 Table 3: Summary of the Variables

Source: 50 Years of Pakistan Economic Survey (various issues).

RESULTS AND DISCUSSIONS.

This section explains the results of an empirical investigation of the factors that influenced economic growth in Pakistan during the period 1980-2007. The results emerged from the linear regression model for annual growth rates of real GDP are reported in Table 5. The over all results showed satisfactory that implies the estimated coefficient's signs are as expected and they are statistically significant at the traditional levels of confidence. A summary and more detail of the results of the explanatory variables are given below.

Table 5: OLS Estimates of Growth Functions, 1980-2007 Dependent Variable: Real GDP Growth Rate

Explanatory Variables	Estimated Coefficients	t-statistics
Constant	-3.09**	-1.73
x_1 (Lagged 2 Years)	2.67**	3.32
x ₂ (Lagged 2 Years)	-3.15**	-2.39
x ₃ (Lagged 2 Years)	2.80**	2.86
x ₄ (Lagged 2 Years)	0.26	1.11
X5	0.04	0.06
X ₆	0.00	0.01
X7	2.13**	4.32
X ₈	2.29**	2.02

** denotes statistical significance at 5 percent.

R² = 0.986 F-statistics = 149.76 Durbin-Watson stat = 2.032 Adjusted R² = 0.980 Prob (F-statistics) =0.000

MACROECONOMIC DETERMINANTS OF GROWTH.

Four main Indicators of Education.

Table 5 indicates that real GDP growth rate is positively related to primary school enrolment (x_1) taken as a ratio to total employed labour force (PSE/LF). The estimated coefficient of (x_1) is 2.67 which imply that one percent increase in primary school enrolment-labour force ratio on average the real GDP goes up about by 2.67 percent per year. This finding supports the idea of Barro (1991), Becker at al (1990), and Barro and Becker (1989), who argued that primary school enrolment-labour force ratio leads to higher economic growth. Similarly, the estimated coefficients of enrolments in high schools (x_3) , and other educational institutions (x_4) as ratios to total employed labour force are statistically significant. The result shows that estimated coefficients of (x_3) are 2.80 which depicts that one percent increase in high school enrolment raises the real GDP growth rate on average by 2.8 percentage points per year which shows that real GDP growth is very responsive to high enrolment rate. Whereas the estimated coefficients of enrolments in other educational institutions (x_4) as ratio to total employed labour force are significant at 10 % level of significance as well. Moreover, estimated coefficient of middle schools enrolment (x_2) as ratio of labour force is also statistically significant.

EXPORTS.

Two main variables of foreign trade are namely exports and imports. In this model, we have used export variable (x_5) only as percentage of gross domestic product which represents openness of Pakistan' economy. The foremost reason for taking export variable was to check that how much export variable will affect the growth of real GDP in Pakistan. The result reveals that the estimated coefficients of exports (x_5) is 0.03, implying that one percentage increase in export as percentage of GDP raises real GDP by 0.03 percent per year. It is obvious from these findings that export (x_5) has positive but not very high affect on real GDP in Pakistan. In addition, technological advancement, from access to goods and services, embodied technology, and discovery of new natural resources (which can be exported) may raise output growth because it shifts the production possibilities frontier out, exogenously. So, this would suggest that, in this regression model, the export variable seems to be picking up effects which run through the level of total factor productivity.

Health

The estimated coefficient of (x_6) Basic health units (BHUs) as shown in Table 5, is 0.01. which indicates that one percent increase in basic health unit raised the real GDP by 0.01 percent per annum.

Literacy Rate

Literacy is an important and very basic indicator of education. Empirical evidences show with an increase in the level of this variable; this might have impact, on the growth of GDP, in the long run, which could ultimately prove important indicator of welfare as well. The estimated coefficient of literacy rate (x_7) is 2.13 which is statistically significant, and can be interpreted that one percent increase in the growth of this indicator, the real GDP on average will increase by 2.13. It implies that literacy rate has very strong impact on the growth on real GDP.

Labour Force Participation.

This is a very important indicator of the economy. With the participation of this indicator we can judge whether a economy is progressing or not. The estimated coefficients of the labour force participation (x_8) is 2.29 implies the real GDP grew by 2.29 percent with 1 percent increase in labour force participation during the study period.

Absolute and Relative Contribution of Macroeconomic Policy variables to Economic Growth

It may be useful to evaluate relative and absolute contributions of each explanatory variable to growth rates. Relative and absolute contributions of key policy variables to growth rates of real GDP have been estimated and are shown in Table 6. Following Hicks (1979), the absolute contribution is calculated as the estimated coefficient of all explanatory variables multiplied by the standard deviation of the respective explanatory variable. The relative contribution of

each explanatory variable is calculated by dividing the estimates of absolute contribution to growth by the standard deviation of the dependent variable.

	Growth Rate of Real GDP y					
	Estimated	Estimated	Absolute	Relative		
Explanatory	S.D of	Coefficients	Contribution	Contribution		
Variables	Explanatory		to Economic	to Economic		
	Variables		Growth	Growth		
	(%)	(1)	(2)	(3)		
x ₁	0.08	2.67	0.21	0.43		
x ₂	0.10	-3.15	-0.32	-0.65		
X3	0.13	2.80	0.36	0.73		
x4	0.14	0.26	0.04	0.08		
X5	0.07	0.04	0.00	0		
x ₆	0.25	0.01	0.00	0		
X ₇	0.09	2.13	0.19	0.39		
X8	0.02	2.29	0.05	0.10		

 Table 6: Absolute and Relative Contributions of Explanatory Variables to

 Growth

Table 6 (column 2) shows the absolute contributions of each explanatory variable to growth rates of real GDP. The results of column (2) show that the absolute contribution of eight explanatory variables, in which seven explanatory variables have significantly positive impact on real GDP while one explanatory variable is statistically significant but having a negative sign. Education indicators (defined as primary, middle, high, other, schools enrollment as a ratio to total employed labour force). The largest positive absolute impact (HSE/LF) which is x_3 (0.36), (PSE/LF) x1 (0.21), literacy rate x_7 is (0.19), labour force participation x_8 (0.05), (OSE/LF) x_4 is (0.04), exports as percentage of GDP x_5 (0.00), basic health unit x_6 (0.00). On the other hand, the one explanatory variable which is (MSE/LF), x_2 is (-0.32) has negative impact on real GDP.

The calculated relative contributions of the same eight explanatory variables on real GDP growth, based on regression are also shown in column (3). It is interesting to note that the sequence of relative effects of explanatory variables on real GDP growth remains the same as in the case of coefficients based on regression⁵. For example, HSE/LF (0.73), MSE/LF (-0.65), PSE/LF (0.43), literacy rate (0.39), labour force participation (0.10), OSE/LF (0.08), exports (0), basic health unit (0).

⁵ It is worth mentioning that relative impact of independent variables on real GDP growth is same as emerged by the coefficient of regression.

CONCLUSIONS AND POLICY IMPLICATIONS.

In order to generate balance of economic growth, the changes on labour market must be monitored as well as the request for knowledge and skills that are being established in an economy. The whole system of education should create and develop person's capability for innovations and their acquisition in order to provide effective support to the processes of economic development. The investment in education is not only the need to increase human capital stock but also a necessity to achieve higher living standard.

In recent years, Pakistan's economic growth has remained unsustainable to an alarming extent, which has caused serious concern to policy-makers, professionals, and foreign donor agencies. The main purpose of this study was to examine the effects of some of the key macroeconomic variables on Pakistan's economic growth. Regression analysis has been done to see the effect of key macroeconomic factors on growth during the period 1980-2007.

The results estimated have led us to the following major conclusions. The quantitative evidence shows that real GDP growths are positively related to the primary school enrolment-labour force ratio. It implies that primary education is an important prerequisite for accelerating growth. Therefore, primary education must be considered as the foundation-stone upon which the economic development in Pakistan can be erected. The Government must provide primary education to all school-age children to improve the literacy rate within a minimum time-span. It is noted that the average annual share of primary school enrolment in total enrolment has been about 90 percent during the period under consideration. Higher and other school enrollments -labour force ratio have shown a greater contribution in the economic growth. Similarly, our study shows that labour force participation variable is a significant predictor of economic growth and it would helped to contribute to real GDP growth of the economy. Thus, the Government must ensure the provision of labour force participation through giving the employment opportunities, better health condition etc, in order to sustain economic growth. In addition, our health indicator reveals a insignificant result, which might be due to a poorly administered basic health units in Pakistan. Moreover, literacy showed very strong impact on economic growth which shows the positive sign for sustainable economic growth and strengthens the education return of economy to some extent.

The policy makers suggest that the measures should be adopted to improve the primary education system in Pakistan, so that a universal enrolment rate in primary education may be achieved in near future. In addition to it measure may also be taken to enhance the literacy rate in the country to give boost to economic growth in Pakistan.

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Using Patent Based Education as a Tool for Increasing Motivation and Teaching Know-why

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Abstract

Motivation appears to be a key factor in quality learning in higher education. Environmental factors such as lack of industrial base often kills intrinsic motivation of students and leaves only extrinsic motivation to be the only factor for forcing students to go forward with the curriculum. In an experiment we have conducted recently, we have found mixing patent related information to course contents not only increased intrinsic motivation of students but also benefited additionally by teaching know-why information to students. This paper summarizes our experiment and lists our final recommendations regarding which types of courses the method is beneficial and which type of patents should be selected for the most benefit.

1. Introduction

21st century is labeled as the age of innovation and engineers of this era are supposed to be entrepreneurial/enterprise engineers. According to Tryggvasson et. al [1], "the engineers of the new era expected to;

- Knows everything-can find information about anything quickly and knows how to evaluate and use the information. The entrepreneurial engineer has the ability to transform information into knowledge.
- Can do anything-understands the engineering basics to the degree that he or she can quickly assess what needs to be done, can acquire the tools needed, and can use these tools proficiently.
- Works with anybody anywhere-has the communication skills, team skills, and understanding of global and current issues necessary to work effectively with other people.
- Imagines and can make the imagination a reality-has the entrepreneurial spirit, the imagination, and the managerial skills to identify needs, come up with new solutions, and see them through."

Although the above description may seem too ambitious, internet era and easy access to information has forced the engineers to assume this new role with the above job definition as described. These requirements are indeed a tall order to fulfill, and students need to be motivated strongly toward achieving such a goal with limited number of courses squeezed into the curriculum. The performance demanded from 21st century engineers can be achieved only if the students learn the material well with quality conceptual learning rather than shallow learning. Problem now is how to motivate students to such quality conceptual learning. When we look at our classrooms, we see students who are not very enthusiastic about what they are learning. As Luechtefeld and Watkins [2] indicated, too many engineering students are passive and dependent learners, whose main interest seem to be "Will this be on the test?" According to Luechtefeld and Watkins, the underlying root problem of this type of behavior is the type of motivation used to push forward the student learning which emanates the very structure of our university education. It is obvious that in order to educate the engineers of the new era we need to find better ways of increasing motivation of students.

The problem of motivation is even more pronounced in educational institutions located in geographies where there is lack of industrial base. In such places, local companies often utilize engineers for service related operations; design related applications are rare. Knowing that design related problems are not likely to be encountered during their work, students tend to take some required courses of the curriculum lightly and pass courses with shallow learning just to get the degree. Design engineering is a skill that needs to be learned and practiced often to keep it honed and sharp. Although some of the graduates learn the necessary design skills in their workplace, most engineering students who graduate with such attitude toward design courses remain crippled for the rest of their career.

2. Importance of patents from know-why point of view

The ultimate aim of teaching a course is to give the students the ability to do something. Under the theme of ability there are two distinct issues; one is teaching *how* to do something and the other is teaching *why* it should be done [3]. Although both *how* and *why* are important to learning process, *why* seems to be more important than *how* in priority since learning why we do something triggers the curiosity of the students who will start finding ways of solving the *how* to part of the problem.

In our search for finding ways of increasing motivation of students and teaching know-why and know-how, we have experimented with using patents as a part of coursework. We have found the results of the experiment pleasantly surprising and decided to share our experience.

Literature search indicated that importance of patents in education has been emphasized by other researchers. McCorquotodale, in his article states that, "Intellectual property, is almost completely foreign concept to most students researchers" so he concludes that, it needs to be

taught just like any other course [4]. Wealth of information can be gathered from studying patents.

Garris, considers patent system as an essential tool for education of engineers [5]. Patents can be a very useful tool in engineering education. Patent databases should be used as a teaching tool more frequently in engineering education. It is almost forgotten that, patenting system is initially designed for the purpose of advancement of science and technology. Baldwin even warns about not using patents as a source of information saying, "It is dangerous for modern design engineers not to be familiar with the role of patents in a competitive industry" [6].

The constitution of United States of America initiated the patent system "To promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries;" [7].

2.1 Benefits of studying patents

Some of the benefits of studying patents can be listed as follows;

- Studying patents refines the design process. By studying case studies from patent databases, one can learn innovative approaches to problems solving.
- Studying patents give the idea of "know-why" which leads to understanding of intricate industry needs that leads to the particular invention. Every patent has a section on "background" which explains the need for the invention. Studying and understanding these needs is the first step in finding the solution.
- Studying patents leads to understanding of ethics, conflicts and infringements. By studying these concepts, students learn how to avoid litigations and learn about what is considered novel.
- Studying patents emphasizes the notion of innovation and financial benefits of innovation. After all, patent system is designed as an incentive to innovate. By learning financial benefits, students are encouraged to innovate.
- Studying patents encourage alternatives ways of design. To avoid infringing existing patents, inventors need to find alternative solutions to the problem. This process enlarges the scope of vision of students and encourages them to find alternatives.

3. An experiment in incorporating patents into a design course

COE 482, Soft computing, is senior level undergraduate elective course with 3-0-3 designation taught in Computer Science and Engineering Department of American University of Sharjah. Soft computing, by definition, refers to a collection of computational techniques used in

computer science, machine learning and some engineering disciplines, to study, model, and analyze complex operations. These computational methods are widely known as, fuzzy logic, neural networks, evolutionary computation, and swarm intelligence. COE 482 course concentrates on fuzzy logic and neural network part of the soft computing techniques. The course is taught in a computer lab where every student has access to a computer with appropriate Computer Aided Engineering (CAE) software tools installed. Computer aided engineering tools are software programs which lets user prototype a system or analyze using computers without going through the exercise of extensive programming.

In case of COE 482, these tools were special software packages to prototype fuzzy logic systems or neural networks using computers.

Desired student population of the course is 25 which is dictated by the hands-on nature of the course as well as number of stations in the lab. The purpose of the course is to teach soft computing concepts with particular emphasis on engineering applications. Soft computing is especially suitable for many interdisciplinary applications due to its linguistic-friendly approach. Typically, the course is taught by introducing soft computing methods one by one and then solving application examples using CAE software tools. The course has a project part, which is presented by students to class at the end of the semester. Students are typically grouped in teams of three members and the teams are assigned to individual projects.

The course is selected as a testing venue for implementation of constructivist approach to see if it s possible to seed spirit of innovation to students. The experiment was conducted in Spring 2007 offering of the course by modifying the project part to include patent based projects. In this particular offering, 28 students were enrolled in the course with 13 female and 15 male students. In this offering, it is decided to use fuzzy logic related patents as source of projects. Group of fuzzy logic related patents with interdisciplinary nature are selected by the instructor and groups are given choice to select the topic of their interest among them. All of the patents selected were recently issued patents with publication date of 2007 (current year of offering). Students were asked to study their patents, and implement the idea using the CAE tools that they have and present their working model at the end of the semester along with detailed explanation of the problem.

3.1 Objectives of the experiment

The objectives of the experiment were as follows:

- 1. Use the project part to increase the motivation of the students toward the course,
- 2. Change the teaching model of the course to embody constructivist principles,

3. Use "good undergraduate design course principles" to turn the course into a better engineering design course.

4. Use the course to increase awareness of students toward innovation in engineering.

3.2 Administration of the course

Major parameter used for the fulfillment of objectives is the project part of the course. Normally, the project part is administered in the last one third of the semester of the course, but in this experiment, the administration of the project started in mid-semester. Project part was started earlier than usual to in order to allocate sufficient time for fulfillment of objectives like increasing motivation toward the course. Since motivation is expected to be the key factor in success of the experiment, building up of motivation in early phase of the semester was desired.

Before the projects were assigned, students were given several sessions on how a patent document is organized. During the introduction particular emphasis placed on objectives of "Background", "Description" and "Claims" sections of a patent document. Each one of these sections provides valuable information toward fulfillment of the objective of the experiment.

"Background" section of patent introduces the problem that is being attacked by the patented invention. It also explains in detail current state of the art of technology. Since most project topics are of interdisciplinary nature, understanding the problem required careful attention to "Background" section.

"Description" section of patent contains the solution and approach of the inventor. Most engineering problems tend to be open- ended problems with no unique solution. This part of the patent shows the engineering approach taken by the inventor and can provide a valuable training in engineering. Since the project ultimately needed to be implemented using CAE tools, this part needed careful attention to extract application details.

Studying "Claims" section of patent is important since it contains information about how to protect the novel idea from possible infringements. Studying Claims part is also important to understand legal implications of not choosing appropriate words in writing the patent application.

Students are asked to form their groups and pick a project of their interest from a pool of patents. All patents in the pool were selected by the instructor as relevant to the topic of the course. Particular attention was placed to select patents with very recent date of publication. In this particular case, all patents are selected to be using fuzzy logic based in solving an engineering problem with publishing date of year 2007. Student groups were assisted extensively during the selection phase of their project. Instructor helped groups to identify an interdisciplinary subject of interest and select a patent accordingly.

After the assignment of projects, groups are continuously guided individually by the instructor during help sessions.

The groups presented their projects during the last two weeks of the semester. Their project grade is based on their presentation of their case and the quality of the model or solution they have constructed using CAE tools.

3.3 Titles of projects

The following patents are selected by student groups from the pool of patents selected by the instructor;

- Threat scoring system and intrusion detection security networks. U.S. patent number: US 2007/0169194 A1 [8].
- Method and apparatus for removal of heat in a refrigeration system. European patent number: EP 1 811 249 A1 [9]
- Patient ventilator synchronization using dual phase sensors. European patent number: EP 1 810 708 A1 [10].
- Novel intelligent search engine. U.S. patent number: US 2007/0050374 A1 [11].
- Method, apparatus and system architecture for performing handovers between heterogeneous wireless networks. U.S. patent number: US 2007/0115899 A1 [12].
- Wireless method and apparatus for monitoring food temperature. European patent number: EP 1 814 010 A2 [13].
- Ultrasonic grading of meat tenderness. WIPO patent application number: WO 2007/111712 A2 [14].
- Fuzzy logic based inverse treatment process. U.S. patent number: US 2007/0081629 A1 [15].
- System and method for fuzzy logic based fault diagnosis. U.S. patent number: US 2007/0078576 A1 [16].
- Elevator car dispatching including passenger destination information and a fuzzy logic algorithm. U.S. patent number: US 2007/0045052 [17].

The important aspects of selected patents and rationale behind selecting them are as follows;

1. All patents were recently granted patents (or applications) and they were less than one year old at the time of administration of the course. So students knew that, whatever they were studying was a recent innovation which fulfills an important need of the industry it is aimed for.

2. All patents involved novel use of fuzzy logic based solutions. Since the course specializes on soft computing, this gives an opportunity to see realistic engineering applications of the theory.

3. All projects were interdisciplinary in nature involving several branches of engineering. This is intended to emphasize the vast opportunities presented by interdisciplinary engineering problems. Fuzzy logic itself is not a new tool, but application of it to a cooling problem or to a problem like measuring tenderness of meat makes it an innovative solution to an engineering problem and deserves a patent.

4. Applicants of most patents collected in the pool were major corporations. Seeing these famous corporations as applicants of patents emphasizes the commercial value of the patent. This fact is intended to kindle the entrepreneurial spirit of students.

3.4 Survey results

The course evaluation survey that is conducted at the end of the semester and did not have any specific questions about the patent related project part. Due to the experimental nature of the approach, instructor has distributed two detailed additional surveys, which are focused on the patent project and effect of the project on outcomes of the course as well as kindling innovative spirit of students. One of the surveys was conducted before the final exam and the other one right after the grades are assigned.

Survey results, related to objectives of the experiment are as follows;

Objective 1: Increasing motivation toward the topic of the course.

To measure the response to this objective, students were asked questions that may relate partially to this objective by using the scale of, 1. Strongly agree, 2. Agree, 3. Neutral, 4. Disagree, 5. Strongly disagree;

• Question: Studying patents increased my understanding of fuzzy logic and soft computing. 85% of respondents agreed. Response is given in Fig. 1.



Fig. 1 Effect of project on understanding the topic

• Question: Instructor's teaching method made it easy to follow lecture and helped my understanding. Response is given in Fig. 2. 78% of respondents agreed.



Fig. 2. Evaluation of teaching method

Objective 2: Constructivist approach through realistic case studies

Students were asked to respond to;

- Question: The project showed me that soft computing techniques can be applied to everyday procedures to get patents. 88% of respondents agreed.
- Question: Did studying the patents made you understand the fuzzy logic concepts better? 80% of respondents agreed.

Objective 3: Use of good undergraduate course design principles

Students were asked to respond to:

- Question: I find the patent related project interesting. 92% of respondents agreed.
- Question: Overall, I find the project useful for the course. 85% of respondents agreed.

Objective 4: Increase awareness of students toward innovation

Students were asked to respond to;

• Question: The project has given me idea how to innovate new products. 77% of respondents agreed.

• Question: The project has kindled my interest in applying for patents in case I come up with an innovative idea. 65% of respondents agreed.

• Question: The project gave me idea about how to write a patent in case I have to. 61% of respondents agreed.

• Question: After studying patents, I find patenting products easier than I taught. 73% of respondents agreed.

4. Suggestions regarding applicability of the method for other courses

The experiment we have conducted was for a specific course and there is no way we claim that it would work for every subject. However, based on our experience we can make the following recommendations regarding applicability of the method.

- In our opinion, teaching through patent approach is best suited for mature audience, e.g junior/senior students would benefit more than freshmen and sophomores. (Although, it would be very interesting to see the affect of giving this notion early in the curriculum.)
- For the best impact, classical textbook approach should be enhanced with patent related approach. Classical textbook approach is good for giving the basics of theory; patent approach shows the students how to think "out of the box".
- For the best impact, patents with recent publication dates should be selected for study. Patents with extraordinary approach are suitable regardless of their publication date.
- Even though we have conducted our experiment without telling our students in advance that patent approach will be used, in our opinion, giving information about the patent approach in advance may be beneficial by triggering the curiosity of the students.

- Courses that deal with contemporary issues are probably the best candidates for patent oriented teaching approach.
- Courses with mature content may benefit from the patent oriented approach if the course material can be compounded with some patents that show "out of the box" approach.
- If a student or a group of students generate ideas worthy of patents during the administration of the course, this would kindle the interest of students even further and may be very beneficial for motivational purposes.

5. Suggestions for adapting patent based learning to E-learning environment

Patent based learning technique is experimented in a face-to-face teaching environment; however, in our opinion the technique has great potential to be adapted to E-learning environment. Our suggestions regarding adapting the techniques to E-learning environment is as follows;

- Patent related case studies can blended through the whole course or can be lumped toward the end of the course. Blending case studies to the course at appropriate times may give the best impact.
- A suggested way for incorporating patent study to the course may be as follows;
 - 1. During the delivery of the course, at a suitable point when student has the necessary background, a "case study" can be injected without mentioning anything about the patent.
 - 2. Using the background information given in the patent document, current state of the art is conveyed to the student using text or rich media. (Video, game setting, audio etc.)
 - 3. Using the information provided in background part of the patent, current problem that needs to be solved is conveyed to the student using text, or rich media. At this point it would help to put a price tag on the worth of the answer with a statement like ".. for a solution worth 1M\$" to kindle interest of the audience and student is invited to find a solution.
 - 4. At this point, students should be encouraged to search for a viable solution on their own with reasonable time allocated for providing answer.
 - 5. After the submission time is over; possible answers should be evaluated with cost and complication considerations. This may be done by the instructor in a face-to-face setting, or in a distance learning setting it may be done through evaluating a series of possible answers with their shortcomings.

