2005

"Impacting Social and Economic Development Through E-Learning"

3rd Annual International Symposium

Learning International Networks Consortium

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PROCEEDINGS OF THE THIRD ANNUAL SYMPOSIUM

OF THE

LEARNING INTERNATIONAL NETWORKS CONSORTIUM

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Forward

The third annual international symposium of Learning International Networks Consortium (LINC) took place **o**n October 27 and 28, 2005 at the MIT campus in Cambridge, Massachusetts. LINC, an MIT managed initiative begun in 2001, is an international community of individuals and organizations that focuses on higher education in emerging countries and the role that technology can play in expanding educational reach. It is a collaboration of practitioners and scholars from around the world whose purpose is to share best practices and to learn from each other's mistakes, in order to move forward with successful distance learning projects in tertiary education in their respective countries.

The theme of the 2005 LINC symposium was "Impacting Social and Economic Development through e-Learning," and the conference brought together education officials, practitioners, researchers, and funders from twenty-four countries - each with a singular view of this highly critical topic. The thirty-six conference talks contained in this book present a frank and comprehensive overview of current successes and continued challenges in the ambitious international effort now underway to spur development in the emerging world through ICT initiatives. Conference participants heard a wide range of powerful presentations including, among the many others, talks by: the Science and Technology Adviser to the U.S. Secretary of State; two idealistic young innovators from rural Kenya; a government official from impoverished Laos; and the Rector of Pakistan's Virtual University, who asked for a moment of silence in memory of victims of his nation's recent deadly earthquake. Each speaker brought a unique expertise and passion to the discussion, and the symposium succeeded in its goal of approaching this important subject from a broad spectrum of valuable perspectives.

As you will discover as you read through these pages, conference speakers reported on exciting innovations and remarkable collaborations in the current international effort to expand distance and e-Learning to all parts of the developing world. The following quote from Professor Mohamed- Nabil Sabry of the French University of Egypt eloquently expresses the message of mutual respect and collaboration echoed at the symposium:

> "The ultimate goal of Open Educational Resources will be to train educators all over the world to incorporate available quality content and up-to-date knowledge from around the world into their own university courses, in a way that preserves their cultural identity while at the same time providing them with a space where they can add their own creative production. In this regard, while it is good to give a hungry man a fish, it is better to teach him how to fish."

Opening Remarks

Presented by Richard C. Larson
Mitsui Professor
Engineering Systems Division and the Department of Civil and Environmental Engineering
Founder and Director of the Learning International Networks Consortium
MIT

Good morning everyone. Welcome to MIT and to LINC, 2005. We started LINC as an MIT volunteer activity late in 2001. The focus of LINC, as you know, is advanced technology in higher education, advanced educational technologies in developing countries. At LINC, we are interested in leveraging the technology to get quality education to underserved people in developing countries. As you also know, LINC is not a content producer but rather a community of professionals - professors, e-university presidents and rectors, practitioners, as well as dedicated people from industry, foundations, and governments. Our focus on technology is not narrow engineering, but rather we are interested in embedding the technology in the social and learning systems in which they are to function. Issues of pedagogy, culture, traditions of learning, financing - all these are just as important as bandwidth limitations, supplies of reliable electricity, computer operating systems, and other bits and bytes. Speaking of bits and bytes, as you will see in the next two days, the engineers at MIT have figured out how to get around lack of telephones and lack of reliable electricity in villages in South Asia and Southeast Asia.

LINC 2005 is our third international symposium. Many agree that the speakers we get here - including rectors of major virtual universities, leading thinkers in the field, and important e-Learning innovators - represent a group of people that is difficult to find elsewhere at any other conference. Thanks to our volunteers and LINC presenters, we have been able to publish the proceedings of both our LINC 2003 and 2004 conferences, and the 2004 proceedings are now available to you in hard copy at the registration desk of this conference. We sincerely thank Liz Murray who has tirelessly and unselfishly served as Editor for these volumes.

With very limited resources, LINC has managed to support other activities during its 3- plus years of existence. For instance, LINC has supported AITI, the African Internet Technology Initiative. AITI is an MIT student-led activity that sends fifteen to eighteen students to Africa each summer to teach teachers as well as students in computer- related subjects. You will be hearing from the AITI current president tomorrow in Panel Seven. LINC has also worked with the Pfizer Corporation, a LINC supporter. Pfizer has helped fund us this year, and we sincerely thank them. LINC has worked with Pfizer to create and install a trilingual website in Beijing. This

website, called "Good Clinical Practices" (GCP), is a LINC initiative which was started and is now successfully completed. Originally this website was created in Spanish and English, and it continues to be used to educate doctors in Latin America to become certified as clinical researchers. Now that Mandarin Chinese has been added as a third language, thousands of physicians in China are being educated in GCP to become certified clinical researchers.

LINC has also generated considerable interest in at least two initiatives that will require substantial funding to become reality. One is what we call the "LINC Greater Middle East Initiative." Former and current LINC participants from the greater Middle East, from the Palestinian Authority, Israel, Jordan, United Arab Emirates, Syria, Pakistan and Algeria, got together last year at the 2004 LINC Symposium and invented this initiative. Some of you here today are co-authors of the Greater Middle East proposal - we have both a long version of this proposal and a short version. The history of this initiative is documented in MIT's *Technology Review*, and the site for this article is available on the LINC website.

The outline of the Greater Middle East proposal includes a focus on high school science and math teachers, with the overall effort organized and directed by MIT. Each country and organized collection of individuals in the Greater Middle East is invited to participate. Each participating country will be required to have both teachers and learners; that is, each will provide educational content in our e-Learning system and each will have students benefiting from it. MIT would coordinate this process, submit its own content as well, and supervise language translations. The effort will be highly leveraged educationally, meaning that having a positive effect on one high school teacher has the potential to positively effect hundreds of high school students. The "students" in this initiative will be high school science and math teachers. The thought is that if we can get to high school math and science teachers and elevate their expertise, then we can excite students in those prospective countries to pursue careers relating to science and math - which would be a good thing. The other aspect of this is pedagogical, in that we would like to have some group learning and would design student teams that are across international boundaries. The teams would include math and science teachers from the different participating Middle East countries, and hopefully, team members would gain trusting relationships with other members of their teams from the various participating countries. So, if successful, this could evolve into an accredited Master's degree program.

One hypothesis of such a program is the fact that many youths in the region are not familiar with the culture and history of the Middle East, particularly relating to some of the great inventions in math and science that came from this region. The idea is to get them interested in and excited about this area of learning again. Then perhaps as they become more employable in the international knowledge economy, they will reach their potentials and their standard of living will rise. The idea here is that this might be a beneficial cycle, helping to improve the economy of each country. Of course

there will be innumerable complexities. The support we are looking for here is some initial financing to get all the co-authors and all the people who have pledged significant assets together for the purpose of writing up an eighty to one hundred page business plan as to how this initiative would function over its first five years of operation. And of course there will be a myriad of problems – for example, political problems, government regulatory problems, and language translation problems. All of these issues have to be ironed out, and the plans put in place for this LINC spin-off initiative to get underway.

A second LINC proposal that we call the China/Mexico Initiative deals with using distance learning to help decrease poverty and thereby enhance economic development. Those are themes of the LINC symposium this year, and we have interested parties in attendance here today. One is Professor Kang from Tsinghua University in Beijing who will speak about the current project that Tsinghua University has undertaken. This project involves beaming e-Learning into poor, rural communities of inland China to enhance economic development and to enhance the expertise of local government people, school administrators, farmers, and entrepreneurs. We also have someone here today from Monterrey Technical University in northern Mexico, a university that has over one thousand community distance learning centers scattered throughout Mexico. Actually, about one hundred of these learning centers are located in the U.S., as far south as Texas and as far north as New York City. These U.S. centers are also designed to elevate the knowledge status of Spanish-speaking people in the U.S. It is interesting to note, however, that the learners at these U.S. centers – formally of Mexico but now living in the U.S. – have asked Monterrey Tec to translate all the content at those centers into English. The representative from Monterrey Tec here today is Laura Ruiz who will discuss these very successful programs from Mexico. So the second LINC proposal I want to mention involves these efforts in China and in Mexico. The idea is that maybe we can put these two programs together for research purposes. With coordination by MIT, we would like to conduct some controlled experiments both in Mexico and in China to see what works and what does not work in terms of using e-Learning in impoverished communities to try to improve economic development. Currently we are working with Professor Kang and Professor Ruiz to develop funding for this initiative.

It is now my great pleasure and honor to introduce someone who has been a strong supporter of LINC since day number one, a leader in MIT's administration, someone who cares about the goals of LINC, and a gentle and compassionate man whom I have known personally since he was an assistant professor in MIT's department of Urban Studies and Planning, Phil Clay, the Chancellor of MIT.

Welcoming Remarks

Presented by Phillip L. Clay
Chancellor and Professor of City Planning
MIT

Good morning. I am delighted to have a chance to welcome LINC again to MIT. I missed this opportunity last year, and my colleague Bob Brown who was then MIT's provost had the honor. LINC is a unique organization, and it is very much in the spirit of MIT to initiate such an activity and to support it. It is a collaboration of scholars, practitioners, students, and business people who are united in the desire to use technology to advance education in places and ways that might not be possible otherwise.

I want to interject a personal connection. When Dick introduced this program, he talked about using distance and e-Learning to teach those who are underserved. Well I want to emphasize the power of this because I was once part of this underserved population. When I was in high school in the 1960's in North Carolina, it was during a period when much emphasis was being placed on education and when the South lagged badly behind in terms of education, especially in my area of the state. North Carolina introduced television learning as a way of bringing master teachers in advanced subjects to places where there were no master teachers or advanced subjects. So I remember going into the auditorium for television instruction in biology and history three times a week and then having the examination. We were told that we were in a class for all students in the state and that we were all being advanced together. At the time, this was probably the only example of integrated education in the state, and while I do not know if I should give all the credit for my learning to that initiative, it certainly was a big part.

There is power in the collaboration that your meeting represents. We could all do our own individual activities that involve e-Learning, but when there is an effort like LINC there is the chance to collaborate with partners who have a much broader vision, there is the opportunity to bring together resources that add up to more than the sum of the parts, there is the opportunity to share best practice and to develop new best practice, and there is the opportunity to use education for national development. Now in many parts of the developing world, there is an increasing realization that education for development is what is necessary in order to move forward. MIT had its start in the 1860's out of a similar tradition. Our land grant background basically was an effort on the part of the U.S. to create a number of institutions in the beginning of the industrial revolution that would make education meet the needs that the nation faced. In the case of MIT, it was originally founded as a school of the Industrial Arts - something we now would call Manufacturing and Technology.

I also have had the experience over the last few years of being a big fan of AITI. This is a group of outstanding young men and women, students from both the U.S. and Africa, who are interested in using their knowledge quite powerfully and quite directly. When I took this job, I was honored to be on the stop as they walked around campus collecting resources – cash in this case – to put their ambitious effort together. Now I am delighted that AITI has grown to be so successful.

I also welcome the proposal for the new LINC initiative that would take this challenge to the Middle East and I am delighted not only with the content but also with the set of institutions and nations that are represented. I believe that all of this effort to use the power of e-Learning will address a current theme -- that "the world is flat." I think the world is flat, but I should also note – and I am sure you would agree – that even though the world may be flat, there are some spires and there are some valleys. I believe that e-Learning will be a great help in making sure that areas that might still be left behind in a flat world have a chance at success. So with that, I again welcome you to MIT and wish you an outstanding collaboration and conference.

PANEL ONE

CHALLENGES AND SOLUTIONS

FOR VIRTUAL UNIVERSITIES

E-Learning: Challenges and Breakthroughs in the Middle East

Presented by Dr. Milad Fares Sebaaly
Founder and CEO of Universal Knowledge Solutions
United Arab Emirates

At the past two LINC Symposiums, I spoke as Provost of the Syrian Virtual University. This year I have changed hats. The reason for this change is that we have realized that there is a need for spreading the e-Learning culture across the Middle East, and yet it is very hard to step over the borders from country to country. Therefore, we decided to create a regional consulting group of e-Learning experts, capitalizing on our experience and expertise gained at the Syrian Virtual University, in order to help other organizations in various countries and also to establish new virtual universities across the Middle East. To this end, we established something called Universal Knowledge Solutions, which is a consulting group based in Dubai and having offices throughout the region, including Kuwait, Saudi Arabia, Damascus, Amman, and Lebanon.

At Universal Knowledge Solutions, we started out by looking at the problem at the macro-level. We realized that most people in the region were talking about the role of e-Learning in Human Resource Development (HRD), and the role of HRD in achieving economic development, building human capital, creating an information society, attaining a knowledge economy, etc. Therefore, we decided that in order for us to proceed with e-Learning, we first needed to look at the macro-level picture in the region and try to design e-Learning solutions that would feed into a global or strategic vision for the entire region. When we talk about Human Resource Development with a focus on higher education, we are talking about people who will be in the marketplace in five years and will stay there for another twenty years. However, there is also a great need in the region to talk about the short-term solution of lifelong learning to train people who are already in the marketplace and will remain there for another ten years. In addition, there is a need to find solutions for young students who are just starting elementary school now and will enter the marketplace in twenty years, remaining there for another thirty years. At each of these three educational levels, there are a number of challenges in the Middle East region, which are, to a certain extent, common with challenges in other regions. Therefore, this is where we decided to start working, with the hope of overcoming some of these challenges by creating breakthroughs at various educational levels for the region. My talk today will be on these three educational levels – lifelong learning, K thru 12 education, and higher education.

To start with, the concept of lifelong learning is very new in our region, and there is still an old educational culture that is based on degrees. This culture holds that, for example, if I have a bachelor's degree from the

American University in Beirut, then I am set for life. It is for this reason that most universities in the region do not have very strong programs of continuing education or lifelong learning. When we used to talk about Human Resource Development in the region ten or fifteen years ago, the first thing that came to mind were training centers not connected at all with universities. However, with the passage of time and with the rapid developments in science and technology, there is now a major role for universities in lifelong learning and in training a workforce that is already in the marketplace. However, this development is putting more pressure on the existing universities in the region that are already overcrowded and also working with outdated curriculums. When it comes to higher education in the Middle East, there is a very limited capacity. Especially in countries of the region where education is still a public service, universities are greatly overcrowded and can barely take in the graduates of the high schools. At the same time, the number of high school graduates is increasing every year because the countries we are talking about are demographically young countries, and the public universities are not able to cope with such exploding numbers. Therefore, because these universities are already overcrowded with fresh graduates, they do not have available resources to provide critical educational programs for workers already in the marketplace.

In addition to this condition of overcrowding at the higher education level, there are many other challenges to face in delivering high quality university education in the region. For example, it is very difficult in the evolving global marketplace to introduce a new educational specialization, having to compete worldwide for the most highly trained professors. If we want to start a department, let us say, in genetic engineering, we will have to find some genetic engineering professors in the U.S. and then pay them more than they are getting here, thus providing higher incentives. However, in most cases, these professors cannot be recruited. One cause of this recruiting failure is the fact that most universities in the region are teaching universities, with very limited resources at the moment for research and development. Another cause of this failure involves the very weak infrastructures at most of these universities. Let me point out here that I am not trying to generalize since there are countries in the region that have very strong universities. However, it must be acknowledged that the average is low.

Turning now to the K thru 12 educational level, there we are facing throughout the region one of the major challenges I experienced while at the Syrian Virtual University, the American University in Dubai, and also other places where I have been involved. Namely, the students arrive at these universities with a completely passive learning mentality. When we required the students to be more proactive and more creative learners, they were not able to perform in that way. As a result, it is necessary to develop a more proactive and creative culture in these students during their four-year university experience, thus taking valuable time away from their university studies. Therefore, our goal with K thru 12 education has been to try to effect a change in the educational culture at an early level, thus delivering a different

product of student to the universities. This type of shift in the early educational culture would be a great help for the overall educational system of the region. To achieve such an educational shift in primary schools throughout the region, it will be necessary to bypass conventional pedagogical models and lecturing styles by applying high quality, modern teaching methodologies and educational technology tools.

In addition to these three areas of educational challenge, there are also several other general challenges faced by the region. For example, the market does not know what the future educational needs will be. In many countries, there may be current needs, but because the economies are already so outdated and badly in need of development, it is difficult to know how the needs will change in five to ten years. In these countries, there is no clear research or strategic planning as to what the needs of the market will be in the next five to ten years and how this is fed back into curriculum design, university education, etc. Most of the job profiling in the market is related to the conventional specializations. For example, if you have a new graduate in electrical engineering, you will not find in this conventional profiling a position for a network engineer. Instead, employers want an electrical engineer or a computer engineer or a mechanical engineer, and so on. It is for this reason that some work has to be done at the market level. Another general problem faced by the region is the fact that in most of these countries the public sector has a major role not only in education but also in other public services. While the region is moving slowly towards privatization, at present this process is still in the early stages.

Now I would like to move to a discussion of the process of change involved in the movement toward e-Learning and virtual education. One of the issues that I would like to mention is the resistance of academics. A major challenges we faced when introducing e-Learning at the Syrian Virtual University can be illustrated as follows: a parent asks his neighbor, a university professor, "what do you think of this virtual university, of virtual education?" The professor's response is that "virtual education is bull shit, that it is just having fun over the Internet and does not have any educational credibility." In reaction to such a view, we need to develop a process of change management, starting within the universities themselves - with the professors, the administrators, the students, and the parents - to get everyone on board as we move in the direction of e-Learning. Beyond dealing with this resistance of academics to e-Learning, there must be an overall picture of educational change, one that examines which critical areas need to be changed and how to prioritize those areas. Of course, we can talk about technology as a major catalyst, but infrastructure is definitely an area that requires considerable development. Other priority areas for educational change include application of modern pedagogical methods, new academic specializations for the region, and introduction of the concept of lifelong learning. There is also a critical need for wider, nontraditional access to higher education because most people do not have the luxury to go to university, nor do they have ready access to different educational systems.

Finally, a critical factor in this process of educational change is the development of ongoing market needs assessments, as I discussed above.

Here again, I want to emphasize how important it is to look at the larger, overall picture and to take into consideration several key components involved in such educational change. Many people view e-Learning simply as a technology and are fascinated with the technological part. Many other people view it largely as a modern educational tool that will enhance modern educational methodologies. However, in order to succeed with e-Learning, one must first look at several complex issues: how to define and develop a business model and a business plan; how to implement it, either through a conventional university, or through a public ministry of education, or as a private, stand alone initiative; and, most importantly, how to implement this change while taking cultural issues into consideration. We consider that technology, and therefore e-Learning, is a major catalyst of change in the Middle East.

When we talk about e-Learning at universities in the U.S. – universities that already have their own infrastructures, networks, management systems, library systems, etc. – then for these universities, e-Learning will just be a plug-in to an already existing system. Yet it is very different in the Middle East where in most instances, it is necessary to develop e-Learning from scratch. Given this reality, when introducing virtual education in the Middle East, it is important to understand that not only will this technology enhance the learning side of education, but it will also bring about the automation of the administrative side in both an existing university or in a newly developed university. So technology can be used to insure sustainable change and improve accessibility and wide reach to different kinds of students. And most importantly, it will help to build a student-centered culture.

Technology in the Middle East region is not only an enabler of communication or of automating different types of processes, but it is also a major tool to provide different types of academic, administrative, and other community services to the students and to the different stakeholders in the educational system. Here when we talk about the academic side of e-Learning applications, it is not necessarily that we want to build a full virtual university. There are different methods of integrating e-Learning. For example, there are different, off-the-shelf international curricula and course contents available. Also, there are efficient explanation tools for professors for use in their university classes to enhance the classroom-based experience. Tools are also available for providing some international experience, for providing collaboration between students and faculty, and for spreading the e-Culture in general. As a matter of fact, many universities in the region are making it obligatory that students take at least one or two online courses per year in order to get used to this e-Culture since they may later work in e-Government or e-Banks, or in other types of technology-based businesses. This e-Learning commitment will enlarge the outreach of universities to people in rural areas and in other previously hard to reach locations.

However, it needs to be stated that implementing e-Learning is not a simple thing, and many people in the region are still working at the experimental stage. It is very important to look at this educational change as an overall transformation that requires a lot of expertise not only in technology or in education, but also in project management, risk management, and change management. One critical requirement of e-Learning is creation of a student-centered environment where the student's interaction is no longer only with a teacher lecturing in a classroom, but also with a full set of different types of multi-media, enhanced contents, collaboration with other colleagues working on different types of projects, etc. Such a paradigm shift can be enabled through the use of technology.

Now I would like to discuss the kinds of challenges we have faced when introducing such a new concept to the Middle East. I think there are three major challenges that are very important to remember. The first is related to technology. The second concerns the cultural change that is required at the educational level, not only for the students and for the teachers, but also for the entire environment and all the stakeholders - including managers and CEO's who will be recruiting virtual university graduates, and most especially, parents. Unfortunately, in our region of the world, it is still mostly parents who decide where and what a student will study, and this reflects a regional cultural difference.

One of the continuing major handicaps or challenges in the region is the issue of accreditation and how to recognize and accredit such programs. I believe at this time there are only three accreditation e-Learning breakthroughs among the different Arab countries. Now of course Israel is another case that my colleague will talk about in detail. However, in the region where we are operating, most ministries of higher education, which are the main accrediting bodies, do not have a clue about how to accredit online programs. This is especially difficult given the fact that there are thousands of programs available online from different countries, some of which are very good and some of which are not good, some of which are accredited internationally while others are not.

One major challenge that we have recognized through our experience is that what is considered to be a good program in the U.S., might not work in our region for a simple reason. The majority of online courses in the U.S. would utilize emails, online discussions, and asynchronous collaboration formats between students and professors. This is considered to be very boring in our region. We have implemented this type of program in different places, and the students were very eager to have either a synchronous online experience or a blended experience, where they need to ask questions and have a more active relationship with the teacher. So one of the points I wanted to highlight during my presentation later on concerns the technology issues. In this regard, in our region we have to bypass the problems of bandwidth, speed, standards, and availability of different types of systems. We have been able to implement something similar to what they have at Monterrey Tec in Mexico, which involves different types of learning centers

across the region. This system is beneficial in several ways. One benefit is that these centers bypass the fact that students are unable to have fast Internet connections from home, and a second benefit is the creation of a community of learners. This is especially important in our region where students can not be expected to jump easily from being passive learners in a classroom, to being students who work from their home or their office in one shot. So there was a need for an intermediary stage, and these types of local learning centers have proven to be extremely effective. In addition, we had to find different technological solutions for the fact that infrastructure is weak across the region; in this regard, the learning centers have enabled us to bypass a weak infrastructure.

At the cultural change level, there were many issues to be considered. Above all, there was a need to change the perception held by parents and others about this new mode of education, and this change involved widespread awareness campaigns. Such a change of perception was especially challenging since most of the ministries of higher education in the region do not recognize these new online programs, and therefore, our awareness campaigns had to target several different levels of resistance. Furthermore, we had to bypass instructor-based resistance and find ways of increasing the confidence and retention of both faculty and students. This challenge in particular has required that we drift from a 100% online program to a more blended learning model. One of the first questions that people will ask, especially when we are talking about a wide spectrum of learning of differing ages, is whether this educational model is a replacement for the classroom or a classroom enhancement. In order to answer such questions, we had to look at different criteria such as the following: what kind of learners are we talking about; how mature are they; how IT-literate are they; do they have incentive and motivation for education or are they doing this just because their parents want them to have a degree in IT, etc? In addition, there are some intrinsic cultural features that we had to face such as bureaucracies when we are dealing with public universities, low purchase power in many cases, free services mentality, etc.

When it comes to e-Learning, there are several critical success factors that we have been made aware of. It is extremely important to have very intensive awareness campaigns to get a wide spectrum of people on board. Change management is a very important factor, in order to secure the acceptance and commitment of all stakeholders. We have not just been building something new from scratch but we have also had to deal with longstanding universities, ministries, and other institutions. One of the most important ingredients for success is to have local leaders who understand international trends in new technologies, can defend what they are doing, and can also present a very clear and consistent message to the different stakeholders. In order to do that from the practical side, we have developed different types of learning models, which include different types of technologies, with main emphasis on the need in the region for some kind of synchronous communication and continuous follow-up. In many places, we

have had to implement e-Learning gradually by having different types of blended solutions along with the latest tutoring and learning models, etc. in order to reach a place where we can talk about a successful e-Learning implementation at the learners level, at the instructors level, at the administrators level, and at the developers level. In short, we have had to work gradually, designing appropriate e-Learning solutions for each situation, in order to develop and sustain the support of all stakeholders.

Now the third type of challenge is the accreditation issue, or issues of regulatory control. Here I think there are several issues to be discussed. One is quality assurance: is there any requirement for an add-up or an additional component for accrediting online education in the region, in addition to what exists worldwide? This is a very important area, and I think that an organization or a group of experts like MIT LINC could provide considerable expertise in this. We can work together to perhaps invite MIT LINC to provide some kind of consultancy services or advice to different ministers of education and decision-makers in the region on how to proceed and how to have the right guidelines in accrediting online education in the region. This is a major prerequisite because when we talk about establishing a virtual university, if it is not accredited then no one will recognize it. Even if the private sector likes and appreciates what you are doing, it is a major obstacle not to have a local or regional accreditation. As of now, we have been able to have three regional accreditation breakthroughs: one in Syria for the Syrian Virtual University, one in Dubai with Dubai e-College for Total Quality Management, and a third new initiative in Jordan.

We have had to deal with all these challenges and we have had to try to devise different solutions for different sectors. And now I would like to present some of the applications we have developed. In K to 12, we have realized that online programs are not needed at the moment. This means that we do not have any virtual lower schools or high schools in the region. However, there is a critical need to implement different types of blended offerings by establishing, for example, "Smart Schools," or e-Classes where a teacher will have a smart board inside the class and be able to pull out different types of interactive materials and online content into the class to explain different topics in physics, math, biology, science, etc., thereby enhancing the in-class experience. This type of program has been introduced in several places.

First, however, it is very important to build the technical infrastructure within a school, thus automating the administration, before implementing this type of enhanced learning capability. At the higher education level, we introduced the virtual university, Syrian Virtual University, and e-Learning Centers of excellence for existing universities to help them move toward the introduction of e-Learning. Recently, we have put an emphasis upon helping universities build a centralized team that has different types of expertise for the gradual implementation of e-Learning. We have done this at several different universities in the region including the E-College for Total Quality Management, the Gulf University of Science and

Technology, a university in Jordan and another project in Dubai. Finally, at the lifelong learning level we have developed similar concepts in what we call an online institute. We have implemented this concept in a twelve million dollar project in Kuwait with the Kuwait Petroleum Company to build their online institute to train more than 8,000 employees. A similar project is getting started at the Water and Electricity Authority of Abu Dhabi to train more than 3,000 employees.

A Look at a Number of E-Learning Initiatives in the Middle East: Problems and Solutions

Presented by Dr. Said Hammad Jahama
Department of Computer Science
Princess Sumaya University for Technology
Amman, Jordan

First of all, I would like to clarify the perspective of my talk here today. This is not a presentation of actual research, but rather a report on the experiences and observations of three people, including myself, working in the field of e-Learning in the Middle East. I am from the Princess Sumaya University in Amman, Jordan. My colleague, Dr. Abdel-Elah Al-Ayyoub, is from the Arab Open University, which is a regional university, and my other colleague, Dr. Saleh Al-Saleem, is from the Saudi Arabia branch of the Arab Open University. My objective in this talk is to give you a broad perspective of what is happening with e-Learning in the Arab world by looking at many initiatives that span the Middle East region. I hope to reflect on our experiences and to report on the problems encountered and the solutions developed.

One important phenomenon in the Arab World is the fact that most of the GDP is dedicated to education. This is the case because the populations in those countries are growing rapidly. Furthermore, these are not old populations, but rather they are young populations. In the oil rich countries of the Gulf States, where oil prices are currently on the rise, there is a large budget surplus, and most of it is going towards education. I could give you examples of this strong focus on education funding in Saudi Arabia, in Qatar, and in all the other Gulf countries. On the other hand, poor Arab countries receive large amounts of aid, and the bulk of this aid is dedicated to education and educational reform. Now let me reiterate that this young, expanding population is an obvious reason why so much of the GDP of Arab countries is dedicated to education. However, the less obvious reason is a political one.

For political reasons, it is very necessary to have educational reform in the Arab countries. As you know, there is a considerable amount of turbulence in our region. If education could be reformed and handled correctly, that would do much to improve this turbulent situation. In Saudi Arabia, for example, and in all of the Gulf states, they are now paying attention to this need for educational reform, and thus they are trying to alleviate some of the effects of an outdated educational system. Along with parents, the teacher is really the one other person who can positively influence children and how they are growing. Through educational reform, Arab governments are trying to affect the problems inherent in our youthful populations - hopefully in a positive way.

The countries that I will be talking about here today are Saudi Arabia, Qatar, Libya, and Jordan - because I am familiar with initiatives in all of these countries. Now let us turn to a discussion of the educational approaches being pursued in these countries. Most of the approaches to educational reform in these countries incorporate some kind of e-Learning. However, some of them, for example Qatar, have gone with a traditional brick and mortar approach. I am sure that many of you are aware of the Qatar Foundation, which has brought American universities into Qatar. However, the cost of this type of implementation is enormous, and even though it might be working in Qatar, it is not a solution that can be duplicated throughout the region. All the other countries that I will discuss are looking at e-Learning as part of their program for educational reform. By e-Learning here, I do not refer simply to virtual, online learning. Rather, I am talking about blended learning, in the sense that you have face-to-face learning and you also have online courses. Blended learning means that you have use of the computer and the Internet as a means to enrich education and achieve educational reform. Such a program of blended learning is how many Arab countries look at education and see it for the future. For this reason, we in the e-Education field are at a very opportune moment in the Arab world and we must seize that moment.

There are many such blended learning initiatives I could speak to you about that are taking place in the Arab world today. For example, I could talk to you about the K thru 12 educational initiative in Jordan. Most of the Jordanian schools are bringing online education into the curriculum. They have developed their own learning management system and now they are implementing some online content. I would not describe this content as actual courses, but it could better be described as supporting materials to the curriculum. In Saudi Arabia, the government is preparing for one huge educational initiative. If my numbers are correct, Saudi Arabia is dedicating about $150 million dollars for a pilot project in online education. This budget is not for the final program, but merely for a pilot online educational initiative. Many people will be participating in this significant effort.

It is my own belief that e-Learning could be the answer to many problems we have in the Arab world. Dr. Sebaaly in his presentation talked to you about the benefits of e-Learning, so I am not going to dwell on that. I will only mention that standardization and uniform quality in education are two significant benefits that e-Learning could bring to our region. At this point, you may be wondering just why we have such a pressing need for e-Learning initiatives in our region. I will give you an example in Jordan. Seventy percent of Jordanian universities are private. Here I do not mean “private” like Boston University, but rather “private” for profit. These are young universities - only ten to fifteen years old – and they exist only for the money. This is a problem for education in Jordan because it is necessary to develop and maintain educational standards if you are going to control educational quality. Currently, officials in Jordan are attempting to provide standards and quality assurance, but without much success. This trend of proliferating

private, for-profit universities is not present only in Jordan, but has spread to many other countries in the region. So what is the outcome of such a trend? If the bottom line for these educational institutions is simply how much money they can make, with no attention to standards and quality control, then overall education in the region will not benefit very much. Government universities also face the same problem in terms of standards and quality because the private, for-profit universities take the best professors since they are able to pay more. For this reason, public universities are left with lower quality teaching.

Now I would like to turn to the four initiatives that we will be looking at here today. First is the Avicenna Project. This is a regional initiative that combines fifteen Mediterranean countries, and its objective is to implement online education and to produce "knowledge centers." Each knowledge center is responsible for producing ten online courses. The second initiative I would like to present is the Arab Open University, which has been very successful. This is a regional initiative in the sense that it has six branches all over the Arab world. Furthermore, it is accredited in all six countries, and is a non-profit organization. The model they use, which is working well, is not purely virtual, but instead is a combination of blended and online learning. Third, I will be discussing the Syrian Virtual University that Dr. Sebaaly mentioned. The fourth and final initiative I will speak about is the K thru 12-initiative in Jordan.

So, first of all, let me summarize for you what has been learned from these four initiatives? We learned that all of them highlight the need for e-Learning and for blended learning. In addition, all four of them have demonstrated that there is a huge target population out there that is interested in this type of learning. If we are able to implement this solution correctly in the Arab world, and if we are able to implement it efficiently, then we will get great results for the region. Thus the emphasis here must be on the correct implementation of this type of learning.

Now let us turn to an examination of the problems encountered in these initiatives and the manner in which they were dealt with. And first, let us consider technology. In terms of technology, the infrastructure providing the learning management systems, or the e-Learning infrastructure, is no longer a problem. In Jordan, for example, there are companies that are competing with Blackboard and competing with WebCT. Many districts of education in New Jersey are getting their learning management systems from Jordan. So these technological systems are no longer a problem in our area. Also, the cost of the infrastructure is no longer an issue if we look at the open source because there are so many open source infrastructures and systems available out there that can be implemented. For example, at the Arab Open University, we were able to implement for minimal cost one of these open infrastructures for an operation that turned out to be very successful.

Next I would like to discuss the challenge we have faced in terms of incorporating e-Learning into a traditional learning system. One cannot simply expect that a student will be ready to leave all aspects of traditional

education behind - including the teacher - and be prepared to undertake online learning. The four initiatives cited above did not do that. In this regard, I would like to mention one very interesting initiative that is done in cooperation with USAID and ESP, with which some of you may be familiar. This initiative introduced project-based learning as an aid in the introduction of e-Learning to Middle East schools. This project-based learning cuts across all the subjects that students may be studying in their various classes. It is one class that incorporates and integrates the subjects and themes of all of the other classes through the medium of e-Learning. This has been very useful and very successful in gradually introducing e-Learning to Arab students. I myself like this approach very much because it has so many advantages over other similar approaches.

Now after discussing three potential problem areas that are no longer problematic, let me go on to describe where the remaining difficulties are to be found. Let me add here that these are my own opinions, my own view of the problem areas. I think that the major problem we are facing is in the area of content development. Here I will turn to a quote I got at the 2004 LINC Symposium during a talk by Jack Wilson, now President of the University of Massachusetts. He was referring to something about Russia, and the quote was: "They pretend to pay us and we pretend to work." In the Arab world, many people dedicate considerable time and money to the development of e-Learning systems. Unfortunately, when it comes to developing course content to be utilized by these systems, they do not recognize the importance or the value. There is an assumption that any teacher can simply come into a studio and put online what he used to do in the classroom. Such a misguided outlook is a major blunder because if we do not produce excellent content, then the whole e-Learning experience may die off. As we know, traditional education has been the same for the past two or three hundred years. That is why it is so critical that we correctly utilize these new technological communications tools – including the computer and the Internet - in order to create an innovative and improved learning process. For this reason, when it comes to content development, there is a lot at stake.

Now I would like to give you examples of what I am talking about. The Avicenna Project is a huge project with millions of dollars in the budget. Yet the cost of developing each online course for that project is between $2,000-$3,0000, out of the millions in the budget. I am not sure whether it is a lack of understanding or whatever, but those in charge of Avicenna seem to assume that producing an online course will not be difficult, costly, or time-consuming. They believe that all you need to do is give teachers the online tools, give them the learning management system, give them a little training -- and then you will have e-Learning. I have dealt with people who are producing content for the Avicenna Program, and what they are doing is simply using their classroom lectures. So rather than having a lecture in the classroom, they are now presenting the same lecture via the computer. This certainly is not e-Learning as I know it!

The Syrian Virtual University has this same problem. Up until now, they have been getting their content from external sources, but in the future they plan to develop their own content. However, the question remains: who is going to develop that content? It will be university faculty members who earn $200-$300 a month. Here we go back to the quote I mentioned above – "we pretend to work and they pretend to pay us." How high a quality of content can we expect out of such an arrangement? This same situation exists at the Arab Open University where I worked for three years. The Arab Open University is getting its courses right now from the Open University of the United Kingdom (UKOU), and the courses there are great. A UKOU team of experts that develops a course is made up of 20-30 people. Whereas in the headquarters of the Arab Open University, there are three faculty members who are assigned not only to do all of the administrative work, but also are expected to author online courses. Now how can we expect that this arrangement will lead to a good result for e-Learning in the Arab world? Here we have a major problem, and it arises from a lack of understanding about what is needed.

Now as I see it, content development is a major undertaking and one that is very important. It is important to be extremely careful about the way in which online courses are designed. When looking at the K thru 12 programs, adequate expenditure for content design may be less of a problem. I am aware of certain initiatives in Jordan that Cisco Corporation has been part of. They have been trying to develop online content, and from what I have heard from the people who received that content, it was not especially well-done. However, it is good to see that people in the Arab world are attempting to develop more carefully designed content. Especially in the K thru 12 level of education, it makes more sense to invest money in curriculum development because the audience is much larger than the audience in higher education. When you design one course in the K thru 12 level, there could be around 300,000 students participating, and therefore the content is beneficial for many students in one country. For this reason, the issue of investment for curriculum design at the K thru 12 educational level is less of a problem because there is a recognition of its value.

However, as we move up to higher education, this problem grows. How should we think about an online course in comparing it with a traditional course? It is similar to the difference between watching theater and watching a movie. In a traditional course when I am teaching without the use of computers, without the use of the Internet, in that situation I am doing "theater." However, if I am teaching with the advantage of using the computer and the Internet, then that situation is more like the movies. Think of how many elements are involved in the movies that are not possible in the theater. Similarly, there are so many new possibilities available with online learning. Now the question begs itself. As you know, there are budgets for movies, and they may be as much as $100 million dollars. Who knows just how they spend $100 million dollars, but we go and enjoy the final product. Now the question is, would you enjoy the same story, the same movie, if the

cost to make it were only $1 million? No, because it would not be the same experience. So this is a similar situation with online courses. One could have a course development budget of $5000, and one would end up with some kind of course because there would be content. A $5000 course would go something like this: “refer to page such and such, refer to page such and such,” and that would be the extent of the online course design. However, if you want to engage the student in a number of ways, then you need to have many experts who combine their talents in producing an online course. That would be a course to admire and one that would greatly benefit the students.

So what can we expect? Are we going to have an education industry in the future, with certain companies that will own courses and distribute those courses all over the world? Is this going to happen? Would this be good or bad? I really do not know. Perhaps in ten years, the curriculum for all Calculus 101 courses may be produced in one place. Would that also imply globalization in the sense that all of us would learn from the same source? It might be a good thing because with it we might get some high quality courses, and then each country or school could customize.

In conclusion, what is it that we need in order to develop and improve e-Learning and online education in the Arab world? Above all, we need major help in producing online content. We need to share best-case practices so we can understand what a well-designed online course really looks like. For example, we need to see a skillfully designed online course in a subject that everyone can agree on, such as Physics or Calculus 101. Then a course developer in the Middle East would understand all the elements that are necessary for the excellent design of such a course. The Arab course developer could then take the various elements and custom design a course for a particular audience. MIT does provide OpenCourseware, but most of it merely includes the class lectures and examinations that are available online. However, this offering does not include the entire course unit that would be helpful to us in the Arab world for designing future university curriculum. Therefore, the type of help we need the most in the Middle East would be assistance in producing online content. That would be of great benefit to the Arab world.

Distance Education: Quality Education or Second Rate?

Presented by Naveed A. Malik, Rector
Pakistan Virtual University
Lahore, Pakistan

I bring you very somber greetings from Pakistan where we are still trying to cope with the aftermath of the terrible earthquake that devastated the northern areas of my country. Thousands of lives have been lost, villages decimated, generations have disappeared. This is only one in a long stream of natural catastrophes that have beset our earth, starting with the tsunami of last year, then hurricane Katrina decimating a city in the United States, and now the earthquake in South Asia. May I request you to join me in at least one minute of silence in memory of those who have lost their lives or their dear ones. We shall continue with the talk after that.

(*One Minute of Silence*)

When Professor Larson asked me to talk at LINC III, the question was what to talk about. I suggested the topic of our examination system where we have to do a formal assessment of students' capabilities across the country. I proposed a presentation that would look at the issues we faced with these examinations and the way we tackled those issues. However, Professor Larson suggested something far more fundamental, and I agreed. That topic was: Is distance education considered to be a quality education or is it considered second rate? Therefore, that is the title of my talk today.

What is the basic issue? The basic issue is that perception is reality. Now here we are all sitting on the same side of the fence. We know that there is no issue in terms of quality in distance education, but is that the perception of the public at large? Is that the perception of the teachers? Is that the perception of the students? Is that the perception of the stakeholders – such as the multinational corporation managers who are going to hire the output of our national education institutions? We all know that there are issues. We have to look at the particular points of view held by the various segments of the distance learning audience.

