LINC

2ndAnnual Symposium & Workshop

2004

"Creating and Sustaining Learning Communities"

Learning

International

Network

Consortium

Workshop 25-26 March

Symposium 23-24 March

PROCEEDINGS OF THE SECOND ANNUAL SYMPOSIUM

OF THE

LEARNING INTERNATIONAL NETWORKS CONSORTIUM

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EDITED BY ELIZABETH MURRAY

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Forward

       The following thirty talks were presented at the Second Annual Symposium of the Learning International Networks Consortium (LINC), which took place at the Massachusetts Institute of Technology in Cambridge, Massachusetts on March 23-24, 2004. The symposium was attended by 118 people from twenty-five countries and was followed by two days of workshops, on March 25-26. LINC is an MIT affiliated community of individuals and organizations that focuses on tertiary education in developing countries. By leveraging technologies of distance learning, LINC seeks to help these countries increase accessibility to quality university education. The two LINC symposia have drawn together educators from all parts of the developing world, many of whom are working in relative isolation with the new e-learning technologies. The annual LINC conference at MIT supports their innovative efforts and sends them back to their home countries with new ideas and a supportive group of colleagues from around the world.

       The theme of this second LINC symposium was "Creating and Sustaining Learning Communities." As Richard Larson stated in his Opening Remarks to conference participants, "one of the difficult challenges with distance learning is how to make geographically dispersed students… feel that they are part of a community with other students, with their professors, and also perhaps with actual practitioners of the lessons they are learning." While Sections Two and Three of the book deal directly with this theme - in both a theoretical and practical context - almost every one of the symposium speakers touched upon this important area to some degree.

       The thirty presentations included here are not submitted papers, but rather they are the actual symposium talks that have been audio taped, transcribed, and edited by both myself and by the individual speakers. For this reason, they clearly reflect the atmosphere of information sharing and congeniality that characterized the symposium. As a matter of fact, the conference itself spawned an exciting initiative created by nine participants from the Middle East, including Palestine and Israel, as well as Pakistan. The LINC Middle Eastern initiative focuses on the use of distance learning to educate science and math teachers in the region. For more information on this, read the article, "A LINC to E-Learning," in the October 2004 edition of *Technology Review* at http://www.technologyreview.com/index.asp .

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Opening Remarks

Presented by Richard C. Larson
Professor of Engineering Systems
Founder of the Learning International Networks Consortium
MIT

Welcome to the Second International LINC symposium here at MIT. We are delighted to see so many friendly faces. We see some familiar faces from last year and we see many new people that were not here last year. We welcome you all. On these tables, there should be flags from each of the countries represented and, at last count, there were 25 countries represented in the total registration, including both the symposium and the workshop. We had nineteen countries in attendance last year, so we are definitely in a growth mode! This makes us very happy.

The theme this year is Creating and Sustaining Learning Communities. Our goal is to study how online educators can achieve such communities. One of the difficult challenges with distance learning is how to make geographically dispersed students -- say students in their homes or students in scattered villages -- how to make them feel that they are part of a community with other students, with their professors, and also perhaps with actual practitioners of the lessons they are learning. This is certainly an important emerging topic we all want to learn about and ideally, we can all learn about it from each other. Over the next two days, you will hear some case studies related to this challenge, along with reports on exciting projects underway designed to address this issue of online communities. We think it will be a terrific educational experience for all of us.

Last year, our LINC symposium was two days. This year we have a four-day event. We are calling the first two days of the conference our "Symposium," and then many of you are staying on for the second two days on Thursday and Friday that we are calling our "Workshops." We will have four workshops, two on Thursday and two on Friday, and these are designed to be very collaborative, hands-on learning experiences. On those days, there will be much less of a symposium lecture style; rather, it will be highly interactive, with some sessions involving hands-on computer work.

In terms of LINC, our focus is on higher education in developing countries. Many developing countries have only four percent of their young people enrolled in college and university education, whereas in most European and North American countries it can be up to 40, 50, 60%. One of our themes with LINC is that even if you can erect buildings and dormitories overnight, you cannot build faculties overnight. You cannot build the excellent, qualified teachers with Ph.D.s overnight because it takes generations to accomplish this. For a country that has only 4% of its people now being educated at the college or university level, it will take several generations to build up the number of faculty, for example, to the level of

faculty/student ratios here at MIT. So it makes good sense that if a developing country has a faculty member who is very talented then that faculty member should be teaching 300 or 3,000 students, rather than just 30 students in a classroom. Such leveraging can be done via distance education, as we will explore over the next four days.

As we begin this second annual symposium, we would like to thank three foundations for supporting LINC this year: the Lounsbury Foundation, the Morningside Foundation, and the Lord Foundation. In addition, certain people have worked to make this event possible, and without their assistance and support this conference would not be happening. First and foremost, I would like to thank Carol Sardo who has been working 68-80 hours a week on LINC over the last couple of months. We are all beneficiaries of her efforts because she has organized the symposium and workshops very well. I would also like to thank Liz Murray who has labored long hours editing the presentations from last year's conference and preparing them for publication. Many of you who spoke here last year have been in contact with Liz via email regarding editing matters. A book of last year's presentations will be available to each of you later today as part of your registration packet.

How many of you know what a web-based learning management system is? Now how many have any idea about how much such a system costs on an annual basis? A web-based learning management system can cost anywhere from $40-50,000, and I believe some new versions are over a $100,000 dollars a year. This is very expensive, particularly for universities and colleges in developing countries. However, we are announcing today that you will receive a free CD ROM containing the LINC Learning Management System developed by Professor John Williams here at MIT. Professor Williams will be available at lunch and break times to discuss the system and will also be presenting it at a workshop on Thursday. This is a terrific development, and we are extremely grateful to John and his team.

The last thing I want to say before we get started concerns Panel Eight tomorrow that will involve interactive activities designed to gather your ideas concerning the future of LINC. We hope to develop a consensus on the top two or three priority LINC programmatic initiatives. We would like LINC to be a society of people who are committed to distance learning in developing countries. However, we envision this as a society with an attitude! The attitude is the fact that we want to go out and do cutting-edge demonstration projects, some of which may be risky in terms of a successful outcome. The hope is that if any of these projects do gain traction and are successful, then perhaps other foundations, government organizations or companies would come in and fund them up to scale. This morning, in just a few minutes, you will hear about three current LINC initiatives. It is our hope that as a result of Panel Eight tomorrow, we can identify others initiatives that you would find useful in your own settings. Then, what we hope to do here at MIT over the next three to six months is to identify foundations and government organizations that might be interested in funding these types of projects. For those of you who are excited and committed to such new LINC initiatives, we

also may ask you for letters of support and recommendation as we are putting these project proposals together.

Now I would like to introduce MIT's Provost, Robert Brown, who will give you some welcoming remarks. You can see his distinguished career summarized in your handouts. I would just like to say that Bob Brown has been very much involved with distance learning for his whole time as Provost and as Dean of the School of Engineering. In fact, he got MIT involved with international distance learning in a major way with the Singapore-MIT Alliance. I think it is fair to say that the Singapore-MIT Alliance was put together by Bob Brown, 95% of it by his energy. Also under Bob Brown's guidance was formation of the Council on Educational Technology. This Council came up with numerous technological innovations in both distance learning and in the local learning at MIT, the major innovation being OpenCourseWare. Later at lunch you will be hearing from Ann Margulies who is executive director of OpenCourseWare. You will also be hearing about some MIT initiatives designed to develop communities of learning around the OpenCourseWare program, all of which is under Bob Brown's tutelage. Now may I introduce MIT's Provost, Robert Brown.

Welcoming Remarks
Presented by Robert Brown
Provost and the Warren K. Lewis Professor of Chemical Engineering
M.I.T.

This morning I would like to make a few brief remarks about how pleased I am to see you here. As Dick Larson said, through my own involvement at MIT, I have a very personal interest in distance education and the use of technology in higher education. First of all, let me describe how a research university like MIT sees its role in the dissemination of knowledge and in global education. First and foremost, as you would guess, MIT is committed to education on the campus in Cambridge. We have over 10,000 students composed of approximately 4,000 undergraduates and 6,000 graduate students. Therefore, our core mission revolves around education and research here in Cambridge, using a relatively small faculty of one thousand. Those faculty members are selected and evaluated on their ability to do the highest quality research and teaching in this environment, and through their efforts, to impact both MIT and the world. In some sense, all of what we do revolves around intense personal interactions between our students and our faculty. We carry out this mission in the narrow corridors that some say look like an urban high school. We believe this style of personal interaction can be approximated using distance technology, but it cannot be equaled in intensity, in the density of people with the same desires and drive, or in the bandwidth of exchange that occurs just through human interaction at a residential university like MIT.

I think that by any metric, MIT carries out our mission extremely well. Possible metrics could be the impact of our students on the world, the number of citations of research papers and books written by our faculty, or the sheer volume of frontier research done in this tiny section of Cambridge, Massachusetts. Even so, there is a growing group of our faculty who strive to do more, to have a greater impact on the nation and on the world, all the while maintaining the core mission of a residential university. How do we do this? This seems like a contradiction.

We do this by distance education technology. Traditionally MIT has been involved with educational development around the world, but we have done this for over forty years using what I would call traditional techniques. We have brought people to Cambridge to learn how to teach and we have put our people on airplanes to go to emerging educational centers. This is the old way of doing things. More and more, we are learning to use the Internet and high bandwidth communications to leverage our knowledge in our environment for others around the world. Several strategies have emerged, ranging over three different levels, and I would like to talk briefly about them.

One of these strategies involves working with newly formed higher educational institutions in emerging countries to aid them in developing

infrastructure and content to launch their educational programs. Here MIT faculty and staff may develop course material, but there is no attempt for us to do continuous course delivery. M.U.S.T., our partnership with the Malaysian University of Science and Technology, is an excellent example of this cooperative strategy. MIT is also involved in other similar, smaller-scale interactions with many other universities.

The second strategy, which is MIT's most visible and ambitious effort of this type, is OpenCourseWare (OCW). As you have heard, MIT is moving to put the content from the bulk of our subjects on the web and to make it freely available. To date, we have over 500 subjects on our website, with the effort focused squarely on adding another 500 subjects by the fall. At that point, the content of one thousand MIT courses will be available to the world. In this initiative, we have not addressed a specific partner or development effort since we are not delivering specific content to specific collaborators. Instead, what OCW offers is MIT content the way we would use it at MIT to anyone who might be interested. Our partners range from the single student in a faraway land using the website to learn a computer science subject, to an instructor who studies an entire MIT curriculum to best understand how to organize the subjects he will teach in his home institution.

There are many aspects of OCW that make it unique. I will let Ann Margulies, OCW Executive Director, talk about these later today. However, I would like to focus on one aspect and just have you think about it. I believe one of the most unique aspects of OCW will be the coverage and consistency of the material. Imagine the scope of having all the undergraduate and graduate courses, from great MIT departments like physics, electrical engineering or computer science, available on the web and changing dynamically from year to year. The impact of this resource, if it is properly archived and indexed, will be enormous for educators and students all over the world. I am sure that no other collection of material like this has ever existed before. We are just beginning to feel the impact of this resource on education at MIT and on students and institutions around the world.

The third part of the strategy I would like to present is the Singapore-MIT Alliance (SMA). Neither of the two efforts I have talked about have attempted to capture or transport the intensity of MIT using distance education technology. As Dick mentioned, our large-scale experiment in doing this has been through a partnership with Singapore in their two leading universities. SMA is just completing its first five years of existence. It began with the goal of answering the following set of questions.

1. Can a group of graduate students in engineering be assembled halfway around the world who have the ability and intensity to do MIT graduate work? I would contend that the answer to that question was obvious. It was just a matter of putting the process in place to do it.
2. Can a combination of web-based material and high-bandwidth communication be used to synchronously deliver classroom education to these students simultaneously with an MIT cohort,

thereby extending our classroom to another site a long way away, in fact 12 to 13 time zones away?

3. Can the intensity of this interaction spread to faculty mentoring and research, i.e. can the students at the distance feel like they are part of the community of learners and researchers at MIT even though they are 12 time zones away?

We launched five Masters of Engineering programs jointly with the two universities in Singapore to answer these questions, and the answers to the first two questions have come in. During the first four years of operation, we have graduated over 550 Masters of Engineering students, and four of the programs have started to produce doctoral students. We have data that tells us the following: we can organize and recruit high quality students from all over Asia to these programs; these students are of the same kind of cohort that we admit as international students to MIT; the coursework performance of these students is essentially identical with that of MIT students studying in the live classroom; by having simultaneous classrooms in many of the subjects, we can actually have a benchmark between the value of the education being delivered synchronously to the students in Singapore and live to the students here.

In addition, approximately 50 MIT faculty members, 5% of all of our engineering faculty, have learned to teach effectively using this technology and have reached out to work with students in cultures that we would not have impacted otherwise. Currently, we are moving to extend SMA to have a greater research focus, with a larger fraction of doctoral students from Singapore, and with Master of Engineering students receiving both Singapore and MIT degrees. The question now is can we extend this success to mentoring and research in the same way we have done with classroom education?

In just a few minutes, I have tried to give you some examples of how we at MIT view technology bringing us all closer together, creating a smaller world for education and for human interaction. All universities must accept this change and find ways to extend their impact. In his book, *A University for the 21st Century,* James Duderstadt, the retired president of the University of Michigan, made a profound statement. He said, "Change will not only be the challenge to the American university, it will be the watchword for the years ahead. With change will come unprecedented opportunities for those universities with the vision, the wisdom, and the courage to lead the century ahead." I believe distance education is one of the elements of this change. I am confident that we are all poised, all of us in this room, at the beginning of a new age for higher education and institutional cooperation. I look forward to hearing from Dick and from other of my colleagues here today about the energy and ideas generated over the next several days to move global higher education forward.

SECTION ONE

A REVIEW OF

LINC PROGRAMMATIC INITIATIVES

The New Wave: Students Empowering Each Other

Presented by Solomon Assefa, Ph.D. Candidate
Department of Electrical Engineering and Computer Science
MIT

Today I would like to update you on our progress with the MIT Africa Internet Technology Initiative (AITI) that we believe is creating a new wave, empowering students across continents and helping them to empower each other. The MIT-AITI is a student training initiative, started by MIT students and run and managed by them. The program selects students from MIT and sends them to Africa during the summer so they can teach African students in colleges, universities and high schools. Two original goals of this project were: 1) to increase the utilization of IT in African schools, mainly universities; and 2) to develop a long-term technical and cultural understanding and friendship between MIT and those African institutes. A third goal was to provide a unique community service opportunity wherein MIT students would be able to share their very technical and highly skilled backgrounds.

As I mentioned before, MIT-AITI is student run, and that fact gives it a unique and dynamic color. The MIT students are very creative, always coming up with new ideas and always utilizing new concepts they encounter at MIT. This constant student input keeps the organization evolving every year. We also get direct inputs from the students who travel to Africa as they analyze the needs of the African students and institutions. They analyze what can be done to assist AITI on the MIT end, such as fundraising and recruitment, and they come up with new and novel ideas on how to address these problems. We designate tasks to the students and we divide them into different committees, such as logistics, publicity, selection, curriculum, program excellence, and fundraising. For example, the selection committee has to select from over a hundred qualified MIT applicants, narrowing that number down to about sixteen students. This committee is also responsible for training the students before they go to Africa. Another committee, the curriculum committee, communicates with the individual African universities to establish what each needs, and then develops the curriculum that will be taught at each institution during the six week program. Of course, we also have a fundraising committee because we need to find money to keep the organization running.