6. The solution suggested by the patent is presented at the end of the case study using text or rich media along with the information about the patent, like number, publication date, owner information etc.

Providing several cases this way could provide a very rich learning experience for the students. Evaluations of the students' submissions for possible solutions at stage 5 listed above should be done carefully and the intention of evaluation should be encouragement rather than ridiculing the answers. It is our experience that sometimes odd-looking solutions can provide excellent solutions and it is very likely that one of the solutions may actually better than the solution provided by the patent.

6. Conclusion

An experiment is conducted with senior level students of computer engineering department who were registered for the Soft Computing class for the purpose of exploring patents for teaching purposes. The students were neither exposed to patents before nor had any expectation of learning about patents when they have registered for the course. We introduced the idea of "using patents as a learning tool" to such an uninitiated audience and observed their responses are measured their reactions using surveys.

The survey results indicated that majority of the students found using patent based project for teaching the course interesting and relevant to the course. The project has made them aware of the interdisciplinary nature of fuzzy logic and its applicability to wide range of engineering disciplines. Seeing wide range of applications and up-to-date nature of patents increased their motivation toward the subject.

The results also indicated that majority of the students liked the idea of using patents for case study and benefited from the approach. A couple of students verbally commented that this process has initiated their interest in innovation and few of them felt confident that they can generate ideas and attempt getting patents.

After the completion of the course, instructor has received several inquiries from students regarding their novel ideas about computer related designs and products. Even though the designs were not related to fuzzy logic, it still indicated a kindled interest of students toward novelty.

As a conclusion, the surveys and the observations of the instructor indicated that patents could be very useful tool in teaching relevant course subjects as well teaching engineering design process.

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Architectural Inefficiencies and Educational Outcomes in STEM

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Abstract

The modern education system is structured as a cellular 'value stream' in which students acquire new skills as they consume discrete courses and move incrementally through successive grade on a yearly clock. Within each classroom, these students are taught at a common regulated pace that is set by teachers based on the needs of the entire class. Inherent in common pace setting is an inescapable tradeoff between the amount of knowledge gained by those students who keep up and the number of students who fall behind. In ⁽Disrupting Class: How Disruptive Innovation Will Change the Way the World Learns, ⁽(1) Christensen, Horn, and Johnson suggest that the 'value stream' model of education in which students move through cellular classrooms could move towards a more dynamic 'network centric' model within the next ten years. Under this new institutional regime, students could work at individualized paces and digest online material. Focus could be on mastery of material regardless of schedule. The teacher role would be that of a mentor and coach rather than the sole imparters of knowledge. This work presents a computational model designed to explore unavoidable losses inherent in the current 'value stream' structure under a variety of assumptions and education policy choices. System performance in these scenarios is compared against an ideal in which a network enabled paradigm eliminates the cellular pacing requirement. It is shown that seemingly benign structural rules embedded in the current system may have tremendous impact on level and character of STEM educational attainment across the population and that easing the pacing requirement could lead to improvements in educational attainment at all levels.

Introduction

While it is clear that the U.S. education system does many things well, it is currently though to be failing in its mission to train sufficient numbers of future scientists, technologists, engineers, and mathematicians (STEM). (2) For instance, while the percentage of college graduates earning degrees in engineering approached 8% in 1985, today only 4.5% do so. (3) Furthermore, STEM disciplines are some of the least racially and ethnically diverse. For some reason, the U.S. education system seems incapable of helping people overcome initial socio-economic disadvantages in a way that allows them to eventually succeed in STEM disciplines. Many of those outside of STEM fields must also have quantitative and analytical competencies as well. Unfortunately, a significant fraction of citizens that graduate from high-school have attained only a 5th grade level of mathematical proficiency. Most people thinking about reasons for society's failure to meet educational goals focus on individual teacher and student attributes such as ability, motivation, and socio-economic status. While these factors are surely important, the structure of the education system and the rules by which it operates may also play a key role. Identically endowed students might experience very different outcomes under a different set of institutional constraints.

Like any complex system, an education system has an *architecture*. An architecture is the underlying structure and set of relationships that (often tacitly) guide and constrain human action. A good architecture will allow a system to perform a primary function very effectively (in this case knowledge transfer to students) while also satisfying as many other stakeholder needs as possible. Under the current concept, education 'happens' when a teacher instructs a group of students within a class and then evaluates their work to ensure that knowledge was successfully transmitted. Over the course of an educational career, these classes join to form a 'value stream' in which students gain capabilities as they move through successive grades. The modern education system, which coalesced last century based on the principles of 'Scientific Management,' is decomposed into discrete subjects and grades-levels that determine which topics are to be covered in each classroom. Within the classroom, students are required to learn the same content as those around them at a regulated pace. The teaching profession has taken on a very cellular character that in many ways mirrors the segmentation of grades, subjects and classrooms. Because coordination costs are high and the workforce has a history of high turnover that negates investment in

cooperation, each teacher is generally expected to act as an autonomous modular unit and is treated as an interchangeable part (Weisberg, et al. 2009) (Lortie, 1975)



It is possible that the current problems afflicting U.S. STEM performance result in part from a misalignment between the current educational architecture and the demands of the 'STEM pipeline' that extends from Kindergarten through University. This is because the process of acquiring mathematics intensive knowledge may be disproportionately harmed by the current institutional design. Learning mathematics can be characterized as the serial acquisition of tightly interlinked knowledge with strong dependencies on prior work. (2) Failure to master arithmetic makes algebra impossible. Failure to master algebra renders calculus and probability unapproachable. For this reason, students who lose proficiency or interest at any point are almost never capable of recovering later in life. The education system can be thought of as a "leaky pipe" in which students who lose interest, proficiency, or confidence in STEM at any stage rarely get it back. Unlike the decision to pursue careers in law or medicine, which can be made during college, decision points that determine whether an individual can ever become a scientist or engineer occur as early as elementary school. Overall system performance may be determined by the weakest link in the value chain.

Under these circumstances, untended interfaces and expectation gaps within and between schools can leave students without prerequisite knowledge needed to continue and succeed. Furthermore, the demand that each class proceed at a regulated pace creates natural inefficiencies. Each teacher must set a start-point and a pace based on the starting-knowledge and abilities of the entering students. This demands an inescapable tradeoff between the amount of knowledge attained by the students who keep pace, and the number of students who fall behind. If a subject is taught more quickly, then more students fall behind. If a subject is taught more slowly, then more in the class do not reach their full learning potential. As variation increases, the system probably becomes less efficient and harder to manage.

In 'Disrupting Class: How Disruptive Innovation Will Change the Way the World Learns,' Christensen, Horn, and Johnson put forth the idea that computer based learning could play a key role in transforming the basic character of the education system within the next ten years. Their fundamental transformation is a change in the role of the teacher, from sole imparter of knowledge to mentor in the art of acquiring knowledge using internet enabled sources. (1) This change in the way value is delivered would enable the current organizational design, based on the 'value stream,' to give way to a 'network centric' paradigm. By decoupling the teacher somewhat from the curriculum and offloading content delivery to dynamically responsive internet sources, two important benefits accrue. First, the requirement of a standardized pace disappears. Secondly, the paradigm could allow students to fill in missing prerequisite knowledge in a dynamic "just in time" fashion. In the ideal, this 'network centric' organizational design would allow each student to perform as if (s)he were taught by a personal tutor who knew everything and could adapt to any learning style.

Simulation Modeling

Computer programs have been written to simulate a variety of social systems. (4) (5) (6) Such programs are models that embody explicit theories about how the world is structured. If a model can adequately capture the essence of some interesting phenomena, then it may lead to insights harder to discern by looking directly at the real world in all its complexity. Exploring the behavior of these simple models under a variety of conditions can help one build insight about the way a social system behaves and what policies may be effective when trying to improve its performance. Models can function as 'flight simulators' in which people can learn about the world by testing ideas in a risk free environment prior to costly implementation.

A simple simulation model was created to explore potential sources of loss in the current education system. Such sources include variance in prerequisite knowledge among students within a classroom, the effects of transitioning between different institutions (such as when multiple junior high schools feed a single high school), differences in individual student abilities, differences in teacher quality, and penalties imposed by the common pacing requirement. The impacts of policies related to the 'tracking' of students within a school based on perceived ability were explored. The impacts of policies for setting learning expectations and standards were also explored. Overall educational attainment under a variety of scenarios with different policies and constraints are compared and contrasted. The final simulation removes constraints associated with the common pacing requirement in an attempt to explore potential gains associated with a transition from a cellular to a network-centric learning paradigm.

Model Structure

The model simulated the mathematics attainment of 480 'students' moving through sixteen years of education. These sixteen years are subdivided into four schools. For model simplicity, each student spends four years in each. The 480 students are initially separated into groups of 60 and allocated to 8 different elementary schools. At four year increments, students experience successive merges and eventually all meet in the same university. At the start of every year, students within a school are assigned to a new classroom containing one teacher and thirty pupils. At the elementary level, each school contains two classrooms per grade, while the university contains 16 classrooms per grade.



Children begin the simulation with a random amount of initial knowledge uniformly distributed between the values 0 and 1. Each year of schooling is intended to impart 1 unit of knowledge. Therefore, after 16 years, one may hope that each student will contain 16 additional units of knowledge.

Because mathematics knowledge is cumulative, knowledge must be gained in a serial fashion. Teachers must work with the knowledge level of the students in their classroom and attempt to advance them along the continuum. Each teacher must choose a starting point (SP) along this continuum and attempt to move students one unit beyond the SP by the end of the year. Multiple rules for setting this SP are explored within the simulations described below. Some rely on the perceived ability of students in the class while others rely on common standards.

Fixed	SP = gradeLevel - 1, (initially 0) Common standards across the system dictate that students make 1 unit of progress each year and that we start at a point below the incoming abilities of all new students.
Floating	SP = mean(students in class)
	Teacher chooses the mean student as the point at which instruction begins.
HalfFixedFloat	$SP = \frac{1}{2} (gradeLevel - 1) + \frac{1}{2} (mean(students in class))$
	Teacher feels pressure to account for both factors.

Rules for setting Start Point (SP):

Not all teachers and students are endowed with equal abilities. Some simulations test the impact of variation in teacher quality and student ability. Student ability (SA) is a modifier that affects each student's ability to learn every year. This value is different from the student's total amount of knowledge (SK) acquired. It is a modifier to the student's rate of gaining knowledge.

Rules for setting variation in student ability and teacher quality:

NoIndividualVariation	TQ = 1 for all teachers.
TQ = teacher quality.	SA = 1 for all students.
SA = student ability.	
TeacherQualityVariation	TQ is a random Normal variable with mean 1 and standard deviation 0.1.
	SA = 1 for all students.
StudentAbilityVariation	TQ = 1 for all teachers.
	SA is a random Normal variable with mean 1 and standard deviation 0.1.
TeacherAndStudentVariation	Both TQ and SA are random Normal variables with mean 1 and standard
	deviation 0.1.

In every year a student must attend a classroom in the school they belong to. Different policies for assigning students to individual classrooms within a school are tested.

RandomAssignment	Every year, students within a school at the same grade level are randomly assigned to classrooms within that school.
TrackingAssignment	Every year, students are sorted by their total knowledge (TK) and then assigned to classrooms with other similar students. Note that this assignment is <i>not</i> based on student ability (SA). This assignment scheme serves to reduce variability of prerequisite knowledge within each classroom.

Rules for assigning students to classrooms:

A penalty may be imposed upon student performance in any year based on the difference between a student's prerequisite knowledge and the SP chosen by the teacher. A student with knowledge equal to the SP will incur no penalty. Students with knowledge greater than the SP will not gain a full unit of knowledge because they will not be required to. These students will fall closer to the class mean. Students with less knowledge than the SP will not gain a full unit of knowledge because they will be harmed by missing prerequisite knowledge. These students will fall further behind their class.

Rules for imposing learning penalty to student based on pacing requirement:

J 1 8 8 8		
PacingPenaltyOn	()	
CSP = class start point.	$e^{\overline{abs}(CSP - TK) + 1}$	
TK = student's total	PacingPenaltyModifier = $\frac{e^{1}}{e^{1}}$	
of the year.	This function peaks at 1 when the student is at the start point and decays exponentially as the distance increases. The function also has the property	
	that $TK + PacingPenaltyModifier is monotonically increasing. This$	
	that TK + Lacing chartywouller is monotomeany increasing. This	
	function was chosen because of some of its useful properties.	
PacingPenaltyOff	PacingPenaltyModifier = 1.	

It should be noted that the pacing penalty rule conspires to harm learning of students more if variation in student total knowledge (TK) is higher. A teacher will be less effective and students will make less yearly progress if the teacher must contend with widely varying prerequisite knowledge among the classmates.

Finally, these rules interact to produce the main effect we hope to study in the model. Yearly progress of each student every year is calculated as:

*StudentYearlyProgress = TecherQuality * StudentAbility * PacingPenaltyModifier*

Applying these rules every year over all 480 students produces distributions of the final total level of mathematics knowledge within our agent population.

Simulation Results

Simulation 1:

SP = Floating NoIndividualVariation RandomAssignment PacingPenaltyOn

In this scenario, there is no individual variation in abilities and students are assigned to classrooms randomly. Only small random variation exists in initial conditions. Teachers set the yearly start point for classes based on the mean starting knowledge of their class. The pacing penalty is imposed.



SP = Floating TeacherAndStudentVariation RandomAssignment PacingPenaltyOn

In scenario 2, the only change is to add variability to both student abilities and teacher quality.





Simulation 3:



1.2

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Simulation 3 is identical to simulation 2 with the exception that teachers now follow mandated curriculum without any regard for the composition of the class. These teachers start each year at grade level with the expectation that the class is ready and will make 1 unit of progress.





Simulation 4:

SP = HalfFixedHalfFloat TeacherAndStudentVariation **TrackedAssignment** PacingPenaltyOn

In simulation four, teachers set their starting position at a compromise point between the demands of class composition and globally set standards. In addition, students are now tracked into different classrooms within a school by their total knowledge at the start of each grade.





Simulation 5:



The following simulation is identical to simulation 4 with the exception that teachers now set expectations entirely by composition of their class without regard to global standards.





Simulation 6:

TeacherAndStudentVariation RandomAssignment PacingPenaltyOff

The final simulation explores the impact of removing the pacing penalty altogether. The purpose of doing so is to provide a theoretical upper limit for comparison with other scenarios.



The following plot shows the distributions of final total knowledge for each of the six scenarios:



The rules explored resulted in very different outcomes at a societal level. Some demonstrate a tradeoff between higher attainment at the upper end and in the middle of the distribution.

Discussion

Much of education research focuses on the relationship between individual attributes (such as student ability, motivation, teacher quality, and socioeconomic status) on educational outcomes. Model results presented here suggest that the architecture of the education system and seemingly benign policy choices made within that institutional regime could play a large role in determining the distribution of social outcomes as well. Increased focus on institutional design and the way structure leads to behavior might provide insights of significant value.

The results presented in these simulations should not be interpreted to endorse any particular policy in the real world. Many important factors were not represented in this simple model, and those that were represented were tuned to maximize conceptual clarity rather than real-world fidelity. It should be noted, however, that the distributions shown of total knowledge at intermediate and final points are qualitatively similar to those observed in the real world. National NAEP test score distributions indicate that students at the 10th, 25th, and 50th percentiles in mathematics ability in the eighth grade have abilities comparable to fourth grade students at the 50th, 75th, and 90th percentiles respectively. (7) This very wide disparity most likely gets even wider between eighth and twelfth grade.

This modeling work suggests that the common pacing requirement within the cellular 'value chain' system may be leading to significant losses relative to an ideal scenario in which students are pushed at individually maximal rates. Further work using more realistic assumptions should be done to explore the potential economic, social, and human-capital value that could accrue from a technology enabled 'network centric' transformation focused on individualization of performance expectations, emphasis on mastery independent of schedule, and the dynamic delivery of prerequisite information in a 'just-in-time' fashion.

Finally, simulation modeling could be productively employed within the education domain. Qualitative education literature contains descriptions of a host of interesting problems in which disequilibrium conditions, non-linear dynamics, balancing and reinforcing feedback loops, momentum and delays, and path-dependence play important roles. Systems characterized by such complex causality are often not well understood or analyzed using traditional statistical or econometric methods. Using system dynamics (6), agent based (4), or network modeling (8) methodologies to represent structure and reproduce behavior described in the education literature could help bring clarity to some of education's thornier issues.

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Graduate Students' Perceptions of Computer-Based Project and Systems Engineering Management Methods

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Abstract

Systems Engineering Management (SEM) is an emerging practice that is being developed hand in hand with the maturation of systems engineering. While classical project management (PM) focuses on scheduling, budgeting, and scope management, SEM emphasizes the management of the project-product ensemble. Standards for SEM and PM that account for the intimate relationships between these domains have been evolving, but most SEM application still use some subset of traditional PM methods and tools, including Gantt chart, Program Evaluation and Reviewing Technique (PERT), Critical Path Method, System Dynamics, Earned Value Method, and Design Structure Matrix. Object Process Methodology has also been studied as a vehicle for Project-Product Lifecycle Management. This research has examined how systems engineers perceive as graduate students the extent to which computer-based PM methods support SEM. Analyzing structured questionnaires using factors that cover both classical PM issues and the project-product interaction, we verified that project and product are indeed viewed as two complementary facets of SEM, and that certain PM methods address both domains better than others with respect to particular examined factors. This integrated approach is particularly suited to educating systems engineers in remote areas via distance learning since its simplified and unified approach caters to students' holistic comprehension of PM and SEM as two facets of the same complex system.

1. Introduction

Systems Engineering (SE) and Project Management (PM) are two tightly intertwined domains. Much of the confusion regarding these definitions and the attempts to draw the line between the technical and the project management aspects is rooted in historical reasons of the engineering and management domains growing as disparate disciplines in both academia and industry. The prevailing view was that engineers are professionals who got their education in engineering schools and master the scientific and technological aspects of the system or product to be delivered, while managers are a different kind of professionals, taught primarily in business schools to manage people, enterprises, and projects, but are much less verse in the science and technology aspects of the task at hand.

Ideally, a balanced mix of engineering and managerial skills is required to successfully run a real-life large-scale project, especially when the end result of the project is a complex functioning system or product. Following this train of thought, we adopt the notion of systems engineering management (SEM) as the integration of

technical management and the parts of project management related to systems engineering.

This research explored perceptions of graduate students who are systems engineering practitioners of the extent to which seven known computer-based project management (PM) methods effectively support the SEM effort.

2. Research Population and Setting

The research population consisted of 24 mid-career systems engineers from companies across the USA with 5-8 years of practice, who were among about 80 graduate students in the Systems Project Management course, one of three core mandatory courses in the Systems Design and Management (SDM) program at MIT's Engineering Systems Division. During the spring 2008 semester course, they studied the seven project management methods surveyed above and practiced them through specific homeworks, as listed in Table 1. The 24 respondents elected to do HW5 and participate in the study to benefit from a mulligan opportunity – grading the homeworks based on the best five out of six homeworks.

Project management method – short name	System Dynamics	Program Evaluation and Reviewing Technique	Critical Path Method	Design Structure Matrix	Earned Value Method	Gantt chart	Object Process Methodology
Project management method – full name	SD	PERT	СРМ	DSM	EVM	Gantt	OPM
Homework assignment	HW1	HW2	HW2	HW3	HW4	HW5	HW5

 Table 1 - The seven investigated project management methods

An Unmanned Aerial Vehicle (UAV) case study [de Weck, 2008] served as a running case study for all of the homework assignments. It was a project of developing a UAV, by an imaginary *New Millennium Aerospace (NMA) Inc.*, a government-contracted leading UAVs manufacturer. A rough specification and sketch of the UAV "pusher" vehicle concept was given to the students, as is shown in Figure 1. The payload is provided by the government as modified government furnished equipment (GFE), while the engine is supplied by an established commercial company (ECC) under a subcontract.



Figure 1 – A rough specification and sketch of the UAV "pusher" vehicle concept
For their first homework (HW1), all the students were tasked with creating a simple SD model and exploring its behavior. They examined the impact of uncertainties in project assumptions on cost and schedule. In HW2, they created a project plan using the Critical Path Method (CPM), drew a project graph, estimated the early finish time (EF) of the project and identified the critical path and slack times. Using PERT, they had to analyze the impact of changes in individual task times on the critical path and consider probability distributions of task times and their effect on the project schedule. HW3 called for applying DSM. Students first translated the project graph from the previous assignment to a DSM representation. Next they added iterations to the project and analyzed their effect on the previous task sequence. They then had to consider partitioning the DSM to reveal meta-tasks. Finally, they estimated the effect of these changes on the critical path and estimated project completion time. For HW4, the students focused on tracking projects and computing the various metrics defined in EVM terms of cost and schedule in order to assess the overall performance of the project and to critically analyze and interpret the results. Finally, based strictly on the text given in a previous homework assignment (HW2), HW5 called for creating two project plan versions, one using a Gantt chart model and the other using OPM [Dori, 2002]. They were then asked to compare all the seven project management methods they had studied in the course with respect to a set of 14 project management factors, as described in the next section.

3. Research Methodology

Since the investigated project management methods were taught in the course during lectures and practiced through homework assignments, we assumed that the participants had identical knowledge of, and training level in these methods. Furthermore, since the same system project case study—an Unmanned Aerial Vehicle—served as the basis for all the assignments throughout the entire course (except for the final projects), the experience students gained in applying all seven methods is free of system-specific bias.

6.1 The 14 project management factors and latent dimensions

Recognizing that systems engineering management entails both the product and the project, we defined 14 factors that account for both major classical project management issues and aspects of the joint project-product ensemble, which is at the focus of Systems Engineering Management. These 14 factors were introduced to all the participants in the same random order listed in Table 2.

Four of the 14 factors belong to the "classical" project management domain and are addressed by common project management methods. These include (1) budget/schedule measurement/ tracking, (2) budget/schedule forecasting, (3) resource management, and (4) iterations management. Four other factors fit in the product domain: (1) product planning, (2) product measurement/tracking, (3) product quality, and (4) performance quality. The remaining six factors are common to the combined product-project domain, as they cannot be uniquely associated with either the product alone or the project alone.

With respect to risk management, we adopted NASA's view of risk management as being common to both the project and the product domains [NASA, 2005]. This approach is founded on the premise that there are technical risks, which are mostly in the project domain, and managerial risks, which are mostly in the project domain, This is contrary to the approach of leading standards [ISO/IEC 15288, 2002; CMMI[®],

2006], which view risk management primarily as a managerial issue and therefore relate to it as project domain issue.

S	ystems Engineering Management Factors	Latent Dimension
1.	Budget/Schedule measurement/tracking	Project
2.	Budget/Schedule forecasting	Project
3.	Inter-relationships (process & product)	Project-Product
4.	Resource management	Project
5.	Stakeholders/agents tracking	Project-Product
6.	Performance quality	Product
7.	Product quality	Product
8.	Product planning	Product
9.	Product measurement/tracking	Product
10.	Risk management	Project-Product
11.	Iterations management	Project
12.	Information resolution level	Project-Product
13.	Ease of communication	Project-Product
14.	Change management	Project-Product

 Table 2 – The 14 Systems Engineering Management Factors

6.2 The survey questions and their analysis method

The 24 research participants were instructed to rank each one of the 14 factors for each one of the seven systems engineering management methods using a Likert scale [Likert, 1932] of 1 to 5, where 1 is poor, 2 is fair, 3 is good, 4 is very good, and 5 is excellent. N/A was denoted by 0.