There is one group, which includes the naysayers. The naysayers are people who simply say, "Well, I do not care what it takes, but without face-to-face interaction, I do not believe that education can be delivered." I know a professor up in Islamabad who is a Rhodes Scholar, very qualified with a Ph.D. in physics from Oxford, and he is one of the naysayers. He belongs to the group which I would say looks back to the era of Aristotle where they had to sit by the feet of the guru and learn from him. These people believe that without such face-to-face experience, there is no possible way for knowledge transference to happen. To the naysayers, all I say is, "Please do not fly in a

Boeing 777." Why? As you all may know, it is required that in order to qualify as a pilot of a passenger plane, one has to have completed a certain number of flying hours in that plane. It turns out that the Boeing 777 is the first passenger liner that has a simulator that is so good that a pilot can quality to fly a passenger flight as captain, just through the process of simulation training. Qualified not as first officer, but as captain! In a way, this is distance education in the extreme, in the sense that there is no face-to-face. It is only man and machine, a simulated environment, and an electronic environment. If that can be done with a Boeing 777, why cannot we succeed with distance education? For this reason, we do not worry about naysayers. We will never be able to reform them.

However, there are enough critics of distance education, and these critics are saying something like this: "Well, there isn't enough rigor in the distance education system. We do not see students doing proper assignments, the depth of the courses is not good enough, etc." Most of these comments are coming from a shallow knowledge of the distance education system. These people also have issues with dubious assessment methodologies. They question whether or not the students' capabilities are being assessed properly. They believe that perhaps these distance learning students just walk into an institution and walk away with a degree.

In addition, there are other issues that the critics talk about. To sum it up, most of the critics assert that there is not a high enough degree of quality in this educational system. Well, there is some justification for such a view. This is a view that is based on historical circumstances. Remember the correspondence schools of yesteryear in the previous century. Of course, that is where distance education actually started. It is not to say that there was poorer quality education in those correspondence courses. However, in terms of not having enough rigor, adequate assessment methodology, etc., there were valid questions that could be raised. But today the world is changing. With this change has come the reality of the Internet, online education, and e-Learning. This change also introduced the establishment of traditional open universities. When I refer to these universities as traditional, I say this because they are senior, early players in the modern distance education field, and they still rely heavily on printed material and snail mail.

So the issues are there, and we have to address them. Part of this critical view is based on reality. This negative perception is due in part to the large number of diploma mills that have cropped up. For example, if I look at my mailbox, on average I get three to four advertisements via email every week. "Get a Ph.D. degree. You do not need to attend, but simply sign the check and we will send you an accredited degree." I do not know who is accrediting these degrees, but it would be interesting to find out. Then, of course, there is this whole issue of online degrees, which is not quite "just send in the check and the degree will arrive in the mail." However, there are questions about whether or not these are properly accredited institutions. As a result of these suspect programs, the overall distance education scenario is viewed negatively. These questionable institutions get lumped together with

us and bring our institutions down. This is a big part of the perception problem.

We all know as practitioners in the distance education field, that there are no issues with quality. We are all part of the process of developing quality programs, quality courses, doing proper assessments, and bringing enough depth and rigor into the courses to make sure that proper education is imparted. So where is our challenge? What is the issue? We need to deal with this because perception is reality. We continue to have this problem of people not taking us seriously. Let us look at some of the plus points for distance education. Our method for developing a course is meticulous. Here I will give you an example. If you look at the guidelines or written, documented procedures for the University of Terbuka, the Indonesian Open University, you will find that every step of the process is documented. This comprehensive document includes: who is going to be responsible for the curriculum; which bodies have to look at it, review it, and approve it; how the choice for the professor of the course will be made; what specific steps are involved in the process of course development; who is going to do quality assurance; what are the assessment parameters; how many assignments are going to be made; etc. At the three-year old Virtual University of Pakistan, we do not have it down on paper yet, but bits and pieces are already there, and systems are being written as we go. We are building in quality parameters as an issue from the very beginning of the way we work.

The pedagogical methodology that we are using is well established and very well done. It is a documented process, which is not quite the case with traditional institutions. For example, I have been a traditional teacher all my life. I know that there have been instances when I just walked in and delivered a lecture, feeling that I knew the material well enough. Maybe that was not the best of my lectures because it should have required some preparation, and I should have reviewed my lecture notes before I went into class. However, none of us do that all the time. Whereas in distance education, everything is hand-crafted. It is done before the fact. All the quality assurance is completed on each and every bit and piece. Then we start using force-multiplying technologies. A senior professor cannot be all over the place. We use information technologies and communications to deliver quality education from these individuals to a wide, geographically dispersed audience. We use these technologies to perhaps provide interactive tools whereby students can experiment with new concepts. Something that is simply not possible with a blackboard and chalk. We provide an enabling environment. Just what is an enabling environment? We provide these computer labs and interconnectivity in order to deliver the world's knowledge to the students' fingertips. We give them access. These things are not present in a conventional institution or in a conventional environment. Of course, certain institutions do provide most of these things. Yet in distance education, we are doing this as the norm.

Yet what is missing? What is our issue? What must be added to this picture to change the popular perception that distance education is second rate

or somehow not of enough quality. What do we add? My humble opinion is, "Where are the stars?" Where are the stars in the distance education scenario? Take the case of MIT. It is an all-star cast. If I talk to Professor Larson and ask him what makes MIT so great, he is probably going to tell me that MIT gets the cream of the crop. They get the best graduate students from all over the world, and that is what fuels MIT. I have been a graduate student at MIT. If you ask me what makes MIT so great, I will answer that it is the faculty. Listening to the MIT professor in the classroom is a whole different experience. It is not necessarily that I must be physically in the same place, but I do know that a star is teaching me. What we, for example, have done at the Virtual University of Pakistan is to shop for the very best individuals and ask them to develop our courses. These individuals belong to organizations all over the place, at various other universities. They are people with acknowledged or established credentials. Our students know of them by name if not by face. We are using video technology. We use broadcast television to deliver our lectures. As a result of this practice of shopping for "stars," I do feel that the amount of criticism that is being aimed at distance learning in general is far greater than the amount that we at the Virtual University of Pakistan are receiving. Of course, we still face it – "Oh this is distance education." However, by in large when they start looking at the lectures and see that so and so is teaching it, then that makes a real difference.

We need to introduce stars into distance education. Why is this so? Look at distance learning right now – the norm is that it is a faceless faculty. There is somebody out in cyberspace or somebody who is authoring a book, and there is a faceless community of students. I spoke about developing a course to a professor from the Indira Ghandi National University in India, and he was able to suggest that we could hire authors who would write out material for the course. 'Authors?" I asked him. He replied that such people are available. Who are these authors? They are the faceless faculty. One never knows actually who they are. They are not Nobel Laureates. They are not really the established professors that we are familiar with. We need to bring the well-known professors and names into this business. Here it is not just individuals that I am talking about. It has to be institutions as well as individuals. Let us take the MIT-Singapore Alliance. No one ever says that this program is second rate. Why? Because the name, MIT, is there. The name, National University of Singapore, is there. These are big names. These are institutions, not just a single professor. Therefore, institutions matter, and individuals matter as well. We must add these two "star" factors to the quality parameters, which I believe are already built into the distance education system. Leaving aside the fly-by-night institutions, it is certain that with such changes, we will be able to change the perception. And remember, perception is reality.

Just to conclude, I will mention that we are conducting a multi-country research into distance learning and distance learning technologies. This is a project that is funded by the International Development Research Centre (IDRC), the Canadian public funding organization. For those of you

who are interested, you can look at the research project that is underway from Pakistan all the way to Vietnam. There are nine different projects, involving about eleven countries and many institutions in these countries. Most of the open universities of the region are involved, including Pakistan, India, Sri Lanka, Indonesia, Philippines, Vietnam, Cambodia, Mongolia, etc. The website for the program is www.pandora-asia.org. PANdora is the name because it is a veritable Pandora's box. So take a look at what we are doing. You should be able to follow along, and I am sure you will be able to contribute to the research effort as well. Thank you.

Important Lessons Learned about Delivering Virtual University Education

Presented by Laura Ruiz
Dean of Social Programs in the Research and Development Vice Presidency
Monterrey Technical University
Monterrey, Mexico

Before I begin talking about distance learning in university education, I would first like to provide a short introduction to the Monterrey Technical University. Monterrey Tec is a university system founded in 1943, supported by twenty-seven non-profit organizations. It is a private institution, independent of any political or religious group. Our mission is to form persons with integrity and with a humanistic outlook, who are internationally competitive in their professional fields, while at the same time able to be good citizens, committed to the economic, political, social, and cultural development of Mexico. These latter two items have been very important during our sixty-two year history. Just recently, our university administration developed an additional mission for the school. Our students, during their educational experience at Monterrey Tec, must somehow connect with the economic, political, social and cultural development of their communities and of their country. This connection and involvement is a very important aspect of education at Monterrey Tec.

So what is our system of education? First let me describe what we have in the way of campuses. We have thirty-four, brick-and-mortar, university campuses located throughout the country. In addition, we have a Virtual University. We also have more than one thousand community learning centers, as part of our outreach effort to bring knowledge through e-Learning to poor, underserved populations. Finally, we have five campuses for our Tec Milenio system, which is the newest educational innovation at Monterrey Tec.

Now let me turn to the Monterrey Tec Virtual University, which was founded in 1989. We currently have fifteen years of experience working in distance education. When we began in 1989, we conducted distance learning via satellite and now we do this via the Internet. The Virtual University offers quality education using innovative educational models, collaborative learning, and advanced information technologies in order to contribute to the development and maintenance of Spanish-speaking communities throughout the hemisphere. The Virtual University programs include graduate degrees, undergraduate degrees, continuing education, national educational development programs, distance education consulting services, development and maintenance of educational science, and tailor-made courses. Through

satellite communications, we have been working with the whole continent, primarily with Central and South America.

What I would like to share with you right now is some of our experience in this field of distance education. When we talk about distance education, I think it is very important to realize that distance education is not simply a matter of having "electronic books." As a university or as a consultancy group, if you want to get into the business of distance education, you must start by doing the following: define an e-Learning methodology; define an educational model that sets forth which pedagogical paradigms are behind it; and select which platform you are going to use - such as Web CT or Blackboard - thereby deciding which learning tools you are going to have.

However, distance education involves much more than simply selecting a learning platform. At Monterrey Tec, our distance learning process involves the following stages. First, we always make a framework, an analysis, taking into consideration all the social and economic characteristics of the learners who will be involved in a particular distance learning program. Therefore, one of the first things we do in developing a distance learning program is to identify the target population. Because we provide programs for a wide social and economic spectrum of learners, it is necessary to develop courses to serve a range of students with different lifestyles. By understanding the target population, we can identity e-Learning needs, previous knowledge and skills of the participants, job requirements and identify any gaps in knowledge and training, etc.

So in this process of distance education, first you must have a methodology, including the learning platform, and then you must identify the target population to determine just what kind of courses you need to develop. Next, you have to define the e-Learning solution. What type of e-Learning course will achieve the learning goals required by the target audience? At this early stage in the distance learning process, it is very important that you think very carefully about the structure of your course. You need to identify the mission and vision of the course. At the start, you have to identify and select general guidelines and parameters for the learning you are planning. Does the population have access to computers? What type of technology do they have access to - for example, is it broadband? In addition to this question of interactivity and usage access, you must consider cost, teaching and learning processes, organizational structures, and Internet speed - which is very important.

We must give serious consideration to this issue of speed because it can make the difference between a successful e-Learning experience and a failed one. If you open an online course for somebody in Guatemala, Honduras, Chile or Peru, and the Internet speed is extremely slow, then those people will lose interest and motivation. If those people come to study and endure an unsatisfactory experience, they will never go back again to online education. In traditional education, we have time to learn from our mistakes because most mistakes will not cause students to drop out. However, when we are dealing with online education, we must be sure that the experience is a

good one. In many of the populations we serve, we are inviting people to use the technology as a means of social inclusion. Therefore, first of all people must feel comfortable. It is not just a matter of knowledge, but it is also a matter of self-esteem, of learning how to do things, and of becoming part of the knowledge society. We are able to empower them in this way, and empowering people is not just a matter of course provision. Rather, it is a matter of transforming education by teaching people how to learn using this powerful new technology. For countries like those we have in Latin America, with their tremendous social and economic challenges, we would never be successful simply working in the traditional, face-to-face model because the economic and physical barriers to education are simply too great.

As I said before, e-Learning is not just a matter of creating an "electronic book." As an educator, I have been a teacher in a face-to-face model, and I have also been a tutor in an online program. Furthermore, I earned my Ph.D. in an online program. I believe strongly that this is the first time as educators that we have had the opportunity to create extraordinary learning environments. With this technology, we can design a course in a way that will embrace every different style of learning. Among students, we have different levels of intelligence, and with distance learning, we can create masterpieces in education that will address all types of intelligence levels. Because all the material is on the Internet, accessible through ICT's, each student can go through the lessons on his own, at his own speed, working on his own skills, working with his own preferred methodology, and having an education available twenty four hours a day. Such a student can study any way he wants. So really, it is a great opportunity to use distance learning to create diverse and exciting learning environments for all kinds of students.

So just what is this new methodology, this new paradigm? At Monterrey Tec, we are no longer teacher-centered, which is a very important change. If you are doing online education and you continue to work in a teacher-centered model, you are losing all the potential of the Internet. Instead, it is necessary to change to the student-centered model. At Monterrey Tec's Virtual University, we have the student at the center, surrounded by professors, digital libraries, collaborative networks, individual learning activities, learning objects, and the tutoring component. In this way, the student becomes the center of the educational system, and he or she is learning from all those different components - not just from a lecturing teacher. Let me tell you what this new paradigm is not. It is not simply having a video of a lecture. If all you are going to do is simply provide a video of a lecture, then why do you call that e-Learning. That is just traditional learning transferred to the computer! Or if all you are going to do is put a text on the computer, do not waste your time. Unfortunately, there are some learning platform systems on the market, which I will not name, that claim they enable e-Learning. However, upon closer inspection, they only enable one to put files on the platform, providing a traditional, passive experience for the student. No, the students must be at the center of the e-Learning process because we want to empower them and we want to allow them to keep learning. As e-Learning

educators, we must change the structure, not with more memorizing of data features, but by achieving a more meaningful learning experience. The advent of e-Learning provides a great opportunity, if we educators can learn how to design excellent and motivating online courses.

Therefore, when it comes to content and material productions, it is important to know how to design wonderful learning environments. That is very important. In the design of online courses, it is not so important to have flashy animations. We must think first in terms of pedagogical issues. Should we put an animation here – would it be pedagogically helpful to our learning objectives or not? Is it a matter of simply having entertaining features in an online course, or is it a matter of having features that we believe can help the students learn in an easy and enjoyable way? Of course it is the latter, and to achieve this complex task you have to assemble a group of specialists. In addition to academic experts in a particular subject, we invite a team of specialists, including: instructional designers; pedagogical experts; project managers; media production experts; video experts; web editors; multi-media designers; technical support. As you can see, it is a highly multi-disciplinary team that is working to design and create these online courses. The course content, generated in this way by a group of experts in diverse fields, is able to provide much more than a single professor could offer.

Yet to undertake this new learning paradigm, you have to deal with an innovative vision of teaching that is very different than traditional teaching. I believe that this cultural conflict, between e-Learning and traditional education, is really hard to deal with. People continue with the mindset that to develop an online course, all one needs is a professor. Why keep talking and thinking in terms of just one professor when we have the possibility of using much more than one professor? We can develop a stimulating, motivating online course that combines the knowledge and experience of a diverse team of specialists. Why do we continue the mindset of one teacher in a classroom? We must change the way we are thinking. We must change paradigms. We must understand that technology can allow us to utilize a wide array of experiences and to share best practices. So this is a major challenge – just how do we change to a new paradigm?

A big challenge always made to distance learning is the question – "How do you know whether or not the student is learning?" With our learning platform, WebTec, which I will discuss further below, we can always see what is happening with the student. For each fifteen or twenty students, we have a tutor who is responsible for helping that group of students. In many other parts of the world, but especially in Latin America, we come from a very traditional learning model. We are used to repetition and rote learning. In this type of system repeating what the teacher said is a rewarded activity. So in this traditional style, we were used to memorizing things. Of course, it is very difficult to make the transition into e-Learning and to shake off the 'shackles' of the past. For this reason, it is important to help each student make the transition, and that is the role of the tutor. Yet the tutor is not alone in doing this job, but is assisted by a coordinator of tutors for a particular course and

also by a specialist conducting research, evaluation and statistical coordination for the course. These monitoring teams are in charge of knowing how the students are doing every day, how we are succeeding or failing in attaining our educational goals. At the top of this online course organizational structure is the academic coordinator who is also involved in this process. It is very hard when you are a teacher in an online program because you can always be contacted by students with questions –even by the very shy students! While the tutors try to answer student questions, it is the teacher or academic coordinator who is ultimately responsible for the answers.

So just what is the process of evaluation and control at the Monterrey Tec Virtual University? We do not evaluate a course when it is over. Our programs are evaluated by means of an "active research" methodology. When you run an online course, you do not evaluate the course when it is over and say, "I am sorry that we did not have a good experience, but next time we will do it better." When you are running an online course, there is no reason why you cannot go back and check every element - step by step - to see if all the elements of the course are working well. "Active research" allows us to see how well things are going and also allows us to make changes. If you notice that a learning strategy, a learning exercise, is not working to achieve its educational goal, then you do not have to wait until the next course. Suppose you have twenty, fifty, or one hundred students in a course, and eight of them tell you that they do not understand what is going on. Perhaps you will discover that the educational strategy was not well designed. Through the evaluative process of "active research" possible with online learning, you can correct such problems and you can make these corrections every day.

With our learning platform, we hold easily accessed information specifically related to every student and thus monitor his/her learning experience. For example, with that tool we can see any communication between the tutor and the student. In a case where the tutor is not working out well, first we will try to help him, but if we cannot, then we change the tutor. Above all, we want each student to have a positive learning experience.

Now I would like to discuss the e-Learning platform that we have developed at Monterrey Tec that enables us to accomplish all this. It is called WebTec and was developed by the Monterrey Technical University specifically for the Virtual University. This platform contains four competencies: 1) Academic manager; 2) Academic counselor; 3) Learning distributor; and 4) Knowledge base builder. The Academic Manager is a space for the academic managers' interaction and decision-making. It is a tool for monitoring the implementation of the educational model, to get the indicators, to get clear information about what is going on in the learning process. The Academic Counselor is a tool to help assign creation and development of content by the specialists and by the professors. The Learning Distributor is a space for academic managers to interact in decision-making. The Knowledge Base Builder is a very important part of our platform and overall program. It is a tool that guides a professor through the

creation and storing of the academic knowledge. We have developed a repository of learning objects, so a professor can create a new course by employing these Knowledge Base Builders to discover which learning objects would be best for enriching the online course he wants to develop.

Now let me describe to you our various target groups. We are involved in creating and running online distance education courses for the public sector, for the social sector, and for the private sector. We have discovered that it is possible to provide quality education for low-income regions. At Monterrey Tec, we have thirty-four campuses, as I mentioned earlier. Sixteen years ago, we were facing a major challenge - how to offer a high quality of education for our students at campuses in the southern part of the country equal to that of our students in the northern part of the country. Mexico is a large country, and the topography is very difficult in terms of transportation, etc. This is why we began using the Virtual University. We have been testing and perfecting this type of learning over the past sixteen years and we have proven that it is possible to use e-Learning not only with our students, but also with our professors. By means of distance education and online learning, we have been able to raise all of our professor to a Masters degree level. Yet realistically speaking, we cannot have ten or fifteen Ph.D. professors in Chiapas or in Campeccio or in Chihuahua. Rather, we invite our Ph.D. professors to help us create high quality, online content for everyone in all thirty-four of the Monterrey Tec campuses.

Now briefly with the time left, I would like to describe Monterrey Tec's e-Learning program for the social sector, which is the program I am involved with. More than 200,000 people in 23 countries have been working with us in this e-Learning initiative designed to promote social, economic and political development. This number includes students from the world of journalism, from non-governmental organizations, from departments of corporate social responsibility, from governmental agencies, from schools, and from various community organizations. Of these students, 19% have access to courses through satellite communications, while 79% have access through the Internet.

In closing, I want to mention the major challenges that exist for online learning. In the academic area, we must always try to improve the content of e-Learning. It is extremely important to keep the students clearly in mind, to stay close to them -- understanding their academic needs, helping them to learn, and motivating them to keep on learning. A major challenge is always the design of content that will accomplish these goals. A second area of challenge is the need to make administration and Services operate more effectively when it comes to online learning. For example, often an administration will insist that an online course take place at a specific hour, with set course start and finish dates. Such inflexible scheduling is counterproductive, since online courses can and should be available 24 hours a day, 12 months a year. A final challenge is with the extremely important component of tutoring. Individual tutors require a significant amount of

training so they know how to work successfully in this new paradigm of education.

I firmly believe that e-Learning can serve as a tool for poverty reduction by helping to create exciting learning environments for people at all socioeconomic levels. This new educational paradigm can help build a higher quality of life for more people around the world, and by inference, create a better world.

PANEL TWO

INNOVATIONS IN

TEACHING AND LEARNING

myCyberTutor

Presented by David E. Pritchard
Cecil and Ida Green Professor of Physics
MIT

I am excited to be here today with all of you to talk about CyberTutor. As a matter of fact, CyberTutor is now known as "myCyberTutor" by our company that makes it. It is also called "Mastering Physics," which is sold by Addison Wesley. 2005 was our second year out in the field, and we had 70,000 students use it out of 250,000 in the market - which is amazing penetration. Therefore, it is by far the number one homework system in the introductory physics with calculus market, and because Pearson Education is extending it to new subjects and to Prentiss Hall, we expect to have a million users in a few years. Here I must add that I am not only an MIT professor, but my wife and I are the sole investors and money losers in this company (which has been recently sold to Pearson).

Basically myCyberTutor is an intelligent, personal tutor that interacts with students based upon experts' educational experience rather than artificial intelligence (A.I.). You may wonder why I chose to work on homework rather than on those issues with which most educational reform is concerned, such as in-class activities, group learning, etc. My response is: think like an efficiency expert. Look at the priorities of teachers – how they allocate their time - preparing lectures is #1 and making homework assignments is about priority # 4. Yet students spend the most time, and report that they learn the most, from homework. Furthermore, if there is one thing that educational researchers agree on - and there is, as a matter of fact, only about one thing they agree on - it is that interactive processes are more educational for most people than passive experiences such as listening to lectures or reading books. In addition, I do not believe that the current homework regimen is optimum, for two reasons at least. First, students waste a lot of time when they are stuck, and second, when they get stuck on some particular point, there is no way that the author of the problem ever learns exactly where they got stuck. If he did learn this, then he could fix the problem or add a pertinent hint in the next edition.

So the goal of myCyberTutor is very simple - we would like to pass the Turing tutoring test. We would pass if the student never guesses that there is not an expert human tutor on the other end of the line. Secondly, the tutor should inform the teacher about the student's progress in as great detail as possible. We are seeing the student interact back and forth on each problem ten times, so we have two thousand interactions over the course of the term. With this kind of information, we should be able to do more than simply put a single numerical grade on the student. And finally, from the process of tutoring hundreds of thousand of students, data can be collected in a way that

informs the authors about how to improve their content. So the result of all this is that we have designed an effective learning tool - and I will define effective later on – that enables people like you to author and deliver and improve content from the feedback. Basically, myCyberTutor is an intelligent tutor that embodies a teacher's (or a group of teachers') expertise, assesses the students' work in real time - giving appropriate feedback - and informs the content authors how to improve their content.

Out of numerous important pedagogical principles that we try to embrace, I would say that two are the most significant. First of all, we believe in mastery learning. That essentially means that if a student cannot do the problem in the allotted time, then you expand the allotted time until 90% of the students get to the solution. myCyberTutor does not instruct for a fixed time, then assess what fraction of the material students know at the end. Rather, it keeps increasing the time until the students have learned what they have to know to solve the problem at hand. Second, we hold that multiple choice is multiple guessing. It often does not involve thinking about the problem, but only about the answer. Free response answers, especially analytic ones, have been highlighted because they make the student think about solving the problem.

So here is how it works. The example problem is called a conical pendulum. How fast does a mass on a string tied to the ceiling have to go around for the string to make an angle theta with the vertical? Now, if a student simply guesses wildly, then the myCyberTutor will respond that the correct answer does not depend on the variables indicated by the student's incorrect answer. That type of response is done by crude Artificial Intelligence in the system. So our student decides that he is truly puzzled and that he should click into the "Hint" button. With that click, he will receive a list of the titles of the hints, and basically these hints are scaffolding that gives an overall plan to do the problem. For example, in the pendulum problem, the hints listed involve: the vertical acceleration, the tension, the horizontal acceleration, the horizontal force, etc. However, at this point the student still may be lost, so he elects to open one of these listed "Hints". This may be a sub-task that sheds enough light on what is happening so that the student can work to what he thinks is the answer. This answer may correspond to a frequently given wrong answer with a specific feedback response entered in by the content author. If this does not enable the student to obtain the correct solution, he can go back to the other listed hints in any order. The fact that the student can use the hints in any order follows from constructivist theory – that the student is constructing the solution himself, so you let him pick his route to solution rather than forcing him through steps A,B,C,D in order. Finally, when the student does get the right solution, he is told that it is correct, and many times there is a little follow-up comment or follow-up question that will be displayed. After you have just solved a specific problem, you are in better shape to understand it than you will ever be again (unless you have to teach it!). So this is a very good time to point out something important about the solution.

The next point I would like to turn to is the assessment. We are developing an online Skills Profile where you list one current grade for each important skill rather than one old grade for each assignment. With this profile, you can identity just where a particular student or class is doing well and where they are doing poorly. One can follow the progress of an individual student and also of an entire class. There are many things we can learn from the online Skill Profile. For example, we can see if a student is missing some foundational skills necessary for the course, or if he/she did not learn certain skills earlier in the course that are needed now. In the myCyberTutor system, a student who has a deficiency like that will have to go into one of the hints when working through the problems. As a result, we can assess the student's skills on that particular component of the course while he is trying to do a more advanced problem. Thus, we can continually update his skills. So this is a kind of assessment that is unobtrusive, one that is based on the learning experience. With the Skills Profile function, it is not necessary to give the student a test every day, since this is an up-to-the-minute assessment that can be displayed in a way that a teacher can see just where the student is deficient in terms of skills needed for the coursework. So you can see that this is a very powerful diagnostic tool, both for the student and for the teacher. It is formative rather than summative assessment, and it reflects tremendous statistical reliability based as it is on so many interactions with the student. With this skill profile, we can do a large number of things - even predict a student's outcome on the final exam. Above all, it certainly is a valuable tool in identifying students who are in trouble.

That is all I want to say about assessment, the second line in the design criteria of myCyberTutor. Remember, the first line is that the tutor has to act like a human, and the second line is that it has to inform the teacher - as you can see it does in the area of assessment. Now I want to turn to the third line of the design criteria, about how it informs the author or teacher about what is going on with his problems. For example, if less than 90% of students get the right answer, the author would realize that more hints are needed. He would look at the wrong answers and respond to the ones that are frequently given. Also, he could look at the students' comments, which would be a guide for future editions of the problem. Finally, the author can look at how long it took the students to do a problem and then decide if that is a reasonable amount of time to spend on that particular problem – or maybe it is too long, and the problem should be simplified or even scrapped. For example, the author can look at a display of wrong answers compiled by the myCyberTutor, after about one hundred students have answered the problem. The author can see if there is an A.I., generic response or if there is a particular response that was previously entered in by an author. What we found is that if you enter in specific wrong answers for the five most frequently entered wrong answers that are not responded to generically, you can make an intelligent response to about half of all the wrong answers. myCyberTutor also allows a student to leave a comment about a particular

problem, and if a teacher receives more than 3% of comments, then those comments are usually directing him to a difficulty in solving the problem.

So a big part of our effort with the myCyberTutor program was spent on refining the problems. We spent about one hour per problem during the period from 2001 to 2002, and we raised the percentage of students who got the right answer from 84% to 92%. Furthermore, the percentage of students who had to request the solution dropped by a factor of two, and the wrong answers per part dropped by about 40%. The average number of hints per part went up slightly, because we had added hints where the students needed them. Although the time that students spent working out the solutions was exactly the same as prior to using myCyberTutor, the frustration level they felt dropped by half. Yet despite all these excellent results, there is still room for more improvement. I am sure that if we went over everything again, spent another hour refining each problem, we could do substantially better.

Originally I developed this CyberTutor in the spring course of Mechanics at MIT. That course is designed for students who took it in the fall and did not do so well. About 70% of the students in the spring class had a final they had taken the previous December and then another one in May at the end of my course. Therefore, I could look at how much of each instructional element (e.g. written homework, going to class, class exercises, electronic homework, tutorials, etc.) each student did and measure the correlation of these various instructional activities with improvement on the second final relative to the first. It is pretty clear from the results, that the electronic homework is overwhelmingly the significant factor in improving exam scores. Doing the electronic homework is the activity that will raise your grade the most, if you correlate like everybody else. While it is also probable that the better students go to class, it is not true that the students who go to class substantially improve their performance from one final to the next. As a matter of fact, in a couple of our studies – we have already done about six studies – attending class actually correlated as a negative factor!

Our research results have confirmed that the myCyberTutor program seems to produce a two sigma effect on the MIT final exam: students who use it improve by two standard deviations on the final exam relative to those who do not. Two sigma is a huge educational effect - about what a private tutor gives. Two sigma corresponds to two letter grades. What it corresponds to in the university learning environment is taking a student who is very solidly failing, initially in the 3rd percentile, and bringing him up to average. Or alternatively, taking a student in the 15^{the} percentile, who is borderline passing, and raising him up to the 85^{th} percentile in the solid A category. That movement is a big improvement, and it really seems to demonstrate the immense promise of this kind of interactive learning.

In conclusion, I would like to offer my personal view about what digital education brings. The main point is that you can get away from broadcast radio - providing the same message for everybody, and you can go to two-way radio where you have a conversation with each student. The student is then interactive rather than passive. You stop thinking about the

class, and instead think about the student. You do not have to have a uniform style, such as a lecture or textbook that is intended for everybody. Rather, you can change it for different students. In the publishing business or in the classroom, you always think about the future – about the changes you will make in the next edition of the book or how you will run the class differently next year. With digital, interactive learning, you can make such changes the next day! As a matter of fact, you have to make the changes because customer service is one of our problems. With this type of digital, interactive learning, the teacher becomes more of a coach. In addition, there is no longer a need to have one author write a huge textbook in a consistent style that covers an impossibly large subject area, for example, from Mechanics to Quantum Mechanics. Instead, you can have authors who are experts on one specific topic within the larger subject area. And finally, you do not need high stakes tests because you can use imbedded assessments for summative assessment (as well as for formative assessment as indicated above).

So remember: we have made a software tutor for science and math subjects. You can write interactive content for it. It enables you to improve your content in just the places where the students need more help. And it gives you, the teachers, as well as the students insight into the students' misconceptions and skills. Your tutor will help students learn what you want with impressive learning effect. This can be provided for about $30 per semester of four courses, so it has enormous potential for spreading education. In conjunction with the $100 laptop computer being developed in the media lab, it promises to solve many third world educational problems.

Creatively Diverse Teams

Presented by Douglass J. Wilde
Design Division
Department of Mechanical Engineering
Stanford University

To start out, I would like to know how many of you, how many systems that you work with, have any of the students put together in teams of some sort? Well I can see that it is more than half the people here. I myself have little involvement with distance learning, but I am in the Mechanical Engineering Design Division of Stanford University, and our design courses involve teams. We have teams of three or four people working together all year in our graduate courses. They get an industrial problem, they design a solution, they build it, and they present it. So about fifteen years ago, I got the idea that maybe we could improve the performance of these teams if we took psychological characteristics into account. That is kind of spooky for an engineer, but it did work! We use something known to psychologists as "The Myers-Briggs Type Indicator." We use the information from that test to put the teams together.

First of all, I want to tell you what happened in the Far East regarding performance of these diversified teams. Professor Yong Se Kim, one of my former students, is a professor at Sung Kyung Kwan University in Seoul, Korea. Perhaps you have never heard of it – it is only six hundred years old and is a Confucian University! Professor Kim and his colleagues decided to try putting together design teams from three different countries -- from Shanghai, from Tokyo, and from Seoul. Therefore, what they did was to form teams of six or seven students, using the methods we employ at Stanford -- that is, using psychological information to form the teams. The students communicated with one another via high definition TV and eventually they all came together last May, inviting me to join them as sort of the Godfather of the whole thing. So at that meeting last May, everybody saw each other for the first time to give preliminary reports on their design projects.

However, I want first to present the theory under which we are operating. The Myers-Briggs Type Indicator is a questionnaire that gives you four letters from which a person's creative mode can be determined, without any computation with scores. The trick I have added is computation with scores, and with this secret weapon, I have been able to make the Stanford teams work successfully. While the Myers-Briggs people do not use the numbers, but only the letters, I do use the numbers. However, I am not going to show you how to use the numbers because I have found a simpler way to do it which gives you something almost as good. I call it the "quick and dirty" method, which I will explain to you a little later on. The Myers-Briggs Type Indicator is based upon the personality theory of Carl Gustav Jung who sees

human cognition as having eight cognitive modes. According to Jung, these eight modes include four mental functions (sensing, intuiting, thinking, feeling) combined with either an internal (introverted) or external (extroverted) orientation.

The relative strength of these eight modes within your personality determines how you process information and make sense out of your life. While individuals have eight of these cognitive modes, it is only their creative cognitive mode - the dominant one - that they are very good at. Also, while individuals may be aware of their top four cognitive modes, their bottom four modes remain "in the shadows," so to speak. So this dominance of certain modes in a person is important for us to know about in putting our teams together. As a result of this knowledge, we work only with the top two modes. This is because an individual person does not do well in all eight, or really in more than perhaps two or three of these cognitive modes. It follows that in building a team it would be best to have team members who possess different creative modes. Our hypothesis was that teams put together in this way ought to operate better, and they did - - we tripled our prize-winning capacity! Yet as you can see, it is not really a secret weapon, but just our weapon – how we put our teams together.

In principle, you could utilize this same process for distance learning online groups if you got a license from the Myers-Briggs publisher, Consulting Psychologist Press. You could administer the test over your distance-learning network and receive the online students' responses. Then it would be your job to put the teams together in some way. You could eyeball it from the test results, estimating which person has which modes. However, that is kind of a clumsy method, and I would like to show you a quicker way. First, however, I want to demonstrate quickly how the Myers-Briggs letters can show you which mode is your own creative mode. Here I must emphasize that this is creative potential, and in some cases, people will not have developed that potential. However, we find that if students know where their creative potential is located, they will start working on it and become more creative in that way. This is a good news outcome that we have discovered in the course of our research.

Now I will use myself as an example. In the Orientation domain of the Myers-Briggs, I come up E (Extroverted) rather than I (Introverted), which indicates that my creative mode will fall into one of the four E modes. Thus, according to this test, my creative mode does not fall in one of the four I modes. Next I can look at a different block, the Perceiving domain, and see that I come up in the N mode (iNtuition) rather than in the S mode (Sensing). After that, I move to the Judgment domain where I have come up T (Thinking) rather than F (Feeling). Finally, I move to the Action Orientation mode, where I am either J (Judging) or P (Perceiving). Here I come up a P. So my four letters on the Myers-Briggs are ENTP, and through these letters, I can identify my personal creative potential, according to this psychological test. Any student can do this same exercise, using the four letters identified by taking the test.

So what is this idea of putting together a creatively diverse team? If I have a team of six or seven people as Yong Se Kim had, perhaps I will be able to cover six or seven different creative modes on that team. At Stanford, we tend to have three or four students on a team, so I will discuss an example of looking at a four-person team. We want some procedure such that our "quartets" are made up of four different creative modes. That is the idea of creative diversity. So I will give you a little rule right now that you can take home with you. Take my case, where my letters are ENTP. In a sorting process to achieve team diversity, initially I should be put into a group with people who have the letters INTP. Once this step is achieved, my rule here dictates that, in the next set of sorting, I should be teamed up with people who have two out of these three last letters different than my own. This is what I call "the two out of three rule" that I use to generate - in a quick and dirty way - teams made up of students who have different creative modes.

In order to put together these creatively diverse teams, we must sort through these four letter groups, ending up with the same number of students in each set. Having the same number is a little tricky and that is the final thing I am going to show you -- how to do this. As an example, suppose w have nineteen students, and we want to make teams out of them. Well, nineteen is not divisible by four, but if we add one, then we get up to twenty, which *is* divisible by four. This number indicates that we will need to put together five teams, but it also indicates that one team will be a "trio." You see, we are simply putting a dummy in the bag, so to speak, whose scores will be right in the middle. I forgot to say that we extend the Myers-Briggs approach to the four letters and we take each dichotomy. So if someone is very close to the middle, we just put an O there, so that we have a three-value logic to work with. This gives us flexibility because if someone is in the middle, then when we are short in one group, we can throw that guy into the short group. Moving along in this sorting process, each team would take a member from each of the four sets of letter combinations, or if you are the "Team-meister" - the one who is doing it from a distance - you can start picking out people. Here you can use other factors – such as all women or all men, or mixed sexes, or ethnic or national groups. There can be considerable flexibility in putting together these teams or groups. For example, Yong Se had to make sure he had the same number of Chinese, Japanese and Korean students on each of his teams.

So how does one do this quick and dirty method of sorting? I often do it on a spreadsheet, and I am sure you could do it that way as well. However, the last time I did this with the teaching team at Stanford, we just took the questionnaires that the students had filled out and we wrote out the letter denotations on the top of each one, for example, ENOP. With our sample case of nineteen students, the first thing we would do is put a dummy in as the twentieth student. Next we would want to split this group of twenty into two equally sized groups. For example, to start out sorting we would partition the twenty students by N's and by S's. We want ten on the N side and ten on the S side. At this point, we would put any O's that we see off to

the side. Also, when the dummy comes up, we would put that off to the side as well. Given this example of nineteen questionnaires plus a dummy questionnaire, we might end up with nine N's and seven S's. So what we would do is take the O students remaining and distribute them around so that we have ten in each group. Then we would take these two groups of ten and split each of them into two groups of five students. After that, we would do a similar sorting process with these four groups of five, but this time we would look for the letters J and P. First we would sort for all the NJ's and the NP's, and then we would sort for all the SJ's and the SP's. Here, for example, if you find you have too many NP's and not enough NJ's, you can put an NP in the NJ group. So at this point we have four groups of five students, mostly sorted as NJ's, NP's, SJ's, or SP's -- but some having other combinations due to necessity. The final step is particularly tricky in this example since five is not an even number of students that we can divide into two teams. Here we have to make a decision -- which of these teams is going to have two and which is going to have three. Then we go through each of the four groups of five, taking one student from each in forming the diverse groups.

Now let me briefly discuss how this "quick and dirty" process differs from the more advanced method used by Yong Se Kim, or from what we use at Stanford. At Stanford, we try to tap all eight creative modes in putting our diverse teams together. Therefore, we have to go to the second mode, the so-called auxiliary mode, and that is really beyond the scope of this talk. To get to that second mode, you have to do some calculation, and I wanted a method where you do not have to calculate to get to the second mode.

In terms of the impact of our method in creating effective working teams, a recent double-blind study has been completed, although the results are not yet published. It was conducted at the University of California at San Diego by Nate Delson, an MIT Ph.D. in Mechanical Engineering, along with Dr. Joan Connell of the Psychology Department. In that study, half of the teams were made up my way, and the other half were made up at random. The students were unaware of which teams they were on, and Nate Delson did not know which were experimental or which were control teams. Once the team members had finished their semester-long work together, questionnaires were completed and an evaluation was done. They found that my teams took longer to get their act together - probably because it is harder to get to know people who are different. Yet through the evaluation he conducted, Nate Delson found that my teams were more creative, which is why I am in the business, you see. Yet an important rule of thumb here is to use this method only if the team members will be working on a project of more than one month's duration. Otherwise, by the time they get to know each other and feel comfortable, the time would be up.

Community of Inquiry Model for E-Learning

Presented by Reuven Aviv
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My subject here today is a Community of Inquiry Model for e-Learning. Before starting, I want to make two comments. First, this is not my own research, and I did not invent anything related to this model for e-Learning. In fact, it is a project developed by certain Canadian people whom I will mention later. My role in this project is as a researcher. I am researching learning groups that are using this particular model. My own research will be presented here only in one slide. However, I did think that it would be very useful to provide the details of this particular model primarily because, as I guessed - and I guessed right - collaborative learning, project-based learning, inquiry models, interactive learning, etc. have already been mentioned here at the LINC Conference or will be mentioned here later today or tomorrow. What this Community of Inquiry Model can provide us with is a way of thinking. Suppose we are making teams similar to those discussed by Professor Wilde. Yet what is it that we are requiring from those teams? What is it that we want to have happen in the teams within the context of higher education? This will be my subject today.