We have divided the AITI year into four seasons. During the fall, we do fundraising, mainly writing proposals to various organizations and various MIT offices. During the winter, we execute logistics, which includes communicating with the African colleges and students, organizing the curriculum, conducting the recruitment/ selection process, and generally taking care of everything before the students travel to Africa. Of course,

during the summer we have our execution phase for six weeks. When we return from Africa, we sit down to write reports on what we have done and we evaluate the execution method as well as the impact on both the MIT students and on the African students and professors.

Now let me give you a very brief overview of what AITI has accomplished in the first three years. The first phase of execution took place in 2000 in Kenya. MIT offices were very generous in giving us about $17,000, and we used that to send four students to Strathmore College in Kenya -- something we repeated in 2001 with the same amount of money. During those first two years, we built a very strong base in Kenya and we demonstrated that we had a very significant impact. This track record helped us write a bigger proposal in 2002 to the Engineering Information Foundation (E.I.F.). By showing them our impact and sustainability, we were able to receive about $60,000 from that foundation. Using this money, we expanded to Ghana where we executed the program in two high schools, Achimota and PreSec. These funds also allowed us to expand into one more Kenyan school, the Alliance High School.

During those first three years, the learning model was the classroom approach. We can call it the old model, but it is proven to be a model that works and a model that is very stable. This model operates as follows. During the morning, the M.I.T. students teach classes, teaching the theory and providing examples. In the afternoon, the African students go into labs and work on problem sets, while the MIT students are there to support them and help them out. This model also includes exams and class projects, as well as student feedback every two weeks. In addition, every two or three weeks, the program involves invited guests from the local area, including entrepreneurs who have set up their own businesses, along with university professors. These professionals share their experiences with the African students and thus motivate those students. Now just to summarize, in 2000 we sent four MIT students and we taught 45 African students and five teachers. In 2001, we sent four students again, but that year we taught 75 students and five African teachers because there was more demand for the program. In 2002, with additional funding, we expanded to two countries and we sent 14 MIT students to teach 180 African students and 10 African teachers.

As I mentioned before, MIT students execute this model, and these students, from various MIT departments, go through a rigorous selection phase. We do not only select engineering students. MIT students are so capable that even if they come from departments such as Biology, they have excellent programming and technical backgrounds and are able to learn any material they need to learn before traveling to Africa. Because the summer program is offered over a period of six weeks, there is a very high demand at MIT to participate. We receive more than one hundred applications for just 14 or 15 spots each year. In addition, there is a very high demand to participate on the African side because so many students want to enroll in our program.

Turning now to the African side of AITI, we provide a manual of possible courses to the professors of the African schools so they can select subjects for their particular institutions. For example, we have JAVA, JSP as Internet cutting-edge technology, and we also provide them with Linux instructions leading them to use free operating systems. The students take exams in these subjects and they also use what they have learned to implement community-based projects at the end of each six-week period. This means that they work with local communities to develop web pages, etc.

In 2003, we actually changed our model a bit and expanded. First, we sent nine students to Ghana and were able to teach 96 students and five African teachers. Next, we expanded to Ethiopia where we sent seven students and we taught 140 students and four teachers. As you can see, even though we sent nine students to Ghana, we taught fewer students than in Ethiopia. That is because when we started the program in Ethiopia, there was such a high demand. There were about 300 students who wanted to participate, and we had to limit participation because we needed to keep the ratio of students to teachers low so that we would have a significant impact. In Ghana, we used the classroom-learning model that I have already described. In Ethiopia, we used the classroom approach and we also started entrepreneurship lectures. There we did not just invite local entrepreneurs to come and give speeches, but we also sponsored lectures every week on how to start businesses and how to come up with unique ways of evaluating local needs so that you can design a potential business. The goal here was to give the students an entrepreneurial mindset for using the material we were teaching them.

We were not able to send students to Kenya in 2003 because of the terrorism threat. We did not want to take the risk of sending any of our MIT students. Instead, there were two native Kenyans who were traveling there, and using them, we came up with a very unique model that I call the self-learning model. In this model, we used MIT OpenCourseWare material. We had been trying to use OpenCourseWare, and this provided a unique opportunity for us to minimize the number of MIT students sent to Africa, while still maintaining, and even increasing, our impact. So we used MIT OpenCourseWare material in Kenya. The lectures were online, and we sent a few books, CDs, and other materials over there with the two native Kenyans to support the students.

We selected only 10 Kenyan students since this was the first time we were executing the self-learning model. Every day in the morning, the students would study together, teaching and helping each other. In the afternoons, they would go to labs and work on solving problems. At the end of the day, they would come together again, discuss what they had done during the day, and come up with a list of questions about problems they were not able to work out during the day. Then their group leader would send an email to MIT where a group of three students would be waiting for these emails, prepared to answer any of the questions. Every day we set up this type of exchange system. The support was through the MIT students, but we also had an African lab coordinator who was mainly monitoring the lab. We

evaluated this self-learning process by giving daily homework, weekly quizzes, as well as a final project, and we learned that this model actually had quite a lot of impact. Some of the students were able to get internships, and others were retained by the school itself to work in the lab executing data risk projects.

What I have described this morning is the core of MIT-AITI. However, every time we sent MIT students to Africa, they would come up with their own initiatives beyond what we had instructed them to do. For example, I mentioned the entrepreneurship program that was initiated by a couple of MIT students and is very well liked by our African participants. This entrepreneurial aspect also provides our program with excellent visibility. Another example of these MIT student initiatives was when some students had open discussions with the African students on how to apply to US colleges and how to access online information and utilize it. These same MIT students also conducted inspirational speeches explaining to the Africans that there are various ways of being successful. The MIT students are viewed as role models over there.

In 2004, this coming summer, we will have an advanced model. Fifty students in each African country will experience the same classroom model. However, we are advancing the self-learning approach model in the three countries. To execute this model in each of the three countries, we will have 20 African students and two MIT students. However, the two MIT students will not be teaching the 20 students directly. What they will do is work with an African professor in each of the schools. The African professors will learn how to utilize the OCW material for teaching and how to use the supplementary materials we send them. In addition, the African professors will be giving practical lectures twice every week. By using this model, we are hoping to create sustainability and also to reduce our costs. The African professors will be equipped to continue the project and the courses after the MIT students depart from Africa and return to Cambridge.

We will also give the entrepreneurship lectures in all three countries and hope to conduct small-scale business-run competitions. In addition, we are working actively to find local internships for graduates of our programs in Africa. There will be one change, however; next summer we will be executing our programs only on the university level because we have learned that the MIT students have a greater impact when they operate on that level rather than in high schools.

As I mentioned, MIT-AITI has had quite a strong impact. First of all, let me go through the impact on the MIT side. This program provides a unique experience for the MIT students. They go to a new part of the world, experiencing a different culture and developing new skills and new mindsets. It also provides them with a community service opportunity in which they can utilize their technical backgrounds. Furthermore, AITI has succeeded in enhancing the involvement of MIT in bridging the gap between developing and developed nations. MIT's name has been mentioned in various African newspapers over the past four years, and we have created goodwill for further

collaboration with several institutions in Africa. In addition, we believe that we have increased awareness about Africa at MIT and about the many challenges faced there today, as well as in the future. Finally, we can evaluate impact through feedback from different MIT offices and from what we hear when the students come back to Cambridge. For example, one of them told us, "…this was one of the most culturally enriching educational and productive trips I have ever been on. AITI enabled us to teach useful skills to Ghanaian students while learning a lot about the local people and their way of life. Ghanaians are simply one of the friendliest and most beautiful peoples I have ever met. An AITI trip is a great service opportunity that complements the MIT experience." So it makes us very happy to see that we are changing how MIT students see the world.

We have huge impacts on the African side as well. We evaluate our impact in Africa by looking at the increased number of applications and the increased number of students participating in our programs. Over the last three or four years, we have accomplished the following: taught over 500 students and 30 teachers; introduced cutting-edge technology; promoted open software; and initiated and used community-based websites. Some of our students have obtained jobs in the local industry, and we have motivated them into using the novel self-learning O.C.W. model, thereby empowering them to utilize OpenCourseWare and other online educational initiatives. In addition, we have inspired our school alumni initiatives and we have inspired the African schools to seek collaborative relationships with various institutions in the US that have unique ways of looking at problems and coming up with models for solving them.

To summarize the impact, the MIT students enriched the African students with the latest and most advanced IT tools, and the African students enriched the MIT students with a deeper understanding of unique cultures and communities. In a sense, we have created a new paradigm wherein students from different continents are able to empower each other. Our future goal is to strengthen the AITI in Kenya, Ghana and Ethiopia, and to expand the program into two more countries. As I told you, the benefit of being students is that we are creative and wishful thinkers. Today we are thinking creatively and wishfully far ahead into the future, hoping to secure about $500,000 dollars in order to expand and grow over the next five years.

Over the past four years, we have been lucky with various mentors and foundations. Professor Paul Gray and Professor Richard Larson are our mentors and they have been supporting us through the years. We have been funded by organizations like E.I.F. and the Lord Foundation, and we have also received grants from government, corporate, and private sources. MIT has been very generous to us and has supported us with ideas and money whenever we needed it. This support comes from the office of the President and the Provost, the Chancellor's Office, the Graduate Students' Office, the Public Service Center and the Academic Computing Service.

We at AITI were very happy when LINC was established last year because the goals of LINC are exactly the goals we had hoped would be

recognized at MIT. For example, LINC wants to build world-class tertiary education in developing countries by leveraging e-learning, television, and so forth. LINC wants to bring professionals together over the Internet by creating and sustaining learning communities. We have shown that MIT-AITI is successful, skillful, and flexible in all of these areas, and we have shown that this program could be a sustaining model for other educational institutions around the country and the world. We have already executed the program in developing countries. We are working on tertiary education and we are involved with e-learning. Therefore, as one of the early LINC initiatives, AITI is a very instructive model with which to evaluate the impact of e-learning on tertiary education in developing nations. We are also creating learning communities that involve people at MIT and people in Africa, people who represent future professionals on both continents. We are impacting the world of tomorrow by bringing future professionals together in learning communities today.

On-line Global Learning Communities:
The Case of Urban Operations Research

Presented by Richard C. Larson
Professor of Engineering Systems
Founder of the Learning International Networks Consortium
MIT

This morning I will be talking about our second LINC programmatic initiative which is ongoing right now and whose subject is near and dear to me. I say this because the initiative involves an OpenCourseWare (OCW) course that I have been teaching for thirty years with two colleagues of mine, Professor Amedeo Odoni in Aeronautics and Astronautics and Professor Arnold Barnett in the Sloan School of Management. Our course is now an OCW offering, and it is being used in this ongoing LINC initiative funded by the Lounsbury Foundation to create an online learning community. This initiative is a work very much in progress, and the community of learners exists only in embryonic form right now. However, today I thought I would give you a review of where we are, where we are going and also ask for your feedback.

The course is called Urban Operations Research, but it also has another name, Logistical and Transportation Planning Methods. You might ask what in the world is Operations Research (O.R.)? I get that question all the time. Basically O.R. is the application of the scientific method to frame, formulate, and solve pressing managerial problems in all sorts of operations. Recently we have been calling it the "science of better"; that is doing things better, doing things more effectively, doing things more efficiently. Usually O.R. involves creating a mathematical model of the particular system you are looking at. For instance, you take a postal delivery or emergency response system and put it on the computer to create a model of that system. Then you manipulate the computer model to analyze how the system operates and how it might operate more effectively.

Urban Operations Research in particular deals with the systems of the city, such as transportation, healthcare, subway, sanitation, repair and maintenance of infrastructure, etc. Basically, the issues tackled by urban O.R. include managerial and planning problems faced by every city in the world. I believe that our textbook, *Urban Operations Research,* published in 1981, is the first book that really focuses on these problems. Our course on this subject, Urban Operations Research, has also been taught at M.I.T. since 1981. All three of us authors were very proud to have this course selected as one of the early M.I.T. courses to be included in OpenCourseWare. I think one of the reasons they selected it is because we had created an early website for the course, thanks to a generous grant from the Sloan Foundation. We are

also very proud that the September 30, 2003 issue of *Wired Magazine* reported that our course was in the top ten most frequently contacted websites of OpenCourseWare and is the only graduate course in that top ten listing. Furthermore, thanks to a substantial volunteer effort, I am pleased to report that the major parts of this OCW course are now available in three languages -- English, Spanish and Portuguese. Finally, if you were to go to our OCW website, you would see that the entire *Urban Operations Research* textbook -- all 550 pages -- has been scanned onto the site, thanks to the Sloan Foundation grant.

Now I would like to spend a little time telling you about the Urban Operations Research/OCW website. First of all, it contains a very large number of homework and exam problems. In a new version of the site, we plan to have password-protected access to the solutions for instructors who want to use the material. These problems themselves are very instructional because they deal with pressing operational problems that cities everywhere might have on a day-to-day basis. Some of these problems are quite important, even lifesaving. Consider ambulance deployment, for instance, where the right decision can make the difference between life and death.

Thinking of ambulance deployment, this website also provides access to something called the Hypercube Queuing Model, an O.R. tool that can be used to improve many urban services, such as ambulance deployment, police allocation, fire department operations, etc. With this tool, you can figure out where to optimally locate your ambulances and how to dispatch them in order to minimize response time and hopefully maximize the probability of saving lives. This Hypercube Queuing tool is not just academic, but has been implemented successfully in New York and other cities to provide online guidance to dispatchers of ambulance services. So as you can see, the course may be theoretical, mathematical, and computer-based, but it has practical, real-world applications. It is for this reason, I believe, that at least half the emails we receive at the website are from people around the world who are practitioners, managers, and supervisors of urban services.

Speaking of these emails brings us right to the new LINC initiative. It is funded by the Lounsbury Foundation, and in it we are attempting to create an online community of learners, scholars, and practitioners centered around the OCW course, Urban Operations Research. Through emails received from users of the O.R./OCW course website, we have identified three types of participants: learners or students; teachers or professors; and practitioners, including urban managers and urban consultants. Therefore, our challenge is to create an online community that will serve all these people. We basically have three types of people, each wanting to communicate among themselves and also with the other two types. Students can be quite supportive of each other, so of course the students are going to want to interact online among themselves. Similarly, the practitioners want to learn from each other. For example, let us say there is a consultant designing a public transit system in Lima, Peru. He or she might want to talk online with somebody who is doing a similar thing in Malaysia or India. Of course, the teachers and professors

want to learn from each other as well, through online sharing of content, problem sets and solutions, exams, etc. In addition to these separate online communities, there is a need for additional paths of communication. Of course, the teachers and students will need to communicate online regarding course matters. The teachers will also want online access to the practitioners in order to learn about practical applications of the theories, new problem sets, and maybe even for potential masters and doctoral research topics. It is also important to provide students with online access to practitioners, thereby encouraging a broad sharing of practical experience.

What I have just described demonstrates the complex gestalt of this online learning community we are trying to create. At last year's LINC Conference, two M.I.T. students presented their research showing how such learning communities, in embryonic form, led to some productive email correspondence. First of all, we had Mike Metzger, a doctoral student working with me, who did a master's thesis on designing an earthquake response and recovery system. On that project, he worked online with students at Sharif University in Tehran, Iran. Then we had another student, Nebibe Varol, who, working online with students at the Istanbul Technical University, developed a plan for healthcare delivery systems in poor, urban communities of Istanbul.