The question posed to the participants was phrased as follows: "Please compare the project models or representations you have done so far as homeworks, with respect to the following Project Management (PM) Considerations. Utilize the excel file entitled HW5 Q4 for this purpose. Wherever you believe a correlation exists between a model and a PM consideration, provide <u>a short written explanation of the relationship and grade its strength numerically (between 1 and 5).</u>"

Since the participants were practicing systems engineers, their views of the project management tools tended to reflect the application of these methods in systems engineering management more than in project management. To examine the participants' view of each project management method with respect to each factor, we compared the results received for each one of the 14 factors, in each systems engineering management method.

The students were not instructed in any way to think specifically of the considerations as related to "project," "product," or "project-product" dimensions. Our aim was to explore whether their unguided perceptions towards the 14 different factors would reflect recognition of these factors as related to the latent dimensions of "project," "product," and "project-product". To this end we also chose to use in the instructions the phrase "Project Management (PM) Considerations" rather than "Systems Engineering Management Factors," which might have invoked their thought in the SEM direction. To determine whether our classification of the 14 factors into the three domains—the *product* domain, the *project* domain, and the joint *project-product* domain—can be verified by the research participants' responses, we first analyzed the grades they had given for each factor and method combination. Alpha Cronbach Coefficient [Cronbach, 1951] was used to determine whether the domain-categorized factors can be considered a dimension, namely project dimension, product dimension, and a combined project-product dimension.

The Alpha Cronbach coefficient is used for estimating how well a set of variables measures a single one-dimensional underlying construct. It determines the internal consistency of items within a single test, indicating reliability. The reliability is in terms of the ratio between the true score variance of the "underlying construct" and the observed score variance of that one-dimensional construct, where the construct is the hypothetical variable that is being measured [52]. The Alpha Cronbach coefficient ranges in value from 0 to 1, when 0.70 is defined [53] as the cutoff value to be an acceptable reliability. It increases when the average inter-variables correlation increases. Therefore, high values of Alpha Cronbach provide evidence that the variables included in its calculation measure the same underlying construct. For this reason, Alpha Cronbach is often used in order to probe underlying constructs that the researcher wants to measure, as part of developing predicting variables and objective scales in surveys.

The variables for the Alpha Cronbach coefficient calculation were extracted from the Likert scale results and calculated for each group of factors defined for each domain: (a) The project domain, consisting of factors 1, 2, 4, and 11, (b) The product domain, consisting of factors 6, 7, 8, and 9, and (c) The project-product domain, consisting of factors 3, 5, 10, 12, 13, and 14. Additionally, we calculated the Alpha Cronbach Coefficient also for a fourth potential dimension—the combined project-product domain, which is the combination of the four project factors 1, 2, 4 and 11 and the four product factors 6, 7, 8, and 9. The median of all the participants' rankings for each factor was calculated, and the sum of all 14 factors for each PM method was taken as that method's score.

4. Results and Analysis

We present and discuss the results of the participants' comparison of the seven project management methods they had studied, listed in Table 1, with respect to the 14 project management factors, listed in Table 2.

4.1 Methods Comparison by Factors

Alpha Cronbach Coefficient was calculated for comparing between the methods with all 14 factors. The Alpha Cronbach coefficients, presented in Table 3, are higher than 0.70 for all but the Design Structure Matrix (DSM) method: System Dynamics (SD), Program Evaluation and Reviewing Technique (PERT), Critical Path Method (CPM), Earned Value Method (EVM), Gantt, and Object Process Methodology (OPM). Therefore we can use the participants' rankings for all the 14 factors for the sake of comparison between the six Project Management methods, from which DSM is excluded.

Figure 2 represents by the solid bars the sum of scores of the 14 factors participants assigned for each method. OPM scored the maximum sum, 885 points. Assigning a cutoff value of 664 points, which is 75% of this maximum score leaves us with three methods: OPM, SD, and EVM.

Project Management Method	SD	PERT	СРМ	DSM	EVM	Gantt	ОРМ
Full name	System Dynamics	Program Evaluation and Reviewing Technique	Critical Path Method	Design Structure Matrix	Earned Value Method		Object Process Methodology
Cronbach's Alpha	.743	.793	.754	.640	.757	.760	.855
Best Improved	-	-	-	.702 ⁽¹⁾	-	-	-

Table 3 - All Factors Set Reliability

(1) Improved by deletion of factor 12 – Information Resolution Level and factor 3 - Inter-relationships (process & product)



Figure 2 – Project management Methods Comparison by Sum of Factors Rankings

When excluding two factors which are in the Project-Product latent domain—factor 12 (Information Resolution Level), and factor 3 (Inter-relationships, process & product)—DSM exceeds an Alpha Cronbach coefficient value of 0.7. Excluding these two factors for all the seven PM methods, we are left with a set of 12 factors that can be reliably used for the comparison of all the seven PM methods. The dashed bars in Figure 2 present the sums of rankings of 12 factors. With these 12 factors, SD scored the maximum sum, 769 points. Assigning a cutoff of 75% of this value leaves four methods in the game: OPM, SD, EVM, and DSM.

Figure 3 shows for each of the three best methods the sum of scores participants assigned to that method for each one of the three dimensions. The project dimension scores (bars with vertical lines) are higher than the product dimension scores (bars with horizontal lines) for all three project management methods. The scores of the combined project-product dimension (bars with crosshatched lines) are reasonably situated between the project and the product dimension scores. OPM scored the highest in three dimensions – project dimension, product dimension, and the combined project-product dimension. For SD and DSM, the project-product dimension. The result is reverse for OPM.



Figure 3 – Project management methods comparison by dimensions

5. Discussion and Summary

Since the research population contains a group of 24 mid-career systems engineers studying in the Systems Design and Management graduate program at MIT, the findings reflect their perceptions of the adequacy of each one of the seven project management methods to tackle each one of the 14 factors. We consider the results to be reflecting the systems engineering management practice in a larger context, since it the participants of this graduate program are also practicing systems engineers in companies across the USA with 5-8 years of practice.

Practitioners tend to use the examined seven project management methods in practice, for different purposes and in different contexts according to their perceived suitability based on their practice and experience. This survey provides a set of reliable factors to be used as means for an educated methods comparison.

This research has examined the suitability of seven project management methods for handling and solving problems associated with the project domain, the product domain, and the holistic project-product ensemble domain, as perceived by systems engineers. To this end, we defined 14 factors that were classified into one of these three domains. Our research population, a group of 24 mid-career systems engineers studying in the Systems Design and Management graduate program at MIT, ranked the adequacy of each one of the seven project management methods to tackle each one of the 14 factors.

Considering 0.70 as the Alpha Cronbach coefficient cutoff acceptance value, the set of fourteen factors was found reliable to be used for the comparison of the seven project management methods. Assigning a cutoff of 75% of the maximum obtained score leaves four methods: SD, DSM, EVM, and OPM.

Three latent dimensions were predefined: the project, the product, and the projectproduct dimension. Using the participants' rankings, these dimensions were analyzed using Alpha Cronbach coefficient to examine the extent to which the participants perceived the 14 factors as domain-related. The findings support the notion of the project and the product as being two complementary facets involved in systems engineering management. Three project management methods—SD, DSM, and OPM—were found more suitable than the others for use in systems engineering management. These three methods were found to address the project and product domains better than the other examined methods, both by dimensions analysis and ranking comparison analysis, with OPM scoring the highest in the methods comparisons.

This integrated approach is particularly suited to educating systems engineers in remote areas via distance learning since its simplified and unified approach caters to students' holistic comprehension of PM and SEM as two facets of the same complex system. Moreover, people primarily from developing countries whose first concern is use of technology to help deliver quality education to under-served sub-populations can benefit from this approach in particular. By integrating the seven project management methods, these methods and tools are derivable from the same unifying OPM model, simplifying not only the comprehension of the system and control of the project, but also the delivery of solid, model-grounded education to doers and practitioners anywhere in the world.

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The MIT LINC 2010 Conference Parallel Presentations

Session #15:

The Blending of Educational Models: Classroom and Technology-Enabled



The History of Blended Learning at Universidad Católica de Santa Fe

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Abstract

This work introduces a personal view about the inclusion of educational technologies and the way to blended learning at the Universidad Católica de Santa Fe, in Argentina. Words will be as objective as possible; keeping in mind that the writer herself is involved on the told history.

First of all, it is necessary to make a description of geographic and socio-economic aspects of the institution in order to establish the context where this work is being developed. Below at the timeline, three events or milestones that marked the decisive moments of this journey are shown. To conclude, an essay of the future situation was made in order to assess whether these changes are profound modifications or just shape changes.

1. Contextualization:

This work is a result of my experience at the Universidad Católica de Santa Fe, in Argentina, hereafter UCSF (<u>www.ucsf.edu.ar</u>). The UCSF is an institution of higher education, private management public that belongs to Roman Catholic Church and according to the ecclesiastic structures its major authority is the Vatican. It recently has completed 50 years of existence in the city and has a very large experience on training professionals.



Figure 1: American Continent (USA and Argentina)

Figure 2: Argentina (Santa Fe)

The work will have a lot of information, some of it could seem to be useless, but one of the aspects we have to care the most at the time of helping each other is to place ourselves in someone else's place to understand their reality and from there to generate a fruitful aid.

Argentina was a very rich country and with significant differences within its regions in regard to education, health, natural resources and infrastructure. Characterized by a large working middle class, with good cultural training and acceptable wages, with two groups at both ends: "rich and poor"; much smaller. However, nowadays in Argentina we have severe problems in all these aspects, now resembling the common denominator of Latin America. In other words, we count with an each time bigger minority of people with access to every resource and basic services; and a very large and growing low class without pay and no chances to access anything.

An interesting program, completely financed by "UNESCO" and "OEI", is "SITEAL". The "SITEAL" (Information System of Educational Trends in Latin America) exists since 2003, and it's macro objective is to observe and analyze statistically and permanently "the deep economic and social transformations that are occurring in Latin America, to contribute to the development and strengthening of the social and educational policies that ensure a high quality education for all of us" (www.siteal.org.ar). Its databases are free published full text through the website. The same "have as objective to give information to the Latin America countries about the relation between education and society, and to monitor evolution of educational trends and social gaps in the region."

Argentina has 23 provinces and the city of Buenos Aires that has autonomy <u>www.buenosaires.gov.ar</u>). The UCSF is located in Santa Fe. This is the third province of the country in terms of population (approximately 400.000 inhabitants) and productive activity, after Buenos Aires (<u>www.gba.gov.ar</u>) and Cordoba (<u>www.cba.gov.ar</u>). And its principal activity is farming, both trough agriculture and livestock.

To contextualized is necessary to clarify that the higher education system in Argentina is comprised as is stated in the report of the Secretariat of University policies of the Ministry of Education of the Nation (www.me.gov.ar/spu).

There are 40 Public National Universities where students don't have to pay to study. The National Government through its budget for education pays for them.

However, the supporting of an education system like this means to assume a cost that it is not able to be paid by an emerging country like Argentina.

On the other hand, there are 45 Private Universities. To enroll, the students have to pay their tuition rates. This income is the only resource that these universities have to overcome all of their academic processes.

As these funds are frequently inadequate, in most cases it is imperative to use fundraising from private companies. This involves assuming a known risk.

The UCSF is a private university and has fixed its tuition and fees for the academic year 2010 in \$5.200 Argentinean pesos (1.350 USD). These fees are extremely low comparing with the one of universities located in developed countries. However, in our city a middle class family must make a big effort to afford them. In the capital city of the Country, Buenos Aires, there are private universities in which tuition and fees can be three times higher than Santa Fe's. For example Universidad de San Andres (www.udesa.edu.ar) and Universidad de Palermo (www.palermo.edu).

According to the report of university statics that are published annually by the Secretary of University Policies (<u>www.spu.edu.ar</u>) the UCSF had in the 2008 a total of 6675

undergraduate students enrolled, and 320 students in their graduate studies. With an annual average growth rate of 3.4% in the range 1998/2008.

2. Three facts

A personal view.

2.1 – I.A.E., the seed.

Following the Steve Jobs's idea "the first story is about connecting the dots", is necessary for the history to begin from a data that a priori would seem not to be related at all. In 1991 I was a young student of Educational Sciences who got married with a young System Engineer student. Being both students, one day I spoke to my husband and told him that we needed to buy a typewriter for the University tasks. In that moment I saw in his eyes that my request was wrong. In a few words he explained me that the technology of a typewriter was obsolete, he added a lot of reasons of why we should buy a computer instead. In love and with admiration for his knowledge I accepted immediately, although I didn't really understand what a computer was, because during the secondary school I didn't get any information about those new technologies. We saved money until we reached 1000 USD and then we bought our first PC.

Once home, my husband installed on it a text processor and I started to use my typewriter "with screen", DOS system (yellow matchstick!!!), etc. On September 1992 I graduated at the UCSF. In those days I had been getting on my own some extra knowledge from my college mates... I knew what a PC was, and even knew how to manipulate it. Immediately I started to work and tried to become a lifelong learner. I enrolled a graduate program of distance learning in the UNED (National University of Distance Learning of Spain www.uned.es). I studied from 1993 to 1995 and got my postgraduate title of University Superior Specialist of Educational Informatics, after that I went to Spain to do a teaching exchange at Universidad de Murcia.

Passing the year 1996 the College of Humanities, inside UCSF, began a changing process of its curriculums. I was involved in those changes as a specialist in education and new technologies of information and communication. Among several changes, my contribution was decisive to include in the training of future professionals in science of education, a curriculum space about new technologies. My arguments were convincing and since 1998 students have a course dedicated to studying the impact of new technologies in education. The hardest part was finding an agreement as to the minimum contents as though the intention was to study Informatics Science Applied to Education (IAE). During the first years we could not reach our goals because we had to start from the very beginning in terms of concepts. Today, after ten years of work, we find in the classrooms, students that are IT literate, this allows us to delve into the possibilities that information technology can offer to education.

Professors at UCSF just connect to their students in the classroom during their classes; we had no offices and other times at university. In the late 90's this generated on me a necessity of having another kind of contact with my students in order to give us more possibilities to teach and learn. After that I included the email in my classes. Then our educational relationship did not depend on weekly meeting at the university but remained open over time and distance. It was a seed sown into blended learning.

The interest and enthusiasm of the students was remarkable and their desires to go further delivered us to the incorporation of a second course curriculum in 2002 for Educational

Technology studies. This course is focused on didactics with digital technologies. Nowadays this course is dedicated specifically to teach about Distance Learning.

2. 2. "Blended Learning", the germination.

The Universidad Católica de Santa Fe, awards annual competitions to get grants for research and development projects. In 1999, I presented a project that was approved about the development environment for Distance Learning.



Figure 3 - "UCSF Blended Learning Environment"

It was decided at the time a completely web-based development. Satellite classrooms and other methods of access or connection were not considered. It was a self developed system. The environment was conceived, designed and implemented having in mind the characteristics and particularities of this university. We considered a variety of details to make it friendly for students and teachers. As it can still be read on its website (http://teleformacion.ucsf.edu.ar/historia) the concepts that we trust from the beginning are about to get the best of two worlds; the best part of traditional classes and the best part of virtual classes. From ever we trusted in Blended Learning.

This environment had, among other virtues, consistency and connection with the Academic Management System (AMS). AMS is the computer system that records every single action of the student's academic life at UCSF. This student data could be read as complete information from a single data system. A breakthrough.

We began to train teachers informally, through speeches, invitations, demonstrations, etc. Gradually, very slow, we were starting to warm them up. And after a year of that work we had our first's virtual classrooms.

So far, we did not do distance learning, but moved for the same reason that teachers do not have student service offices, or while in college outside class time, they began creating virtual classrooms to support traditional classes.

We can say that we never wanted to do blended learning, but blended learning found us naturally and spontaneously and opened lots of doors for us to continue our way there.

Some things that may be considered problematic in this step was the lack of an area inside the university dedicated to organize, manage and guide the process of blended learning. In other words, "Blended Learning" was the "thing" within the organization. Almost everyone knew someone was talking about it (almost like a preacher!) But "Blended Learning" did not have an entity of its own within organization chart.

However, very important and interesting steps were made. Steps by which it was necessary to pass by to build the present stage.

2.3. WEB, flowering

When the year 2008 begins, the University's organizational structure gets modified; this formally originates the Department of Blended Learning, with its own authorities and covering the whole university.

Besides that, a new program for Teacher Categorization is implemented. Within the scope of the evaluation for teacher performance system, the requirement is to be trained in IT and use it in its classes.

Our own blended learning environment, which main feature was to work in an integrated way with the AMS, was shut down. A bad decision!



Figure 4.a: Moodle Environment at UCSF (Home Page)



Figure 4. b: Moodle Environment at UCSF (Free courses of Moodle for Students and Teachers)

Today all of our courses offered for blended or distance learning, are MOODLE based. Among the main reasons of its choice is that in addition to being a very good resource, as virtual learning environment, is free and has a strong team behind the work who is constantly adding and improving its functionality.

In 2009, for first time, student admissions were open at UCSF for a distance bachelor degree. The program is a Bachelor in Gerontology. The people who aspire to be a student of this program must have previous university studies in a similar subject. The experience was highly satisfactory at that moment. We had about 50 adult students attending to a complete process of distance education under Moodle environment. We had interesting opinions and experiences of students, teachers and tutors.

The UCSF web site, from 1999 to 2008, was a traditional brochure but digitized. In 2009, it evolved into an IT mass media. Today students and teachers begin to interact outside the classroom, through virtual classrooms and other social networks like facebook, twitter, buzz, etc.



Figure 5 – Actual web of UCSF

3. A future, final essay

The road has been long and slow. The changes have been just a few. But all of them have been done seriously and precisely. This is a map of the narrated road:



Figure 6: A concept map of the road traveled

Teachers who have used MOODLE and discovered and understood its benefits for education, don't move back. In turn, when these teachers talk about their experiences they say they are happy for them, this is a good way to show new teachers what this change is about and the benefits of mobilizing to it. Young college students, most of them belonging to the NET generation, are the fuel that keeps the whole system to move forward without pause.

In other words, if we need to do a concept map of our situation, could be this:



Figure 7: Today's Teaching and Learning environment at Universities

The final words of this work have to do with the working premise of LINC: "With today's computer and telecommunications technologies, every young person can have a quality education regardless of his or her place of birth." (<u>http://linc.mit.edu/about.html</u>)

If we believe that education, at any age, is a process of building learning among at least 3 actors: a teacher, a student and a content, and, if by the Information Technology, these actors are present in the process of distance education, then we can assume that just because there is access, that means quality assurance.

However, if we believe that formal education occurs inside a pedagogical system, then we have something pending before talking about quality. This topic is called "social and cultural context". Beyond the extensive literature on the importance of school (Elementary and High) for cultural preservation, when children learn "remote", my concerns have to do with the university. By now, I do not care about how to preserve the culture in college; I do care about how to generate it. So my question is about the possibility of transferring the experience gained through distance learning process and OER, to the social and cultural context, nearby and itself.

If Learning is the modification of existing structures due to the development of new structures of increasing complexity; its anchorage must be occur in the whole person. Like individual and social being. It is the own environment who enables or not the transfer and the learning.

Thanks to the advanced development of the IT available to education, we can deliver training to any place in the world. No distances and no differences. But: Can we speak of equal quality in learning among young university of U.S. and their counterparts in Argentina? I think we cannot. Even in the case that they are studying, with the same professors and books would not be the same. The ability to do referencing, sharing, replicating, recreate and transferring, is not the same. We should do a comparative study with control groups.

The main aspect to consider has to do with the digital divide. When a university student learns with a foreign teacher, whose reality is different from that of their students, and then he wants to apply sharing, replicating, recreate and transferring the learning to their own reality, the problems are so many that often the solution most frequently is emigration. They are being finally a great human resource for other countries, but no for their own.

Despite my concern, I reaffirm the statement in the words of Mother Teresa of Calcutta: "What we do can be a drop in the ocean. But the sea would not be complete if it lacked that drop."

Why Blended Learning?

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Abstract

Higher education has changed. A shift in the profile of the student body has changed the face of learning and education. Learning is no longer confined within classroom walls nor are the teachers and students required to be in the same location at the same time. At the University of the South Pacific, distance and flexible learning is the pedagogical concept informing teaching and learning. The University's multimodal learning approach has expanded considerably and continues to grow and diversify in order to best meet the needs of the region.

Blended learning was an inevitable transition for learning at the USP and fitted perfectly with the organisation's overall operational strategy. The multiple instructional delivery modalities in blended learning not only accommodate the various learning needs of our students but also give lecturers the freedom and ability to meet other tasks and responsibilities. On-line learning, previously rejected as foreign to our distance communities and people's field-dependent cognitive style is being viewed more favourably as part of a blended learning mode. The presence of a competent on-line tutor is the key. Three mini-case studies in this paper demonstrate this viewpoint.

1. Introduction

Blended learning represents one of the most naturally evolving processes of development at the University of the South Pacific (USP). The strategy fits perfectly with the university's brand as the premier provider of tertiary education in a region that is diverse and complex. The USP is owned by 12 island countries that traverse a large 30 million kilometers of ocean and five time zones. While there are core values underpinning the basic cultural institutions and structures of the Pacific Island Countries (PICs) and bind them strongly together, there are important variations that make the region culturally diverse. As such the people and communities of the Pacific Island countries (PICs) cannot be treated as a homogenous group but as individuals with their own preferences and needs. For them,

... blended learning represents a real opportunity to create learning experiences that can provide the right learning at the right time and in the right place for each and every individual ... It can be truly universal, crossing global boundaries and bringing groups of learners together through different cultures and time zones (Thorne, 2003; 18).

From its early years the USP as a learning organisation (Laurillard, 2002) has demonstrated determination to be adaptive to the diverse and changing environment it is in. Distance education began at the University in 1970 only a year after the institution began operations. The establishment of University Campuses in all the USP countries and the strengthening of the private satellite network *USPNet* and other communications are major developments that have created greater access and taken education to the people. The mainstreaming of distance and flexible learning (DFL) has meant that what used to be a separate administration of distance and flexible learning and teaching has now become integrated with the rest of the University. DFL activities are now integrated with the academic activities of the faculties and it is the Deans that now drive the DFL process supported by the Centre for Distance and Flexible Learning (CFDL). DFL is the core pedagogical concept informing teaching and learning at the USP.

The organization doesn't just service its customers: they become its lifeblood. People do not just make promises, but they deliver, not once but over and over again, consistently developing better and better service. The organization differentiates itself in the marketplace through its people, its products, its processes and its premises (Thorne, 2003; 8)

In the 1970s the University's distance education courses were offered through print mode and supported by audio teleconferencing via an old satellite donated by NASA. From an original 6 courses and 150 students in 1971, the USP's distance and flexible learning (DFL) operations has grown tremendously both in student numbers and DFL courses. In 2004 there were 150 courses offered over three semesters with a total enrolment of over 15,000 students. In 2006, 340 of USP's total 763 courses were available by DFL. The University's total enrolment in 2008 was 19,146 and over sixty percent (60%) of that number were students who enrolled as flexible learners. This proportion is expected to increase further.