The second comment I want to make is the fact that this model is nothing new. It was developed during the past one hundred years, originating with the educator, John Dewey. However, the challenge we will discuss here is how to implement the particular specifications of this model when you are talking about e-Learning. There is nothing special about e-Learning as far as this model is concerned, but there are several concerns to consider if you want to implement this particular model in an e-Learning environment.

So I am going to talk about a Community of Inquiry Model for e-Learning and then I am going to provide one highlight of the research result. That highlight is my own contribution to the research. Finally, if there is time, I am going to talk about a particular community of inquiry scenario. We will look at a specific E-learning situation to see how each of the components required by this Community of Inquiry Model can be developed in an e-Learning situation.

So just what is a community? Are we a community here in this room today? In a sense, we are a community because we all have the same goal, and that goal is the goal of the symposium. We would like to know much more about using e-Learning and enhanced learning in developing countries. We are also an inquiring community in that we ask questions and we are actually evaluating the answers. Therefore, in these senses, we are a community of inquiry. However, one thing is missing, and that is the social

part. Up until this point in time, we have not developed very strong relations among all of us. By the way, let us do that now. Look at your neighbor, share with him/her your card, and let us have some kind of social communication. I am doing this because I have just mentioned the three components of the Community of Inquiry Learning Model. If there is anything you must remember from this presentation, it is these three components - the **Inquiry,** the **Leadership**, which is me at the moment, and the **Social ties**. So these are the three main components that we will be discussing later.

Now the history of this learning model begins with John Dewey and extends about from 1859 –1952. Here is a quote from him describing his view of what education must be:

> "Education is a process of helping to cultivate an enlightened society in which people live together in a democratic fashion."

This is a very high level idea of education, but if you translate it into more practical terms then you will find out what you really need. First of all, you need critical thinking ("enlightened"), and that is what we want from our students. Second, we would like to have collaboration within a social context ("live together in a democratic fashion"). Third, we have to have some kind of support, helping, guiding, or if you want, some kind of teacher ("a process of helping"). All three of these components are present in various types of learning models, including: group inquiry, community of inquiry, project-based learning, investigative groups, etc. While these all have different names, they all essentially mean the same.

Then following Dewey, we have had several milestones, of which I will only mention a few. About twenty years ago, some people developed a doctrine of "Good Practices" in implementing these ideas. Then later, we had a whole series of papers and books about expanding cooperative learning. Yet these educational theorists were always referring to the context of the classroom, in high school or in elementary school, in a face-to-face learning situation. The expansion of these ideas into e-Learning has been undertaken by Garrison et. al. - the people I mentioned in Canada. There is an entire web site on the Community of Inquiry Model of e-Learning developed in 2002 by Garrison, Anderson, and Archer.

Now let us look in detail into each one of these three components of a Community of Inquiry Model. First of all, we want a high level of critical thinking. The term used by Garrison, one being used consistently today, is "cognitive presence." We would like to have in a community – whether a team or a class, whether online or face-to-face – "cognitive presence," meaning people asking questions, people evaluating answers, people criticizing others, people teaching others. This is an important factor for a teacher to know about. If you have a teacher who organizes collaborative learning, a first question must be how will that teacher develop "cognitive presence" among the students. Just putting a book or other content on the web

site is not enough. That teacher would like the student to do something, to create knowledge.

The second factor that is required in this model is the development of strong social relations. Now this is of course required in class, but it is required much more in e-Learning, and that is a major difference. In a classroom situation, you have social relations automatically, while in e-Learning these relations are difficult to achieve. Therefore, you have to insert it, you have to somehow create a process through which students can present themselves, talk about themselves, participate in joint projects, etc. One can even force them to do this, for example, by dividing the course materials among several students, requiring that they communicate to exchange the materials.

The final component you would like to have in this model is design and leadership. If you are going to include a demand for critical thinking and also a demand for social relations, then these demands will only work if you have some design of the whole scenario of learning and some leadership. Teaching presence really means the role of the tutor, the teacher, the actual presentations, the actual video broadcasts if you have them, as well as the design and evaluation. You have to have teaching presence, social presence, and cognitive presence in your e-Learning community.

Now let us discuss what we mean by "cognitive presence." How do you measure it? Well, you measure it by the extent to which students are able to construct and confirm meaning or knowledge. How do you achieve this? First you must have some kind of triggering event. You have to start it up, for example, by putting up a question to the whole class. You can do this face-to-face and you can also do this on the Internet. You can put up a project or a controversial idea. For example, in a mathematics class ask them to prove that two plus two is four. The students will then make numerous inquiries - "what do you mean by that?" With such a triggering question, you can initiate all kinds of debates. "What do you mean 'prove' – it is obvious, it is an assumption." So once you have a triggering event, then a kind of brainstorming will take place. However, someone has to lead it. This can be done in class and also online. Another way of having cognitive presence is by exploration, asking students to clarify. "What do you mean by two plus two equals four? What do you mean by two? What do you mean by four?" Integration is another way of getting cognitive presence. This calls for a student to summarize what he has learned, for example, after studying for about a week. This could involve each student separately or in groups, and they would be called upon to reflect. "Have we achieved our goals?" Resolution would be a final way to develop cognitive presence.

Social presence is easier to develop. It is defined as: the degree by which participants project themselves socially and emotionally to the community. We can do it here in this group and we can do it online. It is not quite as easy as it sounds, but it has to be done. What you would like to have are different types of affective expressions in the online conversation among participants. "Hi, this is me, that is my name, I am married, I am living here, I

saw this movie", etc. These are the sorts of social exchanges that all of us have participated in since we arrived here at eight o'clock this morning. Next we would want to have interaction about anything that would lead to cohesive group commitments.

The third and final component is teaching presence. We are more familiar with this component. One has to design the goals, the curriculum, the tasks, the assessment, etc. One has to facilitate the learning process and then one has to do some instruction. How much instruction one is going to do depends on the importance of this particular component relative to the other two components.

There is one thing that I would like to emphasize in this presentation, and that has to do with research. There has been much research conducted that actually measures the degree to which these three components are present in a specific online learning scenario. This research also measures the correlation between the relative presence of these three components and the success, failure and satisfaction levels of students with a specific online learning scenario. I myself have been involved in an analysis with two other researchers of one thousand questionnaires completed by students at the State University of New York (S.U.N.Y.). These students were questioned about their experience in an online learning scenario. We have analyzed the responses in a very special way of network analysis to reveal the central, high-level concepts expressed by these students and to understand the relationship between these various concepts. We did learn that teaching presence - not cognitive presence and not social presence - is the most important concept that they were concerned about. They talked about design, they talked about facilitation, they talked about leading the entire learning process, etc. This kind of teaching presence was an important element that they looked for in a pure online education. They did talk about social presence and cognitive presence, along with personal issues such as access and limitations of learning, etc. However, our network analysis revealed that these issues were less important and less connected to other concepts than were the concepts related to teaching presence. This should not be surprising since these students graduated from high schools in which all learning was done face-to-face. So they are looking for a teacher, they are looking for a teaching presence, and they believe that this is important. However, this does not mean that either of the other two components is not important.

Now I would like to look at a specific e-Learning situation to see how each of the components required by this Community of Inquiry Model can be developed in an e-Learning situation. Imagine that you have a class, online or offline, and you give them a task. It could be the two plus two problem or it could be to design a document that would help a cell phone company deal with the controversy of radiation from cell phones. These companies have a public relations problem explaining to the public whether or not there is a danger. So the task of the class is to write a document via consensus. That document is the end product. Now one way to start this process, step one, is to have the entire project planned by the class. In this

case, I would only tell the class exactly what I told you, and that would be all. So this would be a triggering event. I would tell them that this is your goal. This triggering event would serve to initiate all kinds of questions. It is this type of brainstorming that will develop the cognitive presence. Next it will be important for the students to have some kind of virtual meeting in which they will specify the joint assignments. They will plan the assignment together – what are they supposed to do and what are the expectations? Remember that this is all planned by the class. The teacher is virtually present, monitoring and controlling everything. However, the teacher is not going to write down the joint assignment information because the class is going to do that.

In Step Two, the class will be divided into teams, using the method we just heard about from Professor Wilde or some other method. Once these team members meet online, they will inquire and elaborate further about the assignment at hand. How will they do it? Who is going to do what? What strategy should be used? Once again, this is cognitive presence. Now when they are communicating with each other, they are gaining trust. Trust is extremely important. If you do not have trust between the participants, it will be very hard to have collaboration. That is why in this scenario you are actually imposing the whole job of planning on the class and on the team in order to get them talking about the project. This is the way you can instigate the development of trust building by having them talk to one another. At this stage, the role of the teacher is to support the whole process, by, for example, approving the actual task sheet that is produced by each of the teams. So what I have presented so far is just the planning phase, and already we have cognitive presence, social presence and teaching presence.

With Step Three you have the inquiry. There are many ways that this can be accomplished by the teams. Some of the teams may decide that they will contact experts from outside of the university. Other teams will use the Internet, use other people, ask themselves, and discuss among themselves, all deciding together how to write the end result of the project. You have social presence here when they are speaking with people outside of the team, and you have teacher presence here when the teacher is controlling the entire project and requesting reports and providing feedback. I am emphasizing again the role of the teacher because I do not really believe in the idea that a teacher can assign a project and then go home and wait for one or two months until the projects are completed. A teacher has to be there more frequently

Step Four is to draw a conclusion. This step could be accomplished by means of a panel, like the panel we have here, with a representative from each team meeting online. Then that representative would communicate with his team members about what took place on the panel. What went wrong or what went right?

Step Five would be evaluation, which is done in traditional ways, including written submission of the project for evaluation by the teacher.

PANEL THREE

DISTANCE EDUCATION AND E-LEARNING

FOR ECONOMIC AND SOCIAL DEVELOPMENT

Higher Education as a Stakeholder for ICT in Development

Presented by Royal D. Colle
International Emeritus Professor
Cornell University

Two recent events convince me that my message today is important. However, this message goes largely unheeded in the international community. Several months ago, I was standing outside the arrivals terminal at the Los Angeles airport when I overheard one side of a cell phone conversation. Apparently the person I overheard had not been picked up at the airport at the proper time. The conversation went something like this. (Imagine frustration.) "But I left word on your cell phone." There apparently was a response on the other end, and then, the person at the arrivals terminal, said: "Oh, you didn't check your cell phone!" (Imagine anguish.) The brief, simple lesson from this episode is that the tools for connectivity are not enough to produce the benefits that the new information and communication technology promise.

And only a few weeks ago you probably learned of the newest technology from the Apple Computer people. Apple displayed the latest iPod technology - an iPod that will allow you to play television programs on this amazingly small and compact device. Accompanying the announcement of the new technology was the breathless announcement that Apple had forged an agreement with the Fox television network that would provide episodes of the television program, "Desperate Housewives," to iPod users the day after the regular network broadcast version of "Desperate Housewives." The brief point here is that information and communication technology is important - but there are major challenges in generating constructive content that makes the technology worthwhile.

This is especially important regarding the movement to apply information and communication technologies to development. In fact, the convergence of the World Summit on the Information Society and the world-wide focus on the Millennium Development Goals accentuates this essential partnership between ICTs and development. As you know, the central elements of the ICT mix are computers and the Internet. It is important to note that the number of Internet users in developing countries now numbers around the 500 million mark, surpassing industrial nations for the first time. "Yet " the Development Gateway report says, "the long-heralded promise of ICT remains far out of reach for most of the developing world." I would argue that "out of reach" is more than a connectivity issue. But more on that later.

There are some important international players in the movement to put ICTs within the reach of those on the wrong side of the digital divide. These include the International Telecommunications Union (ITU), UNESCO,

the United Nations Development Program, the World Bank, and the UN ICT Task Force, among many others, including both national governments and NGOs. ITU recently announced an initiative to connect the world's 800,000 villages that do not presently have a telephone or Internet connection. It is a public/private sector partnership with 22 founding members. The target date is 2015 - which corresponds with the due date for the Millennium Development Goals. But there is something missing in this whole drive toward connecting the world in the interests of development.

Not present or not obvious are universities, or other higher education institutions. Except for distance learning - where many universities in developing nations have excelled - and in the development of new technologies - where the institutes of technology have excelled, - universities have not been systematically challenged to become part of the ICT and development action.

At this point, let me turn specifically to the subject of telecenters, because it is by means of community-based telecenters that people in those 800,000 villages are most likely to be connected to the world. In fact, India has launched a program to connect all of its 600,000 villages by the year 2007, primarily through the use of telecenters - telecenters being a place in the community where people can have access to ICTs and other services. And speaking of India, we have been associated with a project in Tamil Nadu in which a university has played a major role in providing ICT access to rural people, with considerable attention to women and girl's access. The university incubated several village information centers. The staff of the university taught computer basics to many of the young people, and middle aged and older women. They underwent training for 10 days after which they learned enough to start practicing by themselves. Women belonging to Self Help Groups started entering their daily activities and money saving accounts into the computer. This has lead to transparency in financial dealing among the members. Furthermore, the university helped the village information centers build locally relevant content for web pages and organize small libraries for the community. It is important to note that the universities incubated the telecenters but that the community took them over, and they exist today as the community's telecenters. Their sustainability results, in part, from the content and services and other support provided by the university.

So what do telecenters need? Of course, in addition to local information, telecenter computers, networks and other ICTs provide access to a huge inventory of information. However, as Secretary General Kofi Annan noted at the first World Summit on the Information Society (WSIS), there is a "content divide." He and other experts agree that a lot of web-based information is not relevant to the real needs of people and "at times it crowds out local voices and views." This is where universities can become an important stakeholder in ICT for development.

Now let us be specific about the connection between universities and telecenters. We start with what telecenters need for sustainability. Relevant content has already been mentioned.

Research - A large percentage of telecenters struggle for survival. The reasons vary, but prominent among them is the failure of telecenters to be demand-driven. And this happens because telecenter people often lack an understanding of the communities' information, education, and training needs, and the telecenter people often lack the know-how and resources to build the content and services that could respond to those needs. Research helps telecenters become demand-driven. Telecenters generally have neither the skills, time, motivation, nor interest in systematic research about the communities around them. Telecenters also need research to evaluate continuously how well they are serving the needs of their communities.

Training - People in telecenters need to be trained in how information can contribute to development. Telecenter managers need to go beyond computers and programs and learn how to link telecenter potential to health clinics for health education, or to schools, agricultural extension, or local government.

Community awareness - Likewise, telecenters need to make their communities aware of the value of information, such as agricultural marketing, micro enterprise management, or the chances for more education through distance learning. Training a community about the value of information can help communities realize the value of the telecenter. Logically, universities have the capacity to teach and train, and these skills could be applied to these telecenter-related needs.

Human resources - Telecentres need volunteers who can help make telecenters good places to visit - volunteers who can help people understand the basic rewards of a digital experience and help those people navigate the various media in the telecenter. Volunteers are important in welcoming persons in special groups, such as women and the elderly, who are frequently shut out of access to ICTs and telecenters by culture. A major challenge for telecenters is to "gain, train, and retain" volunteers.

Can it be done? Can universities in developing nations be constructive partners in helping push beyond connectivity to make ICTs and telecenters more vital to the welfare of people in developing countries. Can we "scale up" the example we saw earlier in India's Tamil Nadu state? For the first part of the answer, we turn to the on-line publication called *Science and Development Network*. Recently there, Harvard University professor, Calestous Juma, argues that there is a new awakening of interest within international development agencies about the role of technological innovation in economic growth. Yet, he says, much of the discussion on development only marginally addresses the need to harness the world's existing fund of knowledge in the pursuit of development. Professor Juma's point is that universities and other institutions of higher education can be "engines of development and social renewal" but that a qualitative change in the goals, functions and structure of the university is needed. He suggests that we need

to reinvent the university. We need a new generation of universities that can serve as engines of both community development and social renewal.

The second part of the answer we hope to provide in a new $8-million, 3-year project now in the concept stage. The "we" in this case is a partnership between the World Bank and a consortium of U.S. universities led by Cornell - and, of course, our partner African universities. This is a project linked to the agricultural research networks spanning the African continent. The New Partnership for Africa's Development (NEPAD) and the International Food Policy Research Institute (IFPRI) are central agencies in this activity. The project is an attempt to build the capacity of agricultural universities to make their high level research more meaningful and more useful and more accessible at the grassroots. A vital part is the incubation of community-based telecenters as a means of building an exchange between agriculturalists and the research centers. Those African universities and the telecenters will also focus on information related to the Millennium Development Goals and contribute to the Poverty Reduction Strategy process.

This project has five principal components as part of the "university reinvention" process. They are:

ICT Facilities - Of course, the hardware and the connections are important as a basic step toward building an ICT system. So, on the agenda is developing the ICT infrastructure that includes computer-related and media-related facilities, along with trained staff support that can adapt, produce, and package information resources for telecenters and other information channels.

ICT4D Academic Programs - Academic programs, including specializations, workshops, and student internships (for example, at telecenters) will encourage students to apply information and communication technologies to important national priorities such as agricultural development and the Millennium Development Goals.

Outreach Policies - Developing university policies and programs that foster ICT-supported initiatives is a vital part of legitimizing a faculty's activities outside university walls -- and provide the basis for building outreach activities more firmly into the reward system of the university. This component also includes creating the mechanisms for institutionalizing contacts with its related telecenters and other local bodies such as extension and schools.

Human Resources - The project will emphasize the training of leaders (managers) in the telecenters themselves and will work on mechanisms that will put students into the real world environment of the telecenter.

ICT "Posture" - This means building an ICT posture among the faculties. And this involves training "ICT champions" and encouraging active participation of faculty in research and outreach projects using competitive grants programs.

Although the major focus of this project in Africa is on agricultural and rural development, it will influence the character of the participating universities, hence the "reinvention." The universities can benefit from an affiliation with telecenters in at least three ways:

(1) Telecenters provide universities with a means for reaching beyond their "ivory tower" to extend their knowledge and learning resources to the surrounding communities and to other populations in the region. This includes translating, adapting, localizing and re-packaging information from external sources to fit the agronomic and cultural characteristics of those local communities. This function is especially vital to the worldwide priorities identified in the Millennium Development Goals. Ultimately this makes universities and their faculties more relevant and better candidates for financial support from the public and private sectors and donors.
(2) Telecenters provide a laboratory for faculty and researchers to carry out ICT and extension-related research and development (R&D) projects, especially involving issues ranging from HIV/AIDS to small business enterprises and poverty alleviation. Telecenters as extensions of the classroom can also strengthen student understanding of issues ranging from computer applications in community development to eGovernment and eCommerce. Graduates will be better prepared to enter a world that will increasingly be permeated with information and communication technologies.
(3) Telecenters provide a learning environment for students as telecenter volunteers where they can gain practical experience in helping people in the community. In some countries (for example Taiwan and Ghana), youth have a public service obligation for one or two years. While it is often associated with military service, attention can be drawn to adding community service in telecenters as a means for discharging this obligation.

It is important to note that an active, visible and successful university ICT4D program can have two additional outcomes. One is the simultaneous building of the university's own internal ICT infrastructure - that is, its ICTD (information and communication technology development) which will contribute to the quality and efficiency of its academic and administrative functions. Second is the reshaping of the outside world's perception of the university as a more active agent of change and a more relevant member of society.

I conclude by recalling a study by the World Bank-supported Task Force on Higher Education and Society. The study was called: Higher Education in Developing Nations: Peril and Promise. In its final pages, the Task Force said that there is little in the way of a shared vision about the nature and magnitude of the potential contribution of higher education to development. Without this understanding, higher education institutions are treated - essentially by default - in the same way as other large bureaucracies, leaving them without the power to make choices that improve their individual and collective performance. We need to change that perception and that reality. And the message that some of us are taking to various international meetings such as the World Summit on the Information Society is that it is time for those universities in developing nations to reinvent themselves and for us to include them in comprehensive plans for building a knowledge-based Information Society.

Bridging the Digital Gap and
Establishing a Harmonious Society through ICT:
A Case Study of the Education to Alleviate Poverty Program
At Tsinghua University

Presented by Feiyu Kang, Executive Deputy Dean
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Today I would like to explain the mission of Tsinghua University in the important effort to alleviate poverty in China. I will talk about the four parts of the university's mission in this area: 1) the background of the project; 2) our technical support; 3) our current activity; and 4) our future plans.

As you all know, the economy of China has recently expanded tremendously, and the number of poor people there has decreased significantly. However, we still have a big problem because ICT in China is developing and spreading very quickly. Half of the population can call upon this knowledge source to improve their lives, but the other half, the poor people, do not have this opportunity. For example, students in the poor regions of China do not know computers well and therefore do not have access to the information age. For this reason, it is the mission of Tsinghua University to balance this disparity between computer accessibility in the cities and in the poor, rural regions of west China. During the past twenty years, the Chinese government has been working to help poor people by providing food, clothes, small business loans, etc. Now, however, we at Tsinghua University believe that it is very important to develop high quality human resources among all the people through education. So what can we do as a university? During lunch, Professor Colle spoke about this same issue. My university has decided that we can use ICT to deliver excellent educational resources to people in the poor regions of China, in order to help those people learn more and become better off economically.

The needs in China are quite great because we still have twelve provinces in the western part of the country – out of a total of thirty provinces - that are extremely poor due to a lack of adequate natural resources. Within these twelve provinces, there are 592 counties that are the very poorest areas of the entire country. In those counties, the economic development is extremely slow, and there is a great lack of any access to high quality education. So what are the needs of the people living in those counties? We see that the needs fall in four main areas. First, we need to help the teachers and students in the schools because the teachers in these counties are not well qualified for their jobs, and the education they provide is very limited. Second, we need to help the local governmental officials because they also are not well qualified for their important civic posts. Third, we need to focus on

local industry in these counties because it is barely developed and growing very slowly. Fourth, we need to help the poor farmers who have no access to modern technology and modern agricultural techniques. As a result of this lack of access, every year more and more of them are forced to leave the farms for other jobs, sending very little money back to their families. So these are the four major challenges we are facing – to help the teachers and students, to help the local government officials, to encourage and enable new industrial initiatives, and to assist poor farmers.

To accomplish our mission, we provide education for teachers and school administrators, and also for government officials. In addition, we provide vocational skills training, as well as education around agricultural technology for the farmers. All this education is delivered via ICT's. During the past three years, we have established one hundred distance learning centers in one hundred of the poorest counties in China. We have also developed approximately one hundred courses for the people in those locations. In addition, we have organized numerous face-to-face tutorials not only by sending experts to the rural distance learning centers to teach, but also by bringing some of the local people to Beijing for short-course training. We have also tried to let the farmers know that distance learning can help them have a better income, and gradually our program is proving useful to them.

The technology we employ is a hybrid platform. Since economic development is so uneven in China, the technology development is also uneven and therefore the Internet cannot be used in many poorer locales. For many of these poor counties, we must use the satellite. We use the satellite to access the Internet and bring it to the county-level learning resource centers. Then the content is transferred from the county resource center to the village learning centers via digital TV. This is the technology we are using today. In the learning resource centers, we install satellite receivers along with some data management systems. In addition to the technology, our program also has a volunteer component, and every year we send many volunteers to the rural places to aid our efforts. Most of these volunteers work as tutors in the distance learning centers. These volunteers must receive training along with a certificate from Tsinghua University in order to volunteer in the program.

Now after three years, we already have one hundred learning centers in the poor counties of Western China. These centers have been established in some of the poorest regions including Guizhou, Yunnan, and Sichuan. These areas have huge populations but the economics are very poor. During the past three years, 150,000 people from these counties have participated in our training. So far, the distance education programs for teachers and students have proven to be most popular and successful. You see, every year in China we have an examination for high school students to determine entrance into the universities. In our distance education programs, we have invited many excellent teachers from Beijing - including famous middle school or high school teachers - to give lectures that can be transmitted out to the rural, distance learning centers. These lectures have been extremely valuable for the local rural schools and their students. This year many of these schools have

more students qualified to go to university as a result of these distance learning lectures.

As I mentioned before, we also have several courses for the local government officials. Local governments in those rural communities are not like that in Beijing, Shanghai, or other cities. The rural government officials in these poor counties are mostly high school graduates, and our courses help them to develop improved management skills. As you know, in 2003 China suffered from a serious SARS epidemic. Following that disaster, Tsinghua University sponsored several seminars in these regions to educate the rural government officials about crisis management.

In this Tsinghua University project, we also have worked in cooperation with the World Bank Institute on several educational initiatives. For example, last month we had a speaker from Washington, D.C. whose lecture went out to government officials in these poor counties. Another one of our joint projects was a conference held in Beijing, with participants from many of these rural counties and also from universities. At that meeting, we discussed how to develop more and better resources for poor people. Professor Larson from MIT was invited to present a lecture at that conference. We have also developed, in cooperation with the World Bank, many training programs for local government officials. Every year, we have regular courses that run each month for three days. The lectures originate from Tsinghua University but the government officials - the students - are located very far from Beijing. In the most recent training, in Shagri-la in the Yunan province near Tibet, there were four hundred students enrolled. The Chairman of the University Council at Tsinghua University gave a talk to these government officials at the start of their three-day training program during the first month. This group continued to receive three days of training monthly over a ten-month period.

The Tsinghua University project also involves many face-to-face training programs. For example, a certain number of teachers from the rural areas are brought to Beijing for some specialized training. Of course, however, it would be impossible to bring all the rural teachers to Beijing, and that is why distance learning is so important. Groups of government officials are also brought to Beijing for face-to-face training programs. Last year, we brought a large number of mayors from the rural towns for specialized training programs in Hong Kong on administration and management. The Tsinghua initiative has also been involved in some vocational training. We have brought young farmers from the rural areas to Beijing where they have obtained car repair skills. This training program is two months long, and after it completion, most of the students are able to find employment in Beijing. Another vocational program we sponsor for rural people is beauty skill training. This involves a three-month training program in Beijing, and the graduates have been very successful also in finding jobs in Beijing or in their hometowns.

In terms of future development, we hope that we can have a new priority among all national sectors to achieve poverty alleviation in China.

Previously, only the government has taken care of this issue of poor people in China. We also need to focus on greater development of technologies that will enable us to fully utilize the potential of ICT's in bringing e-Learning to the countryside. The Chinese government has encouraged us to do this. In addition, we need some mechanism to attract outside technical resources and funding sources to continue this project. In the future, we will try to develop increased distance education based on the Internet. We will also try to develop a model of learning centers that has three levels. One level would be at a county-wide site where there would be a central, learning resource center, which connects to Tsinghua University. Connected to that resource center, we would also like to have other levels of learning centers in the towns and villages, which are accessible to schools, businesses and families.

To conclude, I would like to explain why Tsinghua University decided to take on the challenge of trying to alleviate poverty in the rural areas of China. As you know, in China the economy is developing very fast creating a growing gap between the rich and the poor. Yet there are few people or organizations that are working to decrease this gap. Tsinghua University believes that this is a global issue, as well as a national one. The university has decided to try to become a model in developing some methods for poverty alleviation. In the past in China, it would have been difficult for a university to undertake such a challenge, but now ICT is a big help. Using ICT, our professors do not need to go to the poor areas themselves, but can deliver a very high quality educational resource via satellite or Internet to the rural people. Already from our three-year project, we have learned that this is an effective model to upgrade rural education. At this time, Tsinghua University is leading the effort and hoping that others will follow.

ICT-Based Mentorship in
Science, Technology and Engineering in the Middle East

Presented by George H. Atkinson
Science and Technology Adviser to the Secretary of State
U.S. Department of State

The question that I would like to raise today comes in four parts. First of all, I would like to briefly state an opinion about why science and technology (S&T), in general, has become such a major issue in global affairs. Second, I would like to provide a perspective as to why S&T is a vital issue specifically for 21st century U.S. foreign policy. Third, I will briefly touch on the potential value of science as an effective bridge between diverse cultures. Finally, I would like to describe two new programs in the Department of State in which my office has been engaged. The first is the Jefferson Science Fellows (JSF) program that I originated to enhance the S&T literacy within the Department. The second is the Iraqi Virtual Science Library (IVSL) that is a project supported by a variety of government (i.e., Departments of Defense and State) and non-governmental organizations.

Let me begin by considering examples of the expanding role of S&T in global affairs. As a physical chemist myself, for me the principles and achievements of scientific research are of major interest and their value in society is obvious and without question. However, for most of the people in the Department of State, it is not so obvious. To demonstrate the critical role of S&T in policy, I have chosen four issues to highlight here today that illustrate the influence of S&T in the 21st century societies.

The first point to consider is the diverse and continuously changing S&T questions that appear throughout our daily lives, especially those having impact on economies, global health, and how we view the future. The examples are pervasive. I am sure that in the *Boston Globe* today there are articles having to do with everything from avian influenza to energy issues, as well as the White Sox winning the World Series. The modern world is filled with S&T issues that have global significance. Secondly, I find that nations today often can measure their degree of prosperity either by their expertise in S&T or by their access to S&T. Nations live very different existences if they are creating technology versus just buying it. Third, the 21st century opportunities provided by scientific achievements, and by the technology developed from them, differ from opportunities provided by S&T in the last part of the 20th century. Recent S&T advances not only give us new opportunities economically, but they challenge many aspects of our social structure including, in some cases, our ethical behavior. Finally, the message that comes through clearly at the Department of State is that in an increasingly global world, accurate scientific information must inform foreign policy and foreign policy must promote rationally justified scientific goals.

Let us remember, however, that historically global leadership in S&T has been transitory. Up until the middle of the 20th century, the United States was not at the center of global S&T. In the 19th century and throughout the early part of the 20th century, the center for S&T advances was in Europe. The catastrophic events in the middle of the 20th century permitted the United States to rapidly assume global leadership in S&T and to transform the role of S&T in international policy. Certainly, MIT has been one of the centers for this great success. Yet I would suggest to you that in the 21st century the nature of leadership in S&T is going to change again. What will develop is a much more globally collaborative environment for S&T. Commercially valuable innovation is highly dependent on the increased degree of collaboration. Today and tomorrow, you will hear about collaborations that span the international community of scholars. I hope that the consequences of expanded S&T collaboration on global policy as seen at the Department of State are in concert with the conclusions you make in this conference.

There are many opportunities around the world for collaboration in the area of science and technology. These collaborative opportunities should be embraced as part of the great successes to which the United States has contributed over the past fifty years. In the Department itself, in terms of U.S. policy, recent Secretaries of State have embraced this perspective.

> "In the 21st century, American foreign policy must have a sound scientific foundation. And we must build on that foundation to stem the spread of infectious diseases such as HIV/AIDs, to stop proliferation of weapons of mass destruction, to lift people out of poverty, and to lead states onto the path of sustainable development."
>
> Secretary of State Powell - May, 2004

> "Openness in recognizing that there are no boundaries and therefore keeping ourselves open to other people, making sure that we are at the center of scientific discourse…"
>
> Secretary of State Rice – January, 2005

These are remarks, among many made by Secretary Powell and Secretary Rice, re-enforce the idea that science and technology are now important elements in foreign policy and that the U.S. should promote policies that are collaborative. The United States needs to be in the center of the global scientific discourse.

One of the recommendations made at the end of the 1990's in a study of science and technology within U.S foreign policy by the National Academies of Science was that the Department of State appoint a Science and Technology Adviser to the Secretary of State (STAS) – a rather revolutionary idea. This was endorsed by the Department under Secretary Albright, and the first such adviser, Norman Neureiter, served from 2000-2003. I became the Adviser almost two years ago. It is an important position. The adviser

position is described as the "principle interlocutor" for science and technology within the Department of State. The Science Adviser to the Secretary has four areas of responsibility: 1) **Enhancing the S&T literacy and capacity of the Department**: i.e., increasing the number of scientists in the DoS and the exposure of non-scientist DoS personnel to S&T issues; 2) **Building partnerships with the outside S&T community**: throughout the U.S. government, with partners abroad, and in foreign embassies in the US; 3) **Providing accurate S&T advice to those within the Department**: the Secretary of State, other senior Department officials, and embassies on current issues and to address them in a proactive way; and 4) **Developing initiatives to enhance "forward looking" international leadership in the Department on S&T issues**: i.e., assist the Department to recognize emerging and "at the horizon" S&T before it becomes a crisis for policy makers.

I want to deal with one of these four objectives today - Number Four - before turning my attention to perhaps the most important challenge facing the Department. One learns quickly that it is a mistake to believe that going to Washington to give advice - and then leaving town - results in action. You may leave Washington thinking that people have actually heard you and that they will do something about implementing your advice. Let me dissuade you from that impression. It is rare that anybody does anything about advice given in this fashion. If you do not show up, if you do not stay and work the system, if you do not participate in the system, it is exceptionally difficult to believe that something will happen because of your "excellent" advice. If you are not operating within the bureaucratic system, it does not function to change. Thus, one of the main issues for the STAS is to bring scientists and engineers into the Department of State, even if only on a temporary basis, to participate in the decision-making, policy-implementation process. I mean not simply for the formulation of policy, but I emphasize to you, also for the implementation of policy. It is not just a matter of making suggestions, because you also have to make sure that new ideas are understood in detail and appropriately adopted within a policy initiative. This task is not easy in any bureaucracy.

The other three objectives, of course, are no less important to us. We have built partnerships around the world. Tomorrow, for example, I will go to Prime Minister Blair's district in the northern part of Britain to learn about their Innovation Park -- a large center focused on Internet methods for learning. Then I travel to Ukraine to discuss their interests in expanding their science and technology base. These are relationships that we have a responsibility to nurture. We also give advice to leaders in State, the Secretary of State being one. Finally, we are asked to develop a more anticipatory behavior in the policy process. How do you be more anticipatory? I do not think that anybody will be too offended if I just tell you that policy is often done by crisis management. The issues given the most attention are those appearing on your desk on any given morning, or announced via a phone call or email just received - often about an event that occurred thousands of miles away. If those issues involve S&T, it is prudent to at least be familiar with the basic S&T concepts and to be aware that they

may have a policy impact. Anticipatory behavior is unusual in most bureaucracies. One of my responsibilities is to create an environment for more anticipatory behavior, designed to proactively address issues involving science and technology.

Returning to objective Number One in more depth -- how do we bring more scientists into the Department of State? For those of you in the room who are at American universities and have tenure, the following is intended to attract your interest. A couple of years ago, I created an initiative called the Jefferson Science Fellows (JSF) Program. There has been another excellent program in Washington for more than thirty years run by the American Association for the Advancement of Science (A.A.A.S.). They have been enormously successful in bringing scientists to Washington. This year, over a hundred A.A.A.S. Fellows are spread out over the Congress and parts of the Executive branch. However, there has been a minimal impact of this program specifically on tenured faculty who want to stay in universities. What the JSF Program does is to provide a mechanism by which tenured American faculty can join the Department of State for a one-year assignment while agreeing to serve for five more years as consultants, still remaining a tenured university professor. After the year, all JSF Fellows return to their universities, where they continue to teach and conduct research. However, by serving as consultants to the Department, they are gradually inculcated into the policy system. Thus, the JSF program becomes part of the solution for bringing more S&T expertise into the Department.

The JSF program is now a public-private partnership. There are over eighty American universities that have agreed to pay the salaries and benefits for any of their tenured faculty chosen. These Fellows are selected through a two step process with the initial review being conducted by the National Academy of Sciences. The second step is a series of intensive interviews conducted by members of the Department of State, academic scientists and engineers, and representative of professional science organizations. It is indeed an honor to be selected, and the program is about to enter its third year. The MacArthur Foundation and the Carnegie Corporation have been very generous in providing - in addition to the salary and benefits covered by the university - a $50,000 stipend for the one year spent in Washington, and access to $10,000 in travel support to match travel funds provided by the Department.

The five Fellows selected for the 2004/ 2005 program worked on a variety of interesting issues and were enormously successful. One of our current 2005/2006 fellows, Bill Hammock, stepped into my office this morning to talk about his involvement in the nuclear weapons discussions with the North Koreans. With Bill, we have someone with real expertise involved in these important discussions. Yet the work undertaken by all the other Fellows is no less important for the JSF program. The work of Dr. Alex King from Purdue University on the African S&T is a new area of engagement. Dr. Edward Samulski from the University of North Carolina, Chapel Hill, has begun to evaluate the policy impact of nanotechnology and

worked with STAS to help organize several international conferences, while Dr. Michael Prather, from the University of California, Irvine, has become involved in evaluating numerous aspects of advanced S&T. Dr. James Harrington, from Rutgers University, is focused on determining which high technologies meet the regulations concerning the potential dual-use, including lasers and optics.

Now let me move on to discuss with you more general points. We believe strongly that science and technology can impact policy not just through the obvious professional advances in our scholarly fields. S&T can be a central tool for global policy in several ways including to:

- Support sustainable development goals
- Preserve moderate political leadership
- Serve as a vehicle for diplomacy and cooperation between diverse cultures
- Promote democratic values underlying diplomacy

In many ways, Internet connectivity illustrates the value of S&T in global diplomacy. Specifically, I note the Iraqi Virtual Science Library (IVSL), which has been developed through the cooperation of a number of USG Departments and agencies and is now under beta testing. What is the purpose of the IVSL? It is to provide access to current literature information for the Iraqi science, medical and engineering communities. Please recall that these communities have been isolated from regular interactions with the international science community for almost thirty years. The first step forward is to tell them what has been going on in the last three decades. To do that, we have organized a system whereby they have access to literally thousands of journals - the same peer reviewed journals that you read - as well as to professional society information and various types of course materials, such as those offered by MIT. The IVSL is an open portal system that links Iraqi scientists to the same materials available worldwide. Given the peculiar and somewhat agonizing conditions of Iraq, this gives us the opportunity to make a practical contribution to the future of Iraqi science and engineering. Some additional elements of the system include: links to universities and museums; links to NIH, NSF and DoD scientists; and links to national standards organizations. All of these connections are critical to the future of a functioning society in the global community.

How did the IVSL project come about? It is worthwhile to understand this point since it illustrates how government operates in the United States. This is a public/private partnership including the Department of Defense, the Department of State, along with the National Academy of Sciences, and the generosity of U.S. and foreign publishers. We could never afford doing this with what a university normally pays for such access which is measured in millions of dollars. Yet these publishing organizations have been extremely generous in joining in a public/private partnership to find a solution. These are the characteristics of what makes successful discussions

of science within policy - you must find partners. I particularly want to pay homage to five Fellows working in the Department of Defense and the Department of State. They are the people who began the process intellectually and have dealt with many of the practical issues of making the IVSL a reality. If it were not for these science Fellows, the IVSL probably would not have happened. The message is that science Fellows working in policy make a positive difference.

We are currently testing a pilot project in Iraq with the following seven universities that are distributed throughout the country in an ethnically diverse way: Sulaimaniyah, Mosul, Technology, Al-Mustansyriah, Al-Nahrain, Baghdad, and Basrah. We are providing a database that can be searched by a variety of indicators. By the end of the year, we hope to have enough information to stand up the IVSL broadly through many other Iraqi institutions, including government ministries, the national academies, and a whole range of institutions within a society that is still emerging.

The intention from the outset was that the IVSL belongs to the Iraqi community of scientists and engineers. It is a community that has become part of the leadership of Iraq and it certainly is going to be an important part of Iraq's future. This project also looks at cooperation based on understanding, the ability of this country – or any country – to stand up on its own with a science and technology base. Remember that we are connecting to a community that has been out of touch for decades. Of equal importance, we want to be sure that there is an opportunity for them to choose an educational approach that is based on scientific decision-making.

The benefits of such an initiative also extend to a philosophical level. This type of cooperation infuses liberal principles into a society. What are some of those liberal principles? The IVSL promotes the idea of open access to information and knowledge. It also helps to build responsible citizenry by exposing them to the benefits of a knowledge society. In addition, it promotes transparency by open publication in world-class scientific, engineering, and medical journals based on peer review and meritocracy, and thereby, it provides access to critical thinking. Finally, the project provides basic social respect for diverse points of view. The social principles of this project could be described as democratic. The ideas of meritocracy and transparency, quality public education, the governmental and legal guarantees of democratic principles – these concepts are what we are trying to expose to a community that has recently experienced a very different social environment. Whether or not it will have a positive effect - we do not yet know for sure. Only time will tell. However, from our point of view, an initiative like the IVSL is an element that is central to what the Department of State should do as part of an empowering policy agenda.