Now let me describe our process in undertaking this initiative. In 2002, we posted a pop-up questionnaire on our OCW course website and currently we have over one thousand responses from that. This is a voluntary questionnaire, so you do not have to respond even though it pops up. Then in January to March 2003, we directed an email survey to each of the three groups of people accessing the Urban O.R. /OCW website, including students, teachers, and practitioners. At this stage in the process, we are trying to figure out from both these surveys and from the pop-up questionnaires, just what it is that the learning community out there wants. What are their priorities in terms of what they find useful from the website now and what they think we should add to it? Drawing on this input from users around the world, we are focused on how to go about creating this online community of students, teachers, and practitioners. We are working with about five students and with Professor John Williams to create a prototype website which will be up and running by the end of this academic semester.

Now I would like to provide you with a sampling of the pop-up questionnaire comments. We had an open-ended comment area at the end of the questionnaire, and this is from a student in Mexico City. He says he is interested in becoming an Operations Research student because he finds the material especially useful as applied to the problems of Mexico City. Here is another student, from India, who is doing a master's in business administration. He likes the content of this course and has been helped in his business studies by the content. A student from Tehran, Iran is using the content of the website in modeling bus routing and pick up and delivery of crews. Then we have a graduate student from India who is in the area of production and quantitative methods. He plans to use concepts found on the

Urban O. R. /OCW website in his thesis, focusing on transportation networks. Finally, we had an African student write, "I need to undertake more studies in this field to try to understand the best way to develop my country, the Congo."

Next we can look at comments from professors who have accessed the OCW course. One says simply, "In my consulting and teaching profession, I am going to use this material." Another from Brazil writes that in his graduate studies, he had taken an elective course using the book that is now online free of charge. He continues that he intends to create the same kind of course at his university, using the OCW content. Another professor, from the University of Bucharest, finds the content extremely practical and has introduced it to his students to provide them with different computer modeling techniques.

The largest number of responses has come from practitioners, comprising at least 50% of all responses. These are people actually on the urban frontlines, designing and operating urban systems. For instance, the following: "I'm a software developer and I make information technology applications for urban transportation in Monterrey, Mexico." Another respondent is a consultant in supply chain management who appreciated finding on the Urban O.R./ OCW website additional exposure to logistical transportation planning methods. She writes that she can never take a formal course in the subject because she is so busy visiting management sites. This demonstrates how valuable such a website is to practitioners whose lifestyles prohibit them from going to a campus and taking a regular, full-time course. Someone from the catering business in Peru found the site very useful in providing transportation applications to help them efficiently reach their clients located in many different parts of that country. Another respondent found useful material relating to his work, developing the optimal placement of electrical facilities in the country of Columbia. From the Republic of China, we heard from somebody who is interested in using the techniques of the course to improve the postal delivery processes. This provides you with a flavor of comments we have received. It also demonstrates the wide range of people interested in the Urban O.R. /OCW website, from students to practitioners, as well as the broad spectrum of applications worldwide for the course's content.

The next step in this evolving initiative was to develop a community needs analysis. To accomplish this, we sent out three directed surveys -- one to each of the three groups of website users. The goal here was to get user input on how best to design the website to meet their individual needs. About three-quarters of the people who responded said they would like the website to contain a larger amount of reference material. This is in addition to the complete textbook already on the site, in addition to the related problem sets, exams, and solutions, and in addition to the animations and simulations already there. It seems clear that they want other kinds of materials. This is an example of how, in an online learning community, we can all contribute. We hope that it is not just going to be those of us at M.I.T. contributing this reference material. In a true online learning community, people from other

universities and from other countries would also post useful reference material. In this way, the community really becomes a participating, collaborating community.

Over 80% of the respondents said they would like to communicate with others in the urban O.R. field within the online learning community, and we are going to accomplish that. They would like a question and answer board where they could receive advice on problems they are trying to solve. I think this request came particularly from the practitioners. One person was designing a new transit system in Lima, Peru, and anticipated having lots of questions on how to do this, questions that could be posted. Not only could consultants and practitioners answer, but also students and professors could help as well. In an online learning community, everyone could collaborate to solve real world problems.

Returning to the survey, respondents seemed not to be so interested in real-time chats. They did not think this would be useful, particularly in light of the twenty-four time zones around the world. It would be hard to get everyone together at the same time! However, they were very concerned about keeping this community up to date on the latest in urban O.R. research, news, etc., so as to keep it current and exciting. Finally, the practitioners were particularly intrigued by the concept of applying the urban operations research model-based technology and approach to other areas that are slightly out of the box from urban operations research, such as supply chain management and software development. They want to be able to turn to the Urban O.R./ OCW website for suggestions on applying these concepts to many different areas and fields.

Synergistic Experiences in Distance Education
On Good Clinical Practice and Other Medical Subjects

Presented by Robert H. Rubin, M.D., F.A.C.P., F.C.C.P.[1] and
Honorio Silva, M.D.[2]

As the complexity of modern medicine has increased, the need for multidisciplinary collaborations has become obvious. What is still being explored is the nature of these collaborations and what the range of activities should be. In this presentation we will concentrate on the interaction between academic medicine and the pharmaceutical industry - in the best of worlds, there is synergy between the two to reach a common goal, optimal medical care; in the worst of worlds, this relationship is dominated by concerns of conflicts of interest and by a perception of conflicting goals. Ideally, a unique partnership results, one in which long-term collaborations are built, common goals are emphasized, and the individual needs of all concerned are respected and accomplished. The end-result is scientific progress, the potential for improved medical care, and the need for dissemination of this new knowledge to optimize the impact of scientific advances. I have been privileged to enjoy such a successful relationship, in which distance learning has played a key role."

I am a practicing infectious disease/critical care clinician, concerned primarily with infection in immune-compromised hosts such as organ and bone-marrow transplant recipients, AIDS, cancer patients, and those receiving immunosuppressive therapy for a variety of diseases. My professional life has been spent taking care of the "awful awfuls," the rapidly lethal diseases that complicate the conditions listed above. In addition, I am an experimental pharmacologist, who has a research agenda that is informed by observations at the bedside that delineate unmet medical needs. New diagnostics and therapies not only improve my ability to care for my patients but also serve as probes to increase my understanding of particular conditions. If one is involved in such work, I believe that there is a moral obligation to share information with colleagues around the world. Scientific advances are closely linked to educational efforts. We have found that the LINC initiative not only fosters the multi-disciplinary collaboration which is essential for progress, but also is a remarkable tool for disseminating medical knowledge and information about good public health practices.

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In this session, we are talking about major LINC success stories. I would like to speak of a kind of success story that you rarely read about, a successful collaboration between industry and academia to improve the sharing of medical knowledge throughout the world, utilizing distance-learning techniques. In this case example, the collaboration has been between Dr. Honorio Silva, a senior medical officer at Pfizer, and myself, an academic physician-scientist, who share a similar vision of the potential role of educational efforts in improving medical care throughout the world community. This collaboration has nothing to do with the marketing of drugs; it has everything to do with the dissemination of information, both for the care of the individual patient and in improving public health practices around the world.

What kind of Internet-based medical education programs do we have? One is a public health-education program. This is significant because we are using distance-learning technology to disseminate medical information not only to physicians, but also to public health workers, health care planners, and, even, economists. I have had the privilege of working in developing countries and have discovered, somewhat to my chagrin, that the physician was not the most important part of the medical team. Of at least equal importance was the social anthropologist who could take what we needed or wanted to do in the public health arena and reinterpret it so that it fit into the village politics, mores, history, customs, etc. It has been my experience that public health programs in developing countries that had access to social anthropologists were far more successful than those that were wholly doctor-based.

I should point out that my profession, the medical profession, is one that knows the value of, and is dedicated to, continuing education. The issue is not should there be Internet-based continuing medical education for workers in developing regions, but rather how to accomplish it. There are many areas where such programs would work well, and I will only mention a few. Water safety is certainly an important one. There are probably more deaths from impure water, particularly in young children in the developing world, than from most other infectious diseases that occur in that same population. If we could teach principles of water safety to public health workers, which we can do through an internet-based program, that would be a real contribution to world health.

A second area is immunization strategies. There is a great deal of distrust about immunizations, both in the industrialized world and among the newly emerging countries. One could teach public health workers online how to address this distrust, presenting information in a manner and a format that would be most accessible to the target populations. Maternal and child health is a third area. Public health workers, as well as people at risk, in developing countries need education about how to optimize the health of both mother and child. Internet based programs can be "customized" to include general principles, as well as specific points that are important in a particular country or region.

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The traditional way of providing this continuing education is through direct contact between experts and practitioners. Such programs, though useful, are both expensive and inefficient, often with less than ideal carry-over to medical practice. On the other hand, Internet-based education can supplement these symposia, by providing additional information, key references, and a mechanism for creating a network of professionals who share common problems. In addition, the internet can provide a "rapid response" medium for sharing information on emergencies, whether such emergencies are newly recognized diseases like SARS or rapidly changing fields such as AIDS. We can provide critical information on diagnosis and treatment; how to access critical information and how to interact with both medical experts and public health and relief initiatives. There are many new diseases out there for which we do not even have a name now. Internet-based continuing medical education to developing regions is a way to keep people throughout the world abreast of such emerging diseases.

In the initiatives that will be described by my friend and colleague, Dr. Silva, we have courses and we give exams as part of the material that we provide. If a student qualifies by showing the ability to master the information, then that student becomes credentialed and also becomes a member of an international network of medical scholars. Members of this network have the right and privilege, and are encouraged, to send case studies and questions to us, and we send the same to them. Previously I received approximately fifteen inquiries a week through this network regarding how to manage problems. We believe that we will do even better with an e-conference room that will promote problem sharing and solving.

Partnerships are critical in terms of how to accomplish things. So what do we accomplish here? We provide innovative training solutions. We leverage technology to deliver the education. We provide a cost-effective alternative through Internet-based courses, and we provide case solutions that draw on experiences, both positive and negative, from all interested parties. The point I would make that has not been mentioned, about which I feel very strongly, is that this is a bi-directional exercise. We do not have a monopoly on the knowledge in any given area. The practical experience in the field is what sets the agenda for all of us. It is so important to get people around the world working together on new cases, difficult cases, new training programs, etc. This is where the excitement comes from. In my opinion, this is the future of medical education and public health education, and it is going to be exciting to be involved in its evolution.

The impetus for this initiative came out of traditional 3-5 day courses that Dr. Silva and I organized for Latin America. We have found that this Internet-based model by itself is a very effective mechanism for conveying information; in addition, it is particularly useful to supplement information presented in the traditional continuing education symposia. I

am grateful for the opportunity to talk with you, and I am grateful to Dick Larson for making this technology available. Finally, it has been a particular privilege to work with my friend, Dr. Silva, who will take over from this point.

Thank you, Bob, and good morning to everyone. Pfizer has become the largest pharmaceutical company in the world, and we at Pfizer think that we need to change the perception of the pharmaceutical industry. People think of pharmaceutical companies just as moneymakers or pill-makers. But in real life, the pharmaceutical industry makes significant contributions. That industry not only pursues the discovery and development of new drugs, but also works with academia and the medical profession to communicate knowledge of innovative medical concepts. We at Pfizer regard it as a part of our mission to be valued not only as the premier pharmaceutical company, but also as the partner of choice when it comes to challenges of public healthcare. It was in this spirit of partnership that we came to recognize the critical need for information, education, and debate among physicians and all healthcare practitioners. For this reason, we have tried to use the Internet to achieve this objective. By means of this technology, we believe we can effectively create strategic alliances with academia, with medical institutions, and with the medical societies to effectively deliver information, education and debate in medicine.

The first of our activities was started a few years ago around the subject of clinical practice. What is Good Clinical Practice - GCP? Nowadays, no clinical research that is sponsored by the pharmaceutical industry can be conducted without full allegiance to a standard of good clinical practice. It is expected that every study, conducted not only by pharmaceutical companies, but also by any academic or clinical institution, should follow uniform standards of GCP. This means that every investigator, every doctor or healthcare practitioner, conducting the clinical trial should receive formal training in GCP. As a matter of fact, it has become a new trend in the United States and also in Europe to require certification of investigators in the area of good clinical practice. GCP is a set of global standards we find very crucial in order to conduct safe and effective clinical trials. These standards insure not only the quality of the trials, but also the safety of participating subjects.

When we at Pfizer recognized the need for training in this area, we made contact with Dr. Rubin who had started a few years earlier giving in-house training to clinical investigators. Then, we at Pfizer, in collaboration with Dr. Guillermo Rodriguez-Gomez, president of the *Instituto Costarricense de Investigaciones Clinicas,* ICIC, S.A., a research center in Costa Rica, began, in 2000 to present GCP courses in Latin America. These courses were uniformly well received, and were felt to provide a useful way to train clinical investigators. Local medical societies became partners in these educational efforts, and it became clear that we had identified an important need.

However, both Dr. Rubin and I concluded that this method of course delivery was not cost-effective, and for that reason we decided to develop something on the Internet. We created a web-based course on Good Clinical Practices, developed in collaboration with Harvard, MIT and Professor Larson. Basically, this is a 14-hour course that addresses all subjects pertaining to clinical research. The course was initially made available in two languages, English and Spanish, 24 hours a day, seven days a week. It has been received with great acceptance and proven to be quite successful. We offer it in different versions, including audio, video, transcript, etc., and all versions include interactive exercises and a final test for certification by the sponsoring institution.

As you can see, this course has been a real success, and we are very proud of it. For this reason, we are also planning to develop other courses also related to clinical research. Interestingly, the Chinese Food and Drug Administration (FDA) learned about our Internet-based course through Dick Larson, and they became very interested in it to train and certify their investigators. So the Chinese FDA approached MIT, who controls the copyright for this course. They also approached Pfizer to obtain the right to license the material for China. In this way, we worked together and prepared a third version, a Chinese language version of Good Clinical Practice. There was close collaboration between Pfizer China, Chinese-speaking personnel at MIT, Pfizer USA, as well as the Chinese government. This version of the course was formally launched in April 2004 to the Chinese population of clinical investigators for their certification process. It will be available not only on the MIT server, but also on the server of the Chinese FDA.

Now I would like to discuss with you additional efforts of the Pfizer Corporation within the medical community. We have been active in building medical web portals for Spanish speaking populations. Let us start with Promedicum, which has become the second largest web portal in Mexico. It was developed as a cooperative effort by the National Academy of Medicine in Mexico, the National Autonomous University of Mexico, and the Pan American Federation of Medical Schools, with Pfizer as a major sponsor. The aim of this collaboration was to create a web portal in Spanish, developed first to provide information, second for education, and third as a medium for debate. Nowadays virtually everything on the Internet is in English language, but we wanted to produce something for the Spanish-speaking customer. We launched Promedicum with twelve hundred members registered in its inception, with the ultimate goal of reaching 80,000 members. Now, after three years, we have about 30,000 visitors, making us the second-largest portal in Mexico. Originally the people came to the medical web portal for information purposes, and now they are coming increasingly for educational purposes, with about 30%-35% of the users coming for that purposes. The benefit of this initiative to Pfizer is demonstration of

goodwill, creation of a more positive image, and recognition as a contributing partner of academic institutions.