2. Learning & Teaching in Higher Education

Higher education has changed. A shift in the profile of the student body has changed the face of learning and education. Learning is no longer confined within classroom walls nor are the teachers and students required to be in the same location at the same time. Instead, today's students are older, with families, and most must work their school schedule around their work schedule and other life responsibilities (Alarcon, 2002). Learners are "social beings who respond to the social, political and organizational context around them" (Laurillard, 2002).

Approaches to learning are intimately connected to students' perceptions of the context of learning. Perceptions of assessment requirements, of workload, of the effectiveness of teaching and the commitment of teachers, and of the amount of control students might exert over their own learning, influence deployment of different approaches (Ramsden, 1998; 48).

Teaching and learning are inextricably and elaborately linked. "To teach is to make an assumption about what and how the student learns; therefore, to teach well implies learning about students' learning" (Ramsden, 2003). Academics are responsible for their students' learning, which is more than an individual lecturer's duty but the collective responsibility of the organization. The character of the university is defined by its role "to enable a society to make progress through an understanding of itself and its world" (Dearing, 1997; 72). With this changing world and the demand in modern organizations there is increased interest in the definition of the qualities of the effective graduate. Academics are facing an unprecedented challenge to the traditions and values of the profession. Higher education is being forced to change, not only through pressure from within but more now from external sources. According to Laurillard (2002: 3), "the pressures wrought upon it have nothing to do with traditions and values. Instead, the pressure is for reduced costs, for greater scale and scope, and for innovation through technology.

Widely dispersed employees are demanding access to learning anytime and anywhere and on their terms; there is growing recognition that learning is a continuous, life-long process; there is a migration of information to the online environment and more people are coming together in digital classrooms (Rosenberg, 2001; Sanderson, 2002). Educators and leaders of higher education are being compelled to confront existing notions of teaching and learning (Garrison and Kanuka, 2004). In particular they are being challenged to position their institutions in line with the various demands like connectivity of prospective students (ibid). As education moves in the 21st century several aspects like technology & learning styles are being revisited.

We need to preserve the traditional academic values, while seeking change in the means of addressing them. We need to rebuild the infrastructure that will enable a fit between the academic values we wish to preserve and the new conditions of educating large numbers (Laurillard, 2002: 4)

3. Technology and eLearning at USP

Information Technology (IT) has the power to create new types of learning communities in which students can share and learn. At the USP, IT is crucial in educational development and the enhancement of teaching and learning; in fact it has revolutionized the learning systems. IT has become a necessary media because of changing circumstances. While young people are more comfortable interacting with technology than with people, the older generation needs technology to transcend distance and save time and costs. Since 1970 there has been intense development and marshalling of resources at USP to support and accelerate distance education. Today its multi-modal approach uses a range of media including video broadcasting, audio and audio-graphics and video teleconferencing, audio and video tapes, CDROMS and DVDS, and online learning management systems (LMS). In the period 2006-2007 the University's LMS migrated

from WeBCT to Moodle. The opening of the new Japan-Pacific ICT Centre in March 2010 is expected to boost the range and quality of the university's ICT programmes and services further.

New developments are happening all the time. One will happen in the actual programmes of the University from the beginning of 2010 with the introduction of university-wide course that every student will be required to take irrespective of their programme of study. One of these is *UU100 Communications and Information Literacy*. The course will provide students with the necessary knowledge and skills to use computers effectively and communicate through computer-mediated learning contexts. It will meet the needs of mature students who are confronting computers now as returning students. They now realize that technology knowledge skills are important for their own professional competence and also in the new learning modes to support and encourage participation in class activities (Olipiriyakul and Scher, 2006).

4. Why Blend?

Many students complain of loneliness in distance learning and e-learning in particular can be a lonely activity if the environment is not designed and supported well. A feeling of isolation and the absence of a 'human face' to interact with and give direction has contributed to the high attrition rate amongst distance learners. Even the best prepared instructional materials and e-learning environment cannot compare to the visible instructor to answer questions and provide reinforcement. So the demand is for learning programmes where more than one delivery is used with the objective of optimizing the learning outcome and cost of delivery. Enter blended learning, a vibrant mode of learning that brings the best ends of both traditional & virtual worlds together by integrating the best of regular face to face learning with technology-based online learning (Lin, 2008; 56). Blended learning takes account of the impacts of factors such as learner differences, personal characteristics, and learning styles on the learning environment.

Blended learning was an inevitable transition for learning at the USP and fitted perfectly with the organisation's overall operational strategy. It offers a way of thinking about teaching and the use of learning technology effectively in the wider context. The multiple instructional delivery modalities in blended learning not only accommodate the various learning needs of our students but also gives lecturers the freedom and ability to meet other tasks and responsibilities.

There are various definitions of blended learning. Some view blended and hybrid learning differently while others look at them as one. This paper takes the latter view. Blended learning combines various models of traditional and distance education and makes use of all types of technology to offer meaningful learning environments for students (Akkoyunlu and Yilmaz-Soylu, 2008; 27). It is "an effective combination of different modes of delivery, models of teaching and styles of learning" (Procter, 2003; 3). Olapiriyakul & Scher (2006) use blended and hybrid as one to refer to "the mixed mode of instruction which formally combines face to face learning and distance learning by incorporating technology to facilitate the learning process".

This paper defines blended learning as the effective combination of traditional face to face learning and distance learning that incorporates an e-learning component. The online component is of special interest; it was rejected as foreign to our distance communities and people's field-dependent cognitive style (Lieberman, 1994). It marginalized communities and individuals with limited or no access to computer and internet as well as limited knowledge in the use of technology. The absence of a 'human face' to interact with and learn from in online learning also posed a serious handicap for our people who tend to employ field dependence as their cognitive style. Dealing with tangible objects that people can see was easier.

While there are generally accepted reasons for using blended learning, the choices made in each context are based on reasons specific to that learning environment alone. The nature and location of the learners and the resources available are important considerations. The mini-case studies in this paper highlight a new awareness of online learning: the first concerns the author's experience as an online learner with an overseas institution while the other two are about the author's experience in courses at USP that used the blended learning approach. Online learning is being viewed favourably as part of a blended learning mode.

Case Study 1 (CS1)

I was introduced to WEBCT as a distance learner in 2003. We were a small group from the distance and flexible learning centre of the USP that studied with an overseas distance learning institution. I enrolled in a graduate course on instructional design that was totally online. A teacher by profession I was recently recruited as an instructional designer at the university and needed to learn about the new job. However, online learning was a totally new environment and I was not sure what to expect. The class was a mixed group of both young and old, and there were more like me that were new to instructional design. Most of the participants were from that home country and a small minority of international students like me. After planning what to write I made my first posting into the Discussion forum. I remember waiting anxiously for a response and when none came on that day or after that I was disappointed. At 53 years old I was learning to learn online.

I followed the weekly announcements closely. Every week the tutor directed us to content material and links to resources. These were very useful. The tutor linked questions and activities to the discussion forum and invited participation. I made the effort to make one posting every week and tried to link in with other discussions. Students were firing ideas and some ideas were obviously better than others; unfortunately too many good ideas didn't stay on the discussion table long enough. There seemed little coordination of the discussions, which can be done easily in a classroom. At the very least I expected the tutor to do that. On the whole most discussion strands were distorted and incomplete. Some good discussion groups didn't stay connected long enough as new ones were continually being formed. Certain individuals dominated discussions and rambled on; a few times discussions went out of common ground. For most of the semester I learned on my own, following the weekly outline, announcements and links provided by the

lecturer; I left the discussions to the other students. I passed the course but came away with serious reservations about learning online. My biggest disappointment was with the tutor who was "not around" enough to facilitate learning effectively. A lack of response and timely response was cause for frustration. I agree that the facilitation role of the tutor in whatever mode is important in using the tools and available resources carefully to develop and maintain active and collaborative learning; in online learning this is critical during the online component (Heinze and Proctor, 2004). Otherwise the psychological distance (Dickey, 2004) would get the better of students as before.

Case Study 2 (CS2)

My experience with the open-source Moodle was also my first experience with the blended learning approach. In the second semester of 2008 I was among a group of six lecturers coteaching a Curriculum Studies course for second-year teacher trainees studying on-campus. The course had two major components: a one-hour face to face core lecture for the entire group every Tuesday, followed by a 2-hour Methods workshop in each of seven subjects: language, economics, mathematics, science, accounting, geography, computer studies during the week. This was necessary to prepare teacher trainees to teach two subjects in school. The core lectures defined the theme of the weekly workshops.

Close to 200 students made up the group. About three-quarters were pre-service teachers who were studying full-time while the rest were teachers already in the service and studying parttime. The workshop numbers averaged about 30-40 students each. Because of the large class and diversity in learning needs the decision was made to have a Moodle component. The idea was that the core lecture would set the theme for the subject workshops and the Moodle discussions would be a forum for reflection, hearing student voices, engaging students and developing ideas further. The course coordinator assessed online discussions.

I gave the first in-class core lecture on the title "Why teacher education?" Soon after that the course coordinator posted three questions to generate the discussion for the week. I logged in the day after the lecture and was floored by the big volume of individual responses in the discussion forum, which continued through every day of that week and into next. Most comments were short and they were all over the place. The students were not responding to the questions in any particular order and were referring to my lecture at the same time. Everyone was having a say. I did not make any response on that first day because I did not know where to start. On the second day I took an overview of the discussion and decided to comment on two issues that had sparked the most debate: (i) my view that "teachers are made" and (ii) teacher ethics. The teacher in me decided against a defensive approach so I presented a school scenario for people to reflect on. In the days that followed I noticed a slight change: while a good number of entries continued as before unaware that the discussion had shifted, the responses on the new strand were clearly tempered and thoughtful. Two of my colleagues joined that discussion loop also. Later in the week when I broached the topic in my mathematics workshop, I was surprised at the silence and it took some urging to get some response. It was the same throughout – the online discussion

forum was always alive as students freely posted views and even got into some debates. By the time they came to the workshops the Moodle discussions was a thing of the past and they were ready to move onto another level of activity. Moving in between the lecture, online discussion and Workshop activities worked wonders as was evident in the high quality of students' assignments. The reflective exercises were well written and it was encouraging to detect the effect of online engagement. The students had obviously gained important skills. The online forum encouraged thinking and expression. The teaching presence was still important in managing the learning environment and directing the learning experience. The blended learning context has provided the independence and control required to develop critical thinking.

Case Study 3 (CS3)

I coordinate the postgraduate course in Mathematics Education that targets practicing teachers working towards a postgraduate qualification. It is a second semester on-campus course. Because of low enrolments in my course in the second semester of 2009, the decision was made not to offer it that year. However, the semester was into the second week when the Director of one of the regional campuses informed the School of Education that 15 teachers would like to do my course during the two weeks school holidays that would fall in Weeks 4 and 5 of the university semester. This was the only time the teachers could come together for a lecture. We had almost completed arrangements for that group when we received a similar request from another Campus on the other side of the island to offer the same course to another group of 9 teachers during the same school holidays. I readily accepted both requests. The difficult part was to put together a plan to suit both requests and satisfy course requirements.

- A blended learning approach with the following components was adopted:
- (i) A Course Book for students;
- (ii) Face-to-face session at Campus A on week one;
- (iii) Face-to-face session at Campus B on week two
- (iv) Moodle portal to be operating from week one
- (v) One Saturday face-to-face session for presentations near the end of the semester

Of the five days of each lecture week, three were devoted to course content while the last two were spent in front of the Computer, Internet and Moodle. Work was intense from the first day. The full semester programme was laid out from beginning to end. The mixed delivery mode was explained carefully to students especially their role in making blended learning work for them and the course. We spent time on the assignments especially the major project worth 40%. We only had time to look briefly at the first two topics. The two days in the computer laboratory were also intense. While the majority of students had some knowledge of computers, very few were confident with Internet and the World Wide Web, and no one had online learning experience. With everyone sitting on a computer, we tried various things from logging into Moodle, locating the tools, familiarizing with the Course page, taking part in the Discussion

forum, and linking postings to individual email accounts. The two days of hands-on learning on the computer were obviously more exciting for the participants.

For the rest of the semester I posted the weekly outline every Tuesday together with links to course material online and in the Course Books. I made a few Announcements and posted discussion pointers in the Discussion Forum. The latter did not work as anticipated as only eight students out of the whole group made any postings. However, most students sent me at least one email about the course. It was not possible to run the final face-to-face class and changes had to be made to the course outline and additional materials posted online. Twenty four students completed the course very well, the highest and best results ever for this course. The quality of students' projects deserves mention. In their own ways the students searched, collected and put things together. They communicated with me and amongst themselves. The projects were researched and well written. Students wrote a lot. I came to the conclusion that this class showed greater independence in attending to learning and produced stronger learning outcomes than most face-to-face classes.

5. Conclusion

The learners in CS1 would not have gained qualifications without e-learning but we certainly would have done better with greater presence and attention from the tutor. The large group in CS2 would not have been heard consistently and effectively without the online communication mechanisms. However, the face-to-face sessions both at the beginning and later in the week reinforced thinking and provided motivation. The teachers in CS3 represent the many mature learners in the field who will enroll if there is increased flexibility in and access to learning. This group requested face-to-face instruction but acknowledged the need for modifications. The blended learning models that have face-to-face components together with an online experience in between allow distance learners to enroll in a program that they otherwise may not be able to. They have to balance job and family responsibilities with their studying (Owston, Wideman, Murphy and Lupshenyuk, 2008). One teacher's simple comment in an email said it very well:

"I am teaching in this remote school and I have passed my first postgraduate course. Thank you"

For many years the USP has been the only University in the region. That has changed dramatically in the last few years as other players have made inroads into the Pacific region offering a wider selection of opportunities for learners to choose from. Some offers have come with financial support packages. In addition, online learning has traversed distances and brought overseas programmes and courses to people's homes at much reduced costs. The competition for the best students has already begun and is expected to become intense. As students demand a quality learning experience as well as service and convenience, a blended learning mode that has

the best of both traditions will gain popularity over the traditional on-campus learning mode (Garrison and Kanuka,2004; 107) and online environment. On-campus learning could become the most expensive and least preferred mode of delivery. The group in CS1 completed an overseas course without incurring travel and accommodation costs, and the 24 teachers in CS3 paid only a fraction of the cost they would have paid to study on-campus full time, provided they were given study leave by their employer.

The role of teachers is one of facilitating learning and teaching skills. An important part of that is "to nurture students and to manage information in such a way that each student achieves maximum intellectual, social, physical, emotional and spiritual growth" (Barry & King, 2004; pp 6). Good teachers, according to Dewey (1902), can recognise and create genuine intellectual activity in students. The amount and quality of activity and interaction in class is a measure of this effectiveness. Students in CS1 and CS2 recorded much interaction amongst themselves and with lecturers. They freely posted their views and thoughts and some went further to defend and debate. Students in CS3 were not as interactive. In all cases one cannot forget the 'silent' learners who never got a word in. In online learning, the facilitation role of the online tutor is crucial. The role demands special competence that is different to classroom teaching. The on-line tutor has to be 'ever-present' for every learner as well as the class - to motivate, guide, and direct. The management, relationship and teaching skills have to be melded with the specialist technological skills. Overall there is indeed a new understanding of online learning that has come with wide acceptance of the blended approach. Blended learning has provided for students the independence and control that developed deep thinking and also encouraged an acceptance of responsibility to take charge of their learning.

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Evaluating a Blended Course of Methodology of Social Research II¹

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Abstract

Blended learning is an opportunity to improve high education training courses. University's training takes advantage of an effective use of innovative Information and Communication Technologies (ICT). This contribution shows a case study of blended learning in an evaluative perspective. The focus is on the following issues: the definition of training objectives, their implementation using both traditional face-toface and online collaborative learning activities and the perceptions of participants. The aim is to open a reflection starting from the main findings of this research such as strengths and weaknesses that are individuated by monitoring and evaluating the online processes using quantitative and qualitative data analysis.

1. Overview

This paper shows a case study concerning the project of a blended course of Methodology of Social Research and its implementation during the Academic Year 2008/2009².

The course was held within the experimental project of Web Enhanced Learning (WEL), promoted at the University of Genova (Italy) by the Institute for Educational Technology of *Consiglio Nazionale delle Ricerche* – CNR (National Research Council) and it aimed to make use

¹ II= advanced course.

² I was tutor of this course.

of Information and Communication Technologies³ in academic teaching by embedding some tools of instructional design⁴.

My contribution to this conference is to consider, through an evaluation approach, the changes introduced into the course by the online platform, focusing evaluative attention on these specific issues: definition of training goals, implementation of collaborative and evaluative activities and role of social actors involved.

The main purpose of this presentation is to share into the LINC community the points of strength and weakness shared by the participants for reflecting on how to emphasize the strengths and to manage the weaknesses, how to enhance the use of available ICT tools and how to integrate e-support with presence learning.

Starting from the consideration that a consolidation of e-learning is possible only by sharing practice, for Italy, an international environment becomes important in order to allow the improvement of the process of adopting e-learning in high education, taking advantages and stimulations from the international cooperation.

2. The theoretical framework

Blended learning refers to a blend of complementary face-to-face and computer-based environments⁵. In other terms it is not a repetition of online versions of classroom-based courses, but it's a combination of «multiple delivery media that are designed to complement each other and promote learning and application learned behavior. [...] Blended learning mixes various event-based activities, including face-to-face classrooms, live e-learning, and self-paced learning. This often is a mix of traditional

³ According to Harris «the common communications technologies include e-mail, asynchronous threaded discussion boards, live chat boards, telephone, and audio/video conferencing» (2008, 3) [7].

⁴ Please see http://polaris.itd.cnr.it/Gtpages/wel.htm.

⁵«Innovative instructors sometimes develop blended environments where some elements of communication are in real-time and other are asynchronous. Blended environments involve use of a diverse set of tools through which enhanced learning effectiveness is possible» (Harris 2008, 3) [7].

instructor-led training, synchronous online conferencing or training, asynchronous self-paced study, and structured on-the-job training from an experienced worker or mentor» (Singh 2003) [22].

Particularly, Merrill (2001) [15] introduces the first principles of instruction and argues that learning is facilitated when the learner is engaged in solving a real-world problem (problem-based), new knowledge builds on the learner's existing knowledge (activation) and it is demonstrated to the learner (demonstration), applied by the learner (application) and integrated into the learner's world, increasing generalization (integration). It's a problem-based consideration that consists in showing the learners «the task that they will be able to do or the problem that they will be able to solve as a result of completing a module or course» (Merril 2001) [15]⁶. Contemporarily, it means using telematic resources to create a virtual space «where students can work together and help each other learn to use a variety of tools and information resources in pursuit of common goals for learning and problem solving» (Wilson 1996: 122) [31].

Consequently, an active e-learning environment becomes the second consideration. According to Jonassen (2004) [12], it is a constructivist learning environment where there are conditions for the negotiated meanings and cooperative learning. A constructivist learning is not linear but it is an embedded reflexive process that facilitates the transition of students from the role of modular/molecular listeners to the role of molar learners. It encourages autonomy and self-evaluation skills⁷ so that formative evaluation activity (Scriven 1967) [21] becomes an indispensable tool for self-empowerment.

3. The study

The course of Methodology of Social Research II takes place in the Faculty of Education Science of the University of Genova. It's a 40-hours

⁶ For further information please see http://id2.usu.edu/5Star/Index.htm.

⁷ For further information, please see Trinchero 2006) [29]; Mayer and Wittrock 1996 [14].

course on the evaluation of public policies and analyses the process of policy making and its assessment. Part of the course is dedicated to the presentation of some case studies of participatory evaluation in order to deepen the theory of evaluation. It provides, as final test, a case study presented by students and focused on a theme of their choice, including its discussion. Starting from the last academic year it has been turned into a blended learning form using the virtual space of the University of Genova, so called AulaWeb⁸.



Picture 1. Course homepage

The European Community's program cycle management has been adopted to define goals and Kirkpatrick's learning evaluation model (1959 [9], 1967 [10], 1994 [11]) has been used to evaluate four levels: reaction of students, learning, behavior and organizational change.

A formative evaluation (Scriven 1967) [21] is the approach adopted; some tools of social research have been used, as qualitative observation,

⁸ The website address related is https://cds1630.aulaweb.unige.it/login/index.php; a registration is necessary to access by entering the academic credentials.

interviews and online focus group⁹ and as quantitative, using data extracted from the online platform.

The team interaction has been studied by Hesseling' evaluation model (1966) [8]. The communicative processes have been observed systematically and classified into 4 categories: information, evaluation, decision and execution. The interaction can be given or received for each category.

All the results are presented by descriptive analysis.

4. Findings

The online training had 77 logged students; 46 of them attended at least one online activity, as the next figure shows.



Picture 2. Access frequencies

Students shared the training goals by the first online activity, so called "The goals that I would". A forum has been used to mediate this

⁹ For the evaluative main theoretical references, please see: Fetterman, Kaftarian and Wandersman (1996) [6], Pawson and Tilley (1997) [20], Bezzi and Palumbo (1998) [1], Stame (2007) [24], Bezzi (2007) [2], Palumbo (2001) [16], Palumbo and Torrigiani (2009) [19]. For Social Research, please see Stagi (2000) [23], Palumbo and Garbarino (2006) [18]; in particular for the use of internet research, please refer to Jones (1999) [13] and Di Fraia (2004) [5].

individual activity, that recorded 407 visits and 22 messages. The aim was to create a generative learning and a student agreement with the professor and tutor.

The goals explained by students were:

- To do an evaluation research design;
- Adopting a practical approach;
- Studying and applying the issues of Methodology of Social Research I. Then a detailed elaboration of the course goals was completed by using Bloom' Taxonomy (1956) [3], as the next figure shows.

General training	Specific goals	Operative Goals		
goals		In presence	Online	
Module 1:	To know theories	Evaluation	E-contents such as	
To have a basic	approaches,	definitions,	presentations, documents,	
knowledge of	evaluation	approaches, and	bibliography.	
evaluation.	models, criteria	models;		
	and how to do a	tools of		
	draft of an	researcn.		
	evaluation			
Modulo 2:	To know what	To understand	To create and consolidate	
To know public	nublic policy and		the working group, to	
policy	decision making	evaluation	individuate a focus of	
evaluation.	are and how to	through case	research and to participate	
	evaluate a public	studies.	in collaborative activities	
	policy.		such as benchmarking and	
			institutional context	
			analysis by using forums.	
Module 3:	To be able to do	To put into	To realize an evaluation	
To apply	an evaluation	practice and	report and to share	
evaluation	research.	realize a	feedback by using forums	
research.		complex artifact.	and chats.	

Picture 3. Training goals

In particular, 18 students spontaneously created self named working groups, such as ALFA (4 participants), METODOLOGICAMENTE (4 participants), Savoir Faire (3 participants), VERITA' SUPPOSTE (4 participants) and VEKIETTIMABELLI DENTRO (3 participants). Only the last one had been created online; the other teams attended both virtual

and face-to-face activities. As the next figure shows, there was a different participation in the groups and more online access was done by the student per group who showed an organizational leadership, confirmed by students' interviews and observation of interaction in the online and face-to-face settings.



Picture 4. Team accesses¹⁰

Files about interesting topics were published online and standard forums for general use were adopted. A separate group forum was created for writing a reflective journal of the group. Visible group forums were used for the benchmarking, for the institutional context analysis and for evaluation reports writing. A chat group was used for synchronous interaction, although the students chose other informal tools, such as Facebook, telephone or face-to-face meetings.

We studied the reactions of the students on what they thought and felt about the training. The organization of activities (modularization, schedules, tasks and comparison in the presence) was perceived and rated as good by the students.

¹⁰ The horizontal axis shows the groups and the vertical axis shows the individual frequencies.