However, we do have a conundrum, and I would like to leave you with this point as I finish. I think the programs that you have in MIT LINC are remarkable and exceptionally productive. The obvious principles underlying this conference are widely enjoyed in the U.S - freedom of opinion, speech and assembly. Clearly good governance should be based

upon the access to education for all members of society and upon the imbedding of science and technology into human capacity. These are elements that I would suggest define a knowledge-based society. When we discuss these issues, we are not just talking about Iraq. Rather, these are issues that are of concern to most societies that we encounter today.

However, as scientists and engineers, we have a conundrum that I will characterize through a series of quotations.

> "What man desires is not knowledge, but certainty."
> Winston Churchill

The certainty of our lives is not just knowledge. Most people in the community do not want to know about your data. They want to know about the conclusions - what is the certainty you bring from the work that you do? I believe that in modern societies, especially in societies like the United States, certainty is what policy-makers seek. This is the challenge to scientists and engineers - not just to Iraqi scientists, but to all scientists and engineers. The second quotation is one of my favorites:

> "The trouble with the world is that the stupid
> are cocksure and the intelligent are full of doubt."
> Bertrand Russell

The intelligent individuals always have another experiment to do and there is always more research funding needed. Scientific communities have adopted this principle and under the circumstances, we engender uncertainty. Why are we uncertain? Perhaps it is because we know too much. Of course, Shaw got it even better than the first two:

> "If all economists (scientists) were laid end to end, they
> couldn't come to a conclusion."
> George Bernard Shaw

Although there is humor here, there is also a reality. We as a community of scientists have to engage in addressing these questions with clarity and perhaps even more certainty. Decision makers need answers, not a description of all the excellent work you have performed. They do not want a lot of data. They want you to stand up as a scientist or a technology person with conclusions for which you will assume the appropriate degree of responsibility.

Now I want to provide a conclusion of my own. The most important lessons learned from the science and technology of the 20th century only reflect common sense. If we agree that "science is taking opportunity derived from understanding and turning it into reality to benefit mankind," then we really also have to remember simultaneously that scientists are primarily experimentalists. Yet some experiments fail. However, if societies are not

prepared to provide a practical environment in which a reasonable degree of failure is acceptable, then you are not going to promote world-class innovation. If you go around the world, and look at innovation systems, it is remarkable how little flexibility there is for accepting reasonable failure. Governments invest because they expect productive, and perhaps even profitable, returns in the short term. To promote real innovation, we need to be patient.

The last quote I will leave you with is from Voltaire who said

> "We are more responsible for what we
> decide not to do, than for what we actually do."
> Voltaire

Although we scientists recognize the conundrum underlying the need for certainty in making decisions, in a 21st century society, we cannot avoid addressing the significant issues of our time. There is much important work to be undertaken by scientists within a modern knowledge society, and I hope I have encouraged you to become more engaged. There is certainly no shortage of significant S&T issues to address.

Thank you for inviting me to MIT and for your attention.

The Community Learning Center Program:
What We Have Learned So Far

Presented by Laura Ruiz, Dean
Social Programs in the Research and Development Vice Presidency
Monterrey Technical University
Monterrey, Mexico

This afternoon I would like to explain the strategy of Monterrey Tec that aims to reach rural and marginalized communities. The Community Learning Center Program has three main characteristics. The first is the fact that the entire Monterrey Tec Community – professors, students, alumni, administration, everybody – is deeply engaged with the program. The second characteristic is the fact that we are using information and communications technologies (ICT's) in education as a tool for development and social inclusion. The third characteristic is the fact that we have a large network of learning centers and also a large network of support for those centers.

Earlier today, Professor Larson asked me how it was that we became involved in this area of education. As I mentioned in my talk this morning, Monterrey Tec has thirty-four campuses located throughout Mexico. For this reason, it is easy for us to appraise the situation in different regions of Mexico. Furthermore, we understand that if we are concerned about the development of our country, then we must be concerned about the development of every citizen of Mexico. It is not just a matter of educating a population of university students and assuming that they will take care of the entire country.

When talking about inequality and poverty in Mexico, we have some figures that show that those who could be classified as being on or beneath the poverty line increased from 138 million in 1980 to 225 million in 2003. There is also a significant relationship between the level of schooling for persons over 25 and the level of poverty. Not surprisingly, individuals with the least amount of education have the least amount of money. We have also found that there is a relationship between poverty and illiteracy. Another significant issue to understand about Mexico is the fact that levels of education differ significantly between those in the northern part of Mexico and those in the south. For example, we can see this difference in the level of academic sophistication in our students in Nuevo Leon as compared to that among students in Chiapas. Therefore, after seeing this data and understanding the challenges that lie ahead for Mexico, we decided that we had to do something. What was required was something that would attempt to raise the educational levels of all the regions - to make the levels more equal - and, in the process, to spur economic and social development.

Before going on, I would also like to mention that Monterrey Tec is involved with the Hispanic population living in the United States. In the United States, the Hispanic population grew 58% in just ten years, and one out

of every eight Americans is Hispanic. Hispanics have become the largest U.S. minority group ten years earlier than projected. The Hispanic population is expected to reach 98 million by 2050. As you can imagine, the educational gap between those born in the U.S. and those born in Latin countries is enormous. For this reason, we at Monterrey Tec also believe that the Hispanic population in the U.S. will face tremendous challenges in coming years.

Faced with all this data on educational disparities and poverty, Monterrey Tec realized that what was needed was an educational initiative designed to empower people for poverty reduction. So the question became - how to do that? How to use technology and education to empower people for poverty reduction? How to close the educational gap between those who have access to education and those who do not? How to increase both the quantity and the quality of education for these marginalized populations? How to generate new educational opportunities? How to design an educational system that is both effective and efficient? How to provide more alternatives for accessing higher education? In a country like Mexico, and in countries throughout Latin America, using ICT's to expand access to education is an important way to remedy the many social and economic problems.

After asking ourselves all of the questions above, we had to decide what our development strategy should be to reach all the underserved communities. At that time, we decided to open small Community Learning Centers that would bring ICT's, computers, and connectivity to a few isolated communities. We started working in Nuevo Leon, in the poor regions of the southern part of the state. Our objective was to spur sustainable economic development by expanding educational opportunities through the use of ICT's. This would be achieved through Community Learning Centers that would provide the development of skills – human, social, and productive – as well as the development of projects. This particular element is very important - the idea that everything should be translated into productive projects for individuals, families, and communities, in order to achieve sustainable economic development. This path results in better choices, better jobs, and sustainable development in the communities.

As we developed this strategy, we recognized that a very important element of it had to be the participation of our Monterrey Tec students. In Mexico, students at the Bachelor's level have the requirement to do social service in local communities. Right now at Monterrey Tec, we allocate 2.8 million hours of student time exclusively for work in the community. Just imagine that amount of student time and talent that is available to us for use in a project like the one I am discussing. Students help by being tutors for the students in the community learning centers and also by helping us to develop productive educational programs. The intensive involvement of Monterrey Tec breaks down as follow: students work as tutors, professors work as coordinators of tutors, staff help us to develop the educational content, etc. In this way, everyone at Monterrey Tec is engaged in and committed to the

Community Learning Centers educational outreach program to underserved populations.

Of course, a Community Learning Center is not just a room with computers. The most important element of these centers is what is behind the computers. Behind the computer and behind the Community Learning Center is Monterrey Technical University. We are bringing together numerous groups and we are developing alliances among various institutions. In this way, we are not just trying to develop human capital, but also social capital. We try to accomplish this through the network of private, public, and social institutions that are working with us.

As an example of this network, I would like to talk with you about what we are planning to do in the Monterrey metropolitan area. We are going to start working with the government, with some private companies, and with Wimax in order to cover the entire metropolitan area with wireless technology by the end of 2006. In this regard, Wimax will allow us to provide quality, reliability, and affordability. We already have the contents ready and we are going to provide High School, Bachelor's, Master's, and PhD. degrees for different professions that serve as agents of change. The content for these educational programs has already been developed at Monterrey Tec for earlier efforts in rural areas, and now we look forward to providing those programs within an urban area.

Now I would like to describe to you the kinds of academic offerings that we provide at the Community Learning Centers. First, we offer opportunities for formal education. Of course, since this is a computer-based education model, we offer several programs for people to develop basic computer skills. We also develop some courses delivered in four indigenous languages in our country allowing various ethnic groups to integrate with the Knowledge Society. In addition, we offer some courses for basic education. Two years ago, Dr. Rangel, the President of Monterrey Tec, was approached by a group of young students at one of the rural Community Learning Centers. They explained that they had finished all the computer technology courses and wondered what was available for them next. When he asked them what they would want, they replied that they would like to have an online high school, so they would have the opportunity to keep on studying and learning. It is important to mention here that most of the students in these Community Learning Centers are female because so many of the men are living and working in the United States. For these women living in isolated rural communities, there is no other opportunity to study other than the Community Learning Centers. We opened the online high school, and are delighted that the first generation of these students is going to graduate this December. These graduates are now ready to pursue a Bachelor's degree online and have the possibility of going on to a Master's or Ph.D. degree. The goal here is to provide them with a broader perspective, to let them know that there are more possibilities in their lives and that they are not limited to only a basic education.

We also provide continuing education courses. In this area, we select specific agents of change within the community. For example, we realize that in any community a teacher is someone who can really try to change his community through his work in the schools. Therefore, we have different programs for teachers. We also have similar special programs designed for public officials, for health promoters, for journalists, for non-governmental organizations, and for the Hispanic population in the U.S. Examples of programs in the U.S. are GED programs, math and finance programs, and other programs designed to help Hispanic immigrants in their new lives.

Recently we have decided to become an incubator of businesses producing traditional Mexican products. We are going to be working in rural areas with the Faculty of Agriculture of Monterrey Tec and will try to become an incubator of traditional Mexican products. This program will move participants through a program of education towards development of practical skills with the goal of making them productive. This particular program will be ready to start in about two or three months.

What I have just described to you about Monterrey Tec's Community Learning Center Program is what we can share with other countries. This is not an initiative that works alone. In Mexico, it is Monterrey Tec that is supporting the Community Learning Centers. It could be a university in China or in Africa or wherever. We believe firmly. as Professor Colle was saying during lunch, that universities must be deeply involved in this enterprise. Telecenters cannot succeed alone, without content and without a competent bridge to the Knowledge Society. We know that universities must take a leadership role here - along with representatives from NGO's and the private sector - all working closely together with the local, state and federal authorities. We have over 1000 Community Learning Centers in operation and all of them follow this organizational system - Monterrey Technical University, working in alliance with NGO's, with the private sector, and with the local, state and federal government. We also find that it is extremely important to institute a local committee with community leaders, corporate, and government leaders. Also, in each Community Learning Center, we have a "Promoter' who is the social leader. This is the person who runs the center and who encourages people to participate. The Promoters themselves are empowered by the process and some of them are studying to complete their high School and Bachelor's degrees. We in turn are helping them to become leaders - to maintain meaning and coherence in the Community Learning Centers.

We now have 1,150 Community Learning Centers, including those in Mexico and those in the U.S. In Texas, for example, we have 107 learning Centers because we are working with several school districts. The school districts were trying to figure out how to get the parents involved in school, and this had been an extremely difficult challenge for them - even though they had wonderful facilities, including computers and connectivity. So, for example, we opened a Community Learning Center a few years ago in a

Houston school and we have had a great response. Parents are coming in and they are learning. Furthermore, it is not just a matter of learning or having access to information, but it also has a lot to do with developing self-esteem and a sense of security by discovering that they can keep on learning. Later this month, Arizona State University is going to open a Learning Center, and we also have some of them located in libraries in the U.S.

So what we have developed is a model for creating these centers that we can share with other universities in developing countries. We have a flow chart stating all the required elements involved in opening a Community Learning Center. As you can imagine, having opened more than 1,000 of these centers, we do know well what is involved! Of course, we still have many challenges in this undertaking. Some of the Community Learning Centers are working very well, while others are not. We still have problems relating to the fact that some centers will stop paying for connectivity, and then that access is lost. We also have problems with maintenance of the technology. While it is true that there are many challenges to be faced in this undertaking, the incredibly positive results we have seen are enough to keep us trying. One of the most exciting aspects of this effort is the creation of a social network as we invite people in these rural communities to join together with the university. This network includes people from all over Mexico, from the U.S., from Spain, and from other countries who would like to join us in this important work. We do not have all the answers and we welcome new alliances.

Enhancing Human Identity and Social Capital of Rural Teachers through E-Learning: Experience of Living Knowledge Communities in China

Presented by Philip Kwok Eai Hui
Founder and President
Living Knowledge Communities
Hong Kong

It is really my honor to report to you what we have done for the poor in rural China. We all live under the same sky, but we do not all have the same horizons. This is one of the main themes I want to talk about today. Also, due to a time limitation, I may only be able to give you a brief overview of the kinds of educational conditions that exist in rural China. Then I will describe to you the program of e-Learning for teachers in rural China that we developed in collaboration with Tsinghua University.

As Professor Kang has already described, China has undergone an uneven experience of social and economic development, leading to the current situation of a huge gap between the lives of rural and urban Chinese. When we think of China, we think of all the development in the Shanghai and Beijing areas. However, when you count the total number of rural primary and secondary schools, you realize that these schools make up the major part of the Chinese educational system. Ninety-three percent of Chinese primary schools and eighty-four percent of Chinese secondary schools are located in rural areas. Also, looking at the total number of students, you find that eighty-six percent of Chinese primary school students are from the rural areas. Another statistic is the fact that seventy-nine percent of Chinese primary and secondary school staff work in the rural schools. It is for this reason that we cannot neglect and ignore the plight of the rural areas. One of the major goals of Chinese educational reform - universal enrollment - has already been achieved on the East coast of the country. However, in the western part of China, only a sixty-four percent enrollment rate has been achieved.

Now I would like to discuss some of the particular problem areas in these rural schools. What are the Chinese school buildings like? I have photographs showing the dangerous and dilapidated condition of these buildings. Chairs and desks are broken. Often windows are broken and the wind blows in from all sides. Despite these dangerous and dreary educational environments, most students are very keen to learn, and the teachers really have to be ready to teach. A second problem area is the fact that - above all - it is the female population that is not receiving universal education in these rural schools. There continue to be serious difficulties in getting all girls educated.

My organization, Living Knowledge Communities, is a not-for-profit educational NGO working out of Hong Kong. We are dedicated to improving the educational opportunities available to rural students living in poverty and

to eliminating the educational disparities that exist between rural and urban areas. Living Knowledge Communities was established in June 2004 and recognized by the Hong Kong government as a public charity organization in March 2005. Over the past year, we have already run ten projects. Our NGO has been set up specifically to train and support the rural teachers and their students.

We know that as part of the Chinese educational reform, English must be taught starting in the third year of primary school. However, most teachers have no training in English teaching. For this reason, we decided to make our first priority the training of these teachers in modern pedagogical methods of teaching English. One e-Learning program that we have called "Authentic English Language for the Rural Classroom" was developed in collaboration with Tsinghua University and launched in February 2005.

Now I would like to bluntly describe what has been good or bad about the program that we have conducted through Tsinghua University. The good part was seeing hundreds of rural teachers attending the course on the Tsinghua campus by means of Internet broadcasts. The participants were evaluated at the end of the program and demonstrated great success. That was no small achievement for a newly established NGO working on a project for rural communities and staffed by volunteers, most of whom were local teachers in Hong Kong. It was very good to know that the Chinese teachers really appreciated the program. They reported that they learned many new teaching strategies and that they never thought English could be taught in the ways they learned. Most of all, they received some new ideas and new teaching practices, which may have a great impact on their students. We appreciated constant feedback from them via email, outlining how they tried out our strategies in their classrooms and sometime the strategies worked and sometimes they did not.

It was also good to witness certain inner changes that took place among the group; both teaching and mentoring skills can be picked up quickly and copied, but it is more valuable to change one's perceptions of the self and the world. Most of all, the teachers promised they would attempt to teach better and to try their best when returning to their local classrooms. It was good to see that teachers in China are becoming more critical of their own practice, and this was demonstrated in our program as well. This program offered them opportunities to reflect upon their own performance, particularly in their final demonstration lessons. They became more critical of their teaching philosophy and the way in which they construct their lessons. This may be a promising first step toward self-empowerment for this group of teachers.

Now, what problems did we run into? It was bad that we only had eight days for running the program. Free time is very important when it comes to the self-learning experience of e-Learning. Both teachers and mentors will find it hard to have such insufficient time for fruitful reflections on what they have learned and taught in the program. As for our goal of harmony, nothing can be more harmful than organizing the program without

making big mistakes in such a short time and with limited manpower. Special appreciation is given to administrative personnel both from Living Knowledge Communities and from Tsinghua University who worked morning until night behind the scenes on this program.

The symbol of harmony that we aspire to in this program refers to the fact that we try to get the right balance of everything. Here harmony represents the joining of hearts and minds in committing ourselves to becoming better mentors and better teachers of English for the rural areas in China. We have to improve ourselves continuously for the cooperative effort.

This kind of training is useful for the face-to-face program, but how about those teachers that sit in front of the TV and just watch what we are doing? In fact, that type of learning is not so successful because we could not provide enough guidance for them. As a result, some of them were not able to understand what it was that we were trying to do because the whole program was taught in English. Also, some of the teachers worried about pressure from parents if the new teaching methods were used. For this reason, they felt great hesitation about using these new methods.

However, all in all, I would like to emphasize the efficacy of our program. I mentioned that in this program we believed that the teachers' identity capital, human capital, and social capital have been increased. We believe that especially the social capital has been increased. For those living in remote, rural areas, it is not easy to have a chance to learn and especially to interact with city people. We had twenty to thirty teacher volunteers from Hong Kong who interacted with the rural teachers; this undoubtedly helped to develop a real e-Network with urban teachers. They became friends and they learned to communicate through e-Forums to keep the conversations going. As you can imagine, this kind of interaction is very important to students and teachers from the poor, rural areas.

The final area that I would like to touch upon is the function of our NGO in Mainland China. It is not easy to set up an NGO in China, although the government believes in the poverty reduction effort and in everyone involved in this movement. For this reason, we established our NGO in Hong Kong where we could get some financial support through the businessmen there. We firmly believe that a cooperative effort is required to reform these educational institutions in China, including NGO's from outside China and especially from the U.S. Therefore, we are drafting a proposal to set up a series of ten centers for the improvement of rural schools in rural China. In conclusion, I would like to get your advice, support and comments on what we have done over the last two years.

E-Learning Initiatives
To Reduce Poverty and Support Socio-Economic Development:
Case Study – Laos

Presented by Sisavanh Boupha
Deputy Director General
Office of the Prime Minister
Department of Science and Technology Science
Technology and Environment Agency
Vientiane, Laos

Mr. Chairman, distinguished delegates, ladies and gentlemen, it gives me great pleasure today to present a talk on the topic of the "E-Learning Initiatives to Reduce Poverty and Support Socio-Economic Development in Laos." This presentation is based on practical examples in some institutions in Laos. First of all, I would like to express my sincere thanks and profound gratitude to the Massachusetts Institute of Technology for providing funding support for my travel to this conference.

My presentation will include first of all an introduction to the country of Laos. Maybe some of you do not know about Laos. Then I will move on to discuss the current situation of ICT in Laos. I will also provide a definition of e-Learning in Laos because most Laotian people are not yet aware of distance learning and e-Learning. Then I will present a case study from the Agence French University and also a case study from the ASEAN Virtual Institute of Technology (AVIST), which has recently gotten underway in ASEAN member countries. Laos, an ASEAN member, is now participating in the ASEAN Virtual Institute of Technology. Finally, after these case studies, I will discuss the challenges for us in Laos in the near future, identifying links to economic issues and the future plans we have for our country.

Vientiane, the capital of Laos, is located in the center of the country with an area of 800 square kilometers and a population of 5.5 million people. Seventy percent of Laos is mountainous and the per capita GDP is 331 per year. Laos has an agriculture-based economy, and the languages spoken there are Lao, Thai, French and English. The economic indicators of Laos for the moment are still very far from most other countries. For example, the level of education is not very widely developed. In the area of ICT, we have LAONet, the first public email center at the National Polytechnic Institute in Laos, which has been in existence since 1994. Recently our government has established a national goal for a poverty eradication strategy that is based on ICT development in Laos. This strategy has become a priority factor for socio economic development, particularly to support all government activities at the central and local levels.

Since 2002, distance learning has been available through the Agence French University in Vientiane, and a small number of students have participated in that program. Starting in 2005, we have also had the AVIST Project at the Science, Technology and Environment Agency (STEA) in Laos, and gradually the value of e-Learning education is being recognized, and e-Learning has been experienced by some students and professionals to augment their studies and knowledge.

We have three universities in Laos, one in Vientiane and also one in the North and in the South of the country. In addition, we have colleges - government and public colleges - as well as research institutes under the various Ministries, including about five to ten institutes. There are quotas for entrance into the various universities and colleges in Laos, and students have to pass an exam. If they pass, their education will be subsidized by the government.

In support of ICT development, we recently received a grant from the San Franciso Jhai Foundation, which will help us set up the first Internet Learning Center at a high school. It was recently set up but is not yet running. In addition, the Ministry of Education plans to provide two secondary schools in each province with computers and Internet access by the end of this year. Unfortunately, all of the primary schools still do not have access to ICT, e-Learning and distance learning. In Laos, we have found that the human resource is very small compared to the research and development need. In the near future, we have to develop more research scientists and engineers to satisfy the development needs.

The Internet situation in Laos involves three companies - ISP GlobeCom, Laotel, and STEA. There were about 9,000 Internet users by September 2001 - with a ratio of 1.63 users to every thousand households in Laos. STEA is the Internet exchange point between businesses and the National University of Laos.

Through increased ICT communications technology, Laotians could get access and learn through modern technological devices including mobile phones, telecommunications, and Internet e-mail discussions. This is the future that we expect to develop for ourselves regarding e-Learning, to be used by businesses, government staffs, the public, and several kinds of learners at various levels.

Now I would like to mention a case study that involves the ASEAN Virtual University of Science and Technology. It is a learning network for continuing professional development and advanced studies in science and technology for the real practical experience of participating institutes. So there are three courses: Bioinformatics; Introduction to Technology and Innovation Management; and Sustainable Ecotourism Development. Learners are able to get access anytime, anywhere – perhaps from home or from the office - and all the courses are taught in English. These courses are available at different prices and are provided by the Asian Institute of Technology (AIT) in Thailand. We also have a case study at the Agence French University where distance learning has taken place since 2002. That

university offers scholarships for excellent students, which encourages many students to apply. This university offers courses in several disciplines including economics, ICT engineering, electronic communications, and fundamental science. Unfortunately, the number of students in this distance learning program is really small; last year there were only two students from Laos participating!

What have we learned from these courses? We have seen that these courses are very significant for the students who participate -- developing and updating their knowledge. We have seen that they learn very much by sharing information with other students online. This does not mean that we have succeeded in making significant economic change through distance education and e-Learning. The number of students involved in distance education is very small. Students may not be interested in a course because the academic level is high compared with their practical needs. Also, because the courses are taught in either English or French, many students are not comfortable participating. In general, we have found that it is very difficult to get Laotian students to access and participate in these courses. We have concluded that in the near future, we need to examine and re-evaluate the projects in this distance education sector in order to create more direct educational linkages to the wider economy. In short, there is a need for e-Learning and distance education courses that will help students find jobs or upgrade their current working situations.

The challenges for us in the near future include: a lack of financial resources for education leading to a poor quality of education; the lack of modern communications technology since the cost of Internet access is too high for us to cover a wide population; and a lack of national coordination around ICT development. In order to reduce the poverty, we already have developed a strategy for sustainable growth and poverty eradication by using the Internet and ICT technologies to enhance production activities and to help create conditions to support economic development. We also need to create an environment for intra-regional trade, promote corporate mechanism that would lead to the development of a knowledge-based economy, develop our human resources, and enhance institutional capacity building in cooperation with the private sector and the international community. These steps represent the promising links to improving our economy. We should also consider the main issues of human development by looking to industry for more widespread telecommunications services leading to: an improvement in the quality of education; a population re-distribution to lessen the imbalance between urban and rural areas by promoting urban rejuvenation; and development of IT technology for food distribution.

This issue of rural versus urban is a big problem in Laos because the qualified researchers and scientists will not work in the rural areas. These individuals usually prefer to work in the urban areas. This is a serious problem not only for the distribution of food, but also for the distribution of knowledge to the rural areas. For this reason, it is imperative that in the future Laos develops more scientists, not only in the city but also in the rural areas,

by providing the infrastructure of ICT to the rural areas. This is the only way that poor people in the rural areas can upgrade their knowledge, providing more information to the grassroots economy in key areas. Yet to do this we need to develop appropriate curriculum materials for these people.

e-Learning for Chilean Teachers

Presented by Jaime Sánchez
Director of the Department of Computer Science
University of Chile

I am happy to be back at MIT having done my Post Doctoral work here at the Media Lab almost twenty years ago. So I am very happy to be here again. What I am going to present today is a case study which documents a kind of general approach that we are undertaking in Chile in terms of training teachers to use technology, through the use of e-Learning strategies.

You may not know Chile. It is a very long country that has a lot of coastal areas on one side and very huge mountains on the other side. Because it is such a long country, we have different states that actually have different weather - even different seasons - throughout the country. In this way, Chile has a very unique geography. The population of Chile is fifteen million, with a life expectancy of 73.3 years. We are number thirty-eight in the United Nation's Index of Human Development. The GDP growth is 7% annually, and the GDP per capita is almost 7,100, with an inflation rate of a little more than 3%.

As you may know, Chile's economy has grown significantly during recent years, and to achieve that kind of growth, the country has undertaken serious educational reform over the past eight years. We have a new curriculum, we have more hours of learning in the schools, and we have greatly improved the educational infrastructure by building a large number of new schools in both rural and urban areas. We also have raised teachers' salaries, provided free textbooks for all public school students, created new libraries in the schools, and developed computer labs in every school.

So as you can see, we have attempted to substantially upgrade our educational system. Currently we have about 10,000 schools with 130,000 teachers, 3.5 million students and a literacy level of 95.8%, especially in the primary schools. The average level of schooling in Chile is 8.5 years. The enrollment level is 32.5% in pre-school, 98.6% in primary school, 90% in secondary school, and 31.5% in tertiary school or higher education.

In recent years in Chile, we have had a huge national program to adapt ICT into school learning – so far including almost 95% of the students – and to provide them with access to ICT. This program is called the Enlaces network. Most Chilean universities, like my own, are involved in the implementation of this program. Almost 80% of Chilean teachers have been trained in using ICT for education, and we have provided free Internet for schools. By the year 2005, Chile had invested $200 million dollars in this national education reform program.

The Enlaces network connects a network of institutions such as the Ministry of Education, 24 universities, more than 1000 teacher trainers and

facilitators, public research and development organizations, private companies, and local communities.

My university is the University of Chile, and we work training teachers around ICT in schools in central and northern Chile. We have had some initial results, although that is not my topic for today. However, we do have a lot of data and results from this program. According to this information, learners have developed a significant amount of project learning skills, problem-solving skills, collaborative learning skills, communication skills, and critical thinking skills. Instead of learning subject matter topics, which is what most people in the Ministry of Education want to measure, we have found that, above all, what these teachers have learned are skills. These are the specific skills that are needed by teachers in the educational reform project that Chile has set for growing as a country.

Now for some numbers. By the year 2005, we are expecting to have an average ratio of about thirty computers per student. We have 80% full Internet in schools, and there is a program for teachers to have a PC at home. Almost 95% of students have PCs in their school. The goal of 100% computer access is for both primary and secondary schools. We do not know if we will reach this goal, but right now we have a large number of labs with ten, fifteen or twenty computers in schools throughout the country.

The major challenge for Chile is, first of all, to cover rural schools - four thousand rural schools. In addition, we have to train the remaining percentage of teachers who are not yet trained. We also have to do more integration of ICT into the school curriculum. It is not just a matter of having ICT in the schools, but the teachers have to learn how to integrate it into their classrooms and into their curriculums, and act accordingly in their pedagogical practices. This is a very difficult process to achieve. It implies adaptation, adoption, appropriation, and creation with ICT. It takes time for the teachers to master, understand, and apply their knowledge in the school practices. Finally, in Chile we need to have more educational software and we need to upgrade the software and hardware currently in use in the schools.

In this national project, Chile has invested two hundred million dollars as part of the money allocated for educational reform. The last initiatives include ICT integration into curriculum, train the remaining teachers who have not yet been trained, and to put the curricula and contents in a network. As mentioned above, Chile has a major task in rural ICT integration, and we are working hard in that direction. Towards this end, we are using schools to integrate and develop ICT skills in the community. As of now, there are 600.000 community people trained in the digital literacy program. As a result, many schools have become ICT training centers, and this works very well. The trainers are teachers, and they train parents, their families and their relatives. We have also connected some rural schools and we also have a Linux program, in order to get more use out of older computers.

What I have presented above is the larger context for my talk. I first wanted to explain that Chile has been involved in a very big project over the

past fifteen years. As an important part of this undertaking, the Ministries implementing this educational innovation have come to realize that it is necessary to train all the teachers. Teachers throughout Chile need training in how to use ICT and how to integrate it into their curriculums, and we have found the use of e-Learning to be quite effective for this training. To be correct, we mainly use b-Learning, referring to blended learning, a combination of face-to-face and e-Learning strategies.

At our university, we have developed a b-Learning program for training teachers from different regions in the country, and that is what I am going to discuss now. I am going to present a case study about the group of teachers that we have trained. In the branch of this project that covers our university, we are in charge of training 1,300 teachers and we also cover other teachers from the main project in the Ministry of Education.

Today what I want to present is the design and evaluation of the b-Learning course we have developed. A very positive element of our approach is the fact that we have developed a very nice model in our group. It is a model for virtual interaction, a b-Learning model that has five stages.

First of all, we have the **Realizing Phase**, which encourages the teachers to identify the problem and to develop their points of view. This phase involves many cognitive processes, such as problem identification and pre-concept/concept contrasting. Then we have the next phase, **Approaching**, in which we produce new learning and a new point of view on the part of the teachers, thereby using other cognitive processes such as reflecting, retention, adapting, exploring and research. After that, we have the **Conceptualizing Phase,** which means that the teachers have to identify the concept and possible conceptual changes when exploring and approaching the content. In this phase, we involve them in the processes of meta-cognition, representation and adaptation. The next phase is **Structuring,** which means that the teachers construct knowledge through didactic strategies such as synthesis, monitoring, and meta-cognition. This involves the process of analysis, synthesis, retention, meta-cognition, and abstraction. The final phase is **Applying,** in which the teachers must apply their conceptions and their views to different teaching scenarios. The cognitive processes involved here include evaluating, imaging, adaptation, abstraction, problem-solving, conceptualizing, and meta-cognition.

What I have just described is the model that we apply. We came out with this model after five years of working with Chilean teachers in e-Learning courses. This is not a model that we borrowed from another place, but a model that we built after doing and re-doing, failing, having some successes, etc.

As a sample of our training of teachers in b-Learning, I will describe one of our courses, which is based on modules - each of which has working units during six weeks, followed by an evaluation. These units entail individual and collective student products, and the students achieve collective construction through discussion forums. This course also involves the students in synchronous consultation with program tutors. The types of

content we have in this course include: digital literacy; cognition and learning; and IT and education. The second unit of this course involves face-to-face learning in which the students learn about multimedia in education and software development. The character of this content needs the implementation of face-to-face learning strategies.

In this course, we have several different content formats. We use digital documents, including images, videos, web pages, multimedia, and CD ROMs. However, we have found that - even though the teachers like e-Learning - they also like to have hand-outs along with the course textbook. So in this training, it is not simply a case of digitizing everything for them, because they seem to need to have something to read in text form. Therefore, we have found that inclusion of this printed material has been important to the success of the course. We have also found that the course content has to be applied, up-to-date, controversial, as well as motivating. For this reason, we include some controversial material in the training to create discussion and motivation.

The methodology of our teacher training program includes asynchronous virtual interaction through online forums, collective knowledge construction, weekly discussions, active session moderation by the facilitator, and a forum context with a voting system. The different module learning activities include abstracts, term glossaries, document synthesis, and comparative charts, while the module learning strategies include virtual class, synchronic communication between student and teacher, discussion forums, learning activities, and making products. In each of the units, the students have to finish by completing an actual product. We also use case studies, project-based, activities, and collaborative work. For this training, we use different e-Learning platform technologies. We have a Content Management System (Newtenberg Engine) that we have developed with a private company and we also work with an Learning Management System (Moodle) platform. Each of these platforms has its advantages and disadvantages.

Turning to the course evaluations completed by our students, we have received very high grades for the teacher training in terms of accessibility, site structure and information quality. We also received uniformly high grades in the area of the virtual working environment provided, including the area of 'help provided'. We have been especially gratified by the high grades our courses have received in this area of 'help provided' because we believe that quick and responsive assistance is extremely critical to the success of e-Learning.

Most virtual working spaces were rated highly by teachers, such as my courses, virtual news, calendar, and contact. They interacted and used them invisibly in such a way that they could center on the task assigned. Teachers also very often used working tools such as the dialogue room for chat interaction and the mailing system.

Online communication and edition room tools were used less by teachers. Academic aspects such as learning activities, directions, materials, methodology, and evaluation were highly rated by teachers. They used them

habitually, and these aspects were easy to use and easy to interact with. Finally, e-Learning features for academic support such as accessibility, reply and question answering speed, quality of the support, follow up tools, feedback and evaluation, were well accepted and highly valued.

Turning now to conclusions, let me say that we believe we have learned a tremendous amount from this experience. Some of our conclusions are included below:

- The online support through virtual communication tools helped students feel that they were being permanently assisted and thus made them more engaged in the course activities
- The design of weekly learning activities allowed construction of a working rhythm that helped students feel constantly connected to the course activities
- Virtual interaction is not natural in a b-Learning courses and therefore requires a deliberate design that facilitates group participation, use of documents, and finally collective construction
- When they interacted in personal sessions, users worry about the level of security and privacy provided by the Learning Management System and the Web site
- Technical problems during course delivery cause learners to experience frustration and to loose motivation
- The learning model should be implemented with proven LMS tools to assure a successful learning experience
- The use of combined methods such as distance/face-to-face, digital documents/paper text, and the course textbook was critical to the success of our experience
- We highlight the enormous potential of collaborative work and virtual interaction in e-Learning

There are certain key implementation issues we have learned from our experience. The time availability of students is very relevant for the success of e-Learning. Facilitators play an important role in coaching, supporting, and assisting students. The selection of an LMS or CMS technology platform for e-Learning is significant in determining the type of learning activities and strategies since most of them fix a model of learning to be used. The use of a b-Learning model and suitable learning strategies assures the educational basis of methodology and strategy uses, and helps learners to accomplish their goals. Virtual interaction is not accidental in e-Learning, but needs to be carefully designed. Collaborative activities should be implemented during e-Learning in conjunction with individual learning activities. These activities can coexist and help learners attain the goals in diverse ways. Tutoring and follow up strategies are essential in e-Learning courses because they help support and manage learning correctly. Finally, even though e-Learning is based on the use of digital learning materials, paper

printed textbooks also help to accomplish the learning goal. In e-Learning, atoms and bits can coexist in a healthy relationship!

Now in conclusion, I would like to present some final ideas from our experience implementing e-Learning courses for Chilean teachers. Learning strategies are not tacit and even though they can facilitate learning, they can also impede it. Below are some strategies proposed from our study:

- It is important to have some sharing of common interests among learners
- It is important to maintain non formal communications during the course work
- It is important to solve problems collaboratively
- It is important to consider both individual and collaborative learning
- It is important to explore other channels of communication beyond that of just student-teacher

e-Learning should exploit the unique features and added value of a powerful medium such as the Internet. Some constructivist theories and principles can be embedded into virtual environments to promote active learning and the construction of knowledge. Finally, we believe that when taking into consideration these strategies, good e-Learning works for training teachers!

PANEL FOUR

E-LEARNING ACROSS BORDERS

The UNCTAD Virtual Institute of Trade and Development:
Building National Trade Policy Capacity with Universities

Presented by Peter Froehler
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Services Infrastructure for Development and Trade Efficiency Division
United Nations Conference on Trade and Development (UNCTAD)

The subject of my talk is similar to what we have heard quite a bit about already today – namely, the lack of capacity in developing countries. What I will discuss is not a lack of capacity at the primary school or at the basic education level, but a lack of capacity at the top end. What are we talking about? Globalization. We are living in a globalized world, and countries compete with each other, trade with each other, and we have a rule-based trading system

I am sure you have heard about the WTO, the World Trade Organization. This institution is not very popular to many NGO's – in fact, it has created a lot of havoc in Seattle, in Cancun, and in some other places where there were massive demonstrations. But what is the havoc about? It is about the perception that the rich of the world are exploiting the poor. Where does that perception come from? Here let me say that I am simply picking on the WTO because they are just down the street from us. But I could also talk about regional trade negotiations - like NAFTA or others. The "Big Brothers" go to such trade negotiations with teams – a couple hundred experts – and the small countries, in particular the least developed countries like Laos, for example, have very, very limited resources to defend their own interests.

In fact, it is not about defending those interests. In the first place, it is about understanding one's own interests. What is good and what is bad for my country? Many politicians do not know the answers to these questions. They come to negotiations and may sign on the dotted line because they have a political commitment that requires them to be a signatory to such an agreement. Or they wait and listen to see what is being expected of them and then they think – "oh well, that does not sound so bad, so I can sign here." Or perhaps they react by thinking "well, that sounds bad, so I will just block it." However, eventually there is so much pressure on them that they sign. Now the reality is of course that in any negotiation, the negotiating partner never gets everything he or she wants. You always have to compromise. If you understand what is going on, you will understand very fast that in order to win something, you have to give up something else.

My organization is UNCTAD, which is the United Nations agency that is the focal point for trade and development issues to support developing countries in their positive, constructive and fair integration into a globalized world. We want to help those countries get a fair deal. However, we cannot go with our experience and knowledge and make their decisions for them. No

international expert should go to the Central African Republic and tell them, "you have to suffer this kind of blow in order to get that." How dare we tell them what is good for them. We are firmly convinced of the fact that we have to help them build national trade policy capacity. We have to help them train their nationals to understand the global situation so they can advise their government to take their tough decisions for themselves.

Indeed, it is a complicated world because in international trade negotiations, it is not just questions about cattle, agriculture, or services. It is about the multi-lateral trading system and about international financial architecture. For example, if you agree on trade preferences in one form or another, but your country cannot supply what you are supposed to be able to export without any duties to another country, then you get nothing.
Or perhaps you agree on something else, which is nice, but all of a sudden the exchange rate changes. These unexpected changes are a terrible blow to all these trade agreements because they bias everything. In addition, trade policy is about social policy, it is about labor markets, it is about transport possibilities, and it is about your bottlenecks. So it is a multidisciplinary area where both male and female experts have to be proficient in understanding the implications.

Since 2001, we have been delivering regional training courses for national experts to the tune of about three weeks per course. In those courses, we touch on all the pertinent subjects including those mentioned above. Although we have had fairly good results from this training program, we are able to deliver only three such courses per year. We are able to reach out to a maximum of about seventy individuals per year, which is nothing, really negligible, when you look at the large number of countries out there and their needs. So last year we came to the conclusion that we should launch a partnership with selected universities around the world to create a curriculum for a one-year Master's Program for post-graduate students to learn about the multidisciplinary issues involved in trade management.

One of the pilot programs was developed at the University of Campinas in Brazil where one of the professors who launched this pilot program had actually participated in our traditional training course. He has used our curriculum as the basis to develop his university's one-year Master's Program – together with eighteen other professors from various different faculties of the university. The development of that Master's Program was a massive effort, and it is now working quite successfully. However, what we want to avoid is a situation in which every university that wants to do this work has to start from scratch. So we suggested that we try to find a list of universities around the world who understand trade policy problems, who are committed to doing the same work, and who are also willing to share their respective work.

That is when we created what we call the UNCTAD Virtual Institute on Trade and Development - where universities worldwide are joining a network onto which they can put their own case studies, their own teaching materials, their own teaching design - so that other members of the network

can get inspiration from their resources. Now it does not mean that what the University of Campinas in Brazil has done can be used as such in Transylvania, or in Jordan, or in India. But it can be used as ideas, and some of the basics can be used as such, simply requiring adaptation to local requirements.

Now, so much for the background. I would like to turn specifically to the UNCTAD Virtual Institute itself. The rationale for this was to bring the universities in as a source of creating local expertise. In our view, this institute is a new form of sustainable capacity building. It is a long-term approach, and we think each of the universities produce between twelve and eighteen graduates every year. So if three or four of them stay in government, or at the university and available to the government, then we are little by little having an impact on those countries.