Here I want to emphasize that it is not enough only to develop the technological tool. We at Pfizer have learned that the real challenge is how to effectively use the tool. For example, there has been a steady increase in the use of Promedicum by the Mexican population, with a current average of approximately twelve hundred visits daily. However, this has been a result of intense promotional activity on many fronts. You may have a technological tool, but if your tool is not well known, the use will diminish. So what is needed is effective implementation of metrics. When we have one of these projects, metrics must be established in advance so we can assess what the real benefit of the tool will be.

Now I would like to introduce a second Pfizer initiative. This is a cooperative of medical societies that use a common technology provided by Pfizer. There are 25 medical societies included in this cooperative, with 24 of them coming from United States bringing a potential population of about a 140,000 physicians. Each society has its own website, but they share common content. The idea here is that we create a community of users for the exchange of information, education and debate. Each of the participating medical societies has full control of how they want to use the website and the content. We at Pfizer simply cooperate, providing a technological platform and some content, while the member societies decide how to use it effectively. For Pfizer, this initiative is a way of showing that we are partners of choice. We want to become the most valued company for our customers, for our medical population, and for the communities in which we live. In addition, an initiative like this one provides an intrinsic value for society. Through it, diverse medical societies are beginning to speak to each other, to communicate. Actually, there is a waiting list of societies that want to participate, and we are assessing the impact of bringing 20 more societies into the cooperative.

In conclusion, we at Pfizer are working to create communications networks in the healthcare field because such networks have been lacking. Communities of learners for information, education, and debate are needed in public health. To accomplish this goal, we must create partnerships, and the pharmaceutical industry should not be seen as the foe, but rather as a good strategic ally in healthcare. This partnership between Harvard, MIT and Pfizer may become a model of what we can do together in the future.

SECTION TWO

COMMUNITIES OF LEARNERS:

WHAT IS KNOWN?

Distance Learning and Communities of Practice

Presented by Etienne Wenger
Author/Consultant in the Field of Communities of Practice

      I actually started my academic life in a field called intelligent tutoring systems where we were using artificial intelligence technology to try to create a replacement for the teacher. Actually the field just about imploded after I had written a book about it, but by then it had also imploded for me. What was troubling to me about the models we were building, these computer- based models of a learner, was the fact that we were trying to place these models inside a computer, with the goal that the models would be used to direct pedagogical interventions by the system. What disturbed me about these models was the fact that the whole notion of meaning was always something that you had to push outside of the system. We were building models of information structures that were changing over time, but we always had to count on the social world to attribute meaning to the information structures inside our computer-based models. My discomfort with this process caused me to leave the field of technology. I went on to work with anthropologists in part because they were talking about social systems where the negotiation of meaning was happening inside the unit of analysis. My current interest in communities is the result of a quest to include the meaning of learning in the unit of analysis. To this end, we came up with the notion of community of practice, if you will, to enable analysis of a social system in which learning and its meaning could be accounted for inside the unit of analysis.

      Already today we have talked about fun and we have talked about communication. I think what is interesting is that people often think we have to make learning fun. Yet this depends on what you mean by fun. For example, it is interesting to look at adolescents who do things like pierce their tongues to put rings through them. Certainly, that is not my definition of fun! However, for these adolescents the act of piercing is extremely important in terms of what it means to them for their identity, for who they are. Therefore, I think there are certain things we need to think of and do when we try to make learning interesting and fun. We need to have a deep notion of who our learner is. In my past life, when I was building the artificial intelligence model of learners, I had a very simplified, limited understanding of what a learner was. For those of us working in the intelligent tutoring systems field, a learner was an information processor, and we needed to give the right information to that processor so the processor could process better. We had a very simplistic understanding of who a learner was and, therefore, of what learning really was. What is interesting to me now with the notion of online learning communities is that while technology is coming back into my life, it is coming back with a very different sense of the place of technology within

learning. In online learning communities, technology serves the process of the meaning-making in the community, rather than technology taking the place of a teacher. A friend of mine always says that we have to learn how to build systems for experts, rather than expert systems. For me, coming from where I started out, that is a really significant shift in understanding where technology belongs in the design of learning systems.

Here is a quote by Albert Einstein that I think is wonderful because it talks about community and about individuality and about the two needing each other.

> "The positive development of a society in the absence of creative, independently thinking, critical individuals is as inconceivable as the development of an individual in the absence of the stimulus of the community."

I think this is a critical point to start with when you talk about any community because the presence of a person in the community is actually very important. To what extent do the person and the community need each other to survive and thrive? I invite you to think for the next half hour about the connection between learning, identity and community because, to me, those are three fundamental elements of what makes a powerful learning system, a learning system within which people can negotiate the meaning of what they are learning,

You may wonder what I mean by the word, "meaning." Let me attempt to explain with an example. Sometimes we need to teach math by using manipulatives because these manipulatives will teach kids the meaning of what they are doing. To some extent this is true. I think this method is very valuable, but then again, the problem with such an approach is that it still takes a relatively narrow notion of what meaning-making is.

As a boy, I did learn math by understanding that 2+2=4 because I could see that two blocks and two blocks made four blocks, Within the context of early education, I think it is really important for kids to understand this concrete connection. On the other hand, however, I had studied math through the age of twelve before understanding that math was the life of some people. That for some people math was their identity. I remember the teacher who, outside of class during recess one day, invited me into his own identity as a mathematician and explained to me what math meant to him, That was such a revelation, and the meaning of mathematics changed dramatically for me at that moment. However, the change was not just in terms of understanding how a number relates to objects in the world, but also in terms of what mathematics means in my life and in the lives of people who are deeply interested in the field. Now I hope you can see what I mean. I am describing a complex notion of who a learner is and

what the meaning of learning is in people's lives, particularly with respect to the communities in which they express their identities.

Now I will start with a quick case study to introduce some of the ideas that I would like to discuss with you. It is the study of a community that was developed at Health Canada. Health Canada is the body of the Canadian Federal Government that overseas health policies in Canada. An important part of their work is to connect with the public and to involve the public in decision making through a complex public involvement process. In 1997, there was a directive to substantially increase the level of citizen involvement in the decision making process of Health Canada. As is often the case in a bureaucracy like the federal government, they opened a secretariat that they called a "Secretariat of Public Consultation." This was supposed to be a center of excellence on public involvement that would provide consulting services to the different branches of Health Canada. As it turned out, however, the secretariat did not have enough money to do things the way they usually do, i.e. to hire a consultant to write a toolkit or manual. Instead, they started to involve actual healthcare practitioners in the design of their own public involvement toolkit. The end result of this process was the development of a public involvement toolkit that has an excellent reputation not only in Health Canada, but in the whole of the Canadian Federal Government. So what we have here is a toolkit that was designed by practitioners for practitioners and one that is probably the best of its kind around.

Since that experience, the team at the secretariat has realized that its most valuable function within Health Canada is not so much to provide a center of excellence - a consulting service - as it is to weave the community of public involvement practitioners together. While they still do some consulting, the essence of this consulting is really instrumental to weaving together the community of practitioners. Now if a practitioner has a problem, rather than just giving them the solution, the team would connect that practitioner with another who has faced the same situation.

This case study sets forth a proposition that is at the leading edge of my own thinking. As I look around, I am starting to observe something that I would call a process of the "horizontalization of learning." What I mean here is that traditionally we have viewed learning as a process of exchange that involves a provider of knowledge vertically providing knowledge to a recipient of knowledge. Now it seems to me that there is a bit of a shift culturally in our understanding of how this learning process works. When I refer to the "horizontalization of learning," I do not necessarily mean that experts disappear, that each person is helping and is just as good as anybody else. What I mean is that in order for a successful communication of knowledge to take place, there must be a process of negotiation concerning the mutual relevance of that knowledge. For example, a friend of mine works for the National Health Service in the UK and is really interested in the topic of medical consultation. In particular, he is interested in moving from the notion of medical consultation as a

vertical process of expert advising patient, to a more horizontal approach recognizing that any patient living with a disease is also an expert. Can these two kinds of experts - doctors and patients - engage in a process of negotiation by which their two forms of knowledge inform each other in such a way that they can come to a shared understanding of what needs to be done? Especially for doctors, getting patients to take medicines is a great problem that will persist if those patients do not participate in the negotiation of what their disease is all about and what it means in their lives.

In many places, I see the beginning of this shift of a view of learning from a vertical to a more horizontal connection. Business is an area where this idea of "a community of practice" really has taken off. Here I am referring to businesses that need to deal with knowledge. When you create a community of practice within a corporation, what you are doing is creating horizontal processes of learning among practitioners. These horizontal processes really turn traditional Taylorism on its head. In Taylorism, management extracts knowledge from practitioners, transforms it into procedures and policies, and then directs workers to become the implementers of that appropriation of knowledge by management. On the other hand, in a corporation with "communities of practice," management acknowledges that practitioners are in the best position to manage the knowledge they need in their practice. Such management develops a context - either on or offline - in which practitioners can swap stories, thereby creating a horizontal process of learning in which they can improve their practice together. This does not mean that experts do not have a place. It does not mean that the community would not invite an MIT professor from time to time to come and give a talk. Rest assured, MIT professors still have a place to live in this world!

A company where the community of practitioners was not working very well invited me to come and take a look. We very quickly diagnosed what was happening.   These communities of practitioners had taken as their main goal to organize brown bag lunch speaker series.. As it turns out, they had good speakers, but they did not have the opportunity to share knowledge with each other, these horizontal learning connections, so the lunch program was not very energizing. This morning we heard about the Weight Watchers, and what is energizing about that community is the opportunity it affords members to hear their mutually helpful stories. In such a community, there is a degree of high relevance because the person sharing a story is one's peer. Of course, this does not mean that the scientific research done on human metabolism and nutrition is not relevant to Weight Watchers. However, it is absorbed by a community that has horizontal connections among members to negotiate for themselves and among themselves the meaning and the importance of any research that they read about.

A question for us to consider here today is whether or not modern telecommunications technology might have a role in changing the learning process to a more productive negotiation of mutual relevance? I think that there is great advantage to technology, particularly on our campuses where online communities are not just used for distance education but as an adjunct to face-to-face classes. With these online communities, it is important to insure that there are processes set in place by which students can help each other negotiate the meaning of what they are receiving. Actually at Stanford University, many students feel they learn more by watching the distance learning video than by attending the lecture because they watch the video in groups, stopping it at times and negotiating among themselves what was said in the lecture. One Stanford professor has made this into a process by arranging for these groups to have a moderator who helps the students take full advantage of the recorded lecture. Some professors who have included online discussions as an ad-on to their face-to-face classes have told me that the people who talk a lot in class are not necessarily the same people who talk a lot online. It seems that people find their voices in different mediums. It seems that one of the big advantages of modern learning technologies is to offer more "multi-vocality" by drawing in different people through this new medium.

So far we have discussed what this shift from vertical to horizontal learning means to the institution internally. I think that for schooling in general, and higher education in particular, what a major shift like this would question is the relationship of the institution to the rest of the world, the connection of people who are learning in an institution to those engaged in mature practice outside. Historically there were good reasons to separate schools from the world -- to save kids from child labor. This is not so much of a threat today, and, therefore, I think we may need to question this sequestration of learning institutions from the rest of the world. Similarly we need to question whether it is a good idea to front load education in the life cycles of people.

However, I think a much broader question that needs to be put to educational institutions with respect to these horizontal distance learning connections is how to build in the experience of interacting in a horizontal way with masters in the field. This is why MIT can put its courses on the Internet, and it does not matter because the real value of these courses is the negotiation of mutual relevance with an expert in the field. This process of negotiating mutual relevance with an expert in the field is really at the core of our discussions today. How to generalize that negotiation in online learning is the really big question.

Now I would like to move to a discussion about just what I mean by the term "mutual relevance." For example, a patient who goes to a doctor is not expected to know much about the disease. This patient is expected to know a considerable amount about his/her experience of having the disease. The doctor needs to know as much about the patient as the patient needs to know about the doctor, and this does not mean that

either the doctor or the patient is going to know all there is to know. On the contrary, it is precisely in trying to create a relationship, a learning relationship, that the doctor's and the patient's mutual relevance can be negotiated. Here we are not saying there is equality, that both of these people know the same thing. A doctor and a patient know very different things, as do a teacher and a student. As a student, what you know a lot about is your own trajectory and your own goals - where you have been and the kind of life experiences you have had that would allow you to give meaning to what you think. That is your expertise as a student. By using the term "horizontalization," I am not assuming equality in some sort of naïve sense. What I am assuming is equality in the sense of voices, rather than equality in terms of knowledge. The way you achieve this is by honoring the perspectives of all the participants. However, this honoring does not assume equality in some kind of linear sense.

Within the current system of education, we view education as a concentrated preparation for something else. The goal of a learner in an institution is most often to have a degree, and to have a degree means to have acquired a certain amount of knowledge and skill that is certified by an institution and is acceptable outside of that institution. I suggest that a more horizontal approach to learning would prompt us to question current assumptions that education is best viewed as concentrated at the beginning in preparation for something else. Today a person learns in the beginning, and the rest of life is an application of that learning. I think that the ideas we have been discussing here would question this approach and would encourage educators to start thinking about learning trajectories that are a lifelong process. Within this context, the education in the beginning of life is just to jump start a lifelong process of learning. Such a perspective would change the view of education from a process of imparting a defined curriculum to all students in preparation for life. Instead, the process of education would be viewed as the design of trajectories through the broader learning system within which traditional educational institutions have a function.

Fun as a Magnet to Online Learning Communities

Presented by Dr. Lisa Neal, Editor-in-Chief
eLearn Magazine

The basic premise of my talk is that when in an online learning community or online course, if you enjoy yourself in a meaningful and appropriate way, you will learn, participate, and retain more. I would like to present a case study of the project that got me thinking about the role of fun in online education.. Following that, I will talk about what makes learning fun and, in particular, what makes online learning communities fun. Finally, I will conclude with some principles for creating and sustaining online learning communities.

The case study is of Plimoth Plantation's Online Learning Center (OLC), available at www.plimoth.org/OLC. Plimoth Plantation received Federal and private foundation funding to build an online learning center to teach children about the 1621 harvest celebration. I was project manager for this undertaking, my first project for a museum and my first project for children. What I want to focus on here is what I learned and how it has impacted how I design online learning for people of all ages.

Plimoth Plantation is a living history museum south of Boston where visitors talk to interpreters who are in costumes, use authentic dialects, and remain historically correct to the year of 1621 in Massachusetts. We maintained this same theme in the OLC by using two children who, in their modern personas, guide learners through the online program, and who, as 1621 children, the girl an early Colonist and the boy a Wampanoag, provide information about their lives. Also, to add to the sense of mystery that we wanted to have -- and in keeping with some of the fantasy themes that are clearly popular among children today -- in the beginning of the online experience, the two modern children morph into the 1621 children. In addition to the use of the children, the essence of Plimoth Plantation is captured in the OLC through the visual and auditory richness of the site and through "Visit the Expert" pages that capture the expertise of Plimoth Plantation staff.

The driving force behind the design of the OLC, besides capturing the essence of Plimoth Plantation, was to teach children about the events of 1621 and about the lives of the early Colonists and the Wampanoag. Rather than spoon-feed facts to children to meet the social studies standards, we wanted them to acquire an understanding of the abiding impact of 17th Century events on modern culture, in particular, how the Wampanoag People and the early Colonists who settled in the US, met

and lived together. Furthermore, we wanted children to understand what a historian is -- how a historian thinks and works -- and to empower children to become historians themselves and conduct their own investigation into the events that later became known in the U.S. as the first Thanksgiving.