The virtual setting was considered a strength for exchanging new bibliography. Active participation to online and face-to-face activities was considered a strength too. Particularly, a face to face interaction was preferred to virtual meetings, especially for working on difficult tasks, such as benchmarking and evaluation reporting activities, while elearning was considered as a chance to work on distance but too cold (unpersonal and anonymous) to allow effective learning.

The teams had different ways of working. All the teams accessed more to bibliography than to interactive tools. One group (Savoir Faire) used forum more frequently than the others. The chat was not used by two teams, but it was adopted very frequently by the group that had been created online (Vekkiettimabelli). The next picture shows the distribution of team works, distinguishing the access to bibliography tools, forums and chat.



Picture 5. Team work distribution

The result was an increase of knowledge and capability due to the use of e-learning. The evaluation results showed that the use of technologies is a strength for learning although some weaknesses emerged.

"Moving to the core of the matter"; improving personal skills; developing organizational capacities; applying personal skills; enhancing

enthusiasm, motivations and good will were considered points of strength by the students.

On the contrary, the points of weakness explained by the students were the following: computer expertise/skills requirements; difficulty in improving virtual work-team; initial delivery misunderstandings; difficulties during the organization of tasks; scarce participation of introvert or unmotivated students and imbalance of groups related to their spontaneous creation.

Tutorship was a key aspect to blend coherently face-to -ace and online activities. The e-contents were developed by the tutor and the professor during the online course design. During the course implementation, the tutorship supported collaborative learning activities, monitored the workteams and facilitated interactions with students responding to learners' needs. The evaluation results show that the students perceived the role of the tutor closer than that of the teacher. There are more interactions between students and tutor than between students and teacher.

The last studied aspect was the behavior of the students that changed during the course implementation. Active participation forms, such as cooperation, knowledge of different points of view, feedbacks among participants, have been promoted by the experimental collaborative online activities. A more difficult co-decision was the result of an increase of proposals among the participants.

Collaborative outputs require a continuous mediation (Trentin 2008a) [27] and the time of decision can affect the collaborative process especially where there is an asynchronous communication among participants.

A communicative process analysis was done for one of the work team interactions, as the next figure shows.

Interaction	Given	Received
Information	A informs B and C that he's going	B and C receive information
	to prepare a draft essay.	from A
Evaluation	A asks B and C if they have	B and C read the question of A
	already done something.	
	B answers the question of A and	A and C read the question of B
	asks C and A how to go on	

	C informs B about the tasks and asks B and A to participate and collaborate or to change the research issue	A and B read C's proposal
Decision	A decides to keep the same issue and asks B e C to meet on the chatline at 9 p.m.	B and C don't read A's decision on time
Execution	Only A is on line on time	

Picture 6. An application of the Hesseling' evaluation model

Particularly, a reflective group evaluation was created by using the reflective journal. The aim was to increase students' self-assessment and capability to justify personal choices among the group.

At the end of the course the students did an evaluation activity; the focus was on their course and teamwork satisfaction.

The students had to point out three points of strength and three of weakness for each aspect and to give a score from 1 to 5 to each participant of the personal team. This last activity was considered negative (concept to evaluate group mate) and led to the decision of having focus groups.

The data have been elaborated in aggregated form. The main results were that students had been satisfied about the training course and their experimental team experiences.

However they would have preferred simpler, more structured and directive tasks rather than doing a complex artifact as an online evaluation reporting activity.

Besides, the participants would have preferred random virtual teams that would not reproduce face-to-face cooperation and competition.

One point of strength was that the students have been constantly monitored by both e-tutor and teacher during the online activity, making it possible to advise them *in itinere*.

5. Conclusions

On the basis of this case study, the course structuring, the interactive process activation and evaluation are the significant dimensions that have been taken into account for the following year (A.A. 2009/2010).

«In analyzing current distance education, it is useful to think of two primary components: technology supporting self-study and technology supporting interaction between students and between student and instructor» (Harris, 2008:3) [7]. The course design (as goals, action, strategies and evaluation) was crucial. Maintaining flexibility was useful in order to consider the specific needs of the participants (e.g. different level of initial skills, and available time and technologies). This year, the same structured modules have been maintained but a participated evaluation activity was done to share the examination criteria and indicators.

Different aspects of communication were taken in consideration:

1. Among the students within the group, the ancillary unstructured communication development, that is parallel to the structured communication utilized for tasks;

2. Among students, teacher and tutor usually based on formal messaging (synchronous and/or asynchronous) and exchange of materials/information;

3. Among all stakeholders involved in the process (students, teacher/tutor, experts and external specialists), where structured communication is for developing the assigned tasks.

The chat was promoted by introducing focus group for intermediate course evaluation and the use of wiky was suggested for the team evaluation reporting activities. The data are currently in elaboration and analysis.

In conclusion, this contribution suggests that a participated course evaluation allows the improved redesign and implementation of a new edition course, monitoring micro social processes, emphasizing the strengths and managing the weaknesses.
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Promoting a Blended Learning System for Open Education: The AOU Experience

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Abstract

This paper describes the characteristics and features of a dynamically evolving blended system of open education at the Arab Open University (AOU). In creating a blended learning system for open education, it becomes highly important to look, in particular, at the main institutional dimensions underpinning the evolution of said system. It is also significant to examine the guiding measures intended to safeguard the quality of performance. This paper reflects on such issues with particular reference to the AOU experience and the inherent supporting tasks provided by certain specially-developed management information systems.

I. Building a blended learning system of open education

By design, the AOU is structured to operate, by way of Branches, located in a number of Arab Middle East countries. Practically, each Branch is operationally an autonomous academic institution of higher education. However, the Branch operates as a large component within an integrated AOU system. Due to the operational structure of the AOU, the resulting system is perhaps best described as a distributed system of open education.

Managing the learning process and other operational aspects in such a complex, distributed operation, such as the AOU, requires the creation of a somewhat flexible, distributed platform of operation. Our focus in this paper is, however, on attributes of the adopted learning process and its requirements.

II. Building the Framework for blended learning

In structuring the AOU system, a three-tier <u>Framework</u> was utilized in order to invoke the appropriate constructs of various elements of system operation. In turn, said Framework has been motivated by three primary dimensions, serving as the ethos of system operation, management and evaluation:

1. Institutional policy:

The AOU Charter and mission statement make a clear commitment to establishing and funding the institution as a Pan-Arab, multi-branch institution of higher education, based on a highly IT-driven learning system of open education.

2. Pedagogical platform:

Through a formal partnership with the UK Open University (OU), the AOU has adopted, since early operations, curricular program and course design based on open education, with independent study as one of its main tenets. However, the AOU strategy for Student Assessment, while benefiting from certain practices at the OU, has actually deviated markedly in order to foster certain robust measures deemed significant for local accreditation purposes. Technology, for instance, is viewed to play a supporting role to the enhancement of the learning experience, rather than a stand-alone primary tier as viewed in distance education institutions.

3. Learning delivery system:

In translating the general guidance provided by the Institutional Policy and Pedagogy into operational manifests, the AOU leading management team made the decision, since early days of planning, to employ a <u>blended system of learning</u>, thereby encompassing certain particular elements which define such a system of learning.

In turn, we believe that the previous simple Framework encompasses the elements embodied by the more-elaborate Khan Octagonal Framework of blended learning, either in direct form or indirectly as part of the three tires mentioned here. Singh (1) provides an interesting review of this latter framework, while at the same time pointing out how blended learning and training can take on many different forms.

III. Promoting gender equality

Since establishment, the AOU has held a policy of equality in admission with regard to gender. In the early days, the policy was even tilted to the side of female students. The following table, drawn for the AOU-KSA data, illustrates how greater numbers of females are opting for higher education. By design, one of the aims of the AOU is to provide higher education opportunities to marginalized groups, especially in rural areas. Women are considered to fall in this latter categorization.

Year	Total	Female	Male
07/08	15568	6275	9383
08/09	13539	6147	7392

At the AOU-KSA, for instance, teaching is provided on two adjacent campuses, one for females and another for males. However, in other AOU locations such as Jordan and Lebanon, for example, the AOU adopts a full coeducational structure.

IV. Adopting an enhanced blended learning system

As mentioned previously, the AOU has opted, by design, to employ a blended learning system (2) which, in essence, combines certain attributes of traditional education and others borrowed from attributes of distance education. The three primary elements of said

system are described below. These elements, viewed in an integrated manner, define the structure of blended learning as practiced at the AOU.

(a) Face-to-face presentation:

Because of the local cultural settings and the expectations of local educational political machinery, it was decided early on to allocate 25-30% to face-to-face class meetings to be run as tutorial sessions. In addition, computer labs are also made available to students for long hours, six days a week. Tutorial sessions are limited to 25-30 students per group. In retrospect, it is believed that this was a wise decision. It has served to reinforce all aspects of the learning process. In one respect, bringing students together has helped to form active peer study groups. In another, it provides the Tutors, via set office hours, to engage in mentoring. Furthermore, coming to a physical campus seems to cultivate a sense of pride and belonging.

(b) Self-study:

The second important element of the AOU blended learning system resides in the proper provision of support for independent or self-study, carried out by the student. For this purpose, special student learning packs are procured from the partnering institution, the OU. Course book-readers and other relevant reading materials are prepared with self-study in mind. For each course, the pace of learning is spread out in accordance with a dictated course calendar.

(c) Digital learning resources:

Depending on the particular course of study, this part combines online presentation, CDbased learning, and sometimes the use of special applications software packages. In some cases, there is also the provision of "lectures on demand" where students can access videotaped lectures on course contents. These digital resources are usually made available in an asynchronous mode.

Furthermore, in order to keep tuition fees and running costs within reasonable limits, it was also speculated that the ratio of fulltime-to-part time Tutors would be kept around 1:4. As a check on useful productivity, a part-time Tutor's load, for instance, is usually limited to one or two group sessions, depending on the course weight of credit hours.

Once settled on the elements of a blended learning platform, one is tempted to entertain the question of searching for the optimal mix. We believe that it is perhaps more beneficial to keep the learning platform dynamically evolving; always, searching for more effective and efficient ways of delivery

V. Introducing a new educational culture in the region

One of the arduous tasks in setting up the AOU was the need to deal with an educational cultural transformation. With prospective students, the recruited faculty, and the local and

regional political machinery, a clear message had to be articulated about open education and blended learning; thereby, differentiating it from pure distance education.

With faculty, in particular, intensive training workshops were mounted with the help of the OU during a year of preparations (2001-2002). Since then, such training workshops have become a tradition at the AOU.

With prospective students, with parents, and with the local political machinery, the message had to be repeated over and over again; it is blended learning and not pure distance education that the AOU is all about! The same message is still reiterated and celebrated with the arrival of every new batch of students.

It is rather interesting to note that many prestigious American universities which embarked earlier, part-time though, on some initiatives in distance education are now making the switch to blended learn

In promoting responsible academic monitoring, we chose to introduce a special system of "Academic Coordination." It aims at building shared responsibility among the academic staff. The hierarchy of this Coordination calls for the appointment, at Branch level, of a Program Coordinator for each program of study, and a Local Course Coordinator for each course of study. At the AOU-HQ, each course has an assigned Course Coordinator, located either at the HQ or in any one of the AOU Branches. Coordination duties have been clearly laid down. In this system, the Dean serves as the overall Program Coordinator.

VI. An integrated e-Learning platform

An integrated e-Learning Platform has recently been accomplished and put to use in the Saudi Arabia Branch of the AOU (3), for instance. This platform is intended for use by the different segments of university constituencies, including students, faculty, administrative staff, parents and general visitors to the website of the institution.

In essence, the designed e-Learning Platform consists of four main components: a Student Information System (SIS), a Learning Management System (LMS), a Content Management System (CMS), and a Student Support System (SSS). The design of all components is based on open source technologies, based on the Moodle platform.

The SIS is designed to facilitate the processes of admission, registration, grade logging and procurement in addition to other tasks such as enrollment management, billing; etc. The LMS, on the other hand, facilitates tasks of course management; content creation; management of learning activities; and, computer-mediated communication such as chat, dialogue, and interactive forums. The CMS supports various tasks like the institution website, bulletin boards and the sorts. The fourth component of SSS serves as the backbone of a customer relationship management system.

VII. Combating plagiarism

One of the major challenges in today's higher educational system3e, and perhaps more so in an open education environment, is dealing with plagiarism. In part, this is due to the ease of access to resources via the Internet. In order to combat this situation, the AOU-KSA employed a special software package called "Turnitin". However, the software was unfortunately incompatible with the Moodle platform that supports the design of the Learning Management System (LMS) in use. Subsequently, another software package, called "Copycatch", has been called to the rescue. It is successfully in operation at the AOU-KSA.

VIII. Feedback from students and tutors

The AOU-KSA has opted to periodically poll the opinions of students and tutors regarding the delivery of the learning process and the available supporting resources. This is viewed by the institution as a constructive feedback which, in the past, has resulted in certain changes to the operating system and structure. The latest surveys were carried out in 2009. A summary is reported herein.

Based on a highest score of 5, students rated the quality of programs, reading material and course websites at about 3.1. Tutors, on the other hand rated the same at around 3.7. With regard to the supporting e-services such as the LMS, students gave an overall rating of 3 while tutors gave a rating of 3.4. One may conclude on the basis of this feedback that the situation is acceptable. But improvements are also needed.

IX. Fostering measures of quality assurance

As part of the established partnership with the OU, the AOU has, in turn, to demonstrate adherence to approved measures of quality assurance which are inherently based on criteria and principles published by the UK-based Quality Assurance Agency (QAA). In particular, the AOU applies the QAA Benchmark Statements for the design and operation of academic programs of study. For other operational aspects, including, for instance, student services, the reference is the QAA Code of Practice (4). These guidelines have helped the AOU earn external accreditation from the UK-OUVS. Local Accreditation, required by the local Ministries of Higher Education is another yardstick of input to gauging the satisfaction of minimum requirements of quality assurance.

The AOU has, in some Branches such as the Saudi Arabia Branch, adopted additional mechanisms for measuring the efficiency and effectiveness of operation by devising a set of useful Key Performance Indicators (KPIs).

As part of its submission for OUVS Accreditation, the AOU-KSA made a serious initiative in Code Mapping of the various sections of the QAA Code of Practice with particular consideration for application to activities concerning the Branch. In particular,

the exercise proved very useful as a tool for making changes to current practices in the academic and administrative domains, in particular.

The Benchmark Statements are intended to:

- 1. Provide a means for the academic community to describe the nature and characteristics of the program, right at design stage.
- 2. Provide general guidance for articulating the learning outcomes associated with the program; thereby, representing a framework for general expectations about the standards of the award (diploma/degree) associated with the program.
- 3. Encourage innovation within an agreed overall framework.
- 4. Provide support to the institution in pursuit of internal quality assurance.

With regard to the QAA Code of Practice, the percepts contained in its various provisions help the institution to:

- Lay down clear definitions of responsibility and accountability
- Uphold consistent application of policies
- Provide access to information
- Ensure the availability of competent staff/faculty
- Provide adequate student services

To institutions of e-Learning, in particular, the issue of quality education has become very central. It is, nevertheless, an area of great concern in all tiers and norms of higher education (5).

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Session #16:

New Perspectives on Technology-Enabled Education



E-learning Tools and Technologies in Education: A Perspective

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Abstract

Many e-learning tools are currently available for using in education. E-learning tools can provide training and education to large number of students with diverse cultural backgrounds and educational levels. However, e-learning could be failed in education when overestimating what e-learning can accomplish. Some people normally do not understand the weaknesses and limitations of e-learning and some of them may expect too much. In this paper, we review the different e-learning tools such as MOODLE, and Blackboard. We also comment on the most important aims of each tool and analyze the advantages and disadvantages. From this analysis we obtain a global view of the current and future tendencies of e-learning tools and therefore we provide possible important comments for using e-learning tools such as MOODLE in the classroom. Upon to our teaching experience, MOODLE is effective in the e-learning development. Authors and practitioners showed a greater preference for MOODLE over Blackboard. However, MOODLE is not fully pure social software because MOODLE does not provide social networks.

1. Introduction

In the beginning of the third millennium, a new form of learning called e-learning is being introduced. The e-learning decreases the educational costs and it is more effective learning than traditional learning. Globally, it allows the fast dissemination of new techniques and processes, canceling geographic challenges. In addition, time efficiency plays a role, as travel is reduced. Users can conveniently access training materials from home or while on the road via the Internet.

Some technical developments have followed this growth including (i) the increasing importance of broadband, (ii) the decreasing cost of storage, and (iii) the ability of firms to exploit their corporate Intranet. Furthermore, (iv) the emergence of technical standards (such as the Aviation Industry Computer-Based Training Committee and the ADL Initiative) has also facilitated this distinguishable growth. Note that, this sort of distance learning is provided by Information Communication Technology (ICT) and faster computer networks.

Indeed, the rapid use of e-learning systems and technologies has been reported by several studies [2]. In USA, it has been more widely spread than in the rest of the world, and in Europe e-learning has tended to be focused in some countries such as the UK, France and Germany. In a market, Gartner Group Report estimated that e-learning makes up several billion, but the research group expects this to grow sharply.

In Jordan, numerous universities are offering now e-learning sites (portal) for academic and administrative purposes. Jordan Isra University, Petra University, and Hashimate University use e-learning systems such as $MOODLE^1$ and $Blackboard^2$. These portal sites help students and teachers to introduce the contents of courses in easy and effective way [8]. Some activities are offered in these portal sites as follows:

- On-line tests for computer skills, English, and Arabic modules.
- Student authentication to its grades, modules.
- Teacher authentication to its contents such as module description, and student's names, and student's grades.
- Online events and latest news about university campus.
- E-salaries and e-attendance for teachers and employees.
- Distance learning.

However, a little attention has been given to a number of issues that faced the e-learning platforms such as security, usability, flexibility, convenience and efficiency for both in research and in practice.

¹ www.MOODLE.org

² www.blackboard.com

For instance, yet, universities over world have not realized the importance of enhancement of security for e-learning systems. These universities brought some ready security tools to secure their systems. Today, academia requires sharing, distributing, merging, changing information, linking applications and other resources within and among universities and other related organizations [6,8].

This paper is organized as follows: Section 1 describes the importance of technology and advantages and disadvantages of using technology in education. Section 2 reviews the common e-learning technologies, advantages, and disadvantages. A discussion is introduced in Section 3. Conclusions and further work are offered in Section 4.

2. Importance of Technology

Technology is becoming a necessity in university classrooms. Using a technology gives to lecturers the diversity of their lectures, displaying more information, and enhancing student learning. In addition, the use of different technologies in the classroom can help lecturers to save time and allow for more attention to be paid to the content of course.

There are numbers of advantages for using technology and learning materials in the university classroom [13]:

- More active learning
- Diversified teaching ways
- Better student attention and realization
- Less time for lecturers
- Visual stimulation

However there are four weaknesses for using technology when teaching courses [13]:

- Equipment failures
- The need for backup plans and guidelines
- Anxiety for lecturers
- Time spent for learning new technologies and new skills

Even thought these weakness or disadvantages, many of the problems with using technology and learning materials can be overcome by testing equipment beforehand and learning how to properly use each technology.

Several learning materials are available to lecturers including (Cannon & Newble, 2000): (i) Overhead projectors (ii) Video and data projectors (iii) Blackboard (iv) Internet and (v) Course management programs.

3. E-learning Technologies and Systems

A Course Management System (CMS) is a web-based system with a database back-end. A CMS assists lecturers in obtaining resources on the web for students and to facilitate the management of course activities and tasks [7]. Some of common e-learning systems available are WebBoard, WebCT, and Blackboard; from the open source there are: MOODLE, and Sakai [9].

A study conducted by the University of Queensland (UQ) [5] demonstrates that one of the most common successful strategy in teaching large classes is the use of web-based course material (e.g., course website, online resources, discussion boards etc.) and use of mixed media in lectures (e.g., power point, overhead, etc.). Nowadays, use of online course management systems is widespread in education [10].

There are three strengths of web-based course management systems are: accessibility of course resources to students, timely communication between lecturers and trainees and reduce paper usage (paperless systems).

A CMS is different from a face-to-face course. Face-to-face course is a traditional learning, used in classroom and it does not require a Web environment. Whereas, the web-enhanced course is a hybrid (traditional and online) and it can almost be used in local environment. On the other hand, web-based course is always online, can be used in distance learning and all the operations in web-based course require a Web connection [14].

A web course has number of advantages including [14]:

- It is a convenient and inclusive at anytime
- It is dynamic and paperless learning

- It helps to build skills and innovative
- It is comfortable learning
- Web course makes the teaching is easier

One of the main strengths of CMS is a security and privacy. Security and privacy techniques have been implemented in the CMS to do the following tasks [14]:

- Student access controlled to activities and tasks
- Guest access controlled to activities and tasks
- Lecturer's Intellectual Property (IP) protected
- Copyrighted materials secured from hackers and crackers
- Student privacy protected from criminals
- Course content selectively released and updated
- Assignment submissions logged
- Tests and assignments more secure using some levels of security

MOODLE, and Blackboard are three common web-based learning management systems widely used in education, training, and knowledge management. This paper compares them functionally, with a particular focus on the using in the teaching and learning of courses [14].

3.1 MOODLE

MOODLE is a free software package designed to help lecturers and students as a tool to provide in creation of quality teaching. The MOODLE is abbreviated to Modular Object Oriented Dynamic Learning Environment built by Martin Douglas at Curtin University, Australia [10].

MOODLE has a number of advantages in education. MOODLE is easy to install, upgrade and use. It can be installed on as many servers as involved without an additional cost. MOODLE does not also require modification on Unix, Linux, Windows, Mac OS and any other systems [12]. It is implemented for educational aspects which some other e-learning platform is lack off.

MOODLE 1.6 [1] supports user name authentication. Each user is given an account and password to access the MOODLE portal site. Once logged in, users have access to the courses they are registered in. Lecturers are registered as users that can edit the course's site, including modifing the activities and marking students. The contents of course and activities almost are in the middle of the page. The types of resources are: text files, (X)HTML files, links to WebPages, images, multimedia files and links to uploaded files; while the activities commonly used are quiz, chat, forum, choice and assignment.

MOODLE [1] has a module to conduct survey on the users and it supports built-in template for the questionnaires, however it does not have facility to generate or insert a new questionnaire. An online survey using different tools was built then uploaded the survey website on the course page in MOODLE. Students participate in the online survey in their free time (any time).

Upon using the features that was described earlier, the advantages obtained and disadvantages (problems) are encountered by our experience point of view. First, the advantages of tutorial registration are:

- There is not need to physically come queuing in front of the coordinator's office,
- The registration takes place at the convenient time,
- Monitoring the number of registrations and avoid double entry.

However, the main disadvantage of tutorial registration is that the excel file contains only the name list without the ID and the engineering program.