We launched the Virtual Institute at our annual conference in Brazil in 2004. It is indeed a network of member universities who are committed to this effort and who have the capacity to offer the necessary courses. In some of the least developed countries, the universities would not have this capacity, so those universities are not eligible at the moment. Our intention is that after two or three years, we will review our progress and see if our network is sufficiently strong so that we can reach out to those who are in the biggest need of assistance. But for the time being, we have the mission to make this a very strong and committed network. Since UNCTAD is itself a member of this network, it contributes information about UNCTAD, relevant research, and some of our training material - so that we can help member universities facilitate their work.

We currently have twelve universities in the network including:

- Latin American School of Social Sciences, Buenos Aires, Argentina
- University of Campinas, Brazil
- Centre for Trade Policy and Law, Carleton University, Canada
- University of International Business and Economics, China
- Université Pierre Mendès, Grenoble, France
- Jawarhal Nehru University, New Delhi, India
- School of International Relations, Tehran, Iran
- University of Jordan
- University of Mauritius
- Université Cheikh Anta Diop, Dakar, Senegal
- University of Dar-es-Salaam, Tanzania
- University of the West Indies

It will be noted that in the network we do have two Western universities – Carleton University in Canada and l'Universite Pierre Mendes in Grenoble, France. These two universities are committed to development studies, they are working in the same area as we are, and they are very interested in sharing their work with the southern universities. Likewise, they will of course get firsthand experience and case studies from the universities of the South, which

will further improve their own programs. Thus, they are not just doing this because they believe that what we are doing is so great, but because they are getting something out of it as well. In addition, three universities in Africa are on this list. In fact, two are from least developed countries – Tanzania and Senegal. However, it is very difficult to find a university in a least developed country, which has the required capacity.

Now what do the members of this network expect? They of course expect the work and expertise of UNCTAD, and of other members. They also expect the opportunity to learn to work as a network, the development and improvement of their courses, a platform to share their research, and promotion of their activities. In the end, all of this should lead to increased efficiency in their work, promotion of new approaches/change, and better impact on policies.

What does the Virtual Institute do? It develops teaching resources, cooperates in research, and exchanges information, experience, and advice. We also do student/staff exchanges as well as communication and web publishing. In addition, UNCTAD has a variety of teaching resources suitable for a university context, including manuals, presentations, reading lists, student activity workbooks, case studies, simulations, etc. These teaching resources cover a wide range of topics, such as competitiveness and development, economics of commodity production and trade, international investment agreements, sanitary and phyto-sanitary standards, and competition policy and law. While this is just what UNCTAD has contributed, the list of teaching resources is always growing because members are contributing their own resources.

Yet given all these teaching resources, I would like to emphasize what they are NOT. They are not full, standard university courses. Members are expected to localize materials and integrate them into their own academic program, including, possibly the translation of materials. However, as we are growing, we are encouraging members also to put their materials in their local languages on the network, for the direct benefit of other countries using the same languages. But let me reiterate once again, this is not direct online learning, but rather it is an exchange of materials.

The Virtual Institute is a facilitator of joint research, and there are peer reviews and publication of research on the website. There is also exchange and advice among members, and also with UNCTAD. In terms of student/staff exchanges, we have accommodated in Geneva visiting groups from the University of the West Indies and from the Campinas University, and we have accommodated individual staff visits to UNCTAD and staff exchanges among universities. In addition, there is a Virtual Institute newsletter, of which there have been six so far, as well as an interactive website which you may want to visit: http://vi.unctad.org

Turning to our plans for the future, our goals are as follows:

- Current university members
- Translate commitment into implementation of agreed work plan

- Involve more staff and students
- New university members – plan to increase membership to up to 20 in the coming 2-3 years
- Wider outreach beyond institutional membership – category of associate (individual) members
- Building partnerships with donors/sponsors, international organizations and other interested partners
- Review of progress and experience in 3-year's time, decision on a future strategy

In conclusion, some of you may be wondering what is the motivating factor for universities to participate in the UNCTAD Virtual Institute. Certainly money is not a factor because UNCTAD is a very poor organization, which does not have any of its own funds for doing this work. As a matter of fact, we have to raise funds for our own travel to these countries. The motivator is that the participating institutions understand the urgent need for the increase in national capacity around trade policy management or international economic diplomacy - call it what you will. They also understand that if they can share their work and experience with others - who are not in direct competition with them, since they are typically not in the same country - then they will do a better job with the same amount of resources. As a matter of fact, we are only admitting as new members those whom we believe a) are fully committed, and already have been doing this work or are planning to do it, and b) have the capacity to do this work and understand what is being done. So as you can see, we are being very selective. We have turned down a number of universities that wanted to be part of the network, because we did not feel that they were either committed enough or had the capacity to do the work.

The E-Lane Project: Reinforcing E-Learning in Latin America

Presented by Carlos Delgado Kloos
Professor of Telematics Engineering
Carlos III University
Madrid, Spain

The project that I will talk about today is called E-LANE, a project that is funded by the European Commission, within the EuropeAid Program. More precisely, it is funded within the @LIS Program, where @LIS stands for "Alliance of the Information Society". @LIS is a program that works to promote the information society and to decrease the digital divide in Latin America and the Caribbean. To this end, a call for proposals was issued by @LIS. There were 210 submissions out of which 19 demonstration projects were selected in the areas of e-Learning, e-Inclusion, e-Governance, and e-Health. The project I will report on is in the area of e-Learning.

The E-LANE Project – the name "E-LANE" stands for "European and Latin American New Education" – is composed of five European partners and five Latin American partners. The European partners include: the Carlos III University in Madrid, which is the coordinating partner; Telefonica I+D of Spain, which is the research and development branch of Telefonica, the major communications company in Spain; the University of Reading in the UK; Trinity College in Dublin; and the National Institute of Telecommunications in Paris, France. The Latin American partners include: Monterrey Institute of Technology in Mexico; University of Cauca in Colombia; University of Chile; Galileo University in Guatemala; and University of Campinas in Brazil.

So just what are the objectives of the E-LANE Project? The major objectives are to develop the following:

- An open source platform for e-Learning
- An innovative methodology
- Course content production
- Impact measurement and refinement
- Dissemination and sustainability

Yet above all, we want E-LANE to lead to what we have called "Demonstrators" – concrete examples of how e-Learning can be carried out. We want to put e-Learning into actual practice in that part of the world.

To achieve these objectives, there were many things we had to accomplish first. We had to decide what tool or platform we should use. Should we build one from scratch or should we use a commercial one? Neither of those alternatives were viable solutions for us, so instead we chose to take an open source solution, the .LRN tool, and enhance it to fulfill our needs. Also, we produced educational material – which I will discuss later – and we developed a methodology both for content production and for content delivery. However, as I mentioned above, the main objective of the E-LANE

Project has been to develop actual e-Learning programs in the target population areas.

E-LANE is a three-year project, and we are currently about halfway through that time frame. By now, we have accomplished most of the initial objectives and we do have demonstration projects that have already started that I will be discussing. In the second half of the project, we will develop more demonstration projects and also refine the tool and the methodology as a result of comments and feedback we receive from users.

Now I will say a few words about the technical elements of E-LANE and I will try not to become too technical even though I am an engineer! As I said earlier, the decision we made was to employ an open source tool. Why? When you go to a developing country, you cannot ask them to use expensive tools. In addition, an open source solution is really a tool for innovation, and it is one that we can change - adapting the software to our actual needs. This is why we decided to use .LRN, which is a tool that actually originated here at MIT and is used by the Sloan School of Business. They use it for their Executive Education Program. It embraces a worldwide community of users, educators and developers.

.LRN has forums, file storage, and a number of tools that are support for collaboration. However, we wanted a bit more than this for E-LANE, because we wanted to make it an e-Learning solution. We wanted to have strong standards support, according to the latest standard formats that have been defined for e-Learning systems. Just before we started this project, there was SCORM support and learning objects as part of the tool. But we wanted more. So this is what we have been doing technically during the first half of the project – developing a module for supporting the question and test interoperability standard from IMS – IMS QTI – so that we can represent assessments in a standard way, in an interoperable way. What we are finishing now is support for another specification, IMS LD, (LD standing for Learning Design), through which we can describe the scenarios which we want to deploy for actual courses.

However, there is another problem when you go to developing countries. Sometimes the infrastructure is not the best – you do not have local connectivity or the computers are very old models – and the personnel expertise for managing the systems is sometimes not available. For these reasons, it was necessary for us to have a system that would be powerful yet as light as possible, and could be easily self-installable via a CD. Such a CD contains just what you need to put a system in place and start using it. This system is based on Knoppix, a Linux distribution, and on top of it we have put everything one needs to deploy the courses. In addition, a few sample courses are also included on the CD. Thus with this you do not need a complex installation, but you can just insert the CD in your computer and have the system up and running. This CD is based on OpenACS, the basis for .LRN, AOL server and Postgresql – all open source software.

We also had to spend some time thinking about the methodology for the production of courses. We did not just want to write HTML pages that are

difficult to maintain. Therefore, we developed a methodology in which we started with docBook – a standard for the definition content independent of the presentation. We define the courses using the docBook standard, and this we can then transform to a number of different formats. We can go to HTML with different types of presentations or we can even go to PDF if it is necessary to get a print-out. In this way, we can also support different pedagogies. For example, with this methodology, it is possible to put the text on the left side of the screen in order to achieve a better clarity for the text over the graphics. Or the graphics can be positioned on the left when the text is secondary. In this way, we can use the same content while presenting it in many different scenarios, depending on the various needs and pedagogies that the target areas may want. At the current time, rather than writing in docBook – which is an XML language – we are trying to simplify it by working on a WORD-based tool to generate the docBook source in a very easy way.

So enough technical talk! Which courses are we really looking at? There are two categories of courses. First, there are basic courses for digital literacy, and, second, more advanced courses for lifelong learning. In the area of digital literacy, we have based our course on the so-called ECDL Foundation. This is a foundation in Dublin, Ireland. ECDL stands for "European Computer Driving License." This foundation has defined the scope and content of courses that represent the basics a person would need to use computers. So similar to a car driver's license, these are the basics you need to manipulate computers. ECDL has defined the syllabuses for text processing, spreadsheets, data bases, presentations, etc. While they do not define courses, they do define syllabuses and tests.

These ECDL courses are very popular in Europe where hundreds of thousands of people take them. However, they have not been popular in Latin America. So what we have done is to sign an agreement with the ECDL Foundation, enabling us to prepare courses along the ECDL line to be held in Latin America - in those countries where there were no ECDL courses available. ECDL is known internationally as ICDL – "International Computer Driving License." In Colombia, a number of courses have already been announced in a part of the country called Guambia. Some of the ICDL basic computer courses are being translated into Guambiano, which is an indigenous language of Colombia.

As I mentioned earlier, E-LANE also includes courses for lifelong learning. These courses are more tuned to the individual needs of the different target areas in the five demonstration countries. These lifelong learning courses cover subjects such as agro-industry, ethno-education, telematics, programming, etc.

Now I would like to tell you about our "Demonstrators" and the countries in which they are taking place. I already mentioned Colombia, and the target population in that country includes rural residents, indigenous people, and health workers in southern Colombia. Examples of ongoing progress with the project there includes the following data: 57 students have completed an online computer training course; 7 students have completed an

information systems interoperability Masters' program; 27 students are currently enrolled in a Vegetal Health program; and 16 students are currently enrolled in a course on the post harvest of fruit and orchard products. I should mention that some of these courses are presented via telecenters in the rural communities. In addition, some of the courses available in Colombia are more advanced, such as Vegetal Health, Foundations of Ethno-education, Foundations of Digital Systems, Microelectronic Digital Systems, Foundations of Telematics, and Telematic Systems II. While the number of students in these courses is still small – anywhere from 20 to 60 students – it is beginning to grow. I should also mention here that some of these courses are taught in a Blended Learning mode – in which a teacher is present to lead and organize the class, while parts of the course are taught via computer through our E-LANE System.

Now, I would like to give you another example of what is going on in the demonstration project in Guatemala. In that country, the number of students is even higher than in Colombia, and examples of courses already taken by a total of 600 students all around the country include: office automation; finances; mathematics; administration; and analysis. These courses have been presented through partnerships with other institutions in Guatemala. Also through a partnership with Prensa Libre in Guatemala, 890 students have already taken a course on the basics of digital literacy.

Colombia and Guatemala are actually the two E-LANE partners that are more advanced in terms of what they have already accomplished. Other countries, such as Chile and Mexico, are just starting with some pilots. However, we expect some interesting developments in those countries as well. For example, in Chile a pilot project has started already, and the idea is to use a network of more than 300 libraries all along the country to provide courses on digital literacy.

Now in finishing up, I would like to summarize the main decisions that we have taken so far during the first half of the E-LANE Project:

- To base the system on open source tools
- To have open content that is freely available
- To have standard compliance in order to allow for interoperability among systems
- To have a selection of courses that are practical, useful, and needed
- To partner with other institutions, with ECDL and also with local institutions
- To focus on the local needs of people in the target areas served

Of course, we have encountered certain hindering factors, certain problems. The flow of money from the European Commission has at times been slow and awkward, and has hindered the advance of the project. Also, some of the partners have had to learn to cooperate and collaborate. Furthermore, the location of partners and collaborators in different time zones and in different hemispheres has been difficult; for example, when some are on vacation, the others are not. Thus, collaborating around the globe at first

was not easy, but we are working much better at this now. Finally, I should mention that we have had some difficulty with local administrative problems, which we did overcome.

However, I want to finish with the successes. We have developed an enterprise-class e-Learning tool and we are continually improving it. We have defined a flexible course design methodology that is open to everybody. Also, we have defined a set of concrete and very practical deployment guides, demonstrator guides, and course development guides. Finally, we have created a successful set of basic courses and we have started some successful pilot demonstrator projects. For further information, please go to our web site: www.e-lane.org.

The E-Learning System of Inha University

Presented by In-Joo Chin
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Inha University
Incheon, South Korea

I am sure there are not many people here today who are familiar with Inha University, so first I will briefly introduce my university and then talk about the e-Learning program at that university. Then I will show you some statistical data about Korea and speak about the e-Learning policy of Korea.

Inha University was founded in 1954 and was one of the first engineering institutions in Korea right after the Korean War. The country was totally destroyed by the war and was badly in need of an engineering institution. During the 1970's, Inha became one of Korea's "comprehensive universities" and has produced about 100,000 graduates, including many CEO's – among them, the CEO of Samsung. The name Inha is the combination of Incheon and Hawaii. Incheon is the name of the city where the university is located, so that part of the name is understandable. But why Hawaii? It is because the first Korean immigrants to Hawaii were the ones who made an initial large donation to build this institution. Now the university is under a foundation led by the Hanjin Group, which has Korean Airlines, Hanjin Shipping, as well as other holdings.

Inha has about ten colleges and ten schools including the Graduate School and a University Hospital. The university has 17,000 undergraduate students, about 3,000 graduate students, and 700 faculty members. The engineering college of Inha is the largest college, and we have almost every discipline possible including a medical school. We were ranked number nine last year out of about 123 Korean universities surveyed by the Joong-Ang daily newspaper which is one of the influential newspapers in the country.

E-Learning at Inha began by offering satellite courses in collaboration with another newspaper company in 1997. A year later, we joined an Open Cyber University Consortium (OCU), which is one of seventeen Cyber Universities in Korea right now. At that time, we also began to create our own in-house, web-based courses – what we call "cyber classes". Then in 2002, we had a new president, Dr. Seoung-Yong Hong, who is a strong believer in electronic education, so he initiated a campaign to make the campus an e-Campus. As a result, we now have a very sizeable number of e-Learning classes.

This Open Cyber University that I mentioned before is a consortium with about fourteen universities as members, along with a newspaper company. This morning, Professor Wilde mentioned a colleague at Sung Kyung Kwan University, which is one of the bigger universities in this OCU

consortium. Right now at Inha University, we have courses offered through the consortium, as well as our own electronic courses, or cyber classes. Currently we are in a transitional phase of moving more toward blended classes and away from totally electronic classes.

Last semester, we had 85 e-Learning classes, while this semester we have a total of 91 classes. As a result of both the e-Learning courses created at Inha University and the OCU courses available to our students, the number of traditional courses provided by Inha University has dropped from 3,000 to 2,600. In addition, as Inha University has created more and better e-Learning courses, we have found that fewer of our students are taking the OCU courses.

We offer a wide variety of courses by e-Learning, including some of the major university subjects and some of the required courses in general subjects, as well as some elective courses. I should mention here that we mainly offer electronic education for the general elective courses, but some professors are experimenting with the major subjects also. One thing we have noticed is that dependency on part-time lecturers has decreased quite a bit thanks to these electronic courses. As you can imagine, the administration has been very happy about that development!

However, now the challenge for Inha is to learn how to control the quality of these electronic courses. There are various ways by which we try to maintain a high quality. These quality control mechanisms include: conducting surveys with students and professors; documenting the manuals for the classes; offering sizeable incentives for e- course content development; offering periodic seminars on e-course development; and assigning tutors or teaching assistants to the e-courses and providing financial assistance to them.

In addition, we have tried to evaluate the educational impact of the e-courses. For example, we will compare the grades of several typical undergraduate courses taken both offline and online – such as Introduction to Chemistry, Physics and Mathematics. While there are fewer students taking the e-Learning courses, the average grades are somewhat comparable, I would say. An exception, however, is the General Mathematics course, which indicates that the students who take the e-Learning course receive lower average grades on the same exams. We try to do similar comparative grade analyses for all the major courses, attempting to assess the impact or effectiveness of Inha's e-Learning education as a whole.

We also have developed a structure or a system designed to maintain the quality of the e-Learning education. We have the Academic Development Team under the Academic Department and we also have the Media Support Team at the Computer Center. In addition, we have the Independent Center for Teaching, Learning and Technology that attempts to assess the effectiveness of the e-Learning education (as described above). As I mentioned before, we are moving toward the Blended Learning System, which is a new idea for us. Currently we have about ten courses that adopt the Blended Learning structure – meaning that both offline and online learning are blended together for the student. We do have some experimental courses that are also in the Blended Learning mode.

In the future, we would like to develop more consumer-oriented programs that would present practical subjects, foreign languages, and job-related courses. And of course, we are always working to improve the cyber course content and to develop more support systems for those courses. In addition, we would like to explore new consumers for the electronic education – perhaps developing some high school courses as well as some for-profit programs. As an institution, we formed a Global Consortium with many foreign universities, including some in the U.S., in France, in China, in Israel, in Japan and in Australia. We look forward to sharing some of the open, electronic learning experiences with these consortium members.

Now turning to ICT in Korea as a whole, there are about 35 million wireless subscribers – based on the number of units. Thus, if you think about the population of South Korea, which is about 48 million, then that wireless figure is quite a big number. The number of mobile phone users is about 36.5 million, and the number of high-speed Internet subscribers is almost 12 million. The overall ranking of Korea was third, and in terms of high speed Internet, it was number one. I do not know whether that is good or not!

We have a Ministry of Education and Human Resources Development that announced last year that they are very interested in expanding e-Learning throughout the country. In Korea, we spend a lot of money on private education - meaning education that students receive after school, enrolled in expensive programs aimed at improving their future opportunities. Koreans spend a lot of time and money on these courses, and for this reason, the government is hoping to absorb that education through e-Learning. The Ministry also has an E-Campus Vision 2007 - they want to create ten e-Learning Support Centers throughout Korea by 2007.

In conclusion, I just want to mention that we will have the APEC Summit meeting in Korea next month in November 2005. APEC is the Asia Pacific Economic Conference. Leaders of the Asian Pacific countries will gather in Korea, and I believe that tentatively they have agreed that they will develop a joint e-Learning training center. If such a center is formally announced at the summit, then Inha University would like to participate in that program in some way.

PANEL FIVE

E-HEALTH IN THE EMERGING WORLD

The Use of E-Learning for Health Care Education

Presented by Honorio Silva, M.D.
Vice President, Science and Medical Professional Development
Pfizer, Inc.,
New York, NY

Today I want to discuss with you what is going on in the world of e-Health. Here with us this morning, we have a distinguished panel whose members will talk about some of the e-initiatives that have been developed in different health areas. First, however, over the next ten minutes, I will provide an overview of what is going on in the world of e-Health and e-Health Education, and then each of the presenters will elaborate further on these subjects.

Why e-Learning for health education? Of course that is why we are here - and we all know that it is as a result of the explosive use of the Internet all over the world, as well as the spread of globalization to every corner of the planet. These developments have naturally affected medicine, too. "eCME", or e- Continuing Medical Education, has grown not only for physicians but also for non-physicians. Healthcare workers use it, and patients use it as well. There is exponential growth in Internet based technologies around the world, and the former barriers to e-Education have been dismantled. Three years ago, we thought that broadband was unreachable for the emerging world and now we are talking of broadband connections in developing countries as something that is happening. So the future is better than it used to be. I believe that the perspective for the emerging world is very promising; regardless of economic or political circumstances, we can be hopeful in the area of e-Learning.

Why globalization in eCME? It is because all over the world, continuing medical education is moving toward a kind of mandatory model. Doctors are legally required by medical associations, by governments, and even by patients to be certified, re-certified, or re-licensed because of the rapid renewal of medical knowledge. In the past, we used to say that medical knowledge should be renewed every six years. Now we say that medical knowledge needs to be renewed every six months. It will probably become every six hours if this explosion of knowledge continues in the same manner!

Believe it or not, twenty-five or thirty conditions are responsible for 75 or 80 percent of the morbidity and mortality all over the world. So this well-known principle applies also to the area of medicine, with the sole exception of Sub-Saharan Africa. Therefore, there is a need to improve the competence of the primary care physicians, who are responsible for managing the majority of these conditions. On the other hand, medical societies and global medical education institutions, like the World Federation for Medical Education, have requested the development of non-traditional skills -- for

example, that a doctor should be more competent in areas like administration, leadership, communication with the patient, clinical research, understanding of pharmaceuticals, etc. In this regard, Dr. Robert Rubin will share his experiences gained from the programs he developed in clinical research and infectious diseases via e-learning.

So how can the medical profession attain these new educational standards in a cost effective manner? Naturally, it is through the use of the Internet. There are organizations that are assuming leadership in getting medical education to a global level. We say that e-Learning brings reductions in cost, in organizational planning and in execution. However, we do not have solid metrics of the outcome measures and cost efficiency. I think this is an area – at least when it comes to medical education – which we need to explore further.

There is also an explosive growth of the contents available for eCME. For example, the number of Internet-based CME courses in the United States increased by a factor of eight from 1998 to 2003. Over that same time period, the available Internet-based CME courses in hours increased ten-fold. Furthermore, since 2004, eCME has gained acceptance outside the U.S. as a formally recognized, official CME activity. Specifically in Italy and Spain, the eCME activities are accredited for re-certification.

In the United States for the year 2005, 14% of all CME activities were done via the Internet. Thus you can see that the live classroom activities are decreasing, and the online activities are growing. This statistic not only applies to doctors, but also to non-physicians. As a matter of fact, non-physicians comprised 42% of the CME online events. So the e-Education is not only for doctors, but for all members of the healthcare team. In addition, it is also for patients because many times patients learn about the progress of a disease or therapy before the doctor does. So there is a need to inform properly, with evidence-based information - to the patients, to the physicians, and to the non-physician members of the healthcare team.

What are the future trends? Well, the more formalized the requirements are for eCME, the more growth it will have. As more countries require certification and recertification for physicians, those countries will be fertile ground for distance learning. Convenience, cost, and message retention are key advantages of this learning mode. Dr. Pablo Pulido will later present about Project GLOBE, a partnership for leveraging health care through web based CME/CPD in the emerging world. We expect Project GLOBE can corroborate the premises already mentioned.

We know now from just a few studies that the outcomes of the eCME are comparable to conventional, didactic education. However, there are needs for standards, there is a need for increased quality in content, and there is a need for affordable educational initiatives. We also need to identify the outcome measures and, above all, we need metrics of performance and efficiency of eCME. These subjects will be discussed by Dr. Ross Martin. There also are emerging options such as real-time CME merging with clinical care. There is an initiative driven by the American Medical Association

called I-POC, or Internet Point of Care, that goes in line with the development of electronic records and e-Prescribing, and allows the doctor to get trained and to get credits. Interestingly, there are already online graduate programs offered by major institutions in Europe and the USA. This subject will be later discussed by Dr. Sean Rowland.

As I mentioned earlier, the consumers are re-shaping the healthcare landscape. The patient/physician relationship is changing. Patients are asking for more from the physician. Everybody complains that the physician is not paying sufficient attention to the patient's needs and concerns. From a formerly paternalistic relationship, we are moving into a partnership. Given this change, it is easy to see how the Internet can be a great tool for improved communications. Since there is a need for immediate information, we are rapidly moving to a time when both the patient and the physician will have real-time transparency and information about the advances in medicine, discovery, and scientific data - by having direct access to medical information repositories.

So we are moving away from a vertical CME approach by which somebody in the stratosphere dictates and rules what is to be taught, mandating that order through the chain of command. Instead we are going to a horizontal partnership in which the needs of both patient and physician are taken into account by the medical associations, medical schools, etc. in order to provide timely communication and information.

So this is the perspective for the four upcoming presentations, and today we have a group of very distinguished speakers. Now let me turn the podium over to the first of these speakers, Dr. Ross Martin.

Integrating E-Learning
Into the U.S. E-Health Environment through Standards

Presented by Ross D. Martin, MD, MHA
Director of Business Technology
Pfizer Inc.

I am so glad that this talk is coming in the context of yesterday's talks and the dinner conversation last evening because I think there is a lot to build on. First, as a brief background, I am an obstetrician by training and later I got into managed care consulting, eventually getting a Master's in Health Administration. I ended up becoming very involved in technology matters and ultimately did a fellowship here in 1998-99 at the Health Sciences and Technology Division of Harvard-MIT. After that, I came to Pfizer for the health insurance, of course, because I became married and pregnant and needed the Daddy job! So this is where I am today.

What I work on today at Pfizer is a strong focus on technology standards for things like the following: electronic prescribing; electronic medical records; the nationwide health information network that the United States is trying to build; and medical education. Therefore, today I will talk about why standards are important and how they can apply to other countries. In other words, what our experience has been in the U.S. and how that spills over across the globe. I will also mention what we have learned from other countries, and how that has impacted the U.S. market. Because I work as part of U.S. pharmaceuticals, I do have a national focus here in the States. Yet because of the nature of this work, I believe that we are all seeking the same solutions – that need not be figured out over and over again.

My talk today will cover three areas of discussion: 1) Examples of standards in medical education; 2) Linking standards with other standards; and 3) Next steps. Currently, the U.S. has a roadmap to move from what is now happening in the area of electronic prescribing in order to change how healthcare technology is adopted. According to that roadmap, electronic prescribing will be followed closely by electronic medical records, and eventually we want to get to a Nationwide Health Information Network. This Network would not be a central repository of all our healthcare data; rather it would facilitate the exchange of data throughout our system. Ultimately, that transfer can lead to databases of information that can be shared in a way that still protects patient privacy, but leads to a better understanding of what happens to people when they interface with the healthcare system. In addition, one of the goals of having a Nationwide Health Information Network is that instead of doing "scatter-shot" medicine, if you will, we can really move more and more toward truly evidence-based medicine that is focused on outcomes. So instead of getting paid for doing procedures, as we do today in

healthcare, we would actually get paid for improving health. That is a big part of what success looks like in this endeavor.

At every step along the U.S. roadmap toward adoption of healthcare technology, education plays an important role. Here I would define "education" very broadly because it is not just education about medical disease, etc. Unless you can educate people on how to use these technological tools, on how to participate in this changing infrastructure, you will not be able to get very far. For this reason, you have an enormous problem of how to bring people up to speed in this technology in a way that is replicable. Here it is necessary to develop a "force magnification," the phrase that our colleague from Pakistan, Dr. Malik, used yesterday --meaning to be able to replicate the assets that you have.

Today I am going to speak quite a bit about standards and I want to make sure that we have a common definition. A generic definition is that a standard is something where you have an agreed upon set of parameters that can facilitate a marketplace. This does not have to be technical. It could be "where does the light switch go on the wall?" or "what is the size of the socket for the fire hydrant so that when the fire department from Boston comes over to Cambridge, they can still plug into the same fire hydrant?" This hydrant discrepancy used to be an incredible problem in the United States in many places. An SDO is a Standards Development Organization. In the U.S., the main SDO is called ANSI – the American National Standards Institute. It bubbles up to ISO – the International Standards Organization. The U.S. is different from almost every other market because in those other places, the national government is the one that represents standards for that country. However, in the U. S., it is ANSI, a non-profit organization, rather than a government organization that does this. Yet this organization still represents the U.S. in that capacity. This model has some benefits, along with, frankly, some problems.

So why are the lack of standards a problem? At the turn of the century, we were building railroads all over the United States. One of the things that happened then is that everybody was using different gauges of railroad. Thus, in order to get from San Francisco to Miami, you had to change trains in several places, or you had to move your cargo from one train to another. In such a process, somebody is making money; one person's inefficiency is another person's business plan, and there is always money to be made when you have proprietary interests guarding the status quo. It is true that in many instances standards do not naturally flow because someone is benefiting from the lack of standards. In the healthcare system, we spend an incredible amount of money and waste a lot of time - especially in the U.S. - because we do not have a lot of standard connections. Eventually you can get standards to say that there is one railroad track, and that is what eventually happened in the U.S; it was decided that the track would be about five feet, thirteen inches, and we got a standard for what kind of railroad track we would have. However, beyond the railroad, you still have multiple types of networks because you have moats for boats, roads for cars and airports for

planes. Therefore, you always need to have multiple types of standards. The running joke about standards is that the great thing about them is that there are so many to choose from!

The real promise of technology standards is that we can take a lot of these things - electronic medical records, medical education, electronic prescription, claims processing - and create a universal conduit for them. Today in healthcare, we have proprietary transactions, or electronic data interchanges, in the four areas I just mentioned. We already have standards that are really well developed for prescribing transactions for money – who gets paid, how do they get paid? It all happens electronically and has been happening fully electronically for a couple of decades in the U.S. However, what has happened now is that we have this thing called the Internet. When you take the Internet and standards-based XML as an example of a common standard that can be used, then you have this universal conduit. So, for example, you have this little boat that is going - it is a medical education program. However, it thinks that it is on the water because it is wrapped up in its own XML schema, or Extensive Market Language schema, and it does not know that it is traveling over the Internet. The thing is that you can use that same conduit for any type of transaction. That is the inherent advantage of the Internet; there is a single infrastructure required, one that is infinitely scaleable and infinitely leverageable. This is the promise of the Internet - the reuse of this redundancy and repeated repurposing of this connective technology.

So now you can take these things - electronic medical records, medical education, etc. – and you just have to build one type of infrastructure for many purposes. Here the real trick in this whole question is how to reach places that are extremely isolated, places that do not have any connectivity. Whereas the cost of getting there is steep, once you get over it, you can use it for so many things. That is part of the challenge as well, because there may be no one sector that is going to benefit from actually building the connectivity "pipeline." However, once the pipeline is built and operational, you can do many, many things with it.

Now one of the things that we are talking a whole lot about in the U.S. right now is "interoperability." This is certainly a buzzword that is going around globally, but it is a big, big word right now here in healthcare. Why? It is because you want to be able to have your electronic records system from Mass General Hospital be compatible with that at, for example, Beth Israel Hospital. If you know anything about the healthcare system here in Boston, there is the Beth Israel/Deaconess side of things and then there is the Partner's Healthcare side of things. You cannot get an MRI sent electronically from Beth Israel over to Partner's. You just cannot do it, even though they are across the street from each other and even though they probably represent some of the most sophisticated applications of healthcare IT of any place in the country or any place in the world. You still have to walk it over as a plain film!

If you, as a doctor, are trying to create, let us say, an electronic health record or just some storage of information in your own office -- that is pretty easy, and you can do it yourself because it really does not require any standards. Yet then you want these capacities to talk to one another. At that point, you can create a proprietary interface between them, which may be expensive but which you can do yourself since it is just for your information and you can have your own language. However, just to show you how complicated medical information can be, take the following example. What do we call a male and a female? It seems like that is a pretty easy data structure, right? Well, what about undefined? What about someone who is transgender? What about somebody who used to be male but is now female? As you can see, medical information can be extremely complicated, and here I am talking about one simple field. There are other, much more complicated fields than this one.

So, as you can imagine, as soon as a physician tries to go to a unified office system, it starts getting really expensive to do all those custom interfaces, and that physician would prefer to go to one that is based upon standards. As you move into a community repository of health information, you have complicated issues about vocabulary. For example, I might call "stat" and mean "put something on the top of the queue," and in another place, "stat" might mean "drop everything and run and go." You have to have the same common vocabulary in order to make things work in a community setting. Then it just gets more and more complicated when you get to the global level, and there is the question -- do you have a law of diminishing returns? That is a question because at that global level, it becomes more and more expensive to get things in a structured, standardized fashion. So this jump from the local environment to a community environment, and then from a local, community environment to a national and global community environment - those are orders of magnitude more complex and can certainly be more challenging.

Now I want to show you some examples of where there can still be some return and benefit to standards development, if we can figure out how to make it work. What are some current problems in medical education in particular? One problem is the fact that once the medical school training is complete, learning as an activity is often separate from clinical practice. This is the way it works in the U.S. Once you are through residency, you are no longer in training while you are practicing. You go to conferences, you read journals, and these activities are very separate from your clinical practice. A second problem is the fact that learners have difficulties tracking their competency. They wonder -- "Am I learning the right things? Am I competent in my field?" As a physician, you must become a kind of judge of yourself, judging yourself against your peers. However, everyone thinks he or she is a little above average, so therefore it is really hard to do self-assessment. There is no real rigor in self-assessment!

A third problem in medical education is the fact that educators have difficulty measuring their impact: "Did I make a change in this person's

behavior? Did I make a change in outcomes? Did patients get better as a result of whatever intervention I put in?" Here I think that the myCyberTutor demonstration we saw yesterday is a beautiful example of what a feedback loop can do to improve the understanding of a teacher about what the learners are experiencing and what they need. In short, such a feedback loop offers teachers the ability to measure their impacts. Unfortunately, the Healthcare Education Competency Assessment industry is fragmented and uncoordinated in the U.S. In many instances, it is just top down and not responsive to the true needs of healthcare professionals. As Honorio Silva mentioned, the knowledge of medical education is expanding at an incredible rate. Go to any medical library and check out the number of journals that came in just today and will be replaced by new journals tomorrow. It is indeed overwhelming!

So how do you solve these problems? Well, you have to recognize the importance of medical education. You have to have a shared vision of how to improve that education. It is going to require IT because there is really no way around some of this. For example, I am standing here to you live but using information technology tools to convey slides that are re-usable. I have used a lot of these slides in many different contexts. Also, people have borrowed them, and I have seen them in different places. Those are IT-supported activities, and the standard here is Microsoft PowerPoint. Now the fact that this is a proprietary tool does not mean that it is not standardized, because it is the universal way we communicate right now which has its benefits and challenges. We all are sort of beholden to Bill!

Yet the use of IT for medical education is going to require standards, and if you remember one thing from this presentation it should be the website **MedBiq.org**. The organization, MedBiquitous, is an ANSI-accredited standard development organization based out of Johns Hopkins University where it got its start. However, now it has a growing international scope and a growing international participation. They focus on technology standards for: medical education learning objects; professional medical development; professional medical collaboration; and competency metrics. Ultimately these standards bubble up to the international level through ISO. MedBiquitous is a place that anyone interested in medical education should spend some time getting to know and getting involved with. I am on their Executive Committee and have watched them grow over the last three years. For example, this year at its annual meting - just looking at the international participation and the caliber of participants - it is obvious that MedBiquitous has moved beyond the "nice idea" into a real mainstream effort.

So what I am talking about here are some of the things that MedBiquitous is doing to improve healthcare - through data standards, through activity reporting, through measuring competence by means of medical education metrics, etc. They are also building some virtual patient tools so that you can see - using certain clinical standards - and so that you can draw these virtual patient tools from different sources. SCORM was mentioned yesterday - it stands for Shareable Contact Object Reference Model. MedBiquitous is adding a layer onto that to make SCORM healthcare

specific. They have also added MEMs, or Medical Education Metrics, that enables one to have reporting that goes from providers to supporters and accreditors of Continuing Medical Education in a standardized fashion. Another initiative that MedBiquitous and its members are involved in is HEAL, Health Education Assets Library, which is a digital repository of medical illustrations, graphics and other things that are available through open access and have innumerable examples of resources that are shareable.

So in conclusion, linking standards with other standards - these are things that are happening in the U. S. Recently I was involved in a conference where the speaker was late. He was flying in, and I was actually able to track his plane landing on my computer and was able to tell the group that he would be at the conference in ten minutes. We cannot do anything like that in healthcare. Many people have said that since we were able to put a man on the moon in ten years, we should be able to have electronic medical records for everyone in ten years. However, this is not like putting a man on the moon. This is like the Big Dig – the project here in Boston where they had to dig up the highway. We are trying to create a Big Dig for the entire United States where we are tearing up all the interstates and putting them underground so that we can have better healthcare. By the way, you have to keep the roads moving, you cannot stop transportation during this building process, and that is why this is harder than going to the moon. We cannot just stop healthcare for ten years to fix this.

Project Globe: Excellence in Education for Physicians Working in Primary Health Care Services

Presented by Pablo Pulido, M.D.
Executive Director
Panamerican Federation of Associations of Medical Schools

Today I would like to speak about a project that we are pursuing jointly with some other organizations. My background is that I am a physician, also with a degree in Biology from this institution many years ago. In addition, I had the benefit of being Secretary of Health in my country, Venezuela. Now, after founding a Teaching Medical Center in Caracas, my primary focus is medical education to address population needs.

I am currently Executive Director of the Panamerican Federation of Associations of Medical Schools (PAFAMS), which was created in 1962. It is an international, academic and educational not-for-profit organization dedicated to the advancement of medical education in the American continent. This Federation includes 442 medical schools in 21 countries on the continent. The Internet is providing a new and efficient way of communication. Among the nations represented in this federation, we have 67 affiliated medical schools in Mexico, one of them being at the Monterrey Institute of Technology, which we heard about yesterday from Laura Ruiz.

Across the globe, we are immersed in tremendous problems that were very well described in the Mexico 2004 Millenium Development Goals, and specifically in Goal Eight on the need to develop a global partnership for development. There is redundancy here but the central item is to eradicate poverty. How do we do that? These Millenium Goals represent a kind of gospel. There are many, many avenues by which to reach poverty eradication, but we are taking just one – which is health. Then from that avenue, our focus branches out to medical education. The objective is to improve Continuing Medical Education (CME) and Professional Development (CPD). We want to bring this improved medical education to the frontier primary care places, knowing that there have been tremendous changes in medical education in the years spanning the 1930's through 2005. There have been significant changes in leading economic factors, communication factors, the types of practice that we do, research, etc.

There are wide variations in medical and health care knowledge both within and between countries. These variations produce significant differences in: individual health-seeking behaviors; treatment modalities in health care; medical errors in treatment; health outcomes; and health policies. Ross Martin talked about electronic records. Some countries - for example, the Scandinavian countries - are advanced in that area, but it is not a perfect system. Also, the U.K. is attempting to do that with its National Health Service. Electronic records will come, but it is going to take some time.

Modalities of health care vary quite a lot as well. Medical errors occur in treatment. We read quite a lot about this in news reports.

We are focusing on health outcomes, but how do we transfer all these concepts into health policies? Furthermore, how do we improve the quality of medical education? Certainly through standards. We work on standards with the 442 affiliated medical schools on the continent, including higher standards for classrooms, libraries, faculties, staffs, etc. That is one issue. The other issue involves the outcomes. What do these students know at the end of the program and how do they tackle the realities of practicing medicine? We want to insure that medical graduates – wherever they are trained – have similar core competencies, knowledge, skills, and social compromise.

We participated in a study with the Institute of International Medical Education (IIME), based in New York. This study was done in China basically on eight Chinese medical schools, analyzing the characteristics of the graduates of those institutions. This study looked at the graduate medical education requirements within seven domains – scientific knowledge, clinical skills, population health, communication, ethical values and managerial skills. This is an excellent study that is being published right now. It is being presented at the Association of American Medical Colleges next week in Washington. This study is based on outcomes - including standards from the medical schools, characteristics of medical schools, and moving down to standards of the graduates and the outcomes. This study looks at how well these graduates are able to perform.