The biggest challenge we faced was how to design a sit that met the above goals and was appealing, engaging, fun, and educational for children. We wanted children to participate in a purposeful way so that it was clear that they were thinking about what they were doing and that they were learning. Yet at the same time, we wanted them to enjoy the activities. As we designed the activities, we built in rewards for learners; for example, when somebody completes one of the activities, a turkey runs across the screen saying "gobble, gobble". We found that these kinds of rewards and surprises appealed not only to children but also to adults. Additionally, we use audio to supplement text throughout the site because our target learners are children, and the audio helps those who are not strong readers. With the activities, we provide an option called "Visit the Expert," through which online learners have the opportunity to be exposed to learning opportunities beyond what is available to visitors to the physical museum.

One of the objectives of the OLC is to help children, as historians, to understand what a primary source is and how primary sources are understood and interpreted over time. Because this primary source material was in the original English, we used the notion of a magic lens that a learner can drag over the document for translation into modern English.

The Wampanoag page had a number of goals, of which the most important was to help children understand that these people existed not only in the past, but continue to live today in this locale, carrying on in many ways like their ancestors did back in 1621. Related to this, we depicted many aspects of life and giving thanks that are still common among Wampanoags today. To access these various Wampanoag cultural notions, a learner can click carved stones to get information about an aspect of how they give thanks.

Another important page, that of the early colonists, is a multi-layered page. The modern girl shows you the village and then she morphs into her 1621 persona who guides you through aspects of the colonists' daily lives. In developing this page, we needed to anticipate the kinds of questions children would want to ask. Where do you sleep? What do you eat? We even provide information about chamber pots, because it is one of the things children are curious about.

Rather than ending this online learning experience with the multiple-choice test that is so common in online education, we designed a culminating activity. We ask learners to create an online museum exhibit, thus giving them a chance to express their personal understanding of what they have learned. One of the things we hope to do in the future is to give children the opportunity to share their exhibits with other children. There

is a Teacher's Guide with the OLC, and we also want to provide teachers with the opportunity to share in an online learning community how they are using the site in their classrooms and to add their experiences to the guide.

In summary, the activities in the OLC vary considerably, providing visual and auditory richness, layers of information, rewards, and surprises. This is in sharp contrast to the typical e-learning experience, which is linear, interspersed with multiple-choice tests, and without surprises or rewards. Our approach creates a highly exploratory learning environment. We started off trying to find a balance between learning and fun, to engage children and meet our educational objectives. Instead, we realized that we needed to make learning fun: to make it an interesting, enjoyable, and compelling educational experience.

Online Learning for Adults

In contrasting the resulting OLC with e-learning for adults, I realized that adults similarly like to explore, be rewarded, and have fun. Learners of all ages learn and retain more when learning is engaging and enjoyable. In the case of the Plimoth Plantation project, we learned in both the formative evaluation and in later testing that children and teachers understood important concepts, such as what are a primary source, a historian, and a myth. There were also more subtle examples of learning. For instance, before visiting the site, children referred to the historical figures as Pilgrims and Indians, while, afterward, they talked about the early Colonists and the Wampanoags. The experience changed their understanding and moved them away from a stereotypical view of history.

Online Learning Communities

Now you may be asking yourself, "How does this relate to online learning communities?" I believe the implications for online learning communities arise when you start looking at what motivates people to use them, what makes the experience rich and engaging, and how to insure that learning took place. These are fundamental questions to ask in determining how to attract people to a community and how to get them to return. There was a recent Internet study that found that 44% of all adults in this country are contributing to some form of online world, online community, or website. It is obvious that contributing to an online community is becoming pervasive throughout our society. After seeing this study, I started examining my own use of online learning communities and surveying friends and colleagues to ask about the online learning communities they use. What attracts them to those particular communities? What gets them to keep coming back? What type of learning takes place? I will present some examples of what I learned about popular virtual communities.

NeoPets is the world's largest virtual pet community, used primarily by children. This community can seem to be a frivolous world,

but NeoPets is a compelling introduction to economics because you collect currency, make purchases, open a storefront, have an auction, trade, etc. It provides a very effective and highly motivating learning experience.

There have been many recent developments in the use of virtual worlds, some of which are NeoPets-like communities for adults. While some virtual worlds are solely for educational purposes, many are environments in which people create avatars and wander around in that world, exploring and learning about the inhabitants, culture, economy, etc. In many of these worlds, as in many online games, there are cheats, People learn tricks and then share them in communities that evolve around the use of these worlds and the sharing of insider information.

Massive Multi-Player Online Games and Massively Multi-Player Simulations provide virtual worlds that people use for play, but often have educational purposes as well. Examples are military applications, such as *Go Army,* which is used as a recruiting tool by the U.S. Army. When involved in these, people are typically not thinking about learning. Instead, they are focusing on the activity they are engaged in, often in a *flow* state.

The examples so far are graphical and/or immersive, yet the most popular online communities are primarily textual. A number of people whom I interviewed about online communities were embarrassed to tell me about the communities where they spend time. One woman, addicted to *The Bachelorette* T.V. show, is a regular reader and contributor to an online bulletin board about the show on which people share advice about relationships, love, and dating. Similarly, online communities have been created around Donald Trump's T.V. show, *The Apprentice*, where there are lively discussions about issues including leadership, how to get ahead, how to dress, how to conduct yourself appropriately in a business situation, and how to overcome gender and race biases.

Another person told me about her use of supportive communities such as Weight Watchers. This is a perfect example of the donut model that Dick Larson described, where first you have an organization like Weight Watchers, and then a self-policing community develops around it where everybody educates and supports each other. What impressed me the most was how postings start off with personal information and stories, often quite compelling, wrapped around their weight loss advice or request for help. The instantaneous feedback provides a reward system for participation.

With the Internet, everybody can become a critic. Many sites provide non-professional book, movie, restaurant, or hotel reviews and ratings. Amazon.com integrates the reviews and ratings of readers with the ones from Publisher's Weekly reviews, and both are informative in different ways. Some review sights have mechanisms for rating the usefulness of the reviews, which is helpful for readers of the reviews and is rewarding for the contributors.

eBay is an example of an online community in which the discussion area is where informal learning takes place. eBay is also an excellent example of how a community develops and enforces rules for appropriate behavior and rewards for participation. People can see a buyer or seller's feedback score and a buyer's positive feedback percent, all indicators of and rewards for participation. There are countless other virtual communities that provide learning and support, and also reward participation.

Basic principles for creating and sustaining online learning communities

There are many examples of online learning communities that are successful. They attract people by helping them to learn something that is otherwise not possible or more difficult to learn. For instance, if you are programming and have a bug, you can search in a community to see if the same question has been asked and answered or can ask the question. People answer quickly to have the first response and answer accurately to demonstrate their mastery; if they do not then someone will critique their answer. This provides a self-monitoring process and increases social capital and awareness – who is there, what they know, and what they are doing.

There must be a critical mass for a community to survive and at least some contributions must be current, interesting, relevant, and immediately useful to a potential participant. This necessitates understand what someone is likely to be seeking. Community participation is typically voluntary. Most corporate knowledge management efforts suffered from poor participation because employees were mandated to participate, rather than driven to participate because of intrinsic motivation.

In conclusion, people want to learn and to share their knowledge, but they want rewards and a sense of accomplishment. These elements feed upon themselves, providing an incentive to return and to continue participating. A sense of commitment grows in parallel with the sense of satisfaction – even if the trigger is just more points or a higher score to notify others of your expertise. All of this leads to active and highly participatory online learning experiences that can be compelling, engaging, enjoyable, and fun.

Design and Mechanisms of Knowledge:
Constructing Online Learning Communities

Presented by Dr. Reuven Aviv
Department of Computer Science, and Chais Research Center,
Open University of Israel
Tel Aviv, Israel

This morning we have been talking about communities of learning, so let me ask, "Are we a community?" While it is true that there do exist several links between ourselves and other people in this room, are we really a team? Are we constructing knowledge, are we a cohesive community? Certainly we are not. In fact, if you look at what is happening this day, it mostly consists of some people talking while others ask questions. That is not a cohesive community. Cohesive community--this is the topic that I am going to focus on. In fact, my talk will be a continuation of what we have heard in the previous session from Etienne. In fact, I am going to start right at the point where he stopped, namely, we are going to see the same kind of questions, the same kind of recommendations, the same kind of horizontal education in the communities where I have done research. Then we are going to probe more deeply, asking questions about the atomic architectures of various kinds of communities. What is really happening over there in a particular community that constructs knowledge? Of course there are many communities, and not all of them are constructing knowledge.

However, this morning we are interested in learning how to make a community, how to design, control, and monitor a community in order that collaborative knowledge can be constructed within it. As a result of research we have done, we do have some answers. I am not saying that this is the recipe because it will take some time to completely understand these communities. Part of the research that I will discuss has been published, and part is still under review. This work was done by myself and by my colleagues from the department of Computer Science at the Open University of Israel.

First of all, however, I have been asked to spend some time talking about the Open University of Israel. The Open University, which is going to be about thirty years old next year, has about thirty-eight thousand students and four hundred courses. The number of students is misleading because these are students who are all part-time. The full-time student body is about a third of this size. The university offers all kinds of programs -- B.A., B.S.E. , M.A., M.S.E. -- in various fields. Furthermore, it has an open admissions policy, and anyone can enroll with no questions asked about prior education or whatever. In fact, when the university was established about seventy years ago, open admissions was a decision made

by the government. The Open University was established along the lines of the Open University of the UK. In fact, we had advisors from that university, and many of the ideas and much of the organization is the same. What we provide is distance learning, but you have to put the distance in quotes because distances in Israel are very small. In fact, there is no place in Israel that you would have to travel to for more than two or two and one half hours. There is no problem for students if they want to come to study centers. In fact, most students -- 80% -- in the Open University of Israel prefer to go to study centers to have face-to-face interaction, and they are willing to pay for that. Therefore, this is not the usual distance learning, in the sense that you find say in Canada, Australia, or any one of those very large countries.

Students receive packets of textbooks, instructions, assignments, written material, CD's, etc. They also have face-to-face interactions, and I think the number of study centers we have now is about eighty. In addition, we have a web-based environment, Internet conferencing, and satellite communications. On top of all this, we have a special department, independent from any other department in the university that does evaluation. They conduct evaluations of every course, every activity, every tutor, and every component of the educational process.

At the Open University, we employ four technologies. The first is the web environment, including all the usual things such as assignments, literature, connections to the video conferencing, etc. We also have satellite communication that is used only for lecture courses where there is a large number of students. In addition, we have a web- based, synchronous communication, including audio and in some places video, that are used for tutorials. Namely, we have tutorials in which the tutor and the students are all sitting at home. They each have their own camera and microphone, and the number of students is about twenty. Finally, the last component is multimedia. In some courses, we have multimedia, however, it is not the policy of the Open University to assume that everyone has access to the Internet. For this reason, course coordinators have to make sure that those who are not connected -- for example, those in the army -- can receive all the essential materials in another way. On the other hand, we know in many courses, such as my area of computer science, that practically everybody is connected to the Internet. In these cases, it is not a big problem to get access to any one of these technologies, including the one with the synchronous video.

Here I have given you an outline of the components of education at the Israel Open University. However, with all of these components, there has to be a rationale. Why do you do it? What is the purpose of all that? The rationale starts from the point that a student's profile arrives at the university. Students are coming from various backgrounds with open admissions. This means that they have different approaches to learning. Therefore, the purpose of the whole environment, including the textbooks and the technology, is to maximize educational performance despite the

students' diverse backgrounds. This is the main reason you want to develop a technology-enhanced learning environment. However, in order to do that you need to have some model. I cannot emphasize this too strongly. You need to have a model of technology-enhanced education to direct your thinking. One such kind of model is the constructivist model, and this is the kind that I have adopted. I was one of the initiators of the whole technological learning environment at the Open University. As a result of this particular model that I am going to describe, we actually put components into the technological environment that encourage and support active and cooperative learning. I am not saying that this is the only model you can think of, but I do believe that some type of model is important.

So what are examples of the supportive components that encourage active and cooperative learning? For one, you have to provide social support because at the end of the day, some of the students are lonely, needing some kind of support, so we provide them with help forums. Then you also need self-monitoring. Students like to know how they are doing. For this, we offer self-tests in the environment, and this is above and beyond all the multimedia and other activities. There needs to be support for active learning within the environment, and this can be accomplished when students present their own work as teams, or sometimes individually, on the websites where they can be criticized by others.

A possible learning scenario of a course at the Open University would run in the following manner. It would start with a satellite lecture that is delivered to about fifteen of the eighty sites throughout Israel. The students would have pre-assigned readings, using the packet of materials they received, including books. They would complete individual assignments followed by exhibition of those assignments on the Web. The students are able to review each other and review notes on the website. There would also be online discussion tutorial, using the synchronous, multimedia, video-conferencing component. The course would also require group projects, including online exhibition and peer review. As you can see, many of the components of this course involve the students in collaborative learning, which is what I will speak about from now on.

So with such a course scenario, we now have a learning community. Yet, how many of the students are actually participating? All of them? Some of them? We acquired some statistics. There were about 158,000 messages during 220 weeks of studying. The total population of students registered for these courses was about 75,000, but only 12,000 students sent one or more messages. Only about 16% of the 75, 000 students were active, but they were not interactive because they never responded to a message.   Out of this large number of students, only 11% were interactive in that they responded to at least one message during the time period.

These low percentages are typical. I found them again and again in many forms. A valid question to ask here is whether or not these low percentages of active and interactive students is a serious problem. I am saying that it is not really a problem. It depends on the way we are looking at the participation. The question to ask when looking at those interacting students is how many partners were they interacting with? One, two, three? Most of them interacted with one partner, i.e. they replied to a message from just one student. That is a typical interaction rate. The question to ask is: "why are they interacting?" We did find out from our study that the students' interaction has nothing to do with the learning communities or with aspects of the technological environment. We discovered that students are using the website according to their needs -- when and where and if they believe the website will be useful to them. For example, students are accessing the websites just about a week before there is an assignment and just about two weeks before they have a final exam. It is always the same pattern.

Therefore, we have to ask ourselves what are the pedagogical needs of these students, and then we will know whether or not this pattern of interaction is normal. For example, we examine the various pedagogical goals of learning communities. Here there are several possibilities: support; sharing ideas, enrichment; discussion; creation of course material; research; etc. Each one of these pedagogical goals is going to have its own effect on the behavior of the students. This morning I will concentrate on one particular goal, and that is the goal of collaborative knowledge construction. This is a goal that requires more work on the part of students, and as you will see, also on the part of teachers. First of all, this goal of collaborative knowledge construction is interesting in its own right. For us teachers, it actually transforms our behavior and our lectures. For the students, this goal requires them to put in more active effort. In general, students resist the idea of working together. "Why should I work together? I'm great." At least the Israeli students are like that!