Second, the advantages of the communication in MOODLE [1]:

- Avoiding regularly repeating and reminding students during lectures,
- Reduction in number of students enquiring for confirmation of activities,
- Immediate respond to students queries and issues through message,
- Motivating students to work outside of class,
- Saving time spent on writing questions which are usually quite lengthy,
- Allowing for more questions and discussion in class.
- Downloading in 'just-on-demand' basis before class,

3.2 Blackboard

The blackboard is considered a hybrid teaching tool [13]. The blackboard can be used by lecturers throughout the lecture to discuss ideas or identify main points. It is suggested that only main points or

ideas be written instead of long drawn out pieces of information. The blackboard can be a useful tool to help students visualizing key aspects of the lesson but may make things hard if lecturers attempt to teach a large group. Blackboard assessment tools include:

- Tests
- Surveys
- Assignments
- Grading can be automatic and/or manual
- Control over quiz/test features and functionality
- Availability, grading, reporting, and others
- Important technical/software considerations
- Alternative forms of assessment

Blackboard has a number of advantages:

- Integrate assessment with teaching materials
- Available on demand
- Randomised question selection
- Automatic grading with immediate feedback
- Reporting and analysis

However, blackboard has a number of disadvantages:

- Not suitable for testing of all skills and activities
- Needs to IT skills
- Time required to design and input questions
- Security
- Plagiarism

A Survey in blackboard is targeted to gather learner feedback. This means the results not associated with respondent. A survey also is managed via Survey Manager, it almost identical interface to Test Manager and it needs to be deployed in same way as a Test. In addition, survey can contain all question types but:

- No point values
- No random choices
- No correct/incorrect answer
- Cannot be graded (marked)
- No feedback permitted

In a Gartner Group's 2002 "Distributed Learning in Higher Education" Survey reports that 38% of users use WebCT, 26% of them us Blackboard, 25% no campus standard and 9% other [14].

Furthermore, Casey Green's Campus Computing Study of American Public Institutions reports the following [14]:

- 44.6% WebCT
- 27.7% Blackboard
- 23.1% No Standard
- 4.6% Other

4. Discussion

Blackboard and MOODLE are three popular web-based learning management systems widely used in education. In respects to functionality, Blackboard is better than MOODLE. Blackboard permits greater flexibility in designing course curriculum and study schedules, which is particularly fitting for continuing education courses. With many communication and discussion features, Blackboard facilitates active participation among lecturers and students of education courses, and allows more varieties in designing learning materials and resources such as the use of multimedia. The efficiency assessment and grading functions are also flexible enough to meet the special requirements of a wide spread of continuing education courses.

MOODLE distinguishes from other tools in flexibility and conformability. For example, we have used MOODLE in numerous courses from 2007 in Isra University. In "e-transaction" course, the quizzes in MOODLE were conducted in each individual class on different times set by the lecturer. However, the feedback from students was on the different level of difficulties of questions between lecturers, different format of quiz and also inconsistency in grading and feedback, or results were not given at the same time. As for the first, and second semester tests, they are set on fixed dates performed in a common venue.

Another point, in Blackboard, lectures often send email to all students, or to those in a subset workgroup. Whereas in MOODLE; lectures replaces emails with using the Forum instead. When lecturers post to the class Forum, that posting is emailed to the class participants, unless they have opted out (they can also receive daily digests, all set in their profile). Since the posting remains visible in the forum, those not receiving emails, can check for unread postings. Further, the posting remains visible and may facilitate further discussions.

MOODLE also has more conformability and convenience when teaching large class. The following has been identified as the major challenges in managing large classes [5]:

- Distribution/ organization of information.
- Communication.
- Time and place for discussion or presentation.
- Feedback opportunities.
- Group work.

However, we still have some open challenges relating to teaching and assessing students in large classes. We still question that how can Web 2.0 or Web 3.0 satisfy and solve the open issues in large classes? Some of these open issues are listed [7, 11]:

inability to get to know students,

- inability to reduce students feeling of anonymity,
- how to create interest and interaction in class,
- managing marking loads and maintaining consistency,
- dealing with email,
- scheduling office hours for consultation,
- assigning homework or tutorial materials,
- recording grades, and
- how to effectively communicate the subject material.

Another challenge is a security. Built-in security in e-learning tools is not sufficient to protect students and lecturers resources. But because of MOODLE is open so the developers can add extra level of security and enhance the protection method in MOODLE. We have improved the security by add codes that helps us to avoid and prevent some types of web attacks.

Yet, universities over world have not realized the importance of security of e-learning systems. These universities brought some ready security tools to secure their systems.

However, security principles (such as data integrity) of e-learning system could be lost. For example, an adversary (criminal) can penetrate the web system in many forms [3-4]. An insider adversary, who gains physical access to a web server, is able to destroy any type of static content in the root of a web server. It is not only physical access to a server that can corrupt e-learning systems. Malicious web manipulation software can penetrate a server machine and once located on the server such malicious software can monitor, intercept, and tamper online transactions in a trusted organization. The result typically allows the adversary full root access to server data and web server application. Once such access has been established, the integrity of any data or software on a server is in question.

One of the main trends is e-learning 3.0 that use Web 3.0 tools for social learning. New services on the Internet can be swiftly integrated into existing applications such as integrating Weki with Web 3.0. The primary risk comes from the fact that students and lecturers are not entirely realized that their universities do not control these web services. The servers are located in a variety of countries, therefore privacy laws and principles also differ from one country to another.

5. Conclusions and further work

The three main e-learning tools such as MOODLE, and Blackboard have been reviewed. We also comment on the most important aims of each tool and analyze the advantages and disadvantages. While both Blackboard and MOODLE are learning management systems with many in intersections, there are some key differences that we have noted in the Section 3 and Section 4. Our teaching experiences indicated that the MOODLE is effective in the e-learning development. However, MOODLE is not fully pure social software and thus we will understand fully social tools such as Web 3.0 to use it in the university classroom.

One of the main challenges that should be taken in account, the current e-learning systems faces some security issues because a security is not integrated into the e-learning development process.

In the next part of this research, we will arrange survey about the importance of e-learning systems in undergraduate education. We will evaluate the results in accordance to a number of criteria including security, performance, usability and flexibility.

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A Perspective on Online Degrees Vs. Face-to-Face in the Academic Field.

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Abstract

Lifelong learning is being promoted actively by outreach and initiatives like distance education through world campuses or online courses has been used as an effective tool worldwide. The recent efforts of outreach is online and distance learning programs which are gaining increasing importance among working professionals as well as students who want to do multiple courses or work simultaneously. This study examines the acceptance of online doctoral degrees in hiring scenarios. It seeks to find out the importance and preference given by employers to candidates who have an online degree.

It focuses on defining factors which are crucial to the design of online instruction that may improve the acceptability by stakeholders of degrees earned in online programs. For present purposes, such programs are defined as those in which students can obtain a degree either totally or partially online. The questions in the current research are intended to uncover information on why university degrees, earned in this way, are not perceived as equivalent to degrees earn in residential programs by hiring gatekeepers in a university setting.

1. Introduction

It is clear that online degree occupies a very important area of education because of the acceleration in communication technology and high demand on such degree by full time employee. However, on-campus degrees are still preferable by the employers for many reasons such as the residency in the school, interaction among students, interactions between students and instructors, in addition to the accessible resources that could be in the learners' hands any time. Learning for many employers, especially a full time graduate degree is more valuable over an online graduate degree. Employers have raised their concerns and objections for online degrees. By discovering the importance of these objections, course developers and instructional designers may be able to apply this information in ways that can alleviate those concerns. If that can be done, it may raise the perceived quality of online degrees earned by applicants to that of their traditional counterparts. Therefore, this study was designed to provide insight to "what counts" and to understand which instructional features affect the acceptability of online degrees in order to guide the future development of distance learning systems. Online Degree is preferred but yet it doesn't drive a higher salary package. Balancing between family, work, and education is so hard in many aspects. Many people nowadays are seeking online degree to overcome such hardship. But many employers don't even count online degrees as a part of educational experience. These internal and external conflicts cause many people to think twice before pursuing an online degree. It's suitable for some as it meets their needs; it's attractive because of its flexibility component and the balancing idea between family, work, and education, yet many people fear to take it up because of employers not seeing an added value to it.

2. Research Question

As indicated, the purpose of this paper is to examine the acceptance of doctoral online degree in hiring scenarios. Therefore, two research questions were developed for the purpose of this study.

RQ1: Which factors are most important to the acceptability of online degrees in the eyes of hiring decision-makers in the field of academe?

RQ2: What can be done by the hiring decision-makers in the Academe to improve online degrees?

3. Literature Review

3.1 Outreach & Online Education - One of the key initiatives of outreach has been promotion of higher education and its accessibility to one and all through distance learning or online teaching modes. Many reputed schools own world campus which caters to the needs of thousands of students across the globe. Some estimations show that online education has expanded at a rate that is more than 10 times the growth of the general postsecondary market (Allen & Seaman, 2005). Thus, there are millions of students who complete online college courses these days. Increased access to a higher education in this form has allowed people living in rural areas, working professionals, military personnel in distant locations, and single parents with busy schedules to earn college credits (Grenzky & Maitland, 2001). Many students have also taken advantage of online classes as it allows flexible scheduling. For example, many colleges and universities have reported that residential students seeking to increase their course load account for a substantial portion of those enrolled in their online sections (Carnevale & Olsen, 2003). The demand for online course has infused competition for new enrollments and thus has led the virtual institutions to expand both the number of degree programs and the number of graduate degrees that they award. For example, doctoral programs delivered online can be managed by students whose life circumstances prevent them from attending on-campus classes in the traditional way. Thus, the flexibility and convenience of distance learning serves their needs. However the question arises that when these online doctoral students try finding jobs are their degrees given equal importance as compared to a full time doctoral students of any university.

3.2 Current Scenario of Doctoral Programs in USA-There has been a steady increase in the doctoral programs in the United States over the years and with lifelong learning becoming the magic mantra of this knowledge age, it is expected to grow even further in the future. In 2004, the number of doctoral degrees awarded by research institutions totaled 42,155, the largest number of degrees ever awarded in a single academic year (Hoffer et al, 2004). As these trends continue, the U.S. Department of education projects that the number of doctoral degrees conferred will rise by 21% by 2015 (Hauser & Bailey, 2006).Half of all new doctoral graduates are expected to seek academic employment - with life sciences, social sciences, and education representing approximately 49% of the disciplines involved (Facts in brief, 2001). To fill this growing need, many institutions are moving to mirror residential coursework with online versions, or to create new degree programs that are offered entirely online. (Carnevale, 2005).

In summary, the number of graduate programs that are offered completely online is growing to meet the growing number of students and increasing need for new faculty. The strong demand is supported by research that favorably compares educational outcomes of online and residential programs. For example, many studies demonstrate student satisfaction, achievement and learning outcomes that are on par with residential programs (Bernard, Abrami, & Lou, et al.,

2004). Degree.net, a web-based service that reviews online courses of study, lists dozens of accredited doctoral programs offered by U.S. based for-profit, as well as online programs offered by nonprofit institutions (Bears & Bears, 2006). Online degree programs are even appearing in America's Best Graduate Schools published by U.S. News & World Report, which lists seven online doctoral programs in education alone. While none of the for-profit distance education programs offered by virtual institutions are accredited by the National Council for Accreditation of Teacher Education (NCATE), each has a form of accreditation that enables these institutions to advertise in direct competition with residential programs (Blumenstyk, 2003).

3.3 Online Degrees and their Acceptability-There is no question that online degree programs are a substantial part of today's higher educational system. Online distance education courses offer a convenient way for millions of degree-seeking students who are otherwise unable to attend classes in a residential setting to continue their studies. While controversial, research appears to have demonstrated that a degree earned online is in many ways similar to one earned in traditional settings. For example, online courses often have higher dropout rates (Carr, 2000; Jensen, 200 1), but successful students tend to indicate that they are "equally or more satisfied" with their courses when compared to those in "traditional" instructional settings (MacFarland, 1999; Sikora, 2003).

Not every student is successful with their coursework, and variations in success in an online course may be attributable to a student's age, learning style, and motivation (Dyrud, 2000; Diaz, 2002). This may explain why a number of students have migrated back to the classroom, where they simply feel more comfortable receiving their instruction "live" (Guernsey, 1998). Studies that examine no significant difference in test-score achievement (Russell 1999; Gagne & Shepherd, 2001) or retention (Bernard et al., 2004) have inherent flaws because students participating in many of these studies have selected the learning environment that they prefer. In other words, retention or achievement as units of measure are controversial in that they do not create a clear picture of whether online instruction is effective because other factors (such as learning style) cannot be easily taken into account using these methods.

A new area of research (which research?, Needs citation), however, has raised the question concerning the acceptability of degrees that have been earned solely or partly online. The purpose of this new area of research has been to investigate whether distance learning and traditional degrees are equal in the eyes of "gatekeepers" in different situations - those who review the credentials of applicants for various kinds of openings. These studies are not concerned with why students chose to enroll; neither are they concerned with comparing educational outcomes nor with evaluating the educational merits of distance learning. The question that these studies are concerned with has been whether gatekeepers see online degrees as having the same value for their purposes as a degree earned in a traditional residential

program. The results suggest that those who hold online degrees, or whose records include a significant amount of online coursework in their curriculum of studies, are not judged as having qualifications that are equal to those of graduates who earn their degrees in a residential program.

The concept of acceptability has been studied in several recent research settings. These include the following: using credits earned online as a credential when applying to a university graduate program (DeFleur & Adams 2004)1, applying for a job in a business hiring situation with a bachelor's degree earned wholly or partially online (Adams & DeFleur, 2006)2, seeking employment in a university faculty position (Adams & DeFleur, 2005)3, and seeking employment in the health professions (Adams, DeFleur, & Heald, 2007)4. In each of these studies, gatekeeper- respondents were asked to choose between candidates whose qualifications differed only in terms of whether they earned their credits online or in a traditional residential program. A more recent national survey of health hiring practices shows a remarkable consistency with the previous studies, with both quantitative and qualitative analyses yielding similar results. Only 6% of health profession employers indicated a willingness to hire an applicant with an online degree and only fifteen percent would accept an applicant with half of his or her courses earned online (Adams, DeFleur & Heald, 2007). Some respondents pointed out that online courses are more acceptable for training, certificates, and undergraduate classes, but not for graduate classes. Many comments indicated that interaction with professors and peers as being an essential part of an education and that these skills can only be gained by attending classes in a traditional setting.

This study continues a line of research regarding the acceptability of degrees earned wholly (or partially) online by evaluating the importance of those factors that negatively affect the perceived value of online degrees. While online degree programs represent a valuable educational opportunity for millions of people, permitting many to attend college - growing body of research reveals clearly that employers and university administrators regard traditional degrees as being far more preferable. A great deal of research has been conducted to compare online and traditional course work but little attention has been devoted to what happens to graduates of online programs when seeking to make use of their credentials. These findings have implications for students enrolled in online distance education degree programs, instructional developers and university administrators who manage continuing education programs.

4. Findings

The findings thus so far seem to suggest that in part, the perception of face-to-face contact with instructors and mentoring are an important key to what many would consider a

"quality" education. While the reputation of a university for academic rigor is also associated with acceptability, traditional classroom experiences are perceived to offer something more. It may be suggested that online programs, even those offered by institutions noted for excellent academic standards may always be regarded as "missing" key elements.

In summary, then, more research is needed in the area of distance learning and acceptability from the perspective of a potential employer. Further, online distance learning is an established method of delivery, and yet research in this critical area seems to be lagging. Experimentation with innovative technologies appears to be constrained by the institutionalization of content management systems and relying on faculty to work with complex digital media tools to develop innovative models for the delivery of instruction. Future research projects might focus on a more detailed examination of potential curricular solutions including;

1. Additional comparison studies to evaluate whether hybrid or blended learning satisfies the perception that classroom experiences, working with professors, and interaction are "missing." Some research appears to show that this method of distance learning has advantages in that hybrid classes include some face-to-face interaction. For example, hybrid classes are typically designed to offer online course materials, online interaction with teachers and students, and occasional face-to-face classroom based sessions (Delialioglu, 2005). Comparison studies suggest that student achievement rates and satisfaction rates are higher in hybrid courses that focus on study skills (Tuckman, 2002), computer sciences (Lilja, 2001) and in pure sciences (Persin, 2002). While these results seem impressive, the body of comparison studies that evaluate these delivery systems is limited.

2. The overwhelming majority of online, distance learning courses is structured around content management systems that employ text as the basis for all communication (Adams, 2006). The notion that some media is more effective than others or that they may enhance some learning activities is important to the acceptability debate. For example, advancements in streaming video technologies that allow synchronous communication (i.e., visual, verbal, and text) between a group of students and the professor have not been used extensively as a learning environment. While these technologies advance quickly, new models of online learning have been slower to appear. Perhaps new models using holographic projection systems coupled with rich internet applications will change the perception that face-to-face communication is "missing." In short, the perception of academic honesty, social presence, and the validity of degrees earned at a distance from a gatekeeper perspective should be more influential in the development of emerging educational technologies.

3. Finally, perhaps computer guided instruction may offer new approaches to online distance education. As Seymore Paperi (1980) pointed out, computers have the potential to be

more than a conduit for instructional materials. This line of thinking has been advanced by Cobb (1997), who suggested that a computer is part of the learning process - not simply a means for delivering content (Mietimeli. Nokelaincn, Kurhila, Silander, & Tirri, 2005). For example, computers can be programmed to assist learners by responding to their actions, perhaps by automatically selecting or sequencing content. When coupled with databases, programmed lessons can adapt and alter lessons by drawing on a network of resources. In this type of instructional system, each lesson is different - shaped by student test scores, their pacing, or by level of difficulty. The result is a knowledge-based tutor that adapts to, and interacts with students. This approach to online courseware represents a fundamental shift away from content management systems toward a holistic approach of instructional systems design.

5. Conclusion

The study thus reveals that even though online degrees are increasing importance yet they have the following objections attached when finding the right job:-

- (a) Face-to-face classroom experience,
- (b) Reputation of institution for rigor, and
- (c) Mentored learning experiences

These are the stumbling blocks for online degrees to be perceived as being as acceptable as traditional degrees. These findings may provide an important perspective on the difficult issue of how to design new approaches to distance education that will improve the acceptability of course and degree offerings.

6. Limitations of the Study

The present study just looks into the general idea of acceptability of online doctoral degrees. It has some personal thoughts and experiences linked with existing literature review. Both qualitative and quantitative data is required to back up specific studies in this field of research.

7. Implications and Future Researches

For the purpose of distance education, in general, and master and doctoral degree in specific to be acceptable by employers in academic and business and industry fields, distance education should provide activities, games and simulations. Moreover, by activating and facilitating the advanced technology in virtual learning, the issue of interaction and

communication between the instructor and the learners will be partially overcome. Online instruction should follow the face-to-face method in terms of lesson plan preparation, lesson execution, and pre, constructive, and informative evaluation that should be occurred to improve the entire elements of learning.

Areas of research could be to find out whether acceptability issue is only with few disciplines or is consistent for all fields. Future researchers can also look into aspects like how this trend varies or is consistent across other cultures and global academia as a whole .Does this hold true for other cultures and global academia as well could be another field of study

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<u>E-LEARNING IN EMERGING NATIONS - DAWN TOWARDS</u> <u>DEVELOPMENT</u>

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ABSTRACT

Globalization and technological change—processes that have accelerated in tandem over the past fifteen years—have created a new global economy "powered by technology, fueled by information and driven by Knowledge."The emergence of this newglob al economy has serious implications for the nature and Purpose of educational institutions^[11] As the half-life of information continues to shrink and access to information continues to grow exponentially, schools cannot remain mere venues for the transmission of a prescribed set of information from teacher over a fixed period of time. Rather, schools must promote "learning to learn," : i.e., the acquisition of knowledge and skills that make possible continuous learning over the lifetime. Information and communication technologies (ICTs)—which include radio and television ,as well as newer digital technologies like computer and the Internet—have been touted as potentially powerful enabling tools for educational change and reform .When used appropriately, different ICTs are said to help expand access to education, strengthen the relevance of education to the increasingly digital Workplace, and raise educational quality by, among others, helping make teaching and learning into an engaging, active process connected to real life.

KEYWORDS

ICT, infrastructural, distant learning, blendid learning, e-learning, digital divide

INTRODUCTION

ICTs stand for information and communication technologies and are defined, for the purposes of this primer, as a^[2] "diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information." These technologies include computers, the Internet, broadcasting technologies (radio and television), and telephony. The United Nations Educational, Scientific and Cultural Organization (UNESCO) uses the term *ICTs*, or information and communication technologies, to describe^{:[3]}"...the tools and the processes to access, retrieve, store, organise, manipulate, produce, present and exchange in formation by electronic and other automated means. These include hardware, software and telecommunications in the forms of personal computers, scanners, digital cameras, phones, faxes, modems, CD and DVD players and recorders, digitized video, radio and TV programmes, database programmes and multimedia programmes". Any kind of technology Can be understood as a tool or technique for extending human capacity.

In this sense, ICTs extend our human capacity to perceive, understand and communicate. The mobile phone enables us to speak from wherever we are to others thousands of kilometres away; television permits us to see what is happening on the other side of the planet almost as it happens; and the Web supports immediate access to, and exchange of, information, opinions and shared interests. In recent years there has been a groundswell of interest in how computers and the Internet can best be harnessed to improve the efficiency and effectiveness of education at all levels and in both formal and non-formal settings. But ICTs are more than just these technologies; older technologies such as the Telephone, radio and television, although now given less attention, have a longer and richer history as instructional tools.^[4] For instance, radio and television have for over forty years been used for open and distance learning, although print remains the cheapest, most accessible and therefore most dominant delivery mechanism in both developed and developing countries.^[5]The use of computers and the Internet is still in its infancy in developing countries, if these are used at all, due to limited infrastructure and the attendant high costs of access. In the field of formal education, ICTs are increasingly deployed as tools to extend the learner's capacity to perceive, understand and communicate, as seen in the increase in online learning programs and the use of the computer as a learning support tool in the classroom. Although universities were certainly leaders in engineering the Internet and interoperable computer systems to connect researchers for e-mail and data exchange, the use of ICTs for education and training has lagged behind other sectors in society. Education is seen as key in the process of achieving sustainable development. However, in order for formal education to contribute to sustainability, traditional systems and methodologies need to be re-oriented (Tilbury et al., 2002; Huckle and Sterling, 1996; UNESCO, 2003). Visser (1997, p. 2), for example, explains that:

"Centuries of development in education have not been able to avoid that nearly one billion people in the world are illiterate, more then 130 children don't attend school, and many of those who do, acquire knowledge that doesn't sustain them or is irrelevant for their needs. There is a clear indication that yesterday's solutions are inadequate for today's problems, and there couldn't be a clearer signal that doing more of the same is not a valid solution."

Hence efficient use of ICT in education sector is perhaps the solution for tomorrow.

BRIEF HISTORY OF ICTs IN EDUCATION

^[6]The history of the use of ICTs in education is relatively short. Before 1979, computers existed primarily in tertiary level educational institutions. Then, in the eighties, microcomputers began to be distributed to schools, and teachers began to grapple with the question of how to use computing for education rather than simply educating about computing. Starting from the midnineties, the use of ICTs in schools rapidly expanded in developed nations through curriculum support, networking, theprofessional development of teachers and software improvements. A growing number of researchers and educators began to develop applications that used hypertext, multimedia and networking to build cognitivist and constructivist learning environments aimed at improving learning.

In recent years, bandwidth has greatly increased and user familiarity with the Web and ICTs in general has evolved, contributing to an evolution of the Web. Some are referring to this

evolution as numbered "versions" or "generations" (Web 1.0, 2.0 and 3.0). Web 1.0 refers to the first implementation of the Web which mainly allowed users to search for information and read it. The main goal of organizations creating such Web sites was to establish an online presence and make information available to anyone at any time. The Web as a whole hasn't moved beyond this stage yet. Web 2.01 refers to the trend in social networking, user-generated content and software as a service rather than a product. Many of the social networking tools have been around for a number of years (forums, chats, etc.) but there are new trends in communication and collaboration tools which are emerging (e.g., folksonomies, wikis, blogs, tools like Facebook, etc.).