So we -- and when I say "we," I am referring to the Pfizer Medical Humanities Initiative, colleagues from Wentz Miller Corporation, and colleagues from medical schools and WHO -- we got together and developed a vision to provide a better quality of health care and to create an innovative template. Our initiative is called *Project Globe on Excellence in CME/CPD for General Practitioners and Family Practitioners Working in Primary Healthcare Settings*. Yesterday we heard a very interesting talk about a model for trade and development training. We are attempting a similar effort to develop a kind of training template for quality at the level of primary health care services. Who gives care at that primary level? It is the general practitioner or the family physician – those who work at the frontline, in the trenches. So here is the rationale for Project Globe; if these providers represent the first line of care, then they must have access to the best Continuing Medical Education (CME) and Professional Development (CPD). We did want to harmonize this effort, to create a repository or a data bank for such education. To this end, we have joined efforts with Dennis Wentz, a colleague, and with people from the U.S., Mexico, Spain, South Africa, Sudan, and Geneva. As you can see, there is a group of international colleagues involved in this effort.

The goals are: 1) to identify CME/CPD needs of generalists globally, starting with a selected group of countries; 2) to evaluate availability of tools, methods, resources and structures for delivering current evidence-based

CME/CPD; and 3) to search for cost effective ways of delivering CME and CPD. Regarding the first goal listed above, we want to identify the needs of those physicians working in primary health care services. What do they need and what do they demand? To answer this, you could look at the health indicators of the WHO, the Panamerican Health Organization (PAH), UNESCO, the World Bank, and other third level institutions. Yet why not actually ask the physicians themselves? What really are your needs?

Regarding the second goal listed above, we want to review the existing curricula. Is there a basic set of competencies these physicians need to know? What are the recommendations for recognition, certification and accreditation of CME's? What kind of international agencies are available to assist? For example, the World Federation of Medical Education has a set of standards. However, to translate those standards into actions is problematic, because it is not enough to describe the standards needed, but one must also ascertain how to develop the solutions. This is a major challenge we have to face. As part of our goals, we also have to consider the needs of nursing professionals, social workers, and health teams participating in CME's and CPD's. We are looking for partnerships with other organizations because we are not going to do this alone. A final goal of ours is to develop a global "Declaration" on the need for such a CME/CPD effort.

In undertaking this ambitious global challenge, we have created four strategic task forces:

1) To analyze the CME/CPD needs and demands of the generalist physicians;
2) To study effective CME/CPD delivery methods and resources available;
3) To develop a core curriculum based on competencies;
4) To develop a "Declaration of Purpose" which is a political movement to bind the wills of organizations together.

So what are these organizations that we are trying to bind together? Among others, they include: the Institute for Medical Education (IME); the World Federation of Medical Education (WFME); the European Association of Medical Schools (AMEE); the Panamerican Federation of Associations of Medical Schools (PAFAMS); the Global Alliance for Medical Education (GAME); the World Medical Association (WMA), the Foundation for Medical Education (FAIMER), supported by the Educational Commission of Foreign Medical Graduates (ECFMG); and the Pfizer Medical Humanities Initiative (PMHI). The purpose of binding all these organizations together is to capture their commitment and their political will.

The critical issue to consider in examining the delivery of methods and resources is the following -- why does the current CME/CPD system not work? The answer is that it does not focus on what people need. There is a vacuum. So our job is to start getting data from the communities and from the actual places of work. In so doing, we will want to develop a data base, as I said, of what has been done, best practices, and current experiences in

CME/CPD accreditation and certification. In the course of this project, we have attracted some company -- the European Union is stepping in with us

In conclusion, the main issue here is that medical education can only achieve a very promising and deserved future if we focus on figuring out how to fill the gap between societal expectations and the perceived reality. We are starting to work from the bottom up and the "bottom" is really the primary health care services area. What do they really need? This effort follows the Millenium Goals, and it follows any humanitarian goals, for that matter. While ours is a tiny project, I believe that it would be a powerful managerial tool if successful. We need the insight of all of you to help us to perform better. Some people like Peter Green from MedBiquitous is also participating in our group discussions. We hope that Ross Martin will participate, along with similar people. And we welcome you in this group, as well. I believe that the main thrust is to produce a template as an instrument that would help bring about the improvement of health care on the front lines. We want to know what is reality happening there and then we want to focus the Continuing Medical Education onto those urgent needs - by means of the best technology available. It is my firm belief that general practitioners and family physicians ought to be very well trained, rather than being at the end of the line in terms of Continuing Medical Training.

E-Medicine in Action

Presented by Sean Rowland
Executive Chairman
Hibernia College
Dublin 2, Ireland

At the first LINC Conference in 2004, Professor Larson introduced me to Dr. Honorio Silva, Vice President of Science & Medical Professional Development at Pfizer Inc. Since then, we have developed an excellent working relationship, which has proven to be very productive for both Hibernia College and Pfizer Inc. It is in this context that I would like to outline Hibernia College's Master of Science program in Pharmaceutical Medicine, which was developed with the help and support of the Pfizer Corporation. This effort also involved bringing together other partners for the development and delivery of the program.

First of all, I would like to give you a little background on the formation of Hibernia College. In the year 2000, my colleague, Sara McDonell, and myself set up Hibernia College in Ireland, which was the first e-Learning college in the country. More importantly, in my opinion, Hibernia College was the first e-Learning college to get national accreditation. That is the key – to get national accreditation that is recognized worldwide. So Hibernia College is part of the European Union credit transfer system and it has also received the Quality Assurance Award internationally. I believe that any time we talk about e-Learning, we need ask the key questions: where it is from, who is delivering it, and does it have accreditation? There is a considerable amount of content online that will never be accredited and should not be accredited. In my opinion, the most important thing in the whole arena is quality, as it does not do any of us justice to talk about e-Learning if it does not have a quality assurance.

Hibernia College was established to provide distance learning and access to education for people who may not normally have access. What we have found is that most people who want access are those who want continuing education or professional development while pursuing their careers. Most of our students have families and other commitments that do not allow them to go to college in the evening or at the weekend. They do not have lives that allow them to spend their time in pursuit of education. However, they are able to take courses online, or even better, in a blended way. We have a number of courses at Hibernia College, including courses in Teacher Education and Public Administration, a Law program, a Master's in Hospitality Management, and a Master's in Pharmaceutical Medicine.

The efficiency of time is one of the most attractive aspects of e-Learning. However, the Blended Learning approach, in my opinion, brings about almost 100% retention simply because you get to join a class, a

community of learners. In blended learning, you become part of that community of learners and you meet together – it may be once a month or for a month in the summer - and then you are online the rest of the time, both live and also taking asynchronous classes. The numerical blending together in classes that we have found most successful are classes of twenty to twenty-five people, where each student is part of a smaller community of learners. The notion held some years ago that we would have hundreds of people all learning together - in different time zones and in hundreds of different countries – is pretty much shattered. Perhaps we can do that for a few hours of learning. However, in the case of a postgraduate degree pursued over a number of years, I do not think that is a viable option. While it certainly would be a financially viable model, in my opinion, that is the only benefit it would have. As someone who has been in education for over twenty years, I think it comes down to this – if you are looking for the quick fix, it just is not there in education.

Returning to a discussion of our Master's Program in Pharmaceutical Medicine, this course basically grew out of conversations with Honorio Silva, and out of a need that was identified within the industry. As with all of our programs at Hibernia College, you have to address – as our previous speaker, Dr. Pulido, mentioned – you have to address a need. You cannot invent a program and then hope that people will apply for it. If you address a need, you will fill that need. With regard to this area of pharmaceutical medicine, which is still emerging in some countries, I believe that Honorio recognized a very clear need and convinced the Pfizer Corporation to work with us, bringing their global expertise to the table.

In initiating this course, we looked around and asked ourselves, "How are we going to do this, and whom do we need to help us?" At that early point, we examined the content and decided that the program would be a blend of industry and academia. There are numerous highly qualified academics working in industry, and we also looked at partnerships with the Royal College of Surgeons in Dublin. In addition, we looked at Harvard University for one of the course modules on Leadership. Next, we considered the idea of blended learning for this program, and concluded that the best approach would be to bring everybody together. We decided to bring the first cohort together initially at Harvard University where they would take their initial course module in Leadership. This experience had a number of benefits to it; in addition to obviously providing an excellent academic program for the first module, it also afforded the opportunity for everybody to meet each other and to work together. Furthermore, it served to bring together the current and future leaders within a global corporation - to meet each other and to begin working relationships that they would continue online.

In developing the program, we next had to put the modules together – ten modules over two years – for the Master of Science degree. Two of the modules are to be taught on site, one here in Boston at Harvard and one in Dublin at the Royal College of Surgeons. The other eight modules are offered online, with project work to be presented as students move through the

program. The program was developed, as I said, with the help of Pfizer professionals led by Honorio, and with the help of academics at the two colleges mentioned. In addition, we received the help of our own Academic Chairman, Dr. Thomas Mitchell, who is the former Provost of Trinity College in Dublin. As we moved forward, we hired our academics and then when the total program was fleshed out, we presented it to the Irish accreditation body, the Higher Education Training Awards Council (HETAC), which accredits over forty colleges in Ireland. This process was rather rigorous – I would say, more than "rather!" On the final presentation, HETAC sent a panel of experts, and we were required to basically defend ourselves as in a Ph.D. defense in front of those experts for an entire day, from 9:00 am to 4:30 pm. These experts went over every minute detail of the program, across all two years, and in the end, the program was highly recommended because of the expertise that was brought to the table. It was also highly recommended because it is an excellent example of e-Learning.

Once the Pharmaceutical Medicine program was accredited, we moved forward to recruit students. The first class was recruited from within the Pfizer Corporation, and it was heavily oversubscribed. We ended up choosing forty-five people and dividing that number into two groups to keep the class size smaller. The groups were split on the basis of timing – in what time-zone they lived and at what time they could take their classes. The classes are currently running, and the students have just started their second semester in the program. In terms of our selecting students, the first class was drawn from Pfizer and has representation from twenty-three countries around the world, including students from Africa. In 2006, we will open up the program to any applicants from any country.

Time is the biggest challenge to all of the candidates in this program and, indeed, in all of our programs. It is a challenge for the professional to find the time, and I have to say that they work extremely hard, and we at Hibernia College try to be flexible in accommodating the needs of our learners. We ask each candidate at the beginning of the semester to rank what times that semester would suit them best for live tutorials. They can obviously download their asynchronous classes whenever they wish, but to time their live tutorials is difficult. For this scheduling, we use a software package out of the U.K. The live tutorials are timed to suit the majority of the 25 students in that particular semester. We do not set a concrete time – say 7:30 on Thursday. We ask them to pick their top three times so that the flexibility is built in there. You may not get your perfect time this semester, but you may get your first choice next semester. This process does seem to be working very well at the moment.

After we recruited the classes and initially brought them here to Massachusetts and to Harvard, we found that the blended, onsite work is hugely important. A strong, positive learning impact is achieved by the fact that these students know each other, that they have met each other, and that they look forward to meeting each other again. Also, when they break into groups online - say four or five people to do project work - they already have

met each other and they know with whom they are dealing. I believe that the blended, onsite experience has had a strong influence on people to stay in this rigorous program.

I will return when the first class graduates to give you an evaluation of the Pharmaceutical Medicine Master's Program. On the accreditation day, it was highly praised above all because they said we were able to cherry pick the best people in the world to come to the table. I think it also needs to be recognized that the Pfizer Corporation has invested resources that allow us to create such an excellent course. I also think that this course demonstrates some impressive advantages of e-Learning. For example, at Hibernia College, we have a highly qualified professor teaching in our Teacher Training Program who teaches in Chicago and has taught at a number of universities, including Loyola University. Yet he is able to teach Educational Sociology online for our teachers. So I think the Pfizer program, the Pharmaceutical Medicine Program, is an excellent example of how you can look around and see who has published recently, who is doing research in the area, and who can really tell us what is going on in that area at the present moment. No longer do we simply need to rely on those old crinkly notes with the yellow turned-up pages! Due to the nature of many of the subjects we are dealing with, we need to be very current and up-to-date. The wonderful thing about e-Learning is that when we offer this program again, we can determine whether there is somebody else we should include, someone who has just done something very significant in the area of Pharmaceutical Medicine. If so, then we would want to bring that person to the table.

Another advantage of e-Learning is that you can divide the content into modules, first of all, and then you can divide the modules into pieces. So, for example, when you divide a module into, let us say, 12 or 16 weeks, you have the ability with an e-Learning program to introduce somebody for one or two weeks. Now, of course, the flip side of that is that you do not want too much separate involvement as you are in danger of losing the central theme. You need to have a concrete educational base and a concrete developmental program that builds on itself. There is also the flexibility to introduce and to allow your graduate students to have access to very current information. Of course with e-Learning, we are talking about access to information globally – not just from within driving distance of your lecture hall!

In closing, I would like to say that pedagogically, an e-Learning course should not be different than any leading accredited graduate program. Quoting Dick Larson from a few years ago, "the new educational technology should be like a dial tone; you need it there, but it should not get in the way of the learning." I think that what we need to do is bring together excellent content and that the technologies should simply be the vehicle to deliver that content. In some of the programs I have looked at, we have let the technologies get in the way of good teaching and good learning. It is the teaching that is the important part and also the selection of quality students.

Distance Learning in Continuing Medical Education

Presented by Robert H. Rubin, MD, FACP, FCCP
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Associate Director, Division of Infectious Diseases
Brigham and Women's Hospital
Director, Center for Experimental Pharmacology and Therapeutics
Harvard University-MIT Division of Health Sciences and Technology

What I want to share with you today is our experience through Dick, and particularly through Honorio Silva, with distance learning and its application to graduate and post-graduate education in the medical field. I am a doctor and I make rounds every single day of the week on some of the most desperately ill patients in the world. My field is the Immuno-Compromised Host, and this is an area that is blossoming. It is also an area where there is a great need to train people on how to do clinical research.

In partnership with Honorio in the 1990's, we set up some weeklong Continuing Medical Education (CME) courses in Latin America, and these courses were very well received. However, it became clear to me that they were somewhat irrelevant in terms of the practice of medicine. I realized that we had to do something different. In addition, if I continued to go to Latin America once a month - which was very enjoyable - my day job was not going to get done in any meaningful way. At that point, Dick with his people and his technology, made it possible for us to transfer our efforts into distance learning, which we are now thoroughly committed to. So today I want to share this experience with you.

I am a historian by background and I like to quote Goethe when we are approaching new endeavors:

> "Knowing is not enough, we must apply;
> willing is not enough, we must do."

All of us here today in this room are interested in doing. Medical education for physicians, I will submit, is a lifelong obligation and privilege. The pace of medical advances and basic science discoveries has never been greater, and traditional education initiatives are threatened by cost, conflict of interest, and accountability. In addition, we are reminded that we must think globally by the appearance of new diseases from AIDS to SARS, and also by the difficulty of treating age-old pathogens like influenza and cholera. There is a new commitment to think globally by all of us who have made careers in this area.

What we need today are innovative medical education approaches, and here is my own wish list of such approaches:

- A broadly available worldwide medical education network
- Readily accessed with available technology

- Can be utilized for a variety of purposes
- Primary learning for students and trainees (as alternative or supplement to traditional lectures, journals, textbooks
- Continuing education for practitioners
- Creation of networks of clinicians, researchers, and scholars that will share problems, ideas, and insights
- Task forces for particular goals, such as ethics and rapid response needs

I am sure you can make your own additions to this list. Under the heading "Task Force for Particular Goals," you will see that I have included "ethics." I have gotten involved over the last few years in ethics. I do not consider myself an ethicist, and as I say, "there are two things in life I have never understood – religion and ethics." They are very, very similar. We are interested in creating rules of engagement under which intelligent people on all sides can get together and improve the way clinical research is done, wherever it is done. When it comes to innovative medical education approaches, there are several requirements. They have to be interactive and should have a component of self-assessment. Also, they should be able to be done in an uncomplicated manner – as I will demonstrate in a moment. My real ambition is the creation of a community of medical scholars linked by distance learning approaches and not limited by geographic barriers.

Towards the late 1990's, Honorio Silva, Guillermo Rodriguez of Costa Rica, and myself organized a course in "Good Clinical Practices in Clinical Research." This course grew out of my fellowship program here in which I have twenty young physicians that I am responsible for training in these areas. It is called the Clinical Investigator Training Program. We wanted to take some of our educational materials and see if we could adapt them to the needs of Latin America. I devised a weeklong course for which we drew on speakers locally and internationally. However, once the course was completed, we did not leave anything behind for the participating physicians in Latin America. Very quickly it was clear that we needed some kind of continuing stimulus for lifelong learning. So we decided to devise a different approach. We developed a distance-learning tool - accessible in English, Spanish and Mandarin - that contains state of the art lectures, an annotated bibliography, interactive case studies, and now an e-conference room.

An earlier questioner asked Sean Rowland about pedagogical approaches, etc. I do not know very much about pedagogy, but I do know a fair amount about how physicians learn. When I was a student, the textbook of medicine was something like *Harrison's Book of Medicine,* and I had to read it from cover to cover. It weighed fifteen pounds and was about two thousand pages. I dutifully turned the pages, although I did not retain anything. I could have done just as well putting in under my pillow, because that is not the way physicians learn. We learn from case studies. If I can put new information on the skeleton of a patient I saw described to me, then I can learn something. I graduated from medical school in 1966 and I think I can

honestly say that I remember every single one of my patients – particularly the hard ones. So case studies allow me to review and to learn. You will see how we approach this in our distance learning programs.

Now I want to discuss with you one of our attempts at a distance-learning program. I am very interested in organ transplantation, and we put together a module on "Infectious Diseases of Transplantation.' What we have in this module is an ability to have lectures – we have twelve to fifteen state-of-the-art lectures there. Then we also have a two thousand reference annotated bibliography. However, the heart and soul of this module are the case studies, which are interactive. Here is how we do this. First, the case study starts off with the presenting condition of the patient. All of the cases present an area of controversy in which there is a question about what to do for treatment. Second, we ask the question – "What should be done about this situation?" - given the fact that in the real world, an incorrect answer could lead to the patient's death. Third, we provide a series of possible answers, and for each wrong answer, we provide an explanation of why it is wrong, telling the physician to go back and try again. Thus, in this module, you constantly have to commit yourself.

The way we have organized this module is not a summary of the whole case, but rather, the way a physician has to confront a case. If a patient is in the emergency room and is obviously sick, I have got to make some decisions to save the patient's life. That is the most important thing. The test results that I would like to have will not be available for another three days. However, that does not mean that the disease process or the patient will wait for three days. I need to learn how to make the right decision, and this is what we are trying to teach here. In the modules, there is a reward for being right or wrong, and the skill set that they received from the online lecture is constantly being applied, brought up to date, and tested in these case studies. For each of our case studies, we generate about ten or twelve questions, all of which add to the knowledge of the physician. Each case study is followed up by a summary and conclusion.

It is my belief – whether you are teaching biomedical ethics or clinical medicine, or whatever – that the case studies are the most important things we have. We have found that these case studies are very effective. I tease my Harvard-MIT Fellows that the only reason I pay their salaries is to use them as a Beta test site to see how they learn from this kind of experience! To demonstrate the global appeal of this course, we started out teaching it in English in Latin America, and then moved to teaching it wholly in Spanish. Recently we launched the program with Dick, Honorio, and other colleagues in China. We are ready to take it to any part of the world, although we will need help with the language and translating. However, this medium readily lends itself to global distribution.

So what are the lessons we have learned from this initial experience with the program? It involves active rather than passive learning, so you have to commit yourself to an action. And I can tell you that any self-respecting scientist or doctor does not like being wrong; if he disagrees with the answers

that are given, rest assured that he will understand why he disagrees and will fight back with us. However, he or she learns from this kind of interaction. The modules that we already have include those on Fungal Infections and Transplant Infectious Diseases. Modules currently in production include Statistics, Study Design, and Clinical Pharmacology. Now, in collaboration with the Yale Center on Biomedical Ethics, we are starting a module on the Ethics of Clinical Research and Clinical Care.

In closing, let me say that we find this distance learning model to be probably the single best approach to Continuing Medical Education, and I will stand by that statement. We believe that the technology is here, and will undoubtedly get better in the future. For us, these technological advances along with the pioneering spirit of Professor Larson has made all this possible. With respect to Professor Larson, I cannot think of a more generous collaborator that I have dealt with over my many years of professional service. I would like to close with these three favorite quotes of mine:

> "Our heads are round so that our thinking can change direction."
>
> - Francis Picabo

In this vein, I believe that distance learning as I have described it will be the basis of much undergraduate and graduate medical education in the future.

> "Many people say it is the intellect which makes a great scientist. They are wrong; it is character."
>
> - Albert Einstein

> "This is not the beginning of the end. It is the end of the beginning."
>
> - Winston Churchill

Using Blended Learning to
Strengthen Management and Leadership across the Globe

Presented by Jennifer Stavrou Rodine
Director, Electronic Products
Management Sciences for Health
Cambridge, MA

I am from Management Sciences for Health (MSH), and actually we are a neighbor of MIT; we are just up the river a ways on Memorial Drive. We are an independent, non-profit public health organization, and our mission is to bridge the gap between what is known and what is done about public health around the world. Therefore, our focus is on strengthening the management, quality, and access to health care around the world. The organization has been around for about 35 years, has 1500 employees, and is working in over 35 countries in the world right now.

Today I would like to share with you a little bit about our approach to blended learning. In addition, I am going to give you a little sneak peek at two of the programs that we have been developing over the past few years. Both of these are USAID-funded programs; one is the Virtual Leadership Development Program and the other, the Art of Crafting a Business Plan for Social Return on Investment. Dr. Larson asked me to focus on our challenges and lessons learned – so that will be a main focus – and then I also hope to look forward to our future plans and goals.

First of all, I would like to give you a little context. Unlike many of you, we are not focused on higher education per se, but on the continuing education of health professionals. Our work is focused in Africa, Asia, and Latin America, and therefore, we are very cognizant of the connectivity constraints of the audiences that we are working with. We also work hard to customize our programs for each of those audiences. We are dealing with very busy health professionals, and as our last speaker alluded to, that is often a tremendous challenge. So we are trying to create programs that not only deliver content to them, but also provide opportunities for peer-to-peer exchanges. We aim to tailor our programs depending on who the client is and how best the content can be delivered, and to achieve this, we use a blended approach.

Over the last day or so, I have heard just about everyone who has spoken talk about blended learning over. Just to go over our definition - because perhaps I stretch it a little bit - when I talk about blended learning, I am talking about both the learning methodologies and the learning approaches that are used. Is it self-instructive or is it facilitated? Is it individual skill-building or is it team-based learning? "Blended" here also refers to the range of delivery methods that are used, and those include, of course, Internet technologies, the Web, e-mail, CD ROM, etc. However, we do not rule out

the telephone, fax machines, and face-to-face when appropriate. Our main goal is to look for the right combination or "blend" for each audience.

Now I would like to tell you about the first program, the Virtual Leadership Development Program or the VLDP, as we call it. This program was developed to enhance and build on a face-to-face program in leadership development that MSH had been delivering, in Latin America in particular. We wanted to expand the reach of the program and hopefully reach wider audiences. The focus in this program is really on helping leaders within organizations address the challenges that their organizations are facing. The program has an *individual skill-building component* because when you talk about leadership development, obviously there is a lot of self-awareness and self-learning that needs to happen. A second component of the program is *face-to-face group work* that happens at the work site. Therefore, teams enroll as an organization and they are required to participate together in the program throughout its course. In this part of the program, they do not see the facilitator onsite, but they do work with each other.

The VLDP Program also uses an *interactive website* to deliver the content. This website has a combination of individual exercises for assessing your leadership style, looking at where your competencies are, offering opportunities for skill building, as well as leading you through group exercises that you can then work through at the work site. *Virtual facilitation* is intense for this program. The program lasts about three months, and one of my colleagues here, Jim Wolff, just facilitated a program in the Caribbean not too long ago. He has told me that it involved about four hours a day of facilitation time on his part to be able to support the teams and provide feedback. The facilitators give daily emails, which are motivating and show up in people's inboxes to encourage them to stay on track. These emails also let them know what is going on with the program. In addition, there is the need to facilitate the conversations on the website itself. Teams can talk to each other across geographic boundaries using the message boards and some of the interactive features of the site.

By the end of the program, each team has produced *a concrete action plan* that that they will use to address their identified leadership challenge. One of the main things that we have found is that having a concrete work product as a program outcome is really essential for this kind of continuing education. People feel that they are actually doing their work, and that this course is not in addition to or a distraction from their work. Once the program is completed, we also provide *post-program support* to offer participants the opportunity to communicate and collaborate with one another.

In terms of the reach of the program, we have conducted ten programs since October 2002, involving 110 teams in thirty countries. There have been 860 individual participants, and the program has been offered in Spanish, Portuguese, French, and English. Currently we are preparing to put it into Arabic, which will be a big challenge for us. Our current training program is actually in Iraq, working to strengthen the Ministry of Health in that country. The computer interface for the VLDP program includes seven

course modules on the left side and then an announcement on the center of the page that changes every day. In this way, every day when a participant logs on, there will be something new from the facilitator, something that encourages the participant to explore that day's topic and move into the content. Now let me quote one of our participants who talks about the impact of working as a team through the program - as opposed to individual learning:

> "As a result of the course, we are a closer, better team. We discussed things about our strengths and weaknesses…that we would never have shared otherwise."

The second program, which we call the Business Planning Program (BPP), is the Art of Crafting a Business Plan for Social Return on Investment. The goal here is to help teams create business plans for breakthrough ideas. Again, this is a group learning program and we are looking for organizations to enroll a team of learners. The idea is to help them translate their great programmatic ideas into a business plan that could be presented to a donor, via a traditional or untraditional donor - such as a wealthy individual or a corporate foundation. We kick this program off with a face-to-face workshop since we find that some of the concepts are very new and we are using more of a business terminology. These are concepts and terminology with which people in the healthcare sector may not be so familiar. So we kick the program off with a face-to-face meeting where we present the new concepts. In addition, people get a chance to know each other. After that, the groups work off a CD ROM for the duration of the program, where they are guided - module by module - through the process of actually creating their plan. A lot of the teamwork that happens onsite is guided inquiry, so you have a multi-disciplinary team on the site that is working together to create this plan. They are gathering data from their site, talking to others, and really shaping the vision.

The facilitators again play a crucial role in this program both by phone – there are phone-coaching conferences – as well as by email where they provide detailed written feedback on each section of the business plan as it is produced. And at the end of the day, the teams actually emerge with a business plan that is ready for presentation to a donor. What we have often done is try to have a final ceremony where we will invite some potential donors, have presentations, and then have a cocktail reception where teams can hopefully start to sell their ideas. Since 2002, we have conducted seven BPP Programs in five countries involving 21 teams. The programs have been presented in Spanish, English, and French and have produced 19 business plans as well as $513 K of new revenue. In terms of evaluating the program, we view this generation of new revenue as a metric of success, and we hope that still more money will be generated. With the BPP Program, we have program partners in Bolivia, Ghana, and the Philippines. These are organizations that have gone through the program and have indicated an interest in being able to deliver it on their own. They have been brought on as trainers-to-be and have been coached and mentored. The idea is that this

program will become part of the cadre of products and services that they will be able to offer. They will be able to charge what they want for it, thus contributing to their own organizational business models.

Dr. Arnoldo Hax, who is on the faculty at MIT, has been generous enough to share with us his Delta Model for the BPP Program. We actually have a video recording of him where he is helping people understand the strategic positioning of their organization and working through that exercise. Because this is delivered on CD ROM, obviously we are able to have richer media here in this program given our audience. Again let me share with you a quote from one of our participants:

> "The BPP turns ordinary people into entrepreneurs. It gives you all of the tools you need to formulate an idea, implement it, and forecast outcomes."

Now I would like to turn to evaluation, which came up again and again yesterday, and it is certainly something we struggle with as well. Just to give you a sense of where we are gathering data, we try to do pre-assessments as much as possible, so we are going into the program design with really clear data of who our learners are, what their needs are, and what is going to be the best mix of methods that we can provide to them. Evaluation is also critical throughout the program delivery; we do not just wait until the end. These are three-month programs that I have described to you, so we are actually asking the learners for feedback along the way. We have found this feedback to be invaluable because it allows the facilitators to shift direction a little, or address concerns that are coming up in the middle of the program, as opposed to having them wait three months and be frustrated - telling us at the end that something was not working properly. So to the degree possible, we try to make real-time adjustments in the program as we are going along.

Of course, evaluation at the end is critical also, and we do that. We are also doing some post-program follow-up. Business planning is easier to evaluate in terms of empirical data – such as just looking at what is the financial return and who is being funded. However, when you are talking about leadership management, suddenly the indicators are a little bit softer and a little bit harder to grasp. However, doing interviews and in-depth conversations with participants to get their feedback - six months after the program, or a year after the program - is how we are learning what the impact is on the participating organizations.

I have consolidated a few of the "Lessons Learned" already into my talk. Some may seem very obvious, and I have heard the themes repeated here over the last day and a half. Above all, knowing our audience is absolutely critical. It seems an obvious element, but I find that whenever we are approached to help someone adapt a program for distance learning and help secure funding for that initial assessment, understanding the importance of this element is always kind of a tough sell. However, to the degree possible, it is important to figure out: Who are these learners? How are they used to exchanging information? What is their access to technology?

Cultural factors are also extremely important. It becomes challenging as you begin to deliver a program that has some global appeal because obviously there are great diversities of culture. One example I can give you is that we rely on message boards a lot for inter-team interaction or for interaction among participants who are not going to sit in the same room with one another. We found that a lot of people initially are uncomfortable with message boards because they have to put in writing their own thoughts - that are then available for a wide audience to see. Also, if they are not particularly comfortable writing in the primary language, or they are not used to having their name out there and attached, it is a bit of a learning curve to get them to be comfortable with actually posting in a way in which there can be meaningful dialogue. Fortunately, we have been able to work with people to overcome this difficulty.

Language requirements are essential, including not just what language they speak, but what language can they write in comfortably, since so much of the program is written. We also work to use the appropriate mix of media. When we were working with the Ghana Social Marketing Firm, they lost their email for two weeks so they were faxing in their assignments. This system works, and we were able to receive the fax, comment on it, fax it back, and have a phone conversation. From this example, we can see how important it is to have a back-up plan and a multiple media approach. We also believe that motivated learners are critical. In this regard, it is crucial to target your program recruitment and to get strong organizational backing for the program. This helps considerably to prevent attrition. We have experienced enormous retention rates and, because we are training a core of learners within an organization, these learners are actually able to achieve some change – as opposed to one sole person slogging uphill by him or herself. Two other important program elements we have found are the grounding of learning in solid results and having a program that extends over a period of time.

In addition, one can never overestimate the importance of facilitation. We work to select talented and creative facilitators who are willing to stretch the boundaries a little bit. Along with selecting them, we also work to build their skills, particularly their skills related to working in a virtual environment. We focus on tracking participation and rewarding those with high participation and we also greatly value competition as a way of motivating learners. We might say: "Hey Peru, you haven't shown up for a few days. Look at Colombia – they're doing great." In this case, Peru would try to kick it into gear and get back on track with what is going on. Creating an inviting and personal atmosphere is also really critical to this kind of learning, and it is also very important to be responsive to the needs and concerns of participants, despite the time zones and other limitations. Anticipating program scale-up is critical as well – that is, being able to invest adequately in pilot efforts is not always possible, but certainly desirable. Once you pilot something, and it is successful, immediately people want to scale it up and bring it to a larger audience. So here it is important to figure

out how to develop programs that are modularized and that allow for different languages and different content.

A final critical element I would like to mention is the importance of building local partnerships. We build the training of trainers into both of these programs, and we are really trying to develop local ownership of these programs. We also want to decentralize the program delivery system so there can be greater reach. In closing, I only want to say that we at MSH are looking for collaborative partnerships, and therefore, I look forward to speaking with some of you in this regard.

PANEL SIX

ICT INITIATIVES IN AFRICA:

CHALLENGES AND ACHIEVEMENTS

iLabs: Carrying Out Experiments across the Digital Divide Through the Internet

Presented by Jesus del Alamo
Department of Electrical Engineering and Computer Science
MIT

I am going to talk with you today about our work on what we call iLabs, which is about carrying out experiments through the Internet across the Digital Divide. The motivation is simple - educators like me in engineering believe in the enormous educational value of hands-on experience in science and engineering education. However, conventional labs as we know them are quite expensive and they have a very complex logistic. Particularly when you have a lot of students, conventional labs do not scale well, they are not shared, and, as a result, many of us feel that we do not have quite enough lab capacity to offer more to our students.

We have been working for about seven years on the concept of iLabs or WebLabs. These are labs that can be accessed online, through the Internet. Through iLabs, you can actually do real experiments, using real equipment, from anywhere at any time. This is what I want to talk to you about, particularly in the context of education in developing countries. We have been working on this for a while and we have developed a number of iLabs at MIT. We started with the Microelectronics Device Characterization lab, which is for my own discipline, microelectronics. This was started in 1998, and this iLab has been used by many students around the world. However, we have extended the iLab concept to other engineering disciplines, including Chemical Engineering with the Polymer Crystallization experiment. This is a microscope-based experiment with many kinds of laboratory experiences. Also in Chemical Engineering, we have developed a Heat Exchanger experiment. In addition, we have an online Shake Table for Civil Engineering that allows you to study in real time the vibration modes of building model structures in response to vibrations you can set up on that table. More recently in Electrical Engineering, we have been working on a Dynamic Signal Analyzer that allows a student to study the transfer characteristics of various electronic systems.

To tell you more about my own iLab, the Microelectronics Device Characterization lab, it is a lab that allows you to measure remotely the current voltage characteristics of transistors and other electronic devices. So you can set up the experiment through a graphical interface that uses the circuit language of Electrical Engineering to set up the experiment. Then the results are plotted through an interface panel that contains a lot of flexibility for the students to plot whatever they want in whatever manner they want. This graphical user interface is designed to allow students to make lots of mistakes out of which great learning takes place.

We have been using this lab now for seven years. In addition, we have been using it with partners around the world. It has been used by over 3000 students, on four continents, and in many different countries. These are students that are doing projects based on these labs, for which they are getting credit that will to contribute to their final course grade. So these are not casual users that are drawn up from the Web to see what this is all about; rather, they are actual "customers" that are using this lab as part of a course.

Now in parallel with this track of developing these iLabs at MIT and exploring the pedagogy of online labs, we have been working to build a tool set and an architecture to ease the development of iLabs for other people. We have found that it is quite a lot of work to develop new labs. We have also found that labs, although they may be very different, contain a number of generic modules. So we are developing an architecture in which those modules are developed and given clean interfaces that can be readily shared – so that people can more easily put labs online and more effectively manage them.

In the online laboratory architecture that we are developing at MIT, you have the labs themselves that may be located at various academic institutions around the world. These labs are connected to the Internet, and the students, or clients, are sitting at their computers wherever they are located around the world. What is unique about our architecture is that it has a piece of middleware that we call the Service Broker, which has a number of important functions. It can be placed in different locations; for example, it could be placed at the site where the labs are situated or it could also be placed at the home institution where the students are. The Service Broker is connected via a campus network with a university's database that contains the students' relevant information. One of the most important functions of this Service Broker is to deliver the graphical user interface to the student's computer in order to interact with the lab. It also mediates all the transactions between the student and whatever lab the student is using, and will store all the data used by the student for future download and future use.

Now let me summarize for you the vision of our project. The vision is that through this concept of online labs and shared architecture, making it easy and relatively fast to deploy new iLabs, there will be an order of magnitude more lab experiments available to the next generation of students as compared with what was available to us. In addition, these future students will have a lot more lab time because they will have 24-hour access to many labs around the world. With iLabs, students are not limited to the time slots given to them indicating precisely when they must show up in the lab. Furthermore, there will be much more sophisticated labs available, perhaps involving rare materials or very expensive tools - because these labs will be broadly shared and thus affordable. We at MIT also see that communities of scholars will grow around these labs, communities that will not only share the labs themselves, but also share all the educational content that is developed around these labs. This is something that we do not quite do today.

So that is our vision. We have recently been working on exploring the extension of this vision to developing countries. It became quite clear to us from the very beginning of our project that the moment you put a lab online, it remains online – whether you use it or not. To us it seemed a shame that all the times – which is actually most of the time - when our students or our partners around the world are not using these labs that they just sit idle. Therefore, from the very beginning we thought it would make sense for us to donate those spare lab cycles to the developing world so students and educators in developing countries could have access to lab resources that otherwise they would likely not have access to. We have been very interested in exploring the concept of iLabs, and how it ports over to developing countries. In this regard, we have been funded by the Carnegie Foundation to first carry out a feasibility study, and now to conduct a major project where we explore this notion in depth.

Clearly in developing countries, there are great opportunities for this concept. First of all, there is a paucity of labs because they are expensive to afford. In addition, there are lots of young people who are eager to learn and to get ahead, particularly in engineering schools. Furthermore, there is a great need for engineers in all of these countries. However, there are also large challenges to the introduction of iLabs in developing countries. The challenges that we have found include the fact that there is limited access to networked computers at these campuses. There is also limited computer literacy on the part of the students and also on the part of the teaching staff. In addition, there are severe bandwidth limitations.

In this area of bandwidth, let us look as an example at Makerere University in Kampala, Uganda – one of the partners on our team. The actual campus has a state-of-the-art optical fiber network system to connect all of the academic buildings and most of the student residencies. This network has been funded by the Carnegie Corporation. It is a two Gb/s per second, maximum capacity, single-mode fiber system. However, this phenomenal network is connected to the rest of the world through a metropolitan network that goes up to a satellite through one of the local ISP's, and therein lies the problem. This connection is actually very expensive, and as a result, the total bandwidth that the university can afford is very limited. For example, when these data were acquired about a year ago when I was doing the feasibility study, the total bandwidth that the university was purchasing was 2.5 Mb/s, for the entire campus. As a matter of fact, the total bandwidth of the country of Uganda at that time was 25 Mb/s.

These are incredibly meager numbers. Now the reason for this is because the bandwidth cost (to connect to the satellite) relative to the GDP per capita – which is the right way to measure how painful it feels to buy bandwidth – for Makerere University versus that for MIT is four orders of magnitude apart. I was expecting there would be a difference, but I was not expecting a factor of 10,000 in how much it costs for MIT to acquire bandwidth versus the cost for Makerere University. So this is at the root of many of the problems, and it represents a severe challenge. What is the

reason for this situation? It is that there is no optical fiber system running along the coast of East Africa. There is an optical fiber system running along the coast of West Africa where we also are collaborating with Obafemi Awolowa University (OAU) in Nigeria; unfortunately, however, the landing in Lagos does not reach far into the country and does not reach the universities. So we are left with a situation in which each country in Sub-Saharan Africa is really an island in the global Internet. What this suggests is that educational resources must be deployed locally at each individual campus where you want the students to access those resources; otherwise you have to connect via the satellite.

There are operational consequences of this situation for our project, and, I believe, for all other projects that involve rich educational resources on the Internet. First of all, you need to deploy the educational resources locally, right at the campus where it is going to be used so that they can be accessed through a high bandwidth network. Also, the technological solutions developed at a place like MIT – where we are flooded by very inexpensive bandwidth - might not actually work in developing countries because we just do not realize how differently these applications run in a location where you have very limited bandwidth. Not only that, but the pedagogy itself might be very different in an environment in which the bandwidth is so limited. When I gave presentations while visiting our partner universities in Africa, I noticed how sluggish all these MIT applications were. That indicated to me how much more challenging it was going to be to engage the African students with iLabs in the same way we engage students here at MIT. The applications are just not as responsive at the African universities, so this is a huge challenge. We also have to think on the pedagogical side. The ultimate challenge is how do we support the development of homegrown iLabs that will address the particular needs and limitations of universities in developing countries.

So this is what our project is about. It is what we call the iLab Africa Project which is funded by the Carnegie Corporation of New York, and it involves four universities: Makarere University of Kampala, Uganda; University of Dar es Salaam in Tanzania; MIT; and Obafemi Awolowa University (OAU) in Nigeria. The goals of these projects are: 1) to deploy the iLabs created at MIT throughout the curriculums of our partners, helping them to develop new content – while of course giving them our existing content; 2) to support the development of iLabs that are homegrown; 3) to work with them to help them apply our technology to develop new technology for developing their own iLabs; 4) to create opportunities for internships for MIT and African students to come to each others' campuses and work together on these projects to support the first three goals; and 5) to create a scaleable research network that would allow these three institutions to then reach deeper inside Sub-Saharan Africa and continue to spread this technology and this understanding. The iLab Africa Project started in June 2004 and will continue for two years.