In order to achieve this goal of collaborative knowledge construction, we have to build teams. Thus, the key two questions become: "What is a team?" and "How can we create teams?" We want to learn how we can build working teams among people who are collaborating via the Internet with the goal of gaining knowledge. Now this brings me to the title of my talk – "The Design and Mechanisms of Knowledge Construction in Online Communities." We do know some things about this process. All the results that I am going to present were attained by means of certain sophisticated, statistical modeling techniques that I am not going to describe here. While I am going to describe the results, I will mention here and there the kind of models we used. Also, the actual data comes from real communities of learning at the Israel Open University.

So what is the bottom line in all of this? The bottom line is that you have to actually design for collaboration if that is what you are looking for. As educators, we know how to design for collaboration, and this collaborative design sets up certain mechanisms. So in our research, we were after these mechanisms. We wanted to find out the social and psychological mechanisms that actually drive students to participate in a team. A team is formed around a shared goal and the members become interdependent, committed to accomplishing certain things. With such a cohesive community, you are able to get collaborative knowledge construction.

To sum it up, there is nothing new here and, in fact, all these ideas are coming from educational theory about collaborative learning that is encouraged in high schools and universities. What is new in our research, however, is evidence that once you put certain parameters into the distance learning design, then you are able to understand what is happening later, why a cohesive community has developed. The most important of these parameters is that you have to have a commitment for an agreed upon goal. If you really want the students to participate, they have to understand that they have a certain goal and they must be committed to it. Whether or not they are going to be committed depends upon their priorities and upon the reward.

You also have to have interdependence in the design and you can develop interdependency in many ways. For example, the course could be designed in such a way that students have to share books. You can even reward interdependence. For example, suppose I tell my class that if they study for an exam in teams, and their team average grade is above seventy-five, then each team member gets an additional five points. This design parameter is called "promotive" interaction. It encourages students to promote each other, to help each other. Another design parameter is the creation of roles. In many instances, designers of learning communities who are aware of this requirement put the roles right in from the beginning. For example, different students can be assigned at the start to lead a discussion every week during a course. Yet sometimes in these communities, nobody is officially put in any roles, but instead the students undertake roles on their own, due to strong commitment to the goals of the course.

Now I would like to discuss the example of two communities of learners. Each community included about nineteen members plus a tutor, and the community's lifetime was sixteen weeks, or a semester. The course was business ethics, and the two teams were designed differently. One was what I call a "team community," and was designed using the parameters I just discussed. This group of students had a goal, a project they had to achieve together. The other was what I call a "formed community," a typical situation in which students are asking questions and the tutor responds. The two groups were tested independently after the semester for knowledge construction. How do you test for knowledge

construction? We did it by content analysis, which is a complicated and time-consuming business. To do it, you have to have the transcript, but with it you actually can analyze whatever was said in the communities. These two communities were using asynchronous, text- based communication, rather than something fancy. Yet our study determined that the levels of reasoning were significantly higher in the team community than in the formed community.

Now I would like to share with you what our research learned about the "atomic" structure of the communities. Just what was happening in each? In the team community, the students actually made cliques. While many cliques did develop, we also found that these cliques were bridged together by students. As a result, what was formed was a really cohesive community. In the formed community, however, you simply had two cliques, and in each one of them, only two participants participated -- a student interacting with the tutor. I am not saying that all the other students were not participating because they were. However, they did not form cliques. The conclusion is that the team community - the one that really constructed knowledge - had many cohesive cliques and several bridging roles that the students took upon themselves.

Another area our research studied was response power distribution. In the team community, you had many participants who were relatively responsive, while in the formed community there was only one central responder -- the tutor. So, again, you have a specific structure here. In fact you can use this, if you want, as a monitoring device.

SECTION THREE

ACHIEVING COMMUNITIES
OF LEARNERS IN
DIFFERENT SETTINGS

UNESCO International Institute for Educational Planning:
Building International Communities

Presented by Susan D'Antoni, responsible for the
Virtual Institute of the International Institute for Planning (IIEP)
UNESCO Paris, France

This morning I would like to talk to you about several activities of the International Institute for Educational Planning (IIEP) of UNESCO that relate to building international communities. But first of all, let me provide a little bit of background.

UNESCO was created in 1945 with a constitution stressing full and equal educational opportunities for all, and the goal of Education For All is currently one of its main priorities. UNESCO works to achieve this goal by encouraging the unrestricted pursuit of objective truth and the free exchange of ideas and knowledge. UNESCO works as a laboratory of ideas and a standard setter. It also acts as a clearinghouse, which relates specifically to the issues we are talking about here at this LINC conference. Above all, UNESCO promotes international cooperation in its main areas of education, science, culture and communications.

The International Institute for Educational Planning is one of the three main institutes initially created by UNESCO in the education area. The focus is on educational planning and management, and IIEP was established to help member states improve the efficiency and effectiveness of their educational planning through capacity building and human resource development. The functions are similar to those of a university – we undertake research that informs the programs of study and we publish.

Of the three functions, teaching is the main focus. Every year, we bring together a group of about thirty-five mid-career professionals from mainly developing countries for a residential program in Paris, the *Advanced Training Program in Educational Planning and Management*. The candidates for the program are selected through a rigorous process, competing for the limited number of positions in the eight-month programs. However, it is clear that training thirty-five professionals annually cannot meet all the demand, so we also provide training courses in the regions on specific topics that relate to educational planning. And more recently, we created the IIEP Virtual Institute to enable us to extend our outreach even more.

This morning I would like to describe the activities of the Virtual Institute. It is a modest program that offers a number of distance education courses each year. In addition, Internet forums are offered as continuing education opportunities. There is also an alumni network that links the people who have come to the annual program in Paris.

I want to talk briefly about two of those activities. First of all, I would like to discuss the distance education courses because the model we have developed is an interesting one. In a way, this model addresses a comment made in the previous session. It was noted that when you bring people to a face-to-face session, you train them, but then they return to their jobs without the skills or the time to implement what they have learned. Our model of distance education is based on institutional capacity building as well as individual capacity building. When we offer a course, we invite the participation of the institution or organization first in order to gain institutional commitment. The head, for example, the minister of education or the rector of a university, is invited to decide whether the course would be useful to their institution. If so, it is the institution that identifies the group of individuals who would benefit most, and should therefore take part in the course. This means that the people who come together to study have the commitment of their institution to the objectives of the course and to their own participation.

The course methodology is based on a combination of independent study and work in groups, which has proved to be an effective approach. First of all, it overcomes "the loneliness of the long-distance learner" and reduces drop-out. There is a group of between five and seven participants in each institution who work together, and, there are usually between ten to fifteen different institutions participating in the course. Each group has a coordinator who is our local contact to organize the work. Participants first work independently with the instructional materials we send them by mail because our target population is not, in most cases, going to have the capacity to download large files from the web. Then they work together in their group – sharing information, sharing their understanding of the course material, and eventually working together on a task. The work undertaken on the task is sent back to the instructor at IIEP for response. The instructor replies to each group directly, but also informs them of responses received from other teams in the course. Normally, at one point in the course we bring all the participants in all the institutions together to interact on a key topic through an online discussion forum so they can all interact.

This model of course development has proven to be quite effective. Although in course evaluations, some respondents suggest that they would prefer to come to Paris, they note that if the course had been held in Paris only one of their group would have been able to take part – and it might not have been them! The overall response has been positive to this model that we initially were not certain would work. It must be remembered that these people are mid-career professionals who remain in a demanding job while taking the course. They have much call on their time, even crises in their institutions or countries to face. And although courses have been designed to use "appropriate technology," taking into consideration a limited access to computers and limited telecommunications

infrastructure, studying at a distance in these circumstances can be a challenge.

The model has worked well to support individual and institutional capacity building and it is efficient in two main respects. First, there is the efficiency associated with the fact that people are able to stay in place and on the job, and second, we at IIEP respond to the work of the teams, rather than to individuals, which reduces the instructional load.

The second IIEP activity that I would like to discuss is our IIEP Alumni Network, which is truly an international community. Over the years, we have trained a large number of people in our residential program. We always refer to this group of people as the IIEP network, but we realized that while it is a network for us, it is not necessarily so for them. We contact previous course participants when are reviewing the country applications for the residential program, and when we conduct workshops in the field. However, they do not have an opportunity to easily continue to contact each other, despite the fact that they had become strongly involved with their colleagues during that eight-month period in Paris. For this reason, we decided we would try to see whether we could link them up in a virtual network. We invited all graduates with an e-mail address to participate, and we now have almost two hundred and fifty people in a network that functions in two ways. First, we have a general discussion list that people can use to share questions or problems with each other, and secondly, we create specific lists for specific discussions on specific topics. At this moment we have a discussion underway with about fifty participants on the topic of "Indicators for Education for All."

There is always room for improvement in any activity. We have participants who constitute our target audience, yet they are not very talkative. Therefore, we are planning to review this service to determine how to best meet their needs.

To sum up, so far I have presented two activities sponsored by IIEP that bring people from diverse developing nations together in a virtual community of learners. The distance education courses form people into a community for a very short period of time to deal with a focused topic. The alumni network is an ongoing community to maintain contact with and between graduates of the annual program.

The third IIEP activity that is related to the topic of this meeting is a study that we undertook on the virtual university, with support from DFID, the British aid agency, and from the World Bank. The reason we decided to look at the virtual university relates to our focus on educational planning and management – virtual institutions pose different challenges from those in the traditional education system. They are not planned, implemented, managed, and financed in the same way, as are traditional institutions with classroom-based teaching. For this reason, it was determined to be valuable to examine these virtual institutions and we set out to illuminate – through a number of case studies – the policy and planning issues faced by virtual educational institutions.

Twelve institutions were invited to write case studies about their experiences. Institutions were selected to represent four institutional types: the traditional institution, the new institution operating online, a consortium and a private enterprise. It was our assumption that an institution created solely for online learning might have different problems from a traditional institution that is developing an online education activity. We released the information in a web publication, with no print version. This was intentional as we felt we wanted to create a space where people could actually see the work evolve and react to it. The web publication contains an overview text from which you can jump out at any time to the full case study or to a brief bio of the authors.

The IIEP objective for undertaking this study was not only to identify the main policy and planning issues, but also to stimulate discussion and debate around those issues, the second objective being very much in keeping with the UNESCO mandate to be a clearinghouse and forum for discussion. Therefore, following the release of the publication, a series of discussion forums was planned to promote discussion. The focus of the first forum was "Virtual Universities and Transnational Education: Policy Issues – What Are They? and Whose Are They?" The aim of this discussion forum was to examine critical policy issues associated with virtual universities and to determine just where the responsibility for those issues resides – at the institutional level, the national level, or the international level. Obviously we wanted to know whether there were international concerns that UNESCO should take a role in addressing. I must say that I was surprised by the response to this forum. Although we did not extend invitations widely, we had 350 people participate. During the first week, we feared the discussion would actually destroy itself because we had such a high level of interaction that many people dropped out. We had about a hundred and seventy messages during that first week, which overloaded the mailboxes of many.

In the discussion forum, we examined four of the case studies, one representing each institutional model. Each of the cases discussed was written by the head of the institution, who also moderated the weeklong discussion of it. After discussing the policy issues related to each of the four models, participants were asked to classify the overall policy issues as input to the creation of a draft of framework. I would like to emphasize that this discussion clearly touched a need in the developing world. It was interesting to see the interest in what could be seen as a rather dry topic. The participants requested that IIEP continue to support interaction and the first follow-up topic that has been requested for discussion is the issue of Free and Open Source Software for e-learning, which is a timely issue and clearly a concern for developing countries.

In closing, I want to mention another project that has built a community. IIEP is part of a UNESCO intersectoral project, along with the Education and Communication and Information Sectors, on developing a knowledge base on open and distance learning for decisions-

makers. The objective was to try to determine what information such decision-makers would need and then to collect it on a regional basis. Three regions are participating: Africa, Asia and the Pacific and CIS countries. Each conducted a needs analysis of the region, which formed the basis for an information system. The UNESCO Bangkok office started off by identifying the people who could contribute to such a base and the people who would be the users, that is, they began by building a community. By actively involving these groups of contributors and users from the start, I would suggest that this group will be most successful in promoting sustainability, always a challenge with information bases.

Let me conclude this presentation by saying that the commonality of the UNESCO activities I have described today is the fact that they all not only link individuals, but also build international communities with common interests and concerns. This international community building is being supported by the appropriate use of ICT's, taking into consideration both the needs and constraints of UNESCO Member States.

Fostering Web-Based Communities of International Leaders

Presented by Dr. Judith Babbitts
Assistant Director of the Hubert H. Humphrey Fellowship Program
Institute of International Education
Washington, D.C.

The Hubert H. Humphrey Fellowship Program began in 1979 as a special Fulbright program designed to bring mid-career professionals from the developing world to the U.S. for a year of non-degree study and practical experience. It is one of over 200 programs administered by the Institute of International Education –known to many simply as IIE. Founded in 1919, IIE has sought to increase international understanding and acceptance of cultural diversity by facilitating study-abroad, research, and training opportunities for people from around the world. Most of these experiences require that individuals cross borders and travel to another country.

Recently, however, IIE launched two Web-based activities to broaden the scope of the traditional Fulbright programs and to take advantage of the so-called "borderless world" created by the Internet. One was an online leadership workshop for the Humphrey Fellows and the other, an online component of the New Century Scholars Program administered by the Council for the International Exchange of Scholars (CIES), a part of IIE. Both activities sought to create communities of practice, or perhaps a better phrase would be, communities of purpose. These activities offer insights for others who are seeking to involve people working in disparate locations within a country, or in several different countries, in collaborative work, discussion, or mutual support.

Let me begin with the online leadership workshop IIE created for Fellows in the Hubert Humphrey Fellowship Program. Each year approximately 135-170 men and women from more than 100 different countries in Asia, Latin America, Africa, and Eurasia live and study together in groups of seven to twelve at 15 host universities around the U.S. The Fellows are selected because they have demonstrated leadership in their professions and for their potential to become regional and global leaders when they return home.

Although the Fellows discuss the topic of leadership in weekly seminars at the 15 host universities where they study, they often do not have a chance to exchange ideas *across* campuses with other Fellows in different fields. The online participants had met as a whole group of Humphrey Fellows in Washington, D.C. at the beginning of their Humphrey year and would not see each other again until their year-end retreat in June. The asynchronous online discussions, then, were similar to

those they would have as they tried to keep in touch with each other after they returned home.

Last year, the Humphrey Program staff thought we would use the Internet to create a community of Fellows across campuses who might be interested in exploring the topic of leadership in more depth. We had several objectives for doing so. We wanted to:

- Create a community of professionals who would support each other online when their fellowship year was over.

- Provide an online-learning experience for Fellows that would introduce them to the techniques of asynchronous exchanges and collaborative projects.

- Encourage exchange among Fellows in several dimensions: across campuses generally and among Fellows with similar interests or in similar professional fields on different campuses.

- Initiate discussion about concepts of leadership, leadership skills, different styles of leadership, and Fellows' own leadership traits and attitudes. Our goal was not to *teach* leadership skills, but to explore ideas about leadership.

- Help Fellows articulate a leadership issue they anticipated encountering when they returned home.

- Guide Fellows in their roles as online advisers to their colleagues.

- Strengthen the Humphrey alumni network.

We asked for volunteers from every campus and therefore had a self-selected group who wanted to discuss global leadership. Students of online communities recognize that having a common interest is important for lively online discussions. We realized, however, that a common interest would not ensure an enduring community and that we needed to design a series of carefully planned activities to achieve our goals.