Web 3.0, an emerging concept, is used to refer to the artificial intelligence applications that will increasingly become integrated into the Web, as well as to the increasing interoperability that users will have between the diverse information databases and information sources on the Web. It is also called the "semantic Web," defined as "an extension of the World Wide Web in which Web content can be expressed in a format that can be read and used by software agents, thus permitting it to be found, shared and integrated more easily."2 Information and applications on Web 3.0 are expected to adopt a "microformat" as the use of personal devices such as mp3 players, cellular phones, TVs. The increasing trend of social networking is also proving to be very efficient tool for transmitting and sharing educational material and necessary knowledge towards a wide spectrum of people. Thus even very basic elements of ICTs could be used as potential tools for development of educational standards and levels.

E-LEARNING

It is a collective term for all the integrated learning methods that uses computer or the internet or various elements of element.



Fig 1: concept of E-Learning

E learning has basically 2 components, learning and knowledge management. Learning is providing of academic education based on the curriculum of the course and giving adequate training by efficient electronic methods.2nd component is the knowledge management. This refers to both information management and technology management. Information management refers to management large quantity of information in form of electronic content and arranging that information in various courses, chapters and topic and then to different users from different

fields. Technology management refers to the management of technology i.e software and hardware used in the management and distribution of the information in various ways. Thus these two elements and with the the necessary monitoring and infrastructure govern the E-learning phenomenon. The worldwide e-learning industry is estimated to be worth over thirty-eight (38) billion euros according to conservative estimates, although in the European Union only about 20% of e-learning products are produced within the common market. Developments in internet and multimedia technologies are the basic enabler of e-learning, with consulting, content, technologies, services and support being identified as the five key sectors of the e-learning industry. Hence economically E-Learning provides a very lucrative opportunity especially to the developing economies like India to strengthen their economy by investing in this sector and increasing FDI in this sector.

BLENDID LEARNING

^[7]Another term that is gaining currency is blended learning. This refers to learning models that combine traditional classroom practice with e-learning solutions. For example, students in a traditional class can be assigned both print-based and online materials, have online mentoring sessions with their teacher through chat, and are subscribed to a class email list. Or a Web-based training course can be enhanced by periodic face-to-face instruction.

"Blending" was prompted by the recognition that not all learning is best achieved in an electronically-mediated environment, particularly one that dispenses with a live instructor altogether. Instead, consideration must be given to the subject matter, the learning objectives and outcomes, the characteristics of the learners, and the learning context in order to arrive at the optimum mix of instructional and delivery methods.



Fig 2: concept of blended learning

OPEN AND DISTANCE LEARNING

^[8]Open and distance learning is defined by the Commonwealth of Learning as "a way of providing learning opportunities that is characterized by the Separation of teacher and learner in time or place, or Both time and place; learning that is certified in some way by an institution or agency; the use of a variety Of media, including print and electronic; two-way communications

that allow learners and tutors to Interact; the possibility of occasional face-to-face meetings; and a specialized division of labour in the Production and delivery of courses. Such courses are beneficial where the distance between the teacher and the learner is very large and hence face to face learning is not possible. Thus the electronic learning material is provided to the learner by post or by internet. Nowadays instructions and lectures are also delivered online to assist the students in distant learning. And there are provisions of electronically submitting the assignments and giving exams and evaluation and grading. Distant learning have taken education, specially specialized courses and language courses to the places where face to face learning never reached or if reached was never utilized. It has made education more reachable and understandable to each and every section of the society. Nowadays people from urban areas as well as villages are taking to distant learning courses. These have specially helped women who after marriage often have to sacrifice their education. But now they can take to distant learning and get the desired course at their door step without moving out of their homes. Distance learning has also made the children and youngsters to explore greater options in education. They now increasingly take to variety of courses during their vacations and enhance their intellectual abilities.



Fig 3: response to distant learning

This graph shows that the response of people towards distant learning through various means is quite high. People are increasing using this form of learning to enhance their technical skills in a very short span of time and in an economical way. Thus distant learning has given education a new meaning where it is not bounded in a classroom but freely spread towards the whole spectrum of people from all walks of life.

E-LEARNING CHALLENGES IN DEVELOPING COUNTRIES

^[9]These challenges are course challenges, challenges related to characteristics of an individual, technological challenges and contextual challenges.

> COURSE

The most frequently mentioned challenges concern issues relating to the course given. Concerns are raised about the content of the course, the activities undertaken during the course, the support functions provided, and the delivery mode of the course. The first issue identified here is the curriculum which stipulates much of the course actions and content. There are discussions on the need to develop new curricula specifically designed for an e-learning setting; thereby showing awareness that e-learning is different from traditional class-room based teaching. The subject content of the course also matters and refers to what is actually being taught or learned. Some discuss whether the content is interesting and relevant, accurate, up to date and in line with the needs of future employers. The Teaching and Learning Activities (TLAs) used during a course evidently affects e-learning. Another course issue is the delivery mode of the course. One talks about different levels of flexibility and how much personalization is needed for the students to be able to pass a course. The factor concerns whether students should be allowed to learn at their own pace and take the examinations when they want and if they should be allowed to choose the medium of content delivery. This factor is often discussed in a context of the global mobility of learners where the education is not nation-bound. Localization is also discussed.

> INDIVIDUALS' CHARACTERSTICS

The characteristics of the individual student, and in some cases the teacher, are much researched in developed countries, less so in developing ones. Student motivation is a factor that is frequently discussed in surveys on what affects students' satisfaction and capacity. Highly motivated students perform well in most cases whereas non-motivated students tend to drop out. The relation between motivation and other e-learning factors is rarely elaborated; the reasons for success or failure in the studies are simply referred to as "personal motivation" or "lack of motivation". Another factor is conflicting priorities that has to do with the amount of time students have to, and want to, devote to the course. Having enough time for learning is an important predictor of a students learning and retention and those who study more hours are generally more successful in their studies. A third concern is the student's economy and the economic prerequisites for studying. Financial difficulties and lack of student funding can be a predictor of student withdrawal. The student's academic confidence seems to be another good predictor of a student's success or failure in e-learning courses. According to some research academic factors such as previous academic experience and qualifications are the best predictors of a student's performance. The students also need some technological confidence; just having access to the technology is obviously not enough. The students also need to have the necessary computer skills and feel confident in using computers. Lack of experience with computers can be a major hindrance for learning especially for students who are

entirely new to computers whereas computer confidence accounts for much of the predictive power of good achievements. A further aspect, not directly related to the student's personal characteristics (but to individual circumstances), which has an impact on the students performance is the home environment. A stable and supportive study environment affect e-learning to a very large extent and some research even suggest that this is the most important factor influencing drop out and retention. Social support can be about the time and help the student get from family and friends (parents influence is very important here), but also about the attitudes on studying in itself.

Finally, the teachers' qualification and competence (in general and in online teaching in particular) and the time they have available for developing and taking part in e-learning courses matters.

> TECHNOLOGICAL CHALLENGES

Issues discussed are choices of technologies - radio, computers, audio cassettes, different Learning Management Systems (LMS) and so forth; the costs of using the technologies, how they are accessed and in what language they are available. One commonly discussed factor is access. The use of ICT for distance education evidently makes access to the technology an enabling or disabling factor and in developing countries the issue of access is often discussed in terms of availability of so called telecentres and Internet cafés. Access refers not only to whether one has physical access to a computer and an Internet connection, but also to the reliability of the connection and the bandwidth - basically everything that is needed to access the full range of the content needed. A second factor is the cost of these technologies. This factor is only discussed in developing countries where there is a need for affordable and low-cost ICT alternatives (such as television, radio and telephones) and low user charges. A third factor corresponding to the technology is the software and interface design. Aspects that are discussed are whether the LMS chosen supports the chosen learning model and pedagogy and if the software is easy to use (i.e. human-computer-interaction issues). Finally there is the issue of localization; to what extent the technology and software should be adapted in order to fit local culture and languages. Most research suggests that localization is of benefit for the students and the language used is often a good predictor of outcome. Localization in this case is about embedding cultural and religious values and aesthetics into the design of the technology and software.

> CONTEXTUAL CHALLENGES

The context of e-learning includes the context of the delivering organisation (typically a university setting) as well as the context of the society in which the e-learning takes place, including culture, traditions, rules and regulations. A frequently addressed issue here is that of the organisation's knowledge management or knowledge building. This

factor is addressed in terms of the need for a knowledge repository built on research and evaluations and some discuss the importance of sharing experiences among e-learning institutions and to establish e-learning units. E-learning programs also need economy and funding for their activities (both in terms of human resource development and for the technology). In the papers this issue is also discussed in terms of getting return of investments and cost sharing for e-learning projects. Another institutional issue is to make provision for the required training of teachers and staff, an often neglected factor.

CASE STUDY OF INDIA

^[10]India has formulated a department of information technology which comes under the ministry of communication and information technology. Its vision is the e-Development of India as the engine for transition into a developed nation and an empowered society. e-Development of India through multi pronged strategy of e-Infrastructure creation to facilitate and promote e-governance, promotion of Electronics & Information Technology- Information Technology Enabled Services (IT-ITeS) Industry, providing support for creation of Innovation / Research & Development (R&D), building Knowledge network and securing India's cyber space. Various programs undertaken by this dept. in the field of e-learning are:

> Multimodal Digital Distance Education for IT & other Critical Technologies

PROJECT OBJECTIVE: To evolve appropriate Courseware Engg. methodologies for making available quality coursewares at reasonable cost. Field experiments with different modes of Digital Distances Education modes.

ACHIEVEMENTS AND OUTCOMES:

- PG Courses in 6-semester M.Tech. IT (Courseware Engineering) has been designed, developed and offered through Multimodal Digital distances Education format.
- 6 semester ME in Software Engineering course in Multimodal Digital distances Education format (Eleven module have been designed, developed).
- 4 semester M.Tech. IT (Courseware Engineering) course has been designed, developed and offered through face-to-face mode since July 2004.
- 4 semester PG Diploma course on Multimedia and Web Technology has been designed, developed and offered through Multimodal Digital distances Education format.

> <u>Training of Trainers in E-learning</u>

PROJECT OBJECTIVE: To introduce fundamentals of E-learning, H/w and S/w and train teachers for implementing e-learning for the better educational methodologies.

ACHIEVEMENT AND OUTCOME:

- 240 teachers trained (120 from each centre) in use of e-learning in education.
- Trained teachers will be able to locate and use/ reuse the course contents and create their own content in e-learning in their area of specialization and they will act as master trainer for their parent Institute.

• Create multiplier effect to use ICT technologies and create awareness about the usage of information tools, blending it with traditional skills to enhance quality and productivity in education.

Content-Based Streaming and Real-Time Regional Language Captioning of E-Learning Video Data

PROJECT OBJECTIVE:

- To develop new standards and algorithms for e-learning adaptive streaming applications that can optimize the bandwidth utilization. For this, a real-time system is proposed for dynamically changes the resources allocation within a live video streaming session.
- A Regional language captioning is proposed for complementing the end user's comprehension of the lectures delivered in English. The product will have to be deployed and tested through ERNET in few Navodaya/ Central schools.
- A standard Media Markup language needs to be designed to apply the principles of the Web to multimedia, creating continuous Media Web.

ACHIEVEMENTS AND OUTCOMES:

- Standardized development tools for E-learning courseware.
- Software for content-based delivery and distribution of E-learning courseware.
- Documentation and dissemination in terms of research papers of the methodologies and framework for enhanced E-learning.

NATIONAL DIGITAL LIBRARIES CELL

Various digital libraries formulated by different agencies in collaboration with the dept. of information technology are:

- Indian National Library in Engineering Science and Technology Consortium (INDEST), IIT-Delhi- <u>www.indest.iitd.ac.in</u>
- Indira Gandhi National Center for Arts (IGNCA), New Delhi <u>www.ignca.gov.in</u>
- Vidyanidhi Digital Library, University of Mysore. <u>www.vidyanidhi.org.in</u>
- > ERNET, India New Delhi, Digital Library http://www.digitallibrary.ernet.in
- > Information and Library Network Centre, Ahmadabad Gujarat www.inflibnet.ac.in
- National Institute of Science Communication and Information Resources (NISCAIR), Dr. Krishanan Marg, New Delhi-110012 - <u>http://www.niscair.res.in</u>
- \triangleright
- V.V.Giri National Labour Institute, Noida: <u>www.vvgnli.org</u>



Fig: 4 comparison between e-learning and non e-leaning groups.

DIGITAL DIVIDE

The term digital divide refers to the gap between people with effective access to digital and information technology and those with very limited or no access at all. It includes the imbalances in physical access to technology as well as the imbalances in resources and skills needed to effectively participate as a digital citizen. In other words, it is the unequal access by some members of society to information and communication technology, and the unequal acquisition of related skills. The term is closely related to the knowledge divide as the lack of technology causes lack of useful information and knowledge. The digital divide may be classified based on gender, income, and race groups, and by locations.^[1] The term global digital divide refers to differences in technology access between countries or the whole world. This is same as the monetary divide between the rich and the poor. Rich having many education facilities and poor having no facilities at all in remote regions.



Fig 4: growth of internet users in developed and developing nations.

CONCLUSION

Thus we can say that ICT has the potential to replace a teacher by a computer and it is doing so with greater pace. The policy makers should make greater effort to solve the various issues coming in the path on implementation of ICT effectively in education like cost and infrastructural needs. If these issues are dealt with effectively then the ICTs could transform the face of education in an unimaginable better way. It could take the education to the roots where it is most needed to bridge the digital gap. And once this is achieved then it is very much possible to achieve the high levels of literacy by developing countries like India.

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International Product Design & Development Graduate Courses: The MIT-Portugal Collaboration

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Abstract

The Product Design and Development (PDD) course is part of the graduate curriculum in the Engineering Design and Advanced Manufacturing (EDAM) study in the MIT-Portugal program. The research participants included about 100 students from MIT, EDAM, and two universities in Portugal, Instituto Superior Técnico (IST) with Universidade do Porto (FEUP). We investigated the PDD EDAM course in the context of Project-Based Learning (PBL) approach as well as two other groups who studied a similar course in a different setting. Research tools included questionnaires, with questions related to students' learning outcomes and perceptions as well as focus groups with EDAM faculty and students. In a question related to the product life cycle stages the MIT and EDAM students listed on average a higher number of items than that of the IST & FEUP students, indicating a higher level of learning. The learning approach that follows the MIT PDD course has been instrumental in successfully incorporating hands-on activities and students-faculty interactions into the EDAM program and in creating collaborations between faculty from MIT and Portuguese universities. While the PBL approach reported here was done mostly in a faceto-face setting, it is not restricted to this mode. It can be used also via distance and e-Learning technologies to help graduate students from various countries increase their access to quality university education for a larger percentage of the population. However, the lack of experience of the integration of e-learning, either synchronous or asynchronous, into teaching in a PBL mode, calls for further research in this domain.

1. Introduction

Engineering is under constant change due to increasing globalization, impacting the way engineers work and companies make use of their employees' innovation. As Vest [1] noted:

"The engineering workforce of tomorrow, and indeed that of today, will face profound new challenges. Every day the men and women of this workforce will face the stress of competing in the fast-paced world of change we call the knowledge-based global economy of the twenty-first century. They will also face even larger challenges because the nation and world will need to call on them to seize opportunities and solve global problems of unprecedented scope and scale." (p. 235)

This is the context in which the MIT-Portugal Program (MPP) has been formed as an initiative by the Portuguese Government. MPP, which includes six Portuguese Universities and the Massachusetts Institute of Technology, was created after recognizing that Portugal was lagging behind in the world economy for the past decade or more. MPP, together with programs with other foreign universities, was initiated with the objective of enhancing Portuguese higher education and bringing it closer to industrial needs [2]. MPP is divided in four different focus areas: Biotechnology, Sustainable Energy Systems, Transportation Systems, and Engineering Design and Advanced Manufacturing (EDAM). Within the EDAM focus area, three Portuguese engineering schools are involved: Escola de Engenharia da Universidade do Minho (UM) in Guimarães, Faculdade de Engenharia da Universidade do Porto (FEUP) in Porto, and Instituto Superior Técnico (IST) – Universidade Técnica de Lisboa in Lisbon.

The main objective of the Engineering Design and Advanced Manufacturing (EDAM) focus area is to provide Portuguese industry with people with higher education levels and global perspectives on engineering design and product development – the core capabilities in technological innovation. EDAM

itself is divided in two separate third cycle study programs: the doctoral program in Leaders for Technical Industries (LTI) and an Executive Masters program in Technology Management Enterprise (TME). The set of courses devised to fulfill the objectives for these programs is explained elsewhere [2].

One of the key courses offered to both LTI and TME students is the Product Design and Development (PDD) course. This course was developed based on project-based learning, as a means to introduce students to the challenges commonly confronted within the engineering profession. The engineering profession involves handling uncertainty, incomplete data, constant change in the working environment, and conflicting requirements from various stakeholders. Despite the superiority of project-based learning for addressing these challenges, lecture-based delivery is still common practice in many universities and colleges [3].

Project-based or problem-based learning (PBL) has been defined in the educational literature rather broadly. PBL has been used interchangeably for problem- and project-based learning. Thomas [4] who reviewed research on PBL found five criteria for classifying this approach:

1. Centrality: PBL-type projects are central to the curriculum.

2. Driving question: The projects focus on questions or problems that "drive" students to confront central concepts and principles of a discipline.

3. Constructive investigations: The central activities of the project involve students' knowledge construction.

4. Autonomy: Projects are student-driven to a significant extent.

5. Realism: Projects are realistic or authentic.

With a strong encouragement of the ABET engineering accreditation criteria upper level engineering courses have evolved over the years from projects "invented" by faculty to industry-related projects where companies provide authentic problems, along with expertise and sometimes financial support [5, 6]. Examples of studies that investigate the effect of PBL in higher education included cooperative undergraduate student projects [7], science projects carried out by prospective teachers who acted as practitioners and as instructors [8], and a research conducted at the Technion, Israel Institute of Technology, which integrated project-based learning into three academic chemistry courses [9]. In the latter study, undergraduate science and engineering students who carried out PBL activities performed significantly better than their control peers not only on their posttest, but also on their course final examination. The results indicated that PBL incorporated into academic courses can enhance students' understanding of chemical concepts, theories, and molecular structures.

Developments in student-centered approaches, such as project-based learning, are just starting to make a dent in the practice of engineering education [10, 11]. There is a gap between Portuguese universities and industry with respect to product development and entrepreneurship. Teaching these topics is expected to promote students' thinking skills and ability to successfully launch new businesses [12]. Particularly at senior levels of engineering degree programs, others are also experimenting with project-based learning. The differences between freshmen and seniors in design problem solving are another important topic of research. Researchers performed a comprehensive study to analyze the behavior of freshmen and senior students when faced with a typical open-ended design problem. Results have shown that seniors produced higher quality solutions, spent more time solving the problem, considered more alternative solutions and made more transitions between design steps than freshmen [13, 14]. Given the results from this study, one can infer that the difference between freshmen and seniors is the capacity of the latter to concentrate not only on solving the problem but also on setting the problem itself [15]. This is an extremely important fact, often seen in freshmen's work method: concentrating on problem solving, relying on rational and cognitive tools and deductive procedures. Design problems are oftentimes ill-defined and always encompass nontechnical issues, which render deductive and rational approaches inadequate before the actual problem is well set and a reasonable design boundary is drawn.

There are a number of Universities that have excelled over the years in teaching product development to their undergraduate and graduate students, one of which is undoubtedly MIT. Product development encompasses activities that are part of the product lifecycle, starting with a market need and ending in the production and sale of the product. According to Ulrich and Eppinger [16] the product development process is the sequence of activities carried out by an enterprise to design, build, and commercialize a product. The PBL approach to teaching lends itself to the broader perspective that is needed for today's engineers, who must be capable of crossing boundaries to understand technical and non-technical issues in design problems and collaborate with peers from variety of disciplines.

2. Research Goal, Questions, and Setting

The goal of this research was to assess the Product Design and Development (PDD) course primarily within the EDAM focus area of the MIT-Portugal Program. The research included graduate students who were divided into three groups: (1) Engineering Systems Division at MIT, (2) EDAM program, which included students from three universities in Portugal, and (3) Instituto Superior Técnico – Universidade Técnica de Lisboa (IST) and Faculdade de Engenharia da Universidade do Porto (FEUP). The EDAM course is a PhD level course – or, in the European jargon, at a third cycle level – whereas the others are all at a Masters level. The research questions called for (1) assessing the PDD EDAM course and (2) finding similarities and differences between the three groups who studied the PDD course.

2.1. Condensed Teaching Weeks vs. Semester-Long Traditional Courses

As noted by the National Academy of Engineering [17], to maintain economic competitiveness and improve the quality of life for people around the world, engineering educators and curriculum developers need to "anticipate dramatic changes in engineering practice and adapt their programs accordingly." Along these lines, one of the topics of most interest was the effect of the particular method of teaching within the MIT-Portugal Program. The courses are taught simultaneously to students from the three Portuguese universities in a co-located way by a team of MIT faculty and Portuguese faculty from the three Universities involved. Since this was a first experience in PBL for people from remote places working together, it would be too complicated to also introduce distance education as a means at the same time. However, courses in other domains of the MIT-Portugal Program, such as Transportation, already started employing distance education.

Since the universities the students attend are distributed across Portugal, the courses in this program are taught in two condensed periods of one week classes, separated by six weeks without classes. A second reason for the condensed week approach was to involve students in the TME program that would retain their job during the program. In the beginning, this structure was considered potentially disruptive. However, it does reflect current product development practice, which in many cases is conducted on a globalized basis, in which development teams are dispersed around the world [18]. The geographical distribution of the team provided us with a realistic environment useful for PBL and a way of assessing whether this way of developing products has significant implications on the quality of the products, the teamwork or the teaching and learning experience.

2.2. The Product Design and Development Courses and Research Participants

All three PDD courses used the textbook "Product Design and Development" [16] as a foundational resource, but some extra readings were sometimes proposed for some specific topics.

The MIT graduate students studied a project-based semester-long PDD course. Within the EDAM curriculum, the PDD course is part of the Ph.D. and Advanced Study programs. The EDAM PDD course focuses on teamwork, integration of interdisciplinary domain knowledge, with emphasis on system thinking in an industrial setting [19]. The EDAM course was taught by Portuguese faculty from IST, FEUP, and UM, in collaboration with MIT faculty in a condensed schedule with emphasis on project-based learning. This program has a condensed structure. It starts with one-week of intensive lectures, followed by six weeks without lectures. This structure repeats and ends with students' presentations. During their two six-week periods without classes, students have to turn in nine assignments designed to guide them through the product development process, which is adapted to their specific project. Instructors then comment on these assignments individually. Each professor sends his comments independently of the others. This process helps the student teams improve their projects towards the final presentation. After the second six-week period, the students convene for presentations of their projects, in which they also have to show a working prototype and hand in a full report. The third research group – IST and FEUP – took two separate, more traditional, semester-long PDD courses. These two groups were combined because their pedagogical approaches were similar.

About ten EDAM faculty and 116 graduate students participated in this study. The students who responded to the pre-questionnaire consisted of 50 MIT, 25 EDAM, and 41 IST & FEUP students. Figure 1 describes the distribution of these students by their prior academic degrees: B.A. and M.A. or higher.



Figure 1. Graduate students' distribution by their prior academic degree

Comparing the students' distribution by prior academic degrees using Pearson Chi-Square, no significant differences were found between the three research groups. The students were asked to specify their area(s) of expertise and number of experience years in each of those areas. Many students indicated more than a single area of expertise.

Table 1 lists the students' number and percentage of the entire population by their declared areas of expertise. The percentage sum exceeds 100% as students were able to specify more than one area of expertise. The distribution shows that engineering is the most prevalent expertise, followed by management and manufacturing.