Now I would like to give you a brief overview of the challenges that we are facing and how we are trying to address them. On the client's side, we

have found that the graphical user interfaces that we have developed at MIT are too fat, too heavy, and too big. We do not recognize this fact here because we have lots of bandwidth, but when you access it through a satellite connection, it really feels extremely sluggish. We are addressing this sluggishness by developing new thin and lightweight clients. Our clients typically require plug-ins to operate. At MIT, you just download the plug-in and you are done. In addition, our MIT clients are really very demanding on local resources and they run on computers that are high performance. In the developing world, these are complicating matters because large plug-ins can be corrupted during download and because computers are typically less powerful. A previous client, or what we call our graphical client version 6.1, for example, requires a Java plug-in, which is version 1.4.2 and it also is 169 kilobytes.

However, according to measurements taken recently in collaboration with our partners at OAU, it takes 79 seconds on average to download this client from MIT to that university. So we have developed a new client, called a classic applet, which eliminates a lot of the fancy graphical features and as a result is significantly lighter. It is only 94 kbytes, but most importantly, it does not require a plug-in. So these features really simplify the local management of all the computers for this client to run, and as a result, the download time from OAU has been reduced to 63 seconds. It still takes about a minute, so while this is a good improvement, we need an even more significant improvement.

The second challenge regards the Service Broker. This is the piece of middleware that serves the applet to the student when the student wants to do an experiment. This server also mediates the actions between the client and the labs, as well as holding the data for the student to access later when he or she wants it. The problem is that this Service Broker sits here at MIT, so all these transactions are going half a world away through the satellite connection - and it all takes a long time. In addition, this entire middleware system is based on proprietary technology. For this reason, we are currently working to use open source technology to redevelop this piece of middleware. However, the fact that we have this piece of middleware means that we are not limited to deploying the Service Broker at MIT, but we can actually deploy it in the Internet on the campus where the students are located.

In this regard, we have been doing some testing and we now have Service Brokers installed at Makerere University and also at OAU inside their campuses. This installation has had a huge impact upon the performance of the system. For example, when the applet is served from inside the Makerere campus, as opposed to being served from MIT, the download times are cut to 22 seconds for the graphical applet and 17 seconds for the classic applet. Now we are talking! This speed is how it feels when we are at MIT; it takes about the same amount of time, about 20 seconds. This really makes a huge difference. It also makes a significant improvement in the ability to receive this applet in an uncorrupted way because if it takes too long to download, there are more possibilities for a disruption to occur and for the applet to be

corrupted. With the Service Broker in the local campus, the students' data can also be stored locally as opposed to remotely. In this way, the students have ready access to their data at all times.

Let me now say a few words about how we are also working on the hardware. In our typical iLab at MIT, we use very expensive hardware. The rationale was that the iLab concept allows us to use expensive hardware because it is going to be shared around the world, and also so that we can expose the students to professional tools. Thus, when they go to industry, they will have a leg up on the tools they will need to use. So for example, our microelectronics lab has been constructed around an instrument that costs about $40,000. Obviously, these cannot be replicated in many universities, let alone in developing countries. Therefore, we are working on a concept from National Instruments, which is called the Elvis Platform. This is a really very versatile concept that allows you to create many experiments that you can actually do with this instrument – and it only costs about $2000. Right now, we are working on this platform very closely with our partners at AOU to test how it can be used for different experiments.

In addition, we are also examining reducing lab hardware cost by at least another order of magnitude. We are now exploring what my student calls an "iLab mini", which is a very focused version of the instrument required to do the kind of measurements we want. We believe that when you focus exclusively on that precise application, and you do it in a very nimble way, you can actually bring the cost down to about $40. This is a factor of 1000 cheaper than our current lab. So clearly, this is another concept that will export very well to developing countries, and one that we are anxious to explore.

A Strategic Approach to Open Educational Resources (OER's)
At the African Virtual University

Presented by Peter Kuzvinetsa Dzvimbo
Rector of the African Virtual University
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The African Virtual University (AVU) is located in Kenya. It was established in 1997 as a distance education pilot project on the use of ICT's in increasing access to tertiary education in Africa. I think the people who founded it were located at the World Bank, and one of the major issues they were interested in was developing a pilot project that might eventually make us understand on the Continent how ICT's can be used, especially in tertiary education and professional training. The initial focus of AVU was on brokering content from overseas. The whole idea was that they wanted to use ICT's so that African institutions, African students, and African academics could have access to quality content from around the globe. However, this model eventually proved to be very expensive, very unscaleable, and largely unaffordable for the majority of students in the African institutions for which the content was intended.

The current focus in the African Virtual University is on contextualizing this content that we inherited. We are also focusing on enhancing the capacity of our African institutions that we work with, especially in the area of Open, Distance, and e-Learning. The focus is on electronic learning, and we are also focusing on providing connectivity across the continent. The challenge on the African continent lies in the high cost of bandwidth, as well as in the poor and unreliable services as far as connectivity is concerned. Much has already been said about this, and it is becoming a major preoccupation of the African Virtual University because we are saying to ourselves, " If we are to use ICT's and we know what the challenge is, then we have to be creative to find a solution to the challenge." At AVU, we are also focused on developing Open, Distance and e-Learning content for a teacher education program that is funded to the tune of $7.5 million dollars by the African Development Bank. The program covers ten countries in Eastern and Southern Africa.

Our vision is as follows. We envision an African higher education scene in which Open, Distance and e-Learning will play an increasingly substantial part through the use of a wide range of technologies, from print to ICT's, and also will provide a critical access to relevant, affordable, cost-effective, and flexible tertiary education/training. We have developed a learning architecture that takes into account two contexts – one context where there is a low-level technology and the second context where there is a high-level technology. The first context is where students are learning under a tree,

and the second context is where students work in centers where there is access to connectivity and computers.

Today the African Virtual University is a network made up of 54 established learning centers in 28 African countries. In addition, we have global partners in the U.K., Australia, and the U.S. We also have formed a strategic alliance with the Partnership of Higher Education, Intersat, and Netsat, especially to try to resolve the issue of connectivity on the African continent. In terms of the coverage of the African Virtual University, we are all over – including West Africa, Southern Africa, Eastern Africa and also including Francophone, Luciphone, and Anglophone Africa. Our programs are taught in English and in French, and soon they will be taught in Portuguese. Later on, they will also be taught in Arabic to cover Mauritania and the Maghreb.

Internet connectivity is critical for African higher education because of the issues that have been cited by others. However, as I will discuss right now, connectivity continues to be a serious drawback for most of the African Virtual University partner institutions, hampering the delivery of programs, interactions, and access to digital libraries. The Continent has limited fiber optics and few satellites covering – hence the high cost of connectivity. Yet I just want to point out that I think as of today, there are probably close to sixty satellites covering the rest of the African continent, and therefore every square foot of the Continent is covered by satellites. However, the problem is access to those satellites because of the issues of cost. The cost of a typical African university on a list line is on average $1000 per month or $15 per kilobyte per month, and that is indeed very, very high. The AVU has conducted research and surveys in 2002, and our major findings were that VSAT was the only viable solution in the short to medium term. Longer commitment terms can reduce costs over five years. Yet African universities have poor reputations for payment, and this is why we have to go to donors.

Fiber is very expensive at the present time. Most African countries, especially on the western coast, have access to fiber. Senegal and Cameroon have access to fiber. However, this fiber is so expensive even for institutions that are not very far from the coast, and this is one of the issues that we at AVU have tried to address. Above I have tried to give you just a brief history of the cost of bandwidth in African universities. It is common knowledge that a household in Europe or North America has more bandwidth than an average university on the African continent with about 30,000 students. In 2005, we have managed to bring the cost of bandwidth down to $2.3 per kb/s by brokering content from Intersat for a number of institutions.

Now I would like to discuss what we call the *Partnership of Higher Education in Africa*, which I mentioned earlier. This body consists of the Carnegie Corporation, the Ford Foundation, the Macarthur Foundation, the Rockefeller Foundation, the Hewlitt Foundation, and the Mellon Foundation. I would say that this *Partnership* is the best thing that has happened for African higher education; they have committed two hundred million dollars over a 5-year period to improving higher education on the Continent. They

have pooled their resources together for eleven African institutions and organizations working in higher education. I say "organizations" because some of them are networks, such as *KenNet* in Kenya and the *Association of African Universities* in Ghana. With the help of the *Partnership,* we have been able to broker connectivity for institutions in Ghana, Nigeria, Tanzania, Uganda, Kenya, Mozambique, and Ethiopia. These institutions will benefit over the next three years. The connectivity is a $2.3 per kb/s, which is still relatively expensive - comparatively speaking - but we hope that we can bring it further down. We feel that the *Partnership for Higher Education in Africa*, by leveraging economies of scale to achieve cost efficiencies and demand for Internet bandwidth services, has provided funding that eventually will enable us at AVU to roll it out to more African universities on the Continent.

The AVU has also now begun to enter the area of Open Educational Resources (OER's), especially in our African institutions, and we have a two-pronged approach. First is the introduction of Open Educational Resources via what we are calling the Research and Innovation Facility in the AVU. This is a unit that we hope will eventually begin to help African institutions and African academics do both basic and applied research on Open, Distance, and e-Learning. At the moment, this research is not done by us, but is done by others. We also hope that this unit will spearhead our activities in terms of the development of Open Educational Resources across the African continent.

So brokering bandwidth to address connectivity cost issues is critical for the development of Open Educational Resources and for the sharing of these resources on the African continent. Thus, we are obviously focusing on dedicated bandwidth. My colleagues working on the Continent know very well that our problem is that we do not have dedicated bandwidth; instead what we have is shared bandwidth, and it is extremely problematic. This is why it takes so many minutes to download a simple page in most of our institutions.

At AVU, our Open, Distance, and e-Learning initiatives have the following objectives. First of all, we want to initiate the process of creating African best communities of practice, especially in Open, Distance, and e-Learning, across the Continent and across the language groupings - something which has not been done before. We are also working to facilitate the usage of Open Educational Resources via the Research and Innovation facility, in partnership with MIT's OpenCourseWare (OCW) and with the e-Granary Project at the University of Iowa – something we believe has much potential on the African continent in terms of cost-effective educational and library resources. In addition, we have a teacher education project that we call Teacher Education in sub-Saharan Africa (TESSA) that now has been funded by the Hewlitt Foundation, especially the portion that deals with Open Educational Resources for teacher education, mainly in South Africa, Tanzania, Uganda, and Egypt. After that initial portion of the project, we want to roll it out to more countries. Finally, I see someone from the World Bank here today, and we do work with Development Gateway in terms of the development of Open Content.

The MIT-OCW-AVU pilot project objective is to raise awareness in Africa regarding Open Courseware content. Recently I was in Cameroon and was talking to a professor of African Business Management whose room was full of French textbooks. I told him that those of us in Anglophone Africa have no access to those textbooks. However, if we work together to develop this Open Content and if we work together to digitize the content, then most African institutions, most African academics, and most African students should be able to have access to that content. Therefore, we at AVU are playing that advocacy role in terms of Open Courseware. We are also playing that advocacy role in the usage of MIT OpenCourseWare because we know that there is so much out there that MIT has put on the Web that our African students, academics, and most of our institutions could benefit from. At the same time, this MIT OCW pilot project will help initiate the process of creating African communities of best practice for Open, Distance, and e-Learning.

Not to be critical of MIT-OCW, but while browsing in MIT's OpenCourseWare, one sees various presentations on Africa and African institutions, yet there are very few African people that are talking about the initiatives on the African continent. This continues to be a crisis for us because some of the people are doing work on us and some of the people are trying to develop us. You know the old adage – "Don't give fish to people, but instead, teach them how to fish." So I think that what we are trying to do with OCW will probably try to address that issue. Then we also hope to provide research feedback to MIT on usage of OCW in the context of African institutions, especially in terms of teaching and learning. One of the things that we are concerned about in the African Virtual University is that African academics have not been involved in basic and applied research of these activities, and we want to develop that community of inquirers, that community of practice, across the African continent. This will enable African people to engage themselves, to explore, and to push the boundaries of what we are talking about here today - Open, Distance and e-Learning - as it applies to their countries and continent.

AVU's approach to introducing OCW has been threefold. First we want to set up an OCW mirror site within the African institutions' local area network in order to overcome the Internet access challenge. Once you put the mirror site on campus, then students will be able to access it very easily. So for us, this is a big challenge, and we think that we should be able to do it. Having the mirror site situated locally will also enable access to large video and document files. Second, we want to provide sensitization of OCW on the ground, including an awareness campaign and sensitization or launch workshops. At the moment, we are heavily involved in launching this OCW pilot program in a number of African institutions. Recently we were in Madagascar, in Niger, and in Mali, and there is wide enthusiasm for this kind of material. The third prong of our OCW approach is to provide feedback to OCW architects, especially in terms of contextualization of the delivery model to suit the African tertiary education institutions. I believe that this is very

important – that process of contextualization, that process of localization, and that process of Africanization – so that the African institutions and African academics themselves are part and parcel of the process.

What are the challenges that we faced during the MIT-OCW-AVU pilot project? There were five major challenges: 1) limited bandwidth, as I have said; 2) "standard" software is not readily available; 3) our strict university protocols (who to contact and when?); 4) unreliable local ICT infrastructure and 5) the power outages in most African institutions and in most African countries, which tends to significantly affect the use of ICT's.

What were the positive outcomes of the MIT-OCW-AVU pilot project? A successful pilot project was characterized by immense support and a warm reception from participants at the University of Nairobi and at the University of Addis Ababa in Ethiopia. The predominant criticism pertained to the scope of the available content – that this content was not ours and that African institutions ought to take part in the contextualization of that content. In addition, the overwhelming majority of the participants had never before heard of the MIT OpenCourseWare Initiative prior to the marketing of this pilot. I think that there is a map that is usually presented by people from MIT OCW that shows the number of hits that are made by people from all over the world; the hits from Africa are very few.

In terms of feedback from the pilot project, AVU would recommend that MIT OCW consider:

- Ensuring that all content is available within the mirror site (at each university) and not from the main OCW Website on the Internet.
- Bundling together with the OCW content all fundamental software required to set up the mirror site (pdf reader, media player etc)
- Research on various modes for remotely updating content and receiving feedback on usage.
- Configuring the mirror site to enable editing the web template to match institutions' theme and house styles, so as to increase buy-in of the OCW material
- A sustained mixed-media marketing campaign wherever OCW mirror sites are installed so as to keep up the momentum of use

AVU has learned much from this pilot, and the next step is obviously a dynamic and comprehensive Open Education Research strategy to meet the needs of higher education in Africa. Here we are talking about creation, about organization, about dissemination, and about utilization. Our conceptual framework for the development of Open Education Resources on the African continent includes: creating OER collections; organizing OER collections; distributing OER collections; and obviously, accessing OER collections. However, as I have said, the question of connectivity and bandwidth becomes critical even in trying to do this work.

Eduvision E-Learning System: the Mbita Project in Kenya

Presented by Matthew Herren and Maciej Sudra
Eduvision
Kenya

I am going to talk to you today about a project that is different in many ways than what we have been hearing about here, mainly because in comparison, it is a lot younger. We are just getting started. It is a technology development project really and it is also "younger" in a second way – in that our focus is not on tertiary education like most of yours, but rather on primary and secondary education.

Our project seeks to apply Information Communications Technology to education in Africa, with the goal of reducing the cost and increasing the access and the quality of education. Looking at the Millennium Development Goal of *Universal Primary Education by 2015*, current rates in Africa are at about 55%. Given this large discrepancy, it is time for some radical change in how we are thinking about and how we are trying to solve this problem.

In our attempts to tackle this problem, we identified the following constraints as major impediments to increasing access to education: a shortage of teachers and a lack of ability to train teachers; infrastructure gaps, which is a shortage of funds to build schools or to increase the size of existing schools; and costs associated with educational materials, including textbooks and other curriculum content. When you look at these three constraints, I believe that the third one is where ICT could most easily be effective in lowering costs, and that is what we are trying to do. When you look closer at educational materials, the big problems associated with them are: the distribution - getting books to the right places at the right time; cost of printing new books and of updating existing books; and the lack of quality content in these books.

For our project that you will hear about in a bit, we used the existing, printed content material and simply digitized it. However, we had lots of problems with this content because the quality is so bad. We were trying to build these textbook contents into hierarchical tree structures to format the digitized content, and it was very difficult to tell which sections were nested in others. For example, a social studies book that we used had a picture of tourists arriving at Jomo Kenyatta Airport in Nairobi, and it was definitely from the 1950's as evidenced by the type of airplanes in the background. To overcome these various constraints, we have to make sure that children have access to high quality learning materials and to insure that content is always up-to-date and country relevant.

From our experience, the existing textbooks are often made for a national audience and they are not very relevant to communities in different areas of the country. Kenya, where we are based, has very striking differences between the different regions. If you have content that is really applicable to

their daily lives and their surroundings, it is much more interesting and fascinating for them, and they are obviously going to be tied to it a bit better. In addition, you have to make sure that this content is affordable. Finally, if you can at the same time teach skills that will be applicable in the workplace afterwards, then that is all the better.

The project that we are doing now builds nicely on the last presentation where we heard about the need to develop systems that are appropriate. As we learned from Professor del Alamo, you cannot do that from a place like MIT or another university abroad; rather, you need to actually be there to do it, in the local environment, with the people you hope to serve. What we have done is to set up our operations about eight hours out of Nairobi on the shores of Lake Victoria, in a very rural village. What we have developed there is a system that can distribute educational content to anywhere in the African continent, regardless of infrastructure shortages such as power or a lack of Internet or phone lines. In the future, we will work with content publishers, but right now we have been acting as the content publishers ourselves. Let me say that the scope of our project to this point has been very small. We did not develop content ourselves because we are not educational specialists. Right now we are developing a technology and trialing it, and the next steps are to work on the content side, with educational specialists who can help us evaluate whether these tools are really useful in helping the students and how much they help.

The way our system works is that content publishers submit content to us over the Internet to a Web portal. Content right now is in an XML format that we have developed. In our operations center, we have databases that store the content, and we also have databases that show our users where the various contents are located. When content is sent out, we use a WorldSpace link. WorldSpace is a satellite radio, sort of like XM and Sirius here in the States. It covers all of Africa and Asia already and is looking to cover Latin America in the future. At our network operations center, we attach codes to the files that direct them as they are going out. These codes can direct them to as specific a location as one user, or to as wide a location as an entire country or all class five primary students in Kenya – or even to everybody on the network.

The big hindrance with our WorldSpace link, in comparison to an Internet connection, is that it is a one-way only link. Therefore, one of our innovations is to develop addressing that can push content to specific places. Every 24 hours, we dump from our network operations center to WorldSpace where it is transmitted up and then back down to our device that we call a base station, which is similar to the Service Broker that we heard about in Professor del Alamo's talk. This base station is a small, embedded Linux server that runs in the school and can be powered on solar. The station processes the content as it comes in, sorting it out and deciding whether content that arrived that day should be directed to any specific users that are connected to it. It also decides whether to store the content on a hard disk or whether to transmit it on to the clients.

Our clients each have a device called an E-Slate. Our goal in the future is to have each of these devices custom-made to our specifications, but right now we are using off-the-market technology. The model we currently use is based on Sharp source. We run a customized Linux-operating system on the E-Slate. Our content viewer is done in XUL like Fire Fox and is based on the same rendering engine. Our E-Slates then link up with the base station once a day over a WiFi link. In the case of big schools, the E-Slates piggy back on each other, so we need only one base station per school.

Our goal is that this system will cost less than textbooks. However, we are not there yet. We are still developing the system, and our costs for getting an E-Slate, or one of our hardware terminals, right now is down to about $200. Currently in Kenya secondary schools, the cost of buying curriculum materials for one year is about $100 per year, per student. These are costs that families have to meet. So that is our target – to get the cost down. We know that there is a lot of work at MIT about getting down to $100 as well. Our strategy is to focus on an entire e-Learning solution – that is: software to access, manipulate and create content; negotiations with countries to plan implementations; working with content producers to create richer and more dynamic content; running the content distribution network; and training supporting users. We feel that there are already substantial efforts underway to create appropriately priced hardware – projects, such as the $100 laptop at MIT, along with others. We feel that it makes the most sense to let those projects that have already invested substantial time and money in the hardware, continue to do that, while we work on the aspects.

Now I would like to give you a summary of the system. The key about it is that it works anywhere, anytime. For us, it did not make sense to develop a system that only worked in cities or in rural areas that do have power and other infrastructure. We required something that really could work everywhere. This system was built out of looking at education – finding a need there and then addressing that need. It was not built to develop and use technology for the sake of technology. We believe that the quality of education can be significantly improved. This is not something that is within the scope of our problem now, but in the future, we would like to be evaluating to show whether or not this system does improve quality. With this system, you can have content that is rich with video and audio files, as well as other multimedia resources. This represents a vast improvement over paper textbooks. Whether that translates into actual improvements in education is something that we will have to evaluate later on. In addition, it does not hurt that there are positive externalities. Through this system, we are exposing school children in remote areas of Africa to modern communication tools.

The town where our project is taking place is called Mbita, located on the shores of Lake Victoria on a causeway between Rusinga Island and the mainland. It is a very small, rural town. This was the pilot project, and we had one class of sixty students, as well as six textbooks to digitize. The class has now increased to sixty-five because new students came in. The goals of the project are to: 1) to ascertain the feasibility of using modern ICT tools in

rural regions, both in terms of the technology and also the willingness of users to adapt it; and 2) to modify the technology according to feedback and observations from the users. When it comes to the willingness of users to adapt to the technology, a lot of this willingness will depend upon the quality of content available through the technology. For our project, it would have better to have had from the start a more innovative and user-centered content.

The first stage of our pilot project in January involved training the teachers. We did this a month before the actual project start date so that the teachers would be more comfortable with the technology. At the end of the day, they are the ones who will either adopt it or not. The next stage involved the students using both textbooks and E-Slates together - using the E-Slates in conjunction with textbooks. The third stage entailed allowing students to choose whether they wanted to use E-Slates or textbooks, or to continue using them both together. Of course, the students love the E-Slates; for them, it is a new toy! With the E-Slates, they also received more books because in addition to digitizing the six class textbooks, we also digitized other books onto the base station – downloadable to the students. Many of these additions were storybooks and other books that they enjoyed. This is an example of how throughout the project, we were user- testing the interface and making changes accordingly. In developing this technology, we have been highly focused user-testing it and user-centering it.

Now I would like to highlight some of the interesting things we discovered. For one, the students seemed to adopt the technology and the content very fast. It was surprising how quickly they learned how to use it. On the other hand, the teachers took a longer time to adapt to the technology and a longer time to be convinced that it could really help them. Mbita is situated in a very religious part of Kenya, so one of the interesting things we did – perhaps not the best example – was to put the Bible on the E-Slates. Suddenly the teachers were eager to use it! They saw that technology could offer them something more. As I said, the Bible is not the best example, but if you can have user-tailored content, then it will be a lot easier for adoption to take place.

In closing, I want to say that we came up with this idea when we realized that in each of these rural African villages, the school is the center of the community. If you were to look at one of these villages from above, you would see that all the roads lead to the school. Our technology has been created with the idea that it is a conduit of knowledge to rural areas. If one wants to reach users in these rural areas to deliver knowledge, the way to do it is through the schools. In summary, our vision is: to lower the cost of education; to deliver higher quality education; to provide access to more information; to provide exposure to ICT; to deliver exciting new media; and to enable community development.

The Will to Move Forward

Presented by Alex Pentland
Toshiba Professor of Media Arts and Sciences and
Founder Director Program in Developmental Entrepreneurship
MIT

Many people have been impressed with the spread of cell phones, although there has also been considerable controversy because articles in the *Economist* and other places have talked about how the Digital Divide has been cured – because now there are cell phones everywhere. In fact, it is pretty amazing because there are many places, for instance in Africa, where over 90% of the people have access to a cell phone. Of course, that does not mean they own one – it is often shared access. At this point, something like one-third of humanity owns a cell phone. It has been the fastest uptake of technology ever. In addition, it is the most pervasive technology; in the world, there are more cell phones than televisions and there are more cell phones than almost anything else you can mention.

However, the important thing about it was brought home to me in a lunch with the Dr. Abdul Kalam, now President of India. He said to me, "We have enough water. We have enough money. We have enough of everything – except we do not have the will to move forward." Of course, that is where the title for this talk comes from. What he meant by that was that he could not get people to find out what was needed, to figure out where to get it, to agree to a plan, to move forward, to make sure it was done in a transparent way, and then to see what the result was. In other words, what he saw as the major problem for India was the logistics of it – knowing what is needed and how to make it happen and actually getting there. I think this is true in all parts of the world, and it is in that context that cell phones become really interesting. Why? For the first time in history, it is possible to have two-way communication to most people in the world. And not just voice; you can also send bits of data, whether SMS or GPRS. This is really significant!

So what I have done over the last couple of years is to start a class here at MIT, a class in what you might call Meta-Development. In that class, I bring people from all over the world together, and I try to get them excited about these new opportunities. What we do is to help them put together business plans that they will execute back in their home countries. Most of these business plans are for-profit, but not all of them. The students get the plan together, we attach them to people who have funding, we attach them to people they need to talk to, and then they go back and start businesses in their home countries. This course has been rather effective. We have about a 10% hit rate in the sense that 10% of the people who come into the class actually develop a business, actually get it funded, and actually start a business. Of

course, this does not mean that they are going to be successful in the long run, but it is still pretty good.

Now I would like to give you some examples of these businesses. Satellife was mentioned recently and it is an NGO whose board I sit on. By using Internet and cell phone technology, it sets up communications networks for healthcare - called HealthNets - in different countries. For instance, Uganda has one centered at Makere University. It is a health organization run by the local folks. At HealthNet in Uganda, they are rolling out the rural health system for the entire country. This is actually done in conjunction with one of the little start-ups that came out of the course at MIT. The start-up is called *Dimagi,* and they wrote some of the software that is being used by Makere University to roll out the health system for all of Uganda. The same thing is now beginning to happen in Rwanda, and in Zaire, they are designing and prototyping a similar system. In addition, there are portions of South Africa where the AIDS-reporting elements are all being done by this small company, *Dimagi*, that came out of my class at MIT. The most exciting thing they have done is a project they are just beginning. On the back of something called WHONet, they have put together a consortium of 1,000 pathology labs all around the world - essentially all the pathology labs in the developing world. *Dimagi* is writing the software to let these people compare results, to look for mutations, to look for outbreaks of things like Avian Flu and SARS. This is significant because currently all these pathology labs are isolated – they do not talk to each other. There is no way to do systematic surveillance of health in the world. I think it is pretty exciting!

Another small company that grew out of this MIT class – a fledgling company that does not yet have funding – is called *Pharaoh Technologies*. This company believes that the core reason you cannot get anti-retrovials in Africa or many other sorts of drugs is because drug companies are very nervous about sending things that they know might be diverted. If they knew that drugs were going to get to the right people, at the right time, they could be much more generous, and potential donors would be much more generous. So again, as you can see, it is a logistics problem. If I can guarantee to you that your money will result in drugs that get to people who need it, then that makes the equation much more effective than it might have otherwise been. This is what *Pharaoh Technologies* is trying to do – to coordinate with national governments, with local doctors, and with drug companies to provide a secure logistical chain that will enable a change in how people view donations of anti-retrovials and other things.

Way Systems is another company that came out of this MIT class. *Way Systems* just got $15 million in funding from VISA. Their idea is that there are 100 million entrepreneurs in the world – people who sell vegetables, people who fix the motorcycles, little people who do all sorts of things. Almost all of these people today have cell phones. However, what they do not have is a way to be part of the banking system. Therefore, this company has taken cell phones and they created a new back of the cell phone. So you take your cell phone, connect their small, free product on the back of the phone,

and now you can swipe debit or credit cards for payment. You can also act like an ATM – somebody can come to you, swipe their card, their money moves to your bank account, and you give them cash. That means that people do not have to run around with big piles of cash. Incidentally, it also means that a lot of the things that happen in corruption and lack of accountability become much more difficult to do because you cannot track cash, but you can track credit card transactions. You may ask, "But who has a credit card?" Well, many countries are giving out debit cards to their people in lieu of cash payments. It is much cheaper to give people a debit card and an electronic bank account than it is to give them checks - and it is a much more transparent and accountable system as well. For instance, in China there are more than a half billion debit cards. Also, many countries in the Caribbean have done this. It is becoming a trend everywhere. Yet again, you need to have point-of-sale devices to read those cards in order to make this system work. This is what *Way Systems* is trying to do for those 100 million entrepreneurs.

Cellbazaar is a brand new company that has been spawned from the class. Everyone knows that farmers in rural areas pay much too much for their inputs and get nailed when they try to sell. Yet it is just a question of information. If they knew who was selling what, if you could create a local market – with transparency in that local market – then the farmers could buy inputs at better prices and they could sell things at better prices. Oh, and guess what? Now in almost all the places around the world, there are entrepreneurs and there are people in the village who have a cell phone. That cell phone can do little bits of texting and have little bits of information displayed - mostly numeric so that literacy is not a major barrier. In addition, now you can make local "Craigslists" - local markets that run on cell phones that aggregate the information about what people want to buy and what people want to sell. It is like "Craigslist," but it runs on a cell phone. We do not know whether or not this will be successful, but if you look at the inefficiencies in local farming markets, they are on the order of 80 or 90% inefficient. There is an enormous amount of excess to be squeezed out of those markets, by again, making the logistics cleaner, more efficient, and more transparent.

One of the things that drives a lot of this innovation is data drawn from a survey, conducted by the International Telecommunications Union, of more than one hundred countries over a period of a decade. They looked at the contribution made by one new phone to the GDP of a country. So if you put a phone in the U.S., basically no change occurs in the GDP. However, when you add a phone in a place where the average income is $400 per year, you get a $5000 increase in GDP. How is that possible? I just told you that there is a factor of ten to be gotten from increased logistical support and increased efficiency for rural farmers if they could see the market more broadly. Well, that is where this increase in GDP comes from. You put a phone in the middle of someplace, and suddenly people can see the market inputs, they can tell people there is an outbreak of malaria, they can tell people that the bridge is out. All throughout their lives, things begin to happen a little

bit more smoothly. It is through these types of small, local improvements in logistics and coordination that the change in GDP begins.

Now I would like to turn to some words of Peter Drucker, who has often been referred to as the person responsible for Japan's re-engineering of its economic system. He wrote a "law" that says: "New technology first replaces the old, and that gives you about a five-times improvement in productivity." When agriculture came in, people could plant seeds, and that was better than going out and picking berries. However, Drucker went on to point out that there is another ten-fold increase when you begin to re-organize society around that technology. To take agriculture again, when you started having city-states that could afford to create grain silos and markets, that is when you got the real take-off. So that is what I think is happening here. In my class, we are trying to use this new connectivity to create local entrepreneurs who will at first replace existing functions. However, as that net of information begins to extend out, you are going to see a lot of re-engineering of society. It will not necessarily be pleasant, but it will result in greater transparency and efficiency. You can see evidence of this already. I talked to you earlier about disease management and about local markets. You can also do new things with regard to traffic so you can get better logistics and more efficient transportation – for example, so that trucks are full in both directions, and other things of that sort. This is as true in our country as it is in the rest of the world.

With this new connectivity, you also are beginning to see Digital Politics. The President of the Philippines stopped being president largely because of SMS messages. They were able to do SMS messaging among broad groups of people, and suddenly you get 100,000 people showing up to protest. You have seen this also in other places. For instance, recently in China, the Falun Gong used this same method to have crowds of people silently appear. Suddenly you would have 10,000 Falun Gong members just standing somewhere as an official went by. It was unnerving to the Chinese authority, and that is one of the reasons why they reacted so strongly. You have also seen this same phenomenon at U.S. political conventions and at WTO meetings. This is a kind of "nervous system" of people -- people at the grassroots, organizing themselves for more efficiency, for more of a political voice, for more transparency.

So is this going to continue? You bet! First of all, telecoms in rural areas make money; they have a compound return of 15% per year, even during the telecom bust of the last few years. They have taken off, and new generations of computer and communications technologies will only help. These are just the sort of things that follow Moore's Law - price, performance, random access, memory. You put all those things together and you get the recent, outstanding performance of wireless devices. Moreover, it is an exponential increase rather than a linear increase – and we are just beginning to see it with wireless devices. Thus, the process of having better logistics, better voice, and better transparency is leveraging this exponential increase that is all but inevitable.

In conclusion, I will return to Abdul Kalam's comment " we have enough water, enough money, enough everything, except the collective will to move forward." The thing that I would like to leave as a thought is that what we are observing around the world is the nervous system of humanity taking shape. People can talk to each other for the first time. That means they can get more transparency in their inputs and more transparency in their outputs. There is accountability, as those financial transactions are beginning to be digital and visible. People are beginning to have voice. They can send a message to the president of the country saying, "Get out of here, you crook!" This has never happened before, and moreover this new collective intelligence is being leveraged by an incredible increase in communications capacity. It is a very exciting time, and what I would suggest is that what we want to do is get young people hooked up, encourage them to be entrepreneurs, and move them forward.

The eGranary Digital Library: A New Tool for Information Equity

Presented by Cliff Missen
Director of the WiderNet Project
University of Iowa
Iowa City, Iowa

It is a joy to be here again, and I am just overwhelmed by the brilliance of some of the projects I have heard about over the last two days. What a great group of people to be hanging around with!

I would like to start out with a little analogy here about teaching and research with the digital technologies in the West. Transport yourself back to 1990 and think about what you were doing with technology then, and what your colleagues were doing with this technology. We have been through a lot in the last few years; it has indeed been a race. We have had a racer and a racetrack, and we have had to deal with stuff like creating local content, locating content, organizing content, and putting it together. In addition, we have had to preserve the content, categorize it, and deal with copyright issues. Then, of course, there was the need to stimulate people learning the content, disseminate it out to folks in our classrooms, assess its quality, and teach information literacy. Finally, we have had to put the content into our course curriculums - dealing with issues of use and re-use, translation, localization, and even that big humbug, sustainability. Occasionally, somebody crossed the finish line! It has been a long fifteen years of working with this kind of technology, and we have learned a lot of lessons in the process. Now when you take the same look at folks using those digital technologies in the developing world, it appears pretty much the same. There is the racing car and the starting line, but – oops - there is one small problem. There is no racetrack!

That small problem is what I am going to be talking about today. First of all, I will give you an overview of the University of Iowa's WiderNet Project for developing countries, and then we will look at some bandwidth issues, and finally, I will talk about the eGranary Digital Library. Just to establish some street credentials here, we have been working on the WiderNet Project for the last five years with African universities – dozens of them – to get them wired up, using the technology and using it well. We have had 3,000 participants go through our training programs in the last few years. We have collected nearly a million dollars of new hardware and software for our African colleagues and have refurbished a thousand computers, sending them off to our partner universities in Africa. The WiderNet Project focuses on practical, cost effective solutions. Back in December, I took a couple of volunteers to Nigeria, and we visited two universities. We installed fiber optic networks on those campuses – actually, we did not install it, but rather we

trained their technicians to install fiber optic networks. On that trip, we wired up three buildings for less than $500, using donated fiber and volunteer labor.

So what is this World Wide Web business we keep talking about? If you were to look down upon Earth at night from the Space Station, you would see a lot of dark places, a lot of places that do not have electricity. This fact underlines something for me. We like to talk about there being a Digital Divide, but I do not believe in a Digital Divide. I do not buy into that. It is not a Digital Divide – it is an Economic Divide. Our partners and cohorts and colleagues in developing countries would happily buy Internet bandwidths, and the computers to use that technology well, if they had enough money to be able to do so in the first place. What we see in many of these countries is that when it comes to basic infrastructure, there simply are no institutions in place necessary to build that infrastructure out and to support it. The World Bank has developed a graph representing numbers of Internet users and non-users in countries around the world. In sub-Saharan Africa, the number of users does not even show up on the graph because the increment is so small! We have to remember that seven out of eight people in the world today do not have access to the Internet. Furthermore, in a place like Zaire, it is hard even to measure the small number of users, and for those who do use the Internet, it costs ten times the local annual salary just to get a dial-up connection. On the other hand, in Europe, 378 people per thousand are connected to the Internet, and it costs .02% of their annual salary to get connected. So as you can see, it is an economic issue.

What I have seen in the five years that I have been doing research in this area is what I would call "neo-colonializing" networking. A lot of us from the West are happy and excited about the Internet, encouraging our colleagues across the world – sometimes paying lots of money, millions of dollars – to get them connected to the Internet. The fact is, however, that these people have a lot of other, very serious infrastructural needs to address, along with other pressing needs within their universities. I think the Internet connection is important. I think it is especially important for a small group of people at universities, but not at the cost that it has brought upon universities up to this point. In my judgment, it is the internal stuff - local people communicating with local people and becoming effective. It is what our previous presenter was talking about – creating logistics so that people can be effective and efficient in their teaching and in their daily lives. That is important, but do we really need the Internet to achieve it?

Now I would like to briefly discuss local networks, the building blocks of the Internet. For most universities, eighty percent of their email stays on campus - people sending each other messages saying, "Hey, I can't make it for lunch. Can I see you tomorrow?" In addition, ninety percent of the traffic stays on the local network, with people downloading their class assignments, doing accounting management, etc. So local area networks are really critical. There are hundreds of ways to use campus ICT's, hundreds of ways that we do it here on campuses in the U.S. - ways that do not involve an Internet connection. There are companies here in America with tens of

thousands of computers on their local area network and not one of them can see the Internet. However, they have seen the economy of using this kind of technology inside their institution.

In comparing bandwidth, I am from the University of Iowa where last year we had two 150 megabyte connections to the Internet, a 25 megabyte connection just for scientific use, and a hundred megabyte network backbone inside our university. Ahmadu Bello University in Nigeria has a 100 megabyte backbone, but has a tiny connection to the outside world. Yet my university's Internet connection costs as much as theirs does. For us, our connection costs a couple of professors' salaries, but for them, the cost of their connection is equal to the salaries of twenty professors. That is a significant cost. So the African universities are making some really hard choices about using this technology – either limiting who can sign on to use it, or not using the multi-media and high bandwidth connections that we are used to here. In some cases, their most talented ICT staff are used as baby-sitters for the labs, trying to make money by charging for Internet use so they can make money to cover their costs. I call this the myth of bandwidth. There is no real link between quality education and access to the Internet. While we can certainly show that the Internet can be used to improve an institution, it is not necessarily true.

What I find in a lot of cases is that access to the Internet fuels the brain drain. We do some network sniffing and we find that the number one search term that people use is based around, "Where else can I go to school?" or "Where else can I get a job?" As a matter of fact, we do this packet sniffing and we talk with Internet providers around Africa. Through this process, we have found that that the bulk of bandwidth use mirrors exactly the use of it here – that is, the bulk of it is recreational. Very little of it gets down to bona fide academic endeavors. When I show these results to Vice Chancellors of universities, they have to sit and scratch their heads because they are agonizing about how much they should spend on the Internet and how much they should spend internally.

We also do a program that tests user bandwidth. To see this, you can come to our WiderNet site, and one of the first links you will see is "Test your Bandwidth." When you click on that link, it downloads a file that tells you how long it took to download. We have tested hundreds of sites around Africa and we are testing user bandwidth - not what they bought, but what they actually have after sharing it out with everybody on campus. We are testing what the users are experiencing. We have found that the average U.S. connection is about 17 megabytes per second. The average high-end African connection, of which there are less than a dozen, is about 112 k per second. The typical connected person is coming in at 42 k per second. As you can see, there is a huge disparity here. In terms of reliability, we do another piece of research in which we ping machines and test their web servers. Very rarely is it 24x7; most institutions are hard-pressed to come up with six hours a day.

At the WiderNet Project, we are looking for effective solutions for unique problems, and that is where the eGranary Digital Library comes in.

The name eGranary came from the concept of storing the seeds of knowledge. We chose that name to distinguish this library because there are other digital library projects out there that say " Here is a bunch of really free stuff; come and get it!" That "come and get it" part presumes generations of established infrastructure and technology. Yet at the eGranary, we are storing the seeds of knowledge and we are putting it there so they can work with it blithely. What we are doing is replacing bandwidth with storewidth. We take millions of documents and put them inside the local university. Anybody in the world who wants to can participate in the collection of these documents; it is all done via a web site. However, for the receiving university, there is no bandwidth cost - while it augments their typical Internet connection. With the eGranry, everyone inside the university has millions of documents, even when the Internet connection is broken. We have so far garnered permission from over 600 authors and publishers; there are 200 million documents in the collection, tens of thousands of books, journals, and such. We have had sixty installations so far across the world. We do all the documenting and categorization of the documents. When we get a new document, we will go out and search Google, Yahoo, etc. and search out whatever meta-information we can about that document. Then we will index it and send it all out in one lump. Our web site is: www.widernet.org/digitallibrary/

Now let me talk with you about what the eGranary is like out in the field. We built a search engine for it so that a huge variety of topics can be clicked on. With this resource, people in Africa are astounded because they have never seen pages open up so fast! For example, a 200-megabyte video opens up in six seconds. With this, we have got people swimming in information, browsing at the speed of thought. Students in Africa can actually open up on the eGranary the same material three times faster than American students can open it up on the Internet!