The majority of the Fellows were not familiar with online discussions. Many had never subscribed to a listserv, and several had limited capability with computers. We had reasonable expectations, we felt, for what could be achieved in a ten-week period. We were surprised, however, by what emerged. We learned, too, that discussions with one's peers online could reinforce, even awaken for the first time, a new self-identity as a leader in some Fellows.

The workshop topics progressed from simple, introductory questions that enabled all the participants to answer from their own cultural backgrounds to a complex exercise requiring that they use the

skills of an advisory-board member to help solve real leadership problems. The questions and readings compelled the Fellows to explore leadership from many different angles. They realized that they had much to offer each other even though they were from over 100 different countries. They had come to the U.S. to upgrade their professional skills and they had learned much from their American counterparts. But they found that their international colleagues had real-world solutions to their common problems and could best understand how to translate new approaches to fit their developing economies and organizations.

Fellows began the first workshop session by posting short descriptions of two leaders from their own countries they admired. Others responded with great interest, remarking that they were learning a lot about the history and politics of their colleagues' countries and finding similarities with their own. The group then summarized the qualities they had identified as characteristic of the leaders they chose and explored the question: "Are there universal leadership characteristics that are common across cultures?" This question remained a theme throughout the workshop as the participants asked if there were "an American-style of leadership", as they described their own leadership styles or characteristics, and as they examined the grassroots leadership skills of three people from Nigeria, Jordan, and China who were in the daily news. Near the end of the workshop, six Fellows volunteered to post case studies of leadership problems they anticipated grappling with when they returned home. Their colleagues became a sounding board for them, asking questions that clarified the issues and giving advice about how to proceed. As one Fellow from Nepal said to the group, "I want us to continue to meet online and for you to give me advice with the problems I will encounter back home. I don't have people I can talk to about these things as I have done with you."

Many of the Humphrey Fellows came from cultures in which the title "leader" is not applied to mid-level administrators or to those in other than high, appointed positions. Women, especially, often do not see themselves as leaders. The online leadership workshop appeared to create an environment in which some Fellows began to think of themselves differently and to embrace the idea they could be leaders. In responding to the question, "What is your leadership style?" one woman wrote, "No one has ever asked me that before and I have never thought about myself in that way." But as if thinking out loud, she then described a situation at home that demanded courage and integrity of her and that changed the lives of the people she worked with, much like the leaders the group had been discussing. In her culture, leadership was a role men inherited, the eldest son taking over from his father. The workshop participants helped her see that she, too, had leadership qualities.

A community of professionals emerged from the workshop and is still active one year later. For the most part, it appeared to us that the participants became comfortable interacting with each other online. Twice

as many Fellows are enrolled this year, and two alumni are co-facilitating this year's workshop. Several others created their own online discussion groups in their workplaces back home.

At the end of the ten weeks, one Fellow told us, "I found it fascinating getting to know people I hadn't talked to in person. I thought they were much more honest because I wasn't standing in front of them. We also didn't have to end our conversation in a short time, and because of that I think we were more thoughtful in what we said."

The second online activity IIE has started is The New Century Scholars Program (NSC), which was launched in 2001 as a new initiative under the U.S. State Department's Bureau of Educational and Cultural Affairs. The purpose of NCS is to provide a forum for international, interdisciplinary collaborations among outstanding scholars and practitioners on topics of global significance. In its first year, the topic was "Challenges of Health in a Borderless World." For the second year (2002-03), the topic was "Addressing Sectarian, Ethnic and Cultural Conflict within and across National Borders," and in 2003-2004, the research theme was "Toward Equality: The Global Empowerment of Women."

In 2001, thirty academics and professionals from 19 countries worked together for a year on the theme of global health. Their goal was not only to examine the social context of global health challenges and disparities and to recommend innovative approaches to strengthening public health around the world, but to build greater understanding between academic and professional leaders from many countries. In other words, to create a global community of professionals who wanted to share their work and collaborate with others.

The group first met face-to-face at a three-day meeting at the end of October at the Rockefeller Center in Bellagio, Italy. Then the participants dispersed to work on their research, keeping in touch via the Internet. They had a second face-to-face seminar mid-year, and in November of 2002, they gathered in Washington, D.C. for a two-week plenary session. At that session, they made recommendations on global health issues -- and as envisioned when the program was designed, but in no way ensured at its end – the professionals continued to work together, mostly online, on the issues they had identified in the previous year.

What role did the Internet and online discussions play in building this community? Along the lines of the traditional Fulbright Scholar Program, the New Century Scholars Program offered Fellows the opportunity to do research abroad for three to six months. While the participants were in the field, they kept in touch with each other through email and a software package that enabled them to post their research papers and findings. They had formed small working groups based on their interests at their first face-to-face meeting and discussed issues and questions raised by their fieldwork.

The Fellows studied topics as diverse as women's health in Ghana, the public health consequences of environmental disturbances, the recovery of post-conflict societies in Africa and in Kosovo, the development of public health in Russia, the role of information technology for health development in Indonesia, and ways to increase community capacity in Thailand. At the final plenary session, they proposed an agenda for improving health by advocating innovation in public health policy and practice on a global scale. To help accomplish this they recommended the implementation of a series of summer courses that would make available to health specialists at the local level new perspectives and approaches to global health education and training. With support from many different sources, both governmental and private, the course was organized and taught by NCS participants at the Mexican National institute of Public Health in Cuernavaca in August 2003. The course attracted more applicants that any other course offered by the summer institute and was highly diverse including faculty, researchers, graduate students in public health, representatives form public health miniseries and NGOs throughout the region – just the mix of professionals that the original NCS program brought together in the first place.

The New Century Scholars Program clearly demonstrated that, as Carolyn Kickbusch, the facilitator of the first group said, "the networks the scholars built, the community they established, had value and impact far beyond the period of the program." The director of the NCS program believes that the online aspect of the year was crucial to building those networks and to sustaining the community that emerged. The scholars were comfortable communicating online with each other and having serious discussions about their research. They even planned online a good deal of the summer course in Mexico. The participants in that summer course decided that they, too, wanted to remain a cohesive group because they saw that themselves as participants in an historic event. They were pioneers, who not only would bring new ways of thinking about health back to their own instructions and countries, but who would also encourage regional cooperation as a result of their summer gathering.   On the last day of the course they discussed creating an electronic forum to maintain contact with one another. They viewed the forum as a first step in forming a network in Latin America and possibly the precursor to a regional association.

What do both of these programs – the Hubert H. Humphrey online leadership workshop and the online component of the New Century Scholars Program – illustrate about creating successful online learning communities, especially of mid-career professionals from different parts of the world? It appears that it is important for the participants to have a shared interest in a topic or activity; a stated goal or outcomes for the group's online exchanges (it might be a white paper, agreement on a set of new regulations, or a new course outline); a structured schedule of interactions with stated times for their completion; opportunities to form

relationships with one's colleagues through an exchange of information, advice, and support; and, if possible, an initial face-to-face meeting before their online discussions begin.

Harvard University Online Dissemination of Innovation:
An Unrealized Potential

Presented by Winthrop Carty
Ash Institute for Democratic Governance and Innovation
The John F. Kennedy School
Harvard University

I work for the Ash Institute for Democratic Governance and Innovation at the Kennedy School of Harvard University. We originally came out of a program called the Innovations in American Government Awards Program, which was started by the Ford Foundation. Beginning in 1986, they funded us at the Kennedy School to run competitions for seeking out, vetting, and awarding with substantial grants, the best examples of innovation in government within the United States. This program was replicated based on its success, and the Ford Foundation took upon itself to recreate the model in seven other countries, including those in Latin America, Africa and Asia. Much of our work at the Ash Institute during the last few years has revolved around integrating ourselves with what we call our 'sister programs." Two years ago, we went from being simply an awards program, to undertaking a much more ambitious research and dissemination activity. This broader activity is designed to take the best examples of governmental innovation and disseminate them world wide, with technology playing a very important role in that process.

First I would like to give you a couple of examples of what we mean by innovation, and what we mean by dissemination of innovation. To start with -- just as with the word "community" which I have heard spoken frequently over the last couple of days -- the word "innovation" is widely interpreted and reinterpreted, depending on the particular context. We define innovation as a new or reengineered process in government that improves the lives of citizens. An example in this country is the program initiated in Oklahoma that took the process of gathering evidence in rape cases away from the police, transferring it instead to nurses. This change not only made the process more humane for victims, but actually led to an increase in the number of rape prosecutions due to a higher quality of evidence that would hold up better in court.

Another example is one involving "participatory budgeting" from our partner in Brazil. "Participatory budgeting" was an innovation started in the city of Porto Alegre in the south of Brazil. It has now spread not only to other Brazilian cities, but also to other parts of Latin America. Now it is being looked at and adapted in various forms in other parts of the world. It is a process whereby citizens get to vote initially in a sort of town hall style format on funding options for different priorities in their city government. Citizens get a voice regarding where the cities should spend their money -- whether it should be to repair the sewer, improve the school, build a new

school, etc. They actually get to participate in the process, and this has a very important impact, both in terms of securing better transparency/accountability of government and also engaging more citizens in the process.

In my introduction, I also mentioned the word "dissemination." By "dissemination," we do not mean simply taking the recipe of what they did in Porto Alegre, putting it out someplace, and letting others copy it wholesale for implementation in their localities. We are taking about a re-adaptation, a contextualization, of what was done in one place and then transferred to another place. In this regard, we feel that the Internet is a potentially important vehicle with which we can accomplish this dissemination. So for example, Porto Alegre initiated participatory budgeting, and then a city further north in Brazil, called Ipatinga took this same model and extended it dramatically. In that city, they created an online database, integrating it with GPS to enable citizens not only to look and assess their choices for voting at the town meetings, but also to track the actual delivery of those services. In addition, they had an ambitious program to put computers into schools, into community centers, into union halls, and into other institutions of civic society. What the leaders of this program found over time is that the program did much more than simply serve as a tool that allowed citizens to monitor the progress of governmental services. It also brought about a dramatic increase in the number of people showing up at city meetings, along with an increase in the level at which these citizens were informed. Furthermore, there was a change in the age make-up of those attending, with a lot more young people participating who were more inclined to be active online.

So here you have an award-winning innovation from one of our sister programs, that moves to another location in Brazil where it takes on changes and new permutations. What we are trying to accomplish now is the following: how can we facilitate a process in which people can learn about an innovation and then can adapt it, localize it, and make it work for them? Also, how can we utilize the Internet in this process to provide us with a real global reach? We have tried to approach this undertaking in an integrated, yet distinctly two-fold manner. The first part of our approach is a fairly traditional model. We have a file of 1,800 best practice examples that have been Innovation in Government award winners, finalists, and semi-finalists here in the U.S. Our sister programs have similar case study winners from all over the world. Therefore, we have been working to get all of these best practice examples online and available. With this resource, for example, a city manager, policy maker, or researcher in some part of the world could access a particular case study, learn about it, have the contact information, and actually get in touch with the people involved in it.

This first part of our approach is great, and we think that it is valuable. However, there again, we are talking about a kind of cooking recipe. This is like publishing "The Joy of Innovation" and putting it on the Web. Yet where we think we can really accelerate the process of innovation

is by tagging this with online and even face-to-face communities of practice. In this regard, the work of Etienne Wenger and his colleagues has been very instrumental in shaping how we have designed our model. A couple of years ago, we conducted a follow-up study of our past winners, and 86% of them reported that there had been replications of their innovations. It also turned out that these replications entailed some personal involvement of the innovators themselves. They either got on the phone, got on a plane, or the interested people came to visit them. So it is really not a question of just providing a cookbook, but rather of getting the cooks together, working on a new recipe that is relevant to the target environment.

Therefore, to accomplish that goal, we have the portal coupled with what will be developed this year, including online collaboration tools, chats, Power Point presentation online capability, and conference call capability. The goal of these tools is to get the cooks, the innovators, talking to each other and transferring their stories. Of course, we do not just limit ourselves to our core set of cooks, the original innovators or award winners in our seven countries, but we also have a very broad target audience. What we are really trying to do -- and this is the mission of our Institute -- is to have innovation and government be a vehicle for democratic governance and for improving quality of people's lives. We not only need to engage practitioners, but also to sway policy makers, journalists, philanthropy, etc.

Now let me quickly summarize what we have done so far and where we are headed. Almost two years ago, we joined the Development Gateway, which was started by the World Bank. It is a meta-portal with lots of different vertically organized topical areas. We run a section of the portal called "Innovations for Development" that is populated with the content of our best practice examples and other research. We now have over 5,000 direct subscribers, and all the materials posted on that site are vetted through specialists. That is the cookbook on the Web. We are very grateful to the World Bank and to the Development Gateway for providing the infrastructure for this undertaking. Then last year, moving on to the second part of our approach, we developed a prototype in partnership with our seven partners, to examine how we could really integrate all our information and start building out a broader, online capacity. One of the biggest challenges in this effort was trying to come up with a standardized presentation approach, a common language, and an agreed upon taxonomy across all those countries and all those institutions. After considerable effort, we are very proud of our accomplishments in these areas.

Finally, we have begun the development of our own portal, which will have all of the online tools and interactive features necessary to get our innovators talking together and sharing their ideas and expertise. We will be launching the portal later this year. Currently, we are also finalizing an arrangement from a private, U.S. foundation for a significant donation of technology, software, and design support. That is where we will be headed during the coming year. I certainly hope that many of you will be able to join us and collaborate with us on this.

SECTION FOUR

UPDATE ON VIRTUAL UNIVERSITIES

Opening Opportunities: The Role of Distance Education

Presented by Patricio Lopez Del Puerto, President
The Virtual University
Tecnologico de Monterrey
Monterrey, Mexico

This evening I am going to touch upon three topics. First, I will present a brief overview of Monterrey Tech. Then I will discuss the important work of the Virtual University itself. Finally, I will describe how we are coupling with the local, state, and country governments in Latin America to use what we have learned about distance education over the past 15 years. As a matter of fact, we are just celebrating our 15th anniversary as a virtual university.

First, what is Monterrey Tech? Briefly, Monterrey Tech is an academic institution; a university system founded 60 years ago. We just celebrated our 60th anniversary. We have several campuses and we are supported by non-profit organizations around the country. We receive no government money, but rather, are basically tuition-funded in terms of the teaching that we do. The Monterrey Tech System is made up of three legs. One is the original university system with its original campuses. We have 33 campuses around the country, with 8,200 faculty members, about 95,000 students, and over 150,000 alumni. You can tell from this figure of the alumni size that we are quite young in terms of growth. Experts say that usually an academic institution has ten times the number of alumni compared with the number of current students. We do not have even twice the alumni because our growth has been very recent. A second leg of the Monterey Tech system is a new experimental university called TecMilenio which is for lower income people that need to work. This university is only one and a half years old with five campuses already and about 8,000 students. The third leg of the Monterrey Tech system is, of course, the Virtual University. We are celebrating, as I mentioned, 15 years of operation. The Virtual University has 80,000 students, including students in formal degree programs, continuing education programs, and social development programs.