Table 1. Students' areas of expertise

Area of Expertise	Ν	Percent
Engineering	75	60%
Management	66	52%
Manufacturing	51	41%
Industrial Design	36	29%
Other	28	22%

Using Pearson Chi-Square, no significant differences were found between the three research groups with respect to distribution of work experience in any one of the areas, except for engineering. The distribution of engineering work experience, showed that the vast majority of MIT graduate students have three or more years of engineering experience, while most of the Portuguese graduate students (EDAM and IST & FEUP), have less than three years. This difference was significant ($_{-} = 25.74$, p<0.0001). Since the only difference found between graduate MIT and Portuguese students was the engineering work experience, we revisited the distribution of academic degrees. Examining MIT and Portuguese students with respect to their Master degree in engineering, we found a significant difference ($_{-} = 20.87$, p<0.005). There were significantly more MIT students holding a master degree in engineering (80%) than their peers: 40% in EDAM, and 61% in IST & FEUP.

2.3. The Research Tools and Methodology

Research tools included (1) pre- and post-questionnaires, administered to the students of all three research groups, (2) focus groups for EDAM faculty and students, and (3) end-of-semester perception questionnaire. We focus on the analysis of several questions related to students' understanding and perceptions. Questions included describing key PDD concepts and processes, ranking reasons for product success, and identifying team and individual skills required for working on a product development project. In the open-ended questions, students' responses from all three groups were analyzed and the extracted items were grouped into categories. These categories were primarily based on the courses textbook [16] with refinement based on items gleaned from the text written by the students.

The study has employed the qualitative approach in the analysis and interpretation of data. The analysis of the responses to the open-ended questions, focus group transcripts, and end-of-semester perception questionnaire was based on the constructivist and interpretative method [20]. The analysis focused on students' thinking process and on the perceptions of both students and instructors. In order to produce reliable interpretations, data analysis was constructed gradually. The collected data was first read and

processed, listing significant words, phrases, and sentences. We then categorized the data. All responses and transcripts were independently read and interpreted by three experts in engineering and science education. Throughout the analysis process, the suggested categories, views, and insights were examined and discussed, until consensus was reached.

Study corroboration and trustworthiness were established both by methodological and investigator triangulation [20]. Methodological triangulation was obtained by the convergence of data from three sources: (a) responses to close- and open-ended questions, (b) focus groups transcripts, and (c) written perceptions. Investigators triangulation was obtained by having the data jointly analyzed by the three experts.

2.4. Sample Products Resulting from Students' Projects

Examples of the products that the MIT teams developed as part of the PDD course were a battery integrated carry-on bag for frequent business travelers, a medicine dispenser with two compartments, remote keyless door opener, a task management system for blind people living with others, a rechargeable briefcase, and a rack for storing cans and bottles before taking them in for a refund.

Examples of project-based products the EDAM teams developed were "baby bottle anywhere"¹, a portable device to easily carry bags, a soap delivery system to help parents support children's hygiene, and a trash compactor.



Figure 2. Trash Compactor – an example of a product developed by an EDAM team Figure 2 presents the trash compactor which operates by exerting pressure on the compactor lid. The telescopic body will collapse as the bottles or cans are crushed.

The IST teams developed a device for exploitation of solar energy for glacier refrigeration, a cane with sensors for the blind (Portuguese patent DOM PT 1370), and an orange juicer for children. Figure 3 presents the cane, which operates by detecting obstacles using an optical proximity sensor. When an obstacle is detected, be it a hole or a protrusion, the cane vibrates. Different vibration frequencies help the user know if the obstacle is a hole or a protrusion.



Figure 3. Cane with sensors for the blind – an example of a product developed by an IST team FEUP teams developed a solar energy supported baggage, a Web platform for storing medical data, and a social network for elderly people.

3. Findings: Learning Outcomes

The findings of the questionnaire and their analysis are divided into three sections: critical success factors for creating a "good" product, product development activities, and individual and team skills.

¹ a baby bottle nipple that can be attached to any baby food package, dispensing the use of a baby bottle

3.1. Critical Success Factors for Creating a "Good" Product

To analyze changes in students' responses before and after the PDD course, we compared responses to several questions. One of the questions called for ranking critical success factors for a "good" product. Table 2 lists the pre and post average ranking on a 1-5 scale of the entire student population. The score of the post is consistently higher than that of the pre. The highest ranking items in both the pre and the post are fulfillment of (1) the product's intended function and (2) critical customer need. Trend, portability, fair price, and ease of use increased the most (0.7, 0.6, 0.5 and 0.5, respectively). These factors increased the most due to the fact that in the post-questionnaire, the students had to relate these factors to the product they had developed in the PDD course.

	PRE N = 109		POST N = 75	
	Mean	S. D.	Mean	S. D.
The product is easy to use	3.8	1.3	4.3	1.0
The product is attractive	3.2	1.5	3.6	1.2
The product is trendy	2.2	1.3	2.9	1.3
The product is novel	2.7	1.5	3.1	1.5
The product's price seems fair	3.5	1.5	4.0	1.1
The product is portable	2.2	1.4	2.8	1.4
The product fulfills its intended function	4.6	0.9	4.6	0.9
The product fulfills a critical customer need	4.3	1.3	4.5	1.0

Table 2. Students' ranking of a product's critical success factors

The next question called for ranking reasons for product success despite failing technical specifications. The pre and post responses for MIT, EDAM, and IST & FEUP are presented in Figure 4, Figure 5, and Figure 6, respectively.



Figure 4. Reasons for product success despite failing technical specifications: MIT graduate students' responses ($N_{pre} = 47$, $N_{post} = 27$)



Figure 5. Reasons for product success despite failing technical specifications: EDAM graduate students' responses ($N_{pre} = 27$, $N_{post} = 21$)



Figure 6. Reasons for product success despite failing technical specifications: IST & FEUP graduate students' responses ($N_{pre} = 35$, $N_{post} = 26$)

Examining the responses, we see that overall, the ranking in the post-questionnaire is higher than that in the pre-questionnaire for all three groups. The highest ranking items for the three groups were "Fulfills its intended function" and "Fulfills a critical need", both ranking above 4. These are followed by ease of use and fair price. "Trendy" and "Novel" are low-ranking items. Statistical analysis of the relative differences from pre to post revealed no significant difference between the three groups for any one of the items. Based on this and the similarity of ranking we conclude that the three groups had similar understanding of the reasons for product success despite technical failures.

3.2. Product Development Activities

We analyzed two questions from the post-questionnaire that were related to product development activities. The first question was: "List the activities that occurred in the development of the product your team carried out." Following is the list of ten categories which emerged as a result of the item analysis and validation by two experts, arranged by the product lifecycle phases: 1. Social interactions – PDD-related team management, face-to-face or electronically-mediated meetings; 2. Planning and brainstorming – including mission statement; 3. Concept development – including generation, selection, improving, and testing; 4. Market research – survey, interview of needs, questionnaires, competitors research; 5. Analysis & design – Project and product analysis, benchmarking, architecture, design; 6. Prototyping – creating a prototype of the product being designed; 7. Prototype testing – including marketing, patent, and risk; 10. Presentations – students' class presentations of their designed product.

The point score reflect the number of different items we found in each category.

Research Group	N Items	N Students	Items/Student
MIT	218	26	8.38
EDAM	146	17	8.59
IST & FEUP	157	21	7.48
Total	521	64	8.14

Table 3. Number of product development items listed by students in the post questionnaire

The point score reflect the number of different items we found in each category.

Table 3 presents the number of product development items listed by students in the post questionnaire and shows that overall students provided detailed responses. MIT and EDAM students listed on average a higher number of items than that of the IST & FEUP students. Since the items relate to the various stages of the product life cycle, a higher ratio of items per student indicates that the student has internalized the stages by engaging in their actual performance. Thus, it is a way of assessing the level of learning that took place. The MIT and EDAM students scored higher in items per student, indicating profound learning. This is also one indication of the effectiveness of the project-based learning approach compared with the more traditional approach used for teaching the IST & FEUP groups. The close equivalence of the MIT and EDAM students indicates that the "concentrated" curriculum in EDAM is quite effective (perhaps even more than the standard approach because the MIT students had more engineering experience). We found out that the two highest-ranking categories students listed were market research and concept development. These were followed by prototyping, analysis & design, and business plan & IP.



Figure 7. Distribution of product development categories in the post questionnaire by research group Comparing the distribution of categories in Figure 7 by the three research groups, we see that overall the pattern is similar, but there are some interesting differences. MIT students were more inclined to mention later product lifecycle phases, such as prototyping, prototype testing and modification, than their Portuguese peers. This has led to a more balanced approach to product development, in which every phase of the process gets proper attention.

EDAM students were more focused on early stages of concept development and market research, as well as on later stages of writing a business plan and attending to IP issues. This focus is a result of the way the assignments were designed. During the first four weeks of the course (of which the first is devoted to intensive lectures), most of the basic concepts are introduced, and the students work intensively on them, with awareness of business aspects from the outset. In the second half of the semester, the workload decreases somewhat as the students approach the business plan preparation and final presentation.

Analyzing the influence of the course structure of condensed weeks of classes followed by periods without formal class meetings, we concluded that this had no effect on the overall performance of students. The percentage of time spent on social interactions is similar to that of the MIT students and higher than that of the IST& FEUP students.

The fact that the students stayed for a full week at the same location, in the same hotel, working intensively on their project is in itself a team building experience. This helped them communicate when they were dispersed later, during the two six-week periods without class meetings. Although not explicitly asked in the questionnaire, in some informal discussions of the authors with the students, students indicated that most of their interaction during this six-week break was frequent, using email and Skype. The students acknowledged, however, that this working mode was made possible only after the team members had gotten to know each other well enough to freely use electronic means of communication. The faculty feedback on the students' assignments is also done electronically. Every assignment is graded and commented by the faculty during the two six-weeks periods without classes.

Comparing the MIT and EDAM students to the IST & FEUP students, we see that Analysis & Design was highest for IST & FEUP students. This may be a side effect of the background of these students. About half of them have a mechanical engineering background, where analysis is a key factor to their success in college. On average their work experience is limited (see Figure 2), so they rely on what they learn in the course to ensure that their project progresses as it should. This is also reflected later on in their lack of commitment to prototyping and prototype testing, an unfamiliar area for them, and one that is also not emphasized in the traditional course syllabus or the assignments schedule.

The attention to Business Plan and IP is critical for all of the Portuguese students. Both IST and EDAM students were mindful of IP issues, but in different ways: IST students filed a relatively large number of patents while EDAM students were encouraged to search extensively for prior patents that could impinge on their proposed products. MIT students were not encouraged to file patents, although IP issues were mentioned in the course. These differences in IP-related foci are reflected in Figure 7.

The second question related to product development activities, which focused on marketing, was: "*List in descending order of importance three activities that you would carry out in order to market and promote your product.*" Since the question was open-ended, we analyzed the students' free text responses by setting categories, validating them, and classifying the items gleaned from the responses into these categories.

The overall response pattern of the three research groups was similar. The similarity was most apparent between MIT and EDAM. This again indicates very similar learning experiences in the very different learning modes. On the other hand, IST & FEUP students place more emphasis on campaigns and advertising using in particular electronic media. IST and FEUP students have market research and supply and demand chain partnership scores lower than those of their MIT and EDAM peers. From a product development perspective, IST & FEUP students rely more on downstream commitment from marketing campaigns than on upstream market studies or on integrating product development with strategic decisions from the company. These differences can be attributed to the fact that IST & FEUP courses were mostly theory-oriented and lacked practice in being engaged in an industry-like environment.

3.3. Individual and Team Skills

The questionnaire included two open-ended questions related to individual and team skills. The first question, aimed at understand students' views on team skills necessary to develop successful products, was phrased as follows: "What two most important TEAM skills are required while working on a product development project?" Figure 8 presents the results. In this question, as in the previous one, the IST & FEUP group deviated from the similar pattern exhibited by the MIT and EDAM groups. IST & FEUP students estimated the importance of project management and organization, which is a critical topic in developing new products, to a lesser extent than their MIT and EDAM peers. In the pre-course questionnaire, creativity and open-mindedness were ranked by the IST & FEUP group higher than by MIT and EDAM. This likely is due to differences in these students' backgrounds. Indeed, as Table 1 shows, IST & FEUP students included designers and architects, who are typically known to consider these traits as important more than engineers do. In IST, creativity is especially emphasized, and an entire lecture is devoted to this subject, a fact that probably contributed to these differences between the groups.



Figure 8. Distribution of team skills in the post questionnaire by research group

Similar to the first question, but relating to the individual skills as opposed to team skills, the second was as follows: "What two most important INDIVIDUAL skills are required while working on a product development project?" The results of the analysis of students' responses to this question, indicated substantial differences between the three research groups. It seems that IST & FEUP students misunderstood the term "individual skills" within a product development team, taking it to mean individuality or individualism. IST & FEUP students indicated engineering skills as being important more than twice as many times as their MIT and EDAM peers. This too can be explained by the difference in the groups' professional composition – IST & FEUP students lacked professional engineering experience and therefore emphasized the need for it at the expense of teamwork, as they felt lack of engineering experience during their project work.

An interesting difference exists in the view of EDAM students on originality, creativity and openmindedness between the team and the individual. The students attribute this skill almost entirely to the individual and not to the team. The pattern for MIT students, while similar, is less drastic. For IST & FEUP students there is hardly any difference between originality, creativity and open-mindedness of the team and the individual. It is suspected that these results (more than other differences between groups found in the study) reflect cultural differences between Portuguese and American students.

4. Perceptions of Students and Faculty

Students and faculty perceptions were gathered from two sources. The post-questionnaire contained a question in which students were asked to list advantages and disadvantages of the project-based learning approach (for MIT graduates) and of the EDAM program (for EDAM graduates) in respect to their PDD courses. The second source was focus groups with EDAM students and faculty. Examples of MIT and EDAM students' responses are provided below.

4.1. MIT Students' Perceptions

MIT students provided several insights into the contribution of project-based learning to their career. One student said:"I think that project-based is the best way to learn in PDD class as it leads students to think about how to apply the knowledge in the project. Lecture-only approach will not be beneficial if we don't have to work on any project in class." Advantages listed by another student included: "Apply the classroom directly to the project. [We gained] real hands on experience and outside the normal job description. Liked getting hands dirty, and going out to field." Yet another student provided additional benefits: "[We] go through a complete cycle of development; Hands on experiences with each activity and their importance."

The combination of teacher- and student-centered approaches was well received: "Frontal lecture-only approach was useful when we learn something new such as concept generation or selection methods. On the other hand, project-based learning approach made us stay active throughout the entire semester. Also the experience that we learned from our project gave us a very clear connection to the knowledge that we learned from lectures."

Main disadvantages students noted included: (1) "There was a huge learning curve that took a lot time for the project... [We] wanted to learn material better, but [were] focused too much on project." (2) "[We] spend too much time on the actual prototyping phase. Does it add to the learning experiences? Only skim through each phase so no deep learning experiences." (3) "Different time schedule (difficult to manage sometimes) - Some team member commitment - Differences in expectation."

4.2. EDAM Students' Perceptions

EDAM students were more articulate, intertwining the positive and negative aspects of the condensed program. One wrote that for students who keep their day job this format is the best but highly demanding: "*The intensive lecturing periods are the best for those (like me) that have a job during the EDAM program.* But the Saturday with classes is very difficult to manage because we are all week out of house and we have a family and children to take care. By the other side the full-term lecturing allow us to organize very well all the work, because in the intensive lecturing periods we have to[o] much work to deliver at the same time... [Need] a well organize schedule between courses for deliver[ing assignments]."

Other students commented on reading materials: (1) "I think this method is quite good even though sometimes I have a hard time keeping up with the pace when there are a lot of things to read and prepare. Nonetheless that's something I have to improve and not something the program has to change. What I dislike in this method... if there's a good chance that the persons on the class already heard about a given subject, it's preferable to give a case study approach..." We note that, even in classes that take place during 15 consecutive weeks, reading is a problematic issue especially for graduate students who keep working in the industry during the course.

A Ph.D. student discussed acquired skills and project-based learning even though this was not directly asked: "The intensive lectures are a good opportunity to develop our skills to plan, organize and study the materials before the lessons... I can be more effective and focused in my work...The students need to express their thoughts more effectively, perhaps with more visual thinking. The role of concurrent development of the projects (or thesis) is an excellent way to learn new knowledge (project based learning)..."

4.3. Perceptions of EDAM Faculty

During November 2008, EDAM Faculty from three universities, IST, FEUP, and Minho, met one of the authors in Portugal. They were asked to comment on advantages and disadvantages of the EDAM

program's intermittent lecture structure, and to compare it with the typical full-term lecturing structure they teach in other programs. Some of their responses, quoted below, indicate that this unique format has the advantage of getting commitment from faculty as well as students. Faculty D noted:

"I find this lecturing scheme very good for me. I did not get relieved from my previous lecturing duties in my "normal" courses [at the university], so the intensive lecturing of EDAM minimizes the disturbance with the other... three different courses [I teach] besides EDAM. This political compromise of going from one university to the next to teach the several week lectures turned out to be very good in terms of commitment from faculty, since we need to move with the students when the lectures do not take place at our home institution, so we [faculty] also spend time that is totally devoted to the course we are teaching, with minimum interruption from other issues – it's a 'mini-sabbatical', if you wish to call it that..." Faculty G added the students' perspective:

"I think that the one intense week has the advantage of the students being completely concentrated in the program, and not disperse with their company problems. The fact that they are away from their job place is also very important for their success in the program. This is not common in the Portuguese system... but after a period students will find great advantages in this system..."

Another advantage of the non-consecutive learning pattern was pointed out by faculty L: "... It allows rediscussion of the topics of the first lecturing period after a reflection on it or its implementation, define more structured assignments, promote team working during the assignments... and it minimizes faculty [schedule] conflicts."

Linking academia with industry was raised as an advantage by faculty T: "...the main advantage is the bridge between industry and university. The time used during the semester is very concentrated in two hard weeks. It is difficult for the students from the industry to get all the assignments on time. PhD students are more invested in the learning but they [the professors] try to combine them [full time students with those who have jobs in industry] together. The contact between the students and the faculty is very short and sometimes [it] is not easy to understand clearly what the real work of the students is."

One concern EDAM faculty mentioned was overload, as faculty O. noted: "They (the faculty) are doing everything as before, but in addition... they also teach PDD in collaboration with other faculty because it is [an] interdisciplinary program and requires more expertise. The load is much higher for EDAM than for a regular."

5. Summary and Conclusions

This study assessed the PDD course within the MIT-Portugal Program. The research questions were to investigate the PDD EDAM course in the context of two other groups who studied the PDD course – MIT and IST & FEUP. The MIT students studied a project-based semester-long PDD course. The EDAM students took an intensive modular course, taught in a condensed schedule with emphasis on project-based learning. The other group from Portugal took a more traditional, semester-long course.

While we found similarities among the different student populations in a number of areas, there were also some interesting differences. The three groups had similar understanding of the reasons for product success despite technical failures, and they all ranked highest the following items: 'the product fulfills its intended function' and 'the product fulfills a critical need'. In an open-ended question related to the various stages of the product life cycle MIT and EDAM students listed on average a higher number of items than that of the IST & FEUP students. A higher ratio of items per student indicates that the student has internalized the stages by engaging in their actual performance. Thus, it is a way of assessing the level of learning that took place.

The findings obtained from the focus groups and the end-of-course perception questionnaire and the fact that the EDAM students' responses were closer to those of the MIT students indicate that the PDD course has had a positive impact on the EDAM students. The unorthodox lecturing scheme of two one-week intensive classes with a six-week break caused no major disturbance in student learning. Indeed, there are some indications that it might be superior to conventional academic practice and further exploration of this concept in other settings is recommended. Teamwork did not suffer from having to carry out the assignments by geographically dispersed team members, but the need of team members to know each other in person prior to the beginning of the teamwork has been found to be critical. Hoegl and colleagues [21] found that effective teamwork is paramount if the distance between team members increases. Furthermore, if the team can achieve a high level of teamwork over distance, a low-proximity team can attain a higher level of effectiveness and efficiency than a co-located team for the same tasks. In general, this mode of

teaching more closely matches some aspects of professional practice and thus matches with the goals of PBL. This finding also presents an opportunity for potentially improving remote teams' effectiveness in new product development that should be further explored. In particular, it would be of interest and importance to explore the extent to which multi-cultural tams can create effective teamwork that relies on information and communication technologies, without face-to-face meetings, as this would mimic the increasingly deployed mode of remote work in large, multinational corporations.

The formation of teams in EDAM with a mix of technology (LTI) and management (TME) students also seemed to work well. A mix of some industrial experience with fresh scientific knowledge was noticeable in the project outcomes, and students learned a lot from the experience of working with peers with diversified backgrounds. The questionnaires revealed differences in terms of cultural, professional, and educational background. This was also found by [22], who compared different teams in different countries on issues related to the perceived success of new product development in the context of higher education in technology management.

Engineers face design tasks that are growing in complexity, demanding knowledge skills that cut across several traditional knowledge boundaries. These design problems call for broad-based collaboration skills. Researchers [23] found that there are learning barriers stemming from students failing to recognize the relationship between their own discipline and an interdisciplinary subject of study and failing to recognize and value the contributions of multiple technical and non-technical fields to a given interdisciplinary problem. Overall, however, our observation was that MIT and EDAM students were able to overcome this difficulty. Students' achievements in their learning tasks depends, in part, on the match between the teaching pedagogy and the learning processes students experience in their courses [24]. Many studies on higher education confirmed the benefits of student active learning and engagement [25, 26]. Prince [27] noted that the most important student engagement in active learning setting was the personal interaction, both among students and between faculty and students.

The project-based learning approach that follows the MIT PDD course example has been instrumental in successfully incorporating hands-on activities and students-faculty interactions into the formerly teachercentered Portuguese approach.

Researchers [28] have emphasized the importance of team coaching and its relevance when teams are formed of individuals that are very different in their cultures, languages, and/or backgrounds. To some extent, the EDAM PDD students are different in all three elements. EDAM PDD faculty must consider themselves as the students' coaches. This additional role requires extra time and effort to provide students with periodic and timely feedback on students' assignments during the two six-week periods, and toward the end–on the students' final projects. Authentic learning processes normally require a certain level of effort, and this is true for both students and teachers. However, specific measures will have to be taken in order to avoid excessive overloading of both the students and the teachers of the MIT-Portugal Program [29]. Reflecting on the EDAM team mission statement, as specified by Magee and colleagues [2], the EDAM PDD course is one important step in advancing the new educational engineering paradigm in Europe in general and in Portugal in particular. This innovative program and its unique curriculum help promote a new attitude towards entrepreneurship, knowledge-based manufacturing, and competitive product development.

In conclusion, as the National Engineering Education Research Colloquies [30] noted, successful studies in engineering education are expected to be comprised of multidisciplinary teams of engineers and other fields in order to bring their expertise to this emerging field of research. Indeed, the research team who carried out this study consisted of science education and engineering experts from two different universities in different countries. Just as it has been found valuable to involve interdisciplinary teams of students, our research has demonstrated that there is merit in collaboration among faculty from different countries with various backgrounds and disciplines. This seems to be an adequate response to the globalization challenge engineers face, as pointed to by Vest [1].

In addition, PBL approach that was used in the PDD EDAM project can be used also as a basis for distance and e-Learning technologies to help graduate students from other countries increase their access to quality university education for a larger percentage of the population. Further longitudinal studies are needed (a) to strengthen our experience and claim that there is benefit in creating multidisciplinary teams of both students and faculty and (b) to investigate the PBL approach with distance and e-Learning technologies and multi-culture teams.

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