This last year, we have been working on a number of new things for the eGranary Digital Library. We have turned it into an appliance. A lot of people that we were working with out in the field were having a hard time setting it up and making it work, just as a hard-drive. So we have turned it into an appliance, into a machine that is all ready to "rock and roll." It has DNS, DHCP – all the basic infrastructure built into it, so that users can just plug it in and run. It provides a custom proxy service and has server services built in, so the URLs appear in their native formats. You can actually type in a URL, and it appears just like it would from the Internet. The users do not notice any difference from the Internet, except that it is 5,000 times faster! The proxy works in such a way that the users interact with an eGranary proxy, pulling up the documents like lightening. When they click on a link that takes them out to the Internet, the proxy will take care of that as well, handling the request if they have an Internet connection. If they have to pay, they will be prompted – "are you ready to pay and go slow?" The other benefit of using the appliance is that it gives us some real feedback. We have logs about everything everybody is using - all the errors they are running into - so we can improve the quality of the eGranary. It looks, smells, and acts just like the

Internet, so therefore, anybody using this - using our search engine - will learn how to navigate the Internet since everything is just the same. Furthermore, if one develops curriculum using the eGranary, that curriculum will also work on the Internet because all the links will be the same.

In terms of curriculum development, we are just beginning. We have not been funded for this yet, so what we are doing is on the side. However, for an example, just this year we have been working with a professor at the University of Jos in Nigeria to put together some mathematics curriculum. He made the request to us - "Can you find resources for teaching a course via the eGranary network?" We went out and found about 60,000 items for teaching math. One of our graduate students worked with him to winnow those items out, and then the two of them put together a course curriculum. Everything in the curriculum points to items in eGranary. The Nigerian professor scraped his curriculum, put it on CD's, and gave it to his students. Now they have everything they need for three classes on one CD.

We have also developed an update service and we have had to build this around the idea that machines can disappear for days at a time and not be online. Furthermore, very few of our clients are going to have a two-way link. Therefore, we have developed a transport - an update method - that basically involves any possible mode of transport. We have used WorldSpace, the Internet, CD ROMs, etc. Currently, we are working with a group in Uganda that is rolling out the eGranary to two hundred secondary schools in Uganda. They will receive their updates via satellite in Kampala, burn them on CD's, and then distribute them around the country.

In many places where we put the eGranary, it is the 1990's all over again! Librarians are trying to figure out how to use this technology and users are printing out everything they see because they think they will never see it again. People are arguing against it – pointing to all those laggards not using the library stacks! It is right back to the 1990's! Yet throughout all of this, we are trying to build the capacity for people to adopt this information technology and fit it into their mission. Our immediate goals are to get this spread out as fast as possible, serving the information-poor without making them too much poorer. We are looking for partners, and the key thing is that this technology delivers.

PANEL SEVEN

ADAPTATION AND USE OF MIT'S OPENCOURSEWARE IN DEVELOPING COUNTRIES

Bringing MIT's OpenCourseWare to the Developing World

Presented by Anne H. Margulies
Executive Director
MIT OpenCourseWare

My plan today is to really power through this since many of you here already know about OpenCourseWare (OCW). I will tell you very briefly what OCW is, and how we have implemented it. However, I really want to focus more on the outcomes, as well as on what we are trying to do in the way of external outreach.

Very, very briefly – the big idea behind OpenCourseWare is to use the vast power of the Internet to share all of MIT's course materials openly and freely with the world. It is an idea that came from a faculty committee here at MIT. Back in 1999, the faculty committee made the recommendation to President Vest, and it was announced in 2001. When President Vest announced it, he said that "OpenCourseWare expresses MIT's belief in the way that education can be advanced, by constantly widening access to information and by inspiring others to participate."

People often ask, "Why is MIT doing OpenCourseWare?" The reason is that part of MIT's mission is a public service mission, which is "to advance education and to serve the world." Given this mission, MIT can best advance education and serve the world by widening access to the information and materials here at MIT, and then inspiring others to do the same. We are trying to do two things with OCW: first, to create a publication of materials created here at MIT, and second, to do it in a way that will enable others to do the same. Therefore, the big vision is that MIT's OpenCourseWare will be one of many open courseware initiatives.

Of course, OpenCourseWare is not the same as an MIT education, and it was never intended to represent the kind of interactions and other types of activities that go on here at MIT. You cannot register for OCW, you cannot get any degrees for it, and you cannot get access to MIT's faculty through it. Thus, the way to think about it is that it is a publication – in fact, we do not even think of it as a distance or e-Learning program, as many of the ones that have been described here. It is a publication of the raw materials that can be used by educators and learners, and of course, it is open to everywhere in the world. MIT has made a long-term commitment to sustaining it.

So where are we with it now? We are well on our way into the expansion phase; actually, just yesterday we arrived at 1250 courses. That means we are seventy percent towards our goal of publishing all of MIT's courses, which is 1800 courses. In 2008, we will be in the steady state phase – maintaining the publication and keeping it current. We will be publishing seventy-five new courses every year, as well as updating another 225 to 250

courses. The OCW web site is a very large, deep web site. There are about 80,000 documents across all of the courses. The courses are from thirty-three different disciplines. Each course varies in terms of the content depending on the type of course and what a faculty member was willing to share. However, on average, each of our courses has seven types of materials, and on average, about sixty documents.

So this is very, very briefly the story behind OpenCourseWare, and where we are in the implementation. Now moving to outcomes, we measure our outcomes according to access, use and impact. Who is coming to the site and where are they coming from? How are they using the materials and ultimately, what difference is it making in education? In terms of access, as of September 2005, we were closing in on one million visits per month. I mentioned this to a faculty member just recently, and on the spot, he calculated in his head that when we reach a million visitors a month, that will mean we would have a visitor every three seconds, twenty-four hours a day. The visitors to our site come from all over the world, and this next fact would be no surprise to you - eighty percent of those visitors come from regions of the world that are better able to take advantage of the materials. This eighty percent comes from North America, East Asia, and Western Europe. Regarding the ranking of the countries (outside the U.S.) in terms of their traffic to OCW, the top ten users have been pretty steady and consistent for about the past year. China and India are firmly planted in the top two spots, and then regarding the next eight ranked countries, their positions actually change month to month.

So who is it that is coming to our site? We conduct an annual survey on our site and we have learned that visitors generally fit one of three user profiles:

- Educators are 15.3% of all MIT OCW traffic
- Students are 31.4%
- Self-learners are 48.2%
- 66% of visitors hold a bachelor's or master's degree
- Visitors most frequently interested in courses in electrical engineering, business, physics, and mathematics

In this data, we were particularly surprised by the fact that almost half of our visitors are self-learners - incredibly motivated self-learners! Because this is an MIT site I suppose, over half - 66% of the visitors - are highly educated, holding a higher education degree. These people come to our site for those areas that MIT is best known for. Thus, the most popular areas on our site are, in this order: Electrical Engineering; Business; Physics; and Math.

We asked our users in this survey to tell us how they are using the materials. Their input was very exciting to us because people are using the materials in exactly the way that the MIT faculty hoped and envisioned that they would. Educators, who are our primary audience, are using this material to plan and develop their courses. They are taking some of the materials -

typically pieces rather than the entire MIT course - and incorporating those materials into their classes. In addition, educators are using the materials to enhance their own personal knowledge – in other words, educators as self-learners. We hear a lot from students who tell us things like the following: " I was flunking physics until I was able to watch Walter Lewin's videotape," or " I was not doing very well in Linear Algebra until I was able to hear from Gil Strang because we use his textbook." Many students at other universities are using MIT materials to enhance or complement the materials that go with their courses. Finally, of course, self-learners are using the material to explore all kinds of new knowledge.

What impact has OCW made? Eighty to ninety percent of the respondents to our surveys have told us that the OCW materials have helped them to be more productive and effective, helped them to learn, and even increased their motivation and interest in learning. Educators have said that OCW materials have helped them to improve their courses. We receive a lot of fan mail, and it continues to come in every single day, with hundreds of emails arriving each week. The feedback is really over the top, as people continue to tell us that it is changing their lives. Here is a sampling of that fan mail:

- "… the Eighth Wonder of the World."
- "… the Big Bang of the Knowledge Universe."
- "… the greatest thing any institution of higher learning has ever done."
- "… one of the best things ever in history."
- "… like falling in love."
- "… the coolest thing on the Internet."
- "… worthy of the next Nobel Peace Prize."

There are at least twenty who have come up with the "Eighth Wonder of the World" comment, and another twenty who have come up with the "Big Bang" comment! Thus, as you can see, there are many, many like comments behind this. Here however, I must admit that the comment about "falling in love" makes me a little bit worried about that person! However, we are not a self-help site, so…!

Now turning to an update on OCW outreach, I know that throughout this conference you have discussed barriers similar to the ones facing us at OCW as we attempt to get our materials out to all parts of the world. The barriers to use that we have encountered are:

- Awareness
- Access
- Language
- Culture
- Academic context

Of course, there are many barriers to using our materials in developing countries. We are only scratching the surface in reaching the people who could benefit from these materials, and much of that is because they just do

not know that OCW exists. In addition, they may know it exists, but they do not have the infrastructure or the technology to access it. Furthermore, language, culture, and many of the other things that you have been talking about are also barriers for OCW.

In this regard, although we do have limited resources, we are attempting to do a few things to address some of these barriers and to extend the use of OpenCourseWare. One of the things that we have been doing is to deploy mirror sites in those areas that do lack network infrastructure. We currently have about seventy-two mirror sites of OCW content. That means, we put our site on a hard disk and we ship it off to somebody at a university where it is installed. You heard about the eGranary Project, and I want to tell you that about half of our seventy-two mirror sites have been distributed by eGranary – a fact for which we are incredibly grateful. Now I want to give you an example of just how effective these mirror sites are. At Makere University - which the previous speaker mentioned several times, and where we have an iLab implementation - when the iLab faculty member visited here at MIT, we were able to send him home with a mirror site of the OCW materials. He implemented it at Makere University and sent us back data, telling us that for one month he had five thousand unique visitors using that content. For all of sub-Saharan Africa in that same month, our site only had six thousand visitors. So it is quite clear how powerful these mirror sites can be.

We are also working with translation partners. At this point, we have translation partners in China – two there actually, with one focusing on simplified Chinese and the other in traditional Chinese. We also have a partner in Madrid who is translating the materials into Spanish and Portuguese. We have found as a result of these partnerships, that there is a great increase in access to these materials in new locations around the world - once they have been translated into the local language.

Finally, I thought I would share with you the really good news - that MIT OpenCourseWare is not the only open course ware. There are open course wares now emerging around the world. We are now forming an open course ware consortium and we currently have about thirty-five members. This consortium includes different universities that already have live open course ware sites. In addition, there are another thirty to fifty universities who have contacted us, who are in the planning stages of open course ware. The consortium will be working together over time to create a collective body of high quality, educational materials across all disciplines. These materials will be available free and openly to people all over the world. I would be eager – particularly with this group – to receive your feedback if you have advice for us. We know we have a lot we could learn from you. We would love to learn more about how to make our materials more useful to people, particularly people in developing countries. We would love to know and understand more about how people are using our content. In addition, now that these other open course wares have developed, we are very eager to be able to use some of those open materials back here at MIT.

Use of OpenCourseWare: Opportunities and Challenges

Presented by Mohamed-Nabil Sabry, Director
Center for R&D and International Cooperation
The French University of Egypt
Shourouk, Egypt

I am pleased to have this opportunity to have communication and cooperation with all of you present there at MIT. Today I want to talk about the use of MIT OpenCourseWare by focusing on the experience that we have had here in Egypt at my university.

There is no doubt that the ICT revolution has brought with it great fortune for those ready to take advantage of it. However, in Egypt and in other developing countries, the lack of tertiary education in the population has decreased the ability to take advantage of this revolution. It has been known for a long time that the percentage of citizens a country has with tertiary education correlates very closely with that country's per capita GDP. Therefore, a country in which fewer than 10% of the population has tertiary education will have a GDP less than 10,000, while a country with a 20-30% tertiary education level will have a GDP between 20,000 to 30,000. As is made clear from this data, in order to increase its GDP, a developing country must increase the number of students graduating with a higher education degree.

The problem is that in developing countries like Egypt, the number of enrolled students in tertiary education is insufficient, due mainly to a lack of resources. In fact, this is a vicious circle; economic problems lead to less tertiary education, which increases economic problems. During the thirty-year period between 1965 and 1995, while wealthier countries of the world have largely increased their enrollment ratios as a consequence of the ICT revolution, Egypt, like many other developing countries, has continued at the same relatively lower rate. In addition, in data collected in 2002, Egypt had a gross educational enrollment of approximately 30% -- trailing behind the U.S. and Sweden at approximately 70%, Canada and France between 50 and 60 %, and also behind Germany at just below 50%.

Of course, quantity is not always the best measure, so it is also important to look at measures of quality. Unfortunately, here too Egypt and the rest of the developing world lag behind. Whereas Germany and Canada have a ratio of approximately eight students per instructor, and the U.S. and France have a ratio of approximately fifteen students per instructor, Egypt has a ratio of approximately thirty-one students per instructor. Furthermore, the percentage of students enrolled in science and technology domains, among students enrolled in tertiary education in general, can have a fast and direct impact on newly established and/or developing nations. The highest rate is in

Israel at 45%, while the EU countries have an average of 22% of the population enrolled, the U.S. has 18% and Egypt has 12%.

There is no question that modern ICT technologies could help to decrease the educational gaps that I have identified in Egypt and in other developing countries. In these countries, a major cause of the gaps is a lack of adequate tertiary educational resources – including universities and university teachers. It is for this reason that distance learning has the potential to help developing countries close the gaps by multiplying student access to university education, while at the same time improving the quality and lowering the cost of that education. Many people believe that distance learning is something new, but actually it has been going on for many years; therefore, it is not just something of the future but has been ongoing in the past and continues into the present.

Some examples of these ongoing programs are: the National Center for Distance Learning in France, which began in 1939; the Open University of Britain, which began in 1969; China's TV University, which began in 1979; and Distance Learning at Andalou University in Turkey, which began in 1982. In Africa, we have the world's oldest distance education university, the University of South Africa, which started in 1873 using classical mail and switched to e-technology at the appropriate time. It is still, however, one of the very few distance-learning universities in Africa. Furthermore, none of these few universities address French-speaking Africans. These last two facts illustrate the disadvantage that exists for many developing countries in Africa with regard to distance and e-learning.

The arrival of the "Global Village" has brought both opportunities and challenges for all of us. Today a citizen may be born in one country, be educated in another, and eventually be employed by a large corporation that has offices in many different countries. This opens large opportunities, but at the same time, it raises many serious questions. Will the third world countries be only spectators, or at most consumers, of material, cultural and educational wealth developed elsewhere? Will they get access to quality education in order to participate in this "global" planet-wide development? Will they be able to produce cultural and educational materials that will enrich human heritage with valuable creative resources? Preserving cultural diversity is fundamental at this level, in order to enable every nation to embrace other nations' achievements, to assimilate them, and to enrich the world with their own creative contributions.

While we strongly believe that online learning is critical to development in countries around the world, it is hindered by a lack of available, quality content. It is for this reason that we see Open Educational Resources (OER) as an important element in the future of distance and online education in many parts of the world. OER is based on resource sharing as a key concept to achieve the required goal, which is offering quality educational resources for all nations, at reasonable investments. No single university, no single nation, could do this alone. Here I must add: no single nation should do

this alone, because this should be viewed as part of the global human heritage. Every nation should be able to use AND be able to contribute.

Through OER, people around the world will be able to share the expertise of a diversity of science and technology professors - thus building on valuable previous experience and avoiding the process of "reinventing the wheel." Furthermore, OER will be valuable not only to content users but also to content suppliers, providing them with valuable feedback to improve their educational products. Finally, OER will provide an adequate set of resources for a multidisciplinary culture. The ultimate goal of Open Educational Resources will be to train educators all over the world to incorporate available quality content and up-to-date knowledge from around the world into their own university courses, in a way that preserves their cultural identity while at the same time providing them with a space where they can add their own creative production. In this regard, while it is good to give a hungry man a fish, it is better to teach him how to fish.

So we at the French University of Egypt have been involved in an initiative aimed at improving the usability of Open Educational Resources. The three players involved in this initiative have been *sponsors* of the initiative, *suppliers* of the educational content, and *users* at the universities in developing countries. The two sponsors of this project are the Hewlett Foundation and UNESCO. There have been three suppliers involved – MIT (OCW), Carnegie Mellon University, and Rice University. The project users have been my university, Al Akhawayn U. of Morrocco, and Mauritius U. The first explorative phase was a direct collaboration between my university and MIT. The objectives of this initiative have been first of all, to actually adapt, contextualize, and use an OER course, and second, to provide feedback to suppliers concerning usability, translation issues, infrastructure, incentives, etc.

Here at the French University of Egypt, we adapted the following four courses from MIT- OCW:

- Thermal Energy (16.050)
- Solid Mechanics (1.015)
- Circuits and Electronics (6.002)
- Electrical, Optical and Magnetic Materials (3.015)

From our experience adapting these four courses, we have learned many major lessons. The first of these lessons is the fact that the comprehensiveness of *subject* is extremely important. The MIT-OCW courses are comprehensive indeed. Such comprehensiveness is crucial for newly created universities as a start and it is also important for course adaptors who have many other constraints. With these MIT courses, our adaptors could feel confident that there is a high probability to find the content they are looking for in OCW. In addition, the degree of comprehensiveness provided in the MIT courses is particularly valuable for self-learners.

A second major lesson we have learned is that comprehensiveness of *style* is also very important. Again, the MIT-OCW courses are very comprehensive when it comes to style. In some of the MIT-OCW courses,

you may simply have notes, assignments, syllabi, agendas, etc., while in other courses there is a sophisticated, interactive format. For some professors at our university, the former style seemed most comfortable to work with, whereas for other professors – those more used to using educational technologies – the latter style was better suited. Thus, we believe that having this diversity of style is quite beneficial.

Still another lesson we have learned is that translation is not a "cure-all" or a simple process. As a matter of fact, it is not at all simple! We started off using automatic translators, but found that automatic translation – while quick - has many problems. For example, important words used repeatedly throughout the courses were translated incorrectly, the erroneous translation being different depending on the context. In the end, we had to use human translators, which was very time-consuming. Another difficult issue we discovered in translation is that many technical terms have different meanings in the French language as opposed to the meanings in the English language. Let me here advise course adaptors that they will always underestimate the time needed for translation.

In terms of the usefulness of Open Educational Resources, we believe that course modularity is extremely important - that is, breaking a course down into self-contained modules. In fact, we would advise providers not to post an entire course as is, but instead break it into inter-related modules which would be of great help to adopters in order to use those parts or modules that would seem to be most appropriate for their populations. For example, MIT courses are very comprehensive and excellent. However, an MIT course is part of a whole system, defining prerequisites and objectives of each individual course, which may not be the same for that same course in another university system. However, with the MIT courses, it is difficult, for example, to leave out two chapters that may not seem appropriate - because there is substantial cross-referencing. For this reason, we would prefer to work with course modules that satisfy what I call the Four S's:

- Small
- Self-contained
- Structured
- Self-regulated cross-referencing

In addition to modularity, "edit-ability" is an extremely valuable feature for an Open Educational Resource. Edit-ability starts with modularity and then goes to source availability. In fact, when we attempted to break the OCW courses down into more accessible and useful modules, it was difficult to work with figures having annotations in English and then replace them with annotations in French. This was the same for equations, etc. We finally had to re-build figures and equations, which is time consuming. By becoming more editable, MIT-OCW could serve as a universal reference point for universities all over the world. Of course, there will also be other difficult

issues to work out, such as intellectual property rights, version control, etc. However, I believe that the effort will be worth it.

Over the course of working on this initiative, we have come to several conclusions. First of all, we continue to believe that online education is crucial for economic development in many pats of the world and that the main obstacle to this learning for many countries is a lack of available online materials. In terms of its value as an Open Education Resource, MIT-OCW is extremely comprehensive both in terms of subject and style - which makes a big difference. However, the process of translating and adapting these OCW courses is extremely involved and time-consuming. We recommend that Open Educational Resources would be more useful if they were available in a modular format. Finally, we believe that "edit-ability" would enable OCW to go to the next level of being useful as an Open Educational Resource.

The Africa Internet Technology Initiative (AITI)

Presented by Bryant Harrison
Head of AITI
MIT

Today I will start with a very brief description of the Africa Internet Technology Initiative (AITI) and then I will turn to a discussion of how we at AITI have used MIT OpenCourseWare (OCW) in our model for self-learning in Africa. AITI is a student organization founded by three African MIT students in 1999. They founded this organization with the goal of teaching ICT and entrepreneurship to both high school and university students in four African countries -- Ethiopia, Ghana, Kenya, and Gambia. This is really a program run for students and by students, involving a very nice peer collaboration and relationship across borders. It is amazing to see the educational and cultural exchange that takes place as a result of this program.

The original goals of AITI were: to increase the use of computer technologies in African schools; to develop a strong technical and cultural relationship between MIT and the various partnering African institutions; and to foster a significant community service experience for MIT students – getting them out into the world, solving some of the problems that exist out there. In addition to these three goals, there developed a fourth one -- to support the accessibility of free knowledge and free tools in the African community. We have tried to achieve this fourth goal in two ways – first by teaching open source technologies, such as Unix, and second by developing communities of self-learning based around MIT OpencourseWare.

We actually started our self-learning model back in 2003, and it was started almost by accident. I mean this in the sense that we were supposed to go and teach our normal program in Kenya but – due to a travel warning and security concerns – we were not able to send our designated students there to teach. Two of our AITI students from Kenya did travel there that summer and facilitated a self-learning group, involving two groups of five students at Strathmore University. The MIT students basically used OCW, textbooks, and each other as resources to teach the basic curriculum of the OCW courses.

One of the lessons learned that summer was that what worked best was having those two AITI students checking up on the students every day – seeing how they were answering the problem sets that they had. There was a rather minimal amount of time involved, in that the MIT students were not there all day, but they came and checked on the Strathmore students now and then. We also provided those ten Strathmore students with CD's containing the needed OCW curriculum. This was necessary because many of them did not have access to the Internet at home. Another aspect of that summer's experience was the fact that we were forced to select ten highly motivated students out of the originally enrolled group of seventy students; we

discovered that high motivation is very important for self-learning. One problem we ran into that first summer was that the students found the material to be too theoretical and too reading intensive. They also expressed a desire to have more exposure to practical applications of the material. They felt that there was no opportunity for independent thinking since the program that summer involved no lab project in which students would have to come up with their own idea for a project.

Despite these problems, we decided that the self-learning experiment had been successful enough to integrate it fully into the AITI program that was already ongoing in the two other countries where AITI was operating at the time. Therefore, we decided to initiate the self-learning model with students in Ethiopia and Ghana. The students were selected for this program by basically taking the top twenty-five percent and asking them if they would like to participate. Overall, the program that second summer was pretty successful. We introduced the idea of self-learning to the students as a skill that they could learn. We also introduced them to the tools of self-learning, such as MIT-OCW, Java API, and basically everything that is available for free. In addition, we gave the students more control over how they wanted to learn. As it turns out, they went way beyond the Java curriculum that we had planned, moving on to JSP and databases. In the end, they made very impressive projects. I will say that these students were picked very carefully in an attempt to insure they would be a good match for self-learning.

Now there were some things that did not work out well. First of all, we attempted to implement this program in some locations where there were not appropriate resources. We encountered the same problem that we have been discussing all day here -- a great lack of connectivity. Some of the schools' computers did not have the Internet, or there would simply not be enough working computers for the students. Self-learning can not be done in an environment where you are fighting for computer time. Another mistake that was made was selecting students who were somewhat inexperienced. By this I mean that although they may have had past programming experience, this does not necessarily translate into success at self-learning because perhaps they lacked the significant motivation required. Another problem was selecting the students too quickly. While in Kenya we had taken time for careful selection, in Ghana the students were selected right away without adequate scrutiny. A final mistake we made that summer was not really making clear ahead of time just what the experience would be. A lot of the students came with expectations that they would be taught by MIT students. Therefore, when we said, "Hey, go off and learn on your own." they replied, "that was not what we signed up for." We should have informed them that they could actually go further and faster as self-learners, and that the MIT students would be there to support them, even though they were not serving as lecturers. Those African students needed to understand that they were actually responsible for their own learning and that the MIT students were there to help them.

This past summer when we conducted the self-learning program, we did things a little bit differently. First of all, during the previous fall, we debriefed on how the model had run during that first summer of operation in all three countries and we discussed ways to improve it. At that time, we also investigated how we could work with OCW even more closely, and one of the ideas we came up with involved setting up OCW mirror sites to help with the problem of connectivity. Another idea involved increasing awareness of OCW in the countries where we work. Subsequently, we went to Kenya and set up mirror sites at the University of Nairobi's Kikuyu campus. There AITI staff gave presentations and workshops – one to staff members and one to students. These workshops explained how to use OpenCourseWare and what its benefits are, and we feel that they went very well. We also set up some mirror sites at Strathmore University and at Alliance High School, the high school where we teach. Both of these schools have very bright students – especially the high school, which has students like I have never seen before! Now that they have the complete OCW curriculum accessible to them, we feel extremely confident that they will make the most of it. As a matter of fact, we look forward to seeing many of these high school students here at MIT in the future. During last summer, we had also planned to set up a mirror site in Ethiopia, but due to some safety concerns, we did not get to Ethiopia. As a result, the African Virtual University is supposed to implement that mirror site.

The last aspect to be completed is, of course, assessment, and that will be done in the future by AVU or by our AITI students. In addition, some students in classes of Professor Miyagawa - who will be speaking with you in a few minutes - will go and actually assess just how well OCW is working in those institutions.

So what are some things that we have learned through this work? Students thrive and can learn so much more than we can teach them – as long as they have the right resources and as long as they have access to open source ware - whether it be through the Internet or through mirror sites. With those resources, they are now able to go much further than what we could provide them in a six-week period. In addition, these African students are learning a very important skill. It is not just a matter of teaching someone something -- for example, our teaching them part of a course from MIT. Rather, it is really much more important because what they are learning is a lifelong skill they can use throughout their lives, with many applications. Thus we are trying to empower them by giving them these self-learning skills early on so that they may be more successful in the future.

One may wonder how this effort is sustainable, given that those of us involved in AITI are only in Africa for six or seven weeks. Well, in addition to trying to teach students and professors about our curriculum and how to use OCW, the AITI experience also allows students to continue learning Java and learning JSP on their own after we leave. Of course, it is our hope that MIT-OCW will be a major tool of future learning for them.

The MIT-China OCW Initiative:
Adaptation, Implementation, and Dissemination of MIT OCW
With Partners in China

Presented by Sean Gilbert
Director of Internship Project Development and Training
MIT-MISTI China Program

At the 2004 LINC Conference, I spoke about the MISTI-China Program and reported on our plans to send a team of MIT students to introduce OpenCourseWare (OCW) content at Qinghai University in northwest China. Today I will present the results of our activities at Qinghai University last summer, and will also provide an overview of our 2005 projects, which include OCW teaching at three other Chinese universities – Tsinghua, Xi'an Jiaotong, and Dalian.

I work for the MIT-China Program, which is located in MISTI – the MIT International Science and Technology Initiatives. The China Program is one of eight MISTI country programs. We train MIT students to work as interns in China. We have been in operation since 1994, sending about forty MIT students annually to work in China. The students work on a wide range of projects – anything from electrical engineering projects at universities, to working with international companies, to conducting biomedical research, to teaching at high schools and universities. I will not discuss our program's individual internship program today; but, rather, our educational technology team teaching internships administered through the MIT-China Educational Technology Initiatives (CETI). Our CETI program offers a number of team internship opportunities in the following educational technology areas:

- MIT-OpenCourseWare
- MIT-iCampus
- MIT-D-labs
- Chinese High Schools

We place OCW at the top of this list because we introduce elements of OCW in all four of our CETI initiatives.

We have course requirements for students to participate in the China Program, including Chinese language studies and courses on Modern China. We also hold a "Spring Training" program, which is a three-credit seminar, "Issues of Contemporary China," that prepares students prior to their arrival in China. This seminar includes both cultural and technical training for team projects in China.

The CETI Program was established in 1996 with the objective of providing applied China experiences to MIT students through their working with Chinese high schools on Internet technologies. We have worked very

successfully with Chinese high schools on team projects for several years, and then decided that we should attempt to expand and challenge the program by introducing OCW online course content at Chinese universities. Our pilot project was held in northwest China at Qinghai University just outside of the city of Xining on the Qinghai-Tibetan Plateau. We chose this university through our work with Tsinghua University in Beijing. Tsinghua University has partnered with Qinghai University in an effort to raise education standards in China's western regions.

Qinghai University faculty are particularly interested in biology, computer science, and environmental engineering courses which are posted on the OCW website. I therefore recruited MIT students who have strong backgrounds in these disciplines, along with Chinese language skills and some previous China work or travel experience. I selected teams of five students for Qinghai University for the summer 2004 and 2005 programs. We taught a group of one hundred Qinghai University undergraduates, adopting MIT's course structure of lectures, recitations, and labs. We taught an introductory genetics course, presenting the concepts, lecture notes, and using the exams that are posted on that course's OCW site. We also taught a computer science course, "Structure and Interpretation of Computer Programs," using the OCW notes and labs. The environmental engineering course on fluid dynamics utilized OCW notes, example problems, quizzes, and supplementary materials as well. These courses were all taught in English, and separate English conversation classes were also included in this summer program.

Following the success of this pilot project at Qinghai University, we held summer programs in 2005 with Tsinghua University and Xi'an Jiaotong University, introducing computer science courses from OCW and MIT-iCampus online content. The curricula at both universities included MIT's "Structure and Interpretation of Computer Programs," "Artificial Intelligence," and a culture and communication component. We also sent a team of students to Dalian University of Technology during summer 2005. That program introduced online semiconductor characterization experiments through MIT-iLabs and relevant electrical engineering course content from OCW. The MIT team of three students installed a Service Broker at Dalian, connecting that university to MIT's microelectronics online labs. A class of eighty Dalian University of Technology students took the semiconductor iLabs class, while forty students took a course that introduced Java from the OCW website. At Dalian, we were able to interweave OCW microelectronics or Java lectures with MIT-iLabs and iCampus online educational content.

The biggest challenges we have encountered to date in introducing these technologies in China have been more technical than communicative or cultural. Accessibility to the MIT website in certain regions of China is an issue. There is also a cost issue, as it costs on average somewhere between US$ 12 to 25 cents per hour for Chinese students to access overseas' websites. It is very helpful, therefore, that an organization such as China Open Resources for Education (CORE) in Beijing is building local mirror OCW sites at several Chinese universities so that students there can access the sites

for free. However, there are still some technical issues that need to be resolved in order to work more easily with online technologies in China, such as improving search functions, and network issues related to firewalls, proxies, and ports. These are the types of challenges that our program's students are well trained to handle.

In summer 2006, we will be expanding our efforts to eight Chinese universities, including Dalian University of Technology, Kunming University of Science & Technology, Sichuan University, Qinghai University, Yunnan University, Tsinghua University, Xi'an Jiaotong University, and Zhejiang University. Despite our early successes, we are still just learning how to introduce educational technologies in China and work with Chinese universities. For the Chinese universities, these are their first ongoing collaborations in English on IT educational technologies. The faculty and students at these universities view our CETI program as a bridge to MIT faculty, MIT technologies, and the most current MIT/American teaching practices. For our MIT students, they are receiving direct, applied training to conduct technology transfer work and establish professional relationships in China. Not only will these technical and cultural experiences have direct applications in their future careers, but the work these students are doing in China is also serving MIT very well. Our students are ambassadors, introducing MIT innovations, and testing and installing applications in China. They also assist by identifying ancillary research and business development opportunities between partners in China and MIT.

OpenCourseWare Beyond MIT

Presented by Shigeru Miyagawa
Professor of Linguistics
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OpenCourseware(OCW) started some five years ago here at MIT, and today we have heard a very nice explanation of it from Anne Margulies' presentation. I hope you have seen already with several other presentations that OpenCourseWare is going beyond MIT in terms of our having these sites in China and in Africa. In addition, we have translation projects going on all over the world and we have open courseware projects at other institutions whereby they are putting up their own material as open courseware.

What I want to do is to go back a little bit and think about why this element – participation by institutions other than MIT - should be important for open courseware. Anne talked about the faculty committee that came up with the idea of OpenCourseWare and she also gave the main reasons why OCW was suggested. I would like to go back to that room, where I also was present, and to the faculty committee in which we talked about a variety of reasons why MIT should consider something like OpenCourseWare. An important thing to tell you, to begin with, is the fact that we actually started by looking at for-profit models. I will put that right up front – it was 1999, in the heyday of the dot.coms. At that time, every day we were reading in the paper about tens of millions of dollars being made on an IPO. It was not just private companies, but also universities around the country that were launching for-profit models. As a matter of fact, we studied many of those models quite extensively and we came to the conclusion that for MIT, at that point, it would not have been appropriate to start a for-profit venture. However, at the same time, it seemed important for MIT to take a leadership role in this area by offering an alternative, and so we came up with this alternative to the commercial model. That is not to say that commercial models are not viable; there are perfectly good commercial models. We simply decided that for MIT at that point, it was not an appropriate model. Hence, the idea of OpenCourseWare was born.

Something else that is important to emphasize is the fact that this openness of teaching materials did not just appear out of the blue. Rather, it is very much – at least in my mind – a natural extension of the open policy MIT has towards basic research, something MIT has always been known for. MIT faculty members abide by the policy of openness with regard to research. This really should be true for all U.S. institutions, in most cases anyway. What this means is that we are free to publish the results of our research in professional journals, and we guard that right of openness. What we are doing

with OpenCourseWare is to take that notion of openness for basic research – which is really sacrosanct in research – and extend it to teaching materials.

We believe, just as with research, that the sharing of knowledge - including teaching knowledge - will increase that knowledge. Knowledge is not like money – if you spend it, you have less. With knowledge, the more you share, the more it grows. This is part of the spirit of OCW. This is something that our former President, Charles Vest, who so embraced OCW, speaks eloquently about. Educational materials of the sort we have on OpenCourseWare do not belong only to the faculty member or to MIT, but to humanity. The knowledge that we have is something we created as faculty members, but it is really based on cumulative knowledge of human civilization. Thus, it is something that we should share with the rest of humanity. "

If you look at these reasons, you see that they are really completely independent of MIT. This is why it is so important that when we talk about OpenCourseWare and the ideas behind it that we understand that it is not just about MIT. We would like to see this idea and this spirit be shared around the world. So our faculty committee actually had two visions. The first is quite well known – we should create the OpenCourseWare model here at MIT. Since no one else was going to do it, MIT had to do it. Thanks to Anne's leadership and her able staff, we are fulfilling our commitment to put virtually all courses on OpenCourseWare - materials from nearly 2000 courses. We have now completed up to 70% of the courses, so we know that we will get there. It is important to realize that this is all voluntary on the part of the professors, but by now there is a certain amount of peer pressure to participate. We feel that our success so far is quite an accomplishment. The second vision about OCW set forth by our faculty committee was the vision that MIT would be a leader in this new important movement of open educational content and sharing. It is this second vision that I want to discuss at length.

It is interesting to compare a map of MIT OCW usage, first with the map of ethernet coverage displayed by Professor del'Alamo, and second with Cliff Missen's NASA map showing the bright and dark spots around the world. One can pretty much map the OCW usage map onto those two maps – so that some of the thickest ethernet coverage correlates with the brightest spots, and both correlate with heavy OCW usage. I was so pleased to hear Dr. Dzvimbo tell us that the ethernet availability in Africa is changing. This is very encouraging.

Now I want to go back to two presentations ago, the AITI presentation. I had the honor of teaching this semester a course on the Digital Divide and I simply put out the word that I was interested in doing this. By pure luck, the AITI people got wind of it, and now I have seventeen students in my class working on projects, many of those related to OpenCourseWare in Africa. What students are doing is to take up many of the same issues that Dr. Dzvimbo discussed in his presentation concerning the challenges to MIT OCW - challenges in terms of localization. These are MIT students from

Computer Science, from Electrical Engineering – the top programs in the country – addressing these challenging issues. What is doubly amazing to me is that all these students are from Africa; MIT undergraduate students from Cameroon, Zambia, and Kenya are a part of this course, so they are very familiar with the issues on the ground. The class will visit Dr. Dzvimbo's institution, as well as other African institutions, in January, presenting some more localized, appropriate versions of OCW courses. We will be testing them out.

Yesterday in a presentation by Dr. Said Jahama on the Arab Open University, it was stated that e-Learning programs in that region of the world need major contributions from well-known institutions to demonstrate how quality content can be developed. Dr. Jahama also stated that this content be available for free. That is just exactly how we feel about OCW, and once again, let me emphasize here that I am not just referring to MIT. We want to see institutions around the world begin to open up and share their high quality content for free.

We believe that the open courseware movement is very much consistent with another kind of movement that is going on in the world. This is a very important movement by the United Nations - *The Declaration of Human Rights of the Millennium Declaration.* Article 26 of this declaration states that "Everyone has the right to education." A project like open courseware, where not just MIT but institutions around the world begin to offer their content free, can certainly begin to address this issue of the universal right to education. *The Millennium Declaration* says:

> "To ensure that, by the same date, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling and that girls and boys will have equal access to all levels of education."

Here again, this is a commitment that the world has made to the developing countries. We all have a role to play in this commitment. For our part here at MIT, OpenCourseWare is one way in which we are attempting to contribute to this human rights goal – inviting institutions around the world to play a role in this important movement.

You heard from Anne that there are many, many institutions around the world now doing open courseware. In Sean Gilbert's presentation, we heard about the need to give independence to institutions for technology transfer. One way we at MIT are doing this is that we are helping institutions around the world launch their own open courseware initiatives. If you go to the "How to" site on the OCW web page, you will find a very detailed description of how to develop an open courseware program. It is a very thick document, taking you through technical issues, intellectual property issues – pretty much the whole package.

Last year, I worked with the presidents of the top nine universities in Japan – absolutely the top universities. These nine institutions included the universities of Tokyo, Kyoto, Osaka, Tokyo Tech, Keio, Waseda, Kyushu,

Hokkaido, Nagoya. I met with the presidents to get them to start an open courseware initiative, and they launched the Japan OCW Alliance on May 13th, 2005. At that time, I went to Japan to participate in the press conference. I was told that this was the first time in the history of Japan that the presidents of the top universities were together in the same room. I was quite inexperienced! These presidents are very competitive so they did not want to show their sites to each other until May 13. Therefore, we all got to see the sites at the press conference! It is quite a remarkable web site, and you can get to it at: www.jocw.jp

Here let me mention something that is very important – language is an issue with educational content. We want learners to be able to enter these sites feeling comfortable, and for this reason, the nine Japanese institutions decided to put their site in bilingual – Japanese and English. There are six courses offered on the site now, and six more are coming up very soon. We enter through the Japanese portal – everything there is in Japanese – and then move to the individual university's site. There are some really remarkable courses in the fields of engineering, science, and the humanities. These institutions embraced this idea of intellectual philanthropy, and they are putting up these sites to contribute to this knowledge that we are creating. We at MIT are also helping other institutions to do the same. The reasons that we had for starting OpenCourseWare were in many ways independent of MIT. We really do want to see other institutions start as well.

My final point here today is to tell you just a little bit about a project that I have, a project of my own called *Visualizing Cultures*. The reason I want to tell you this is that this is on OpenCourseWare, and just got launched last week. What we are doing is that we are taking the idea of open courseware and applying it to another institution that also holds very valuable content. We have been working with a number of museums to create visual content that we are using in our class. The designs in our course are all Japan-related since my partner in this project, John Dower, is a Pulitzer prize-winning Japanese historian. For example, for the first unit, the Smithsonian Museum gave us the rights to an exhibition of Japanese art they put together in 1992. The next three units, which we just finished, were done with the Boston Museum of Fine Arts. We went into the bowels of the Boston MFA and ran across things that even they did not realize they had! We then asked them to digitize those objects and to make them available under the Creative Commons License for non-profit purposes. You can pretty much use the images however you want. Finally, we are working with the Hiroshima Peace Memorial Museum to put together drawings from atomic bomb victims; these are very striking drawings. I suggest that you take a look. The world has not seen many of these drawings by Hiroshima atomic bomb victims. For that matter, the world has also not seen most of the MFA visuals. So this is a project that I have undertaken on my own, to apply this open concept of sharing to other types of institutions that also have very valuable content. This is still another way of addressing the needs of education.