I would also like to mention that the Monterrey Tech system has offices around the world to increase and encourage the exchange of students and faculty between educational institutions. We actually do have a representative here in Boston in connection with LASPAU, which is the Latin American scholarship program for American universities. The most important accreditation, in terms of international accreditation, is the SACS, which allows our students to go to any university in the United States without having to transfer credits. In addition, we have other accreditations,

both international and national. We are regarded as a very high quality educational institution in Latin America, and especially in Mexico. One example of this high regard that we like to show off is our ranking over the last two years by corporate recruiters in the *Wall Street Journal*. This ranking has nothing to do with the *US News and World Report* ranking of the universities based on various measures. The *WSJ* ranking just asks recruiters where they like their employees to come from. Last year, in September of 2002, we were ranked number 16th in the world. The previous year, in 2002, we were ranked 27th in the world. We are the first Latin American institution to appear in this ranking. Strangely enough, MIT is not there. Do not ask me why because I did not do the rankings! Also not present on the list are other very high quality institution, like Stanford. However, this ranking is simply a measurement of the recruiters' attitudes, which is a different thing. Yet the list is important, of course, because we are there!

Now I would like to tell you a little bit about the alumni profile of Monterrey Tech, so that you will understand that we have had something to do with the development of Mexico as a country. If you take the directors of the 200 largest firms in Mexico, 24% of these directors are Monterey Tech alumni. We have had a big influence in new business development. For example, we have a very intensive entrepreneurial program at the university, and 20 years after graduation, 62% of our graduates own their own businesses. In addition, we have 19% of the state governors as alumni and 23% of the mayors of the state capitals. Even though Monterrey Tech represents only 3% of the higher education in Mexico, our representation at top levels of both the private and public sectors is quite high. So far, we have had two presidential candidates, although neither one was elected. One of them was assassinated some years ago, while the other one lost the election. However, we began to worry some years ago about our politically active alumni, fearing that pretty soon there would be nobody else to blame but us for Mexico's problems!

Now let me talk a little bit about the Virtual University. We began in 1989 with the following objective: to extend the educational coverage of the Monterrey Tech. Fifteen years ago, we recognized that we had a problem. With all our campuses across the country, we needed to guarantee that we had the same quality of teaching in each of those campuses. We understood that there was no way we could provide high quality education in very small, isolated places like Laguna, or Morelia, or Sonora, small cities in which we do have campuses. How could we train our faculty there? The decision was made to use technology to train those faculty members, and that is how the Virtual University started 15 years ago, based on the satellite delivery of courses. Of course, over the last few years, we have moved very rapidly from satellite to Internet delivery. As a matter of fact, this transition has been so fast that as of August 2003, we no longer offer satellite delivery of our Master's degree programs. All of our 12 Master's degree programs are fully on the Internet, and only on the Internet. This was the founding vision

of the Virtual University – to use modern technology to extend quality higher education throughout Mexico. It still holds true for us, and we try to live up to it, especially for the Spanish-speaking communities. Where is the Virtual University now? We reach out to the entire Latin-American continent. Furthermore, we have students in France, in Germany, in Indonesia, and in Israel. Usually these are Mexicans who have traveled there to work and are taking courses with us. At the undergraduate level, the Virtual University has 6,000 students, and at the Master's degree level there are close to 6,000 students.

About six years ago, the Virtual University had to change its teaching model because we found, as I think most universities have found, that the traditional talking head teaching model does not work with the Internet-based learning. We also found that the productivity of the lecturing, as measured through the success rate of the learners, was not very high. We were looking for a model that would help us understand how people learn best for maximum retention of that learning. We all know that the best way to learn something is by teaching others. There is no replacement for that. Teaching others is without question the foundation of our learning pyramid and brings about the greatest rate of retention. The order of importance then moves up from the foundation of the pyramid to practice, discussion, demonstration, audiovisual, and lastly to presentation. What I am doing here tonight is presentation. So I can hope that between 5% and 10% of what I say will stay in your minds by tomorrow morning. With that, I will be a huge success in my presentation.

However, what we want to do at our Virtual University is to move away from the presentation mode into the more learning retentive modes such as discussion group, practice and teaching. However, in order to get this retention capacity, there must be a change in the paradigm of how we teach. This change requires moving away from a teacher-centered model -- the way most of us learned -- to a student-centered model. The old model was based on the premise that the teacher has a knowledge that I do not have, and he has to transfer that knowledge to me. This is a model we all followed in the past, sometimes very badly. You probably knew faculty members who just came to write on the blackboard, to transfer their notes to the blackboard. Very often, this was a process by which the notes of the teacher became the notes of the students, without going through the brains of any of those students. That is how it used to be.

We are now moving to the student-centered model -- but how do we do it? We try to put the student in the center, and begin the educational process with a lot of self-guided learning. We try to have meaningful learning, which means that everything we present to the students -- the case studies, the problem-based learning, etc. -- all have to do with things that they are going to find during their lifetimes, or during their professional careers. In addition, this self-learning is supported by collaborative learning. We no longer believe that students learn from the faculty. Instead, we view the faculty member as a kind of facilitator who is there to help students

acquire the knowledge from whatever source is available. Most of the time, the source is in another student's mind or another student's research. Therefore, the role of our faculty within this learning model is to coach and guide the students to acquire the knowledge that they require.

As you can imagine, this has been a tremendous change, easier to say than to do. At the beginning, many faculty members resented this change, especially the ones who had been teaching for the longest time. I think they have embraced it by now, but I do not know whether they did so because they believe in student-centered learning or because they had no other option. However, they now are beginning to see that the students are more interested, more proactive, and achieving a better result in terms of the actual knowledge they receive through this learning model. All the courses at the Virtual University are based upon this student-centered model of collaborative learning. Students must learn from each other. Sometimes the examination or the grading for a student in a particular course is based upon the perception of the other students as to how much they learned from that particular student.

In the Virtual University, the process of developing a new course requires a lot of effort. It is an intensive undertaking that involves a lot of people. Of course, the teaching team is usually the faculty member who has the knowledge base for the content to be delivered over the Internet. We surround that faculty member with graphic designers, media producers, web editors, etc., and, sometimes, if the course requires it, technical support, multi-media staff, or system developers as well. We put all these people together, and it is like a course factory. Together, they develop all the course content and materials that the student is going to work through. In this way, the intellectual content and the learning process experienced by the student are carefully designed by the teaching team, especially by the primary faculty member.

Once the course is delivered, the student is of course in the center and interacts with three types of people throughout the learning experience. One is the academic counselor who is assigned from the moment the student registers until he or she graduates. The whole process is trying to counsel the student on what courses to take, how many courses to take each semester, and which faculty member to select, etc. Of course, for each particular course we have the professor, who is the person that actually designed the learning experience that a student will move through. Finally, there is the tutor who is responsible for each group of 25 moving through the process designed by the professor. The professor is always in the background coaching the tutors and sometimes interacting with the students. However, in one course you may have 500 students divided into 20 sections, with perhaps 20 tutors, and just one faculty member supervising all 20. In order for all this to happen, we need to have a system that provides the student with learning resources, such as didactic techniques, course content, learning activities and an evaluation. These are created by the professor and delivered on a platform, thus insuring that what was assigned to happen

actually happens, and that the student goes through the experience that was designed.

In this way, we promote active participation by the students, and we have received very positive feedback from them on this learning model. They report that they not only receive the academic content, but are also required to develop a series of new and useful skills, such as learning by oneself, team collaboration, research, and concise self-expression both orally and in written form, usually written because it is usually the Internet. Also, there is a lot of inter-cultural learning because students are from different states or from different countries, etc. In addition to these advantages for the student, there is a considerable cost reduction and there is a reduction in training time, especially for the tutor. We have seen this true also in developing countries. When you need to move a lot of students through the university, it takes a long time to train the teaching faculty members if you are using the traditional teacher –centered learning model. On the other hand, when you have one group developing the content for all students taking a particular subject, then the training of the tutors themselves is not that complicated. In this student-centered model, the tutors require training not so much around the actual course content, but more around the learning method and the didactic methodology. This particular attribute of student-centered, online learning significantly helps to reduce the time necessary to develop a quality education program in a developing country. We are seeing this happen in the Middle East, in China, and in other countries that develop this type of education.

What programs do we offer at the Virtual University? There are four programs that I want to mention. I already mentioned a little bit about undergraduate courses, which we now teach from Monterrey to any part of Mexico or the world because of Internet availability. We also teach undergraduate courses for our own consumption within our 33 campuses. In addition, we teach online graduate degree programs and continuing education. Finally, we have begun in the social area to have a national education development program that I will discuss at length a little later. Having already mentioned the undergraduate program, I would first like to discuss the graduate program. At the Virtual University, we offer 12 Master's Degree programs, fully online. The most popular is the Master's in Administration, or the online MBA. Then there is the newest one we just started this January, the Master's Degree in Applied Public Management. This is a Master's Degree program for state and local officials in Mexico and Latin America. We have many other Master's level programs, and I will only touch on a few. There is a Master's in Applied Ethics. We also have an interesting program, which is the Global MBA for Latin American Managers. This is a joint program with the University of Thunderbird in Phoenix. We teach this program using satellite, and we have approximately 300 students taking this 2-year program, 150 each year. In addition, we have a diploma in E-Commerce and Financial Management, as well as a Ph.D. in Educational Innovation. We have the support of the University of British

Columbia for this PhD. program, and for some of the other courses. The third area of programming at the Virtual University is Continuing Education, about which I do not need to speak because there we offer standard courses and contents that would be of interest to corporations.

However, I do want to spend time today talking about the Social Development Programs of the Virtual University. In those undertakings, we are working with state, local, and national governments, trying to make an impact through four different programs: the National Education and Development programs; the Training of Public Officials; the Training of Personnel of Non-Government Organizations; and the Community Learning Centers. In the National Educational Development Programs, we bring lessons leaned in Mexico to other developing countries. We just received an $8 million contract from El Salvador to conduct training in the Kindergarten thru grade 12 schools there. In looking at any educational system, we understand that it is made up not only of teachers, but also of managers, parents, and students. Our goal is to use the Internet to have an offering for each of these educational partners, so that, at the end of two or three years, we can actually make a significant impact upon the entire system.

For the teachers, we want to develop some competencies and to achieve this we have a series of offerings and programs. These include an undergraduate program in education. For educational managers, we also offer all those Master's Degree programs already mentioned. In addition, we have some Continuing Education Programs that are especially suited to teachers. An example of such an offering is the Competency for the 21st Century, which is a program providing basic information on improving schools through enhanced teaching skills and methodologies. All of these programs are only offered online. However, once an educator completes an undergraduate or graduate program, or even a continuing education program, we set them up in "Virtual Academies" to have a multiplying effect. "Virtual Academies" are a very exciting and innovative part of what we do in our Social Development programs. Once a schoolteacher finishes a Master's degree program, we give him a brief technological training and then we put him in charge of tutoring 25 teachers around the area in which he has educational expertise. For example, it may be mathematics, or geometry, or history, or geography. If it were geography, then we would assign him as a tutor to 25 teachers that are actually teaching elementary school geography. Consider the result if we have 500 teachers who get their Master's degree and then go on to tutor 25 teachers, each of whom teaches about 40 students. Through this multiplying effect, we have half a million students improving the quality of their learning.

What I have described is how the Virtual University's Social Development Programs impact education through teacher training. Of course, the school administrators play a very important role in terms of education, and must learn how to use the new technology. Otherwise, when a teacher comes with a new idea, they would not understand that idea and would usually reject it. For this reason, we began to develop training for the

administrators, the supervisors, and the principals to help them understand what the teachers are doing in class with the computers and other new technology. It is a new type of competency in these administrators that we have to develop, and again, this is a program that we offer fully on the Internet. Just as with the teachers' programs, some of these can be Master's level programs and even MBA's, while others are Continuing Education Programs.

The Social Development Programs of the Virtual University also offer courses for parents. In terms of parents, we need to consider their personal development, and to give them some understanding of how to use information technology. Be reminded that we are talking about Mexico, not Boston. In Mexico, there are a lot of parents who have never seen a computer before. We need to have them understand what their kids are going to be doing with the computer at school. We have discovered that when the parents get trained, something very interesting happens. The teacher gets much more support from the parent. Without this parent training, the child might have complained about a teacher and an assignment, and the parent would have agreed with the child. With training, however, the parents have more respect for the teachers, knowing that those teachers have Master's level or Continuing Education training. There is a reevaluation of the teacher's role in the community, and that significantly strengthen the students' learning. We offer numerous courses for the parents if they want to take them, but, of course, not all of them can take courses at this level. We also have online courses that we offer to the students in various subjects, and these are usually Continuing Education courses. However, we are now beginning to offer fully online high school, as well as some undergraduate university programs, for kids in very isolated areas of Mexico.

Another area of the Social Development Programs offers courses for public officials and the staffs of non-profit organizations. When you have a mayor elected in Mexico, usually he is in office for three years, and was elected simply because he was a friend of the governor, or something like that. More than likely, he has no previous experience in government, with no clue about what to do next. We offer these new mayors a training program. The course provides concrete directions - this is what you need to do in your first 100 days as a mayor. We tell them step-by-step, so they will know what to do. We also have other courses, including one on ethics -- how to fight corruption. We caution them that even though they may not be corrupt, some people in their cities may be corrupt. Unfortunately, in the end, it could be the mayor or other governmental official who is charged and sent to jail because he failed to notice, or to take action against, some corruption going on in his city, state, etc.

As I mentioned earlier, we also have several programs for nongovernmental organizations, including four diplomas that are part of a Social Leader Discipline program on NGO management. To sum it up, you can see that the Virtual University through its Social Development programs

offers many courses for educators, public officials, and non-governmental organizations. We offer these programs throughout Latin America and we receive support for them from organizations like the World Bank, the Kellogg Foundation, the Hewlett Foundation, and J.P. Morgan. Of course, we also receive support from the Mexican government.

Finally, I would like to talk with you today about our newest program, the Community Learning Centers. Two years ago, we asked ourselves how we could take all we have learned about doing distance education and put it to the service of the poorest, most isolated people in Mexico. When we went to the government and to most of the private enterprises in Mexico, they said, "You are crazy." These government and business people did not learn by computers themselves, and furthermore, they do not understand what online learning is all about. They could not understand how we could expect people in poor, isolated communities to learn by using the computer. However, we decided to prove them wrong, and fortunately, we have done just that!

The first thing we proved was that being poor does not necessarily mean that you are dumb. We knew the fact that people are not educated and cannot express themselves in proper grammar, but that does not mean something is wrong with their brains. It was for this reason that we moved ahead with the Community Learning Centers. A typical center is just a ten by ten room, with between six and ten computers connected to the Internet. We have developed a list of courses that we teach to these people fully online. We began this program three years ago, and our goal was to develop these centers in especially low-income communities that are geographically isolated. Starting out, we actually went to the most isolated places that we could find because we knew if we could make it work there that we could make it work everywhere.

Where are we now? Well, we have close to 700 learning centers -- 622 in 27 Mexican states, and 72 in the United States. We began developing them in the U.S. when we realized that not all poor Spanish-speaking people live in Mexico. The largest number of U.S. Learning Centers are in Texas -- in Houston and Dallas -- but we do have them in other parts of the U.S. as well. Probably in the future we may see more community learning centers in the United States than in Mexico. We have made some calculations and we believe that Mexico requires 20,000 of these centers. We think that in probably five or six years, we may come close to 3,000 centers in Mexico. There are many, many more required in the country to serve all the people who need them. In these centers, we work with community social leaders and train them to use technology. Last year, we trained 20,000 in this program.

It has not been easy to get our government to go along with the idea of these Community Learning Centers. This is especially true because we are a private institution in Latin America, where the difference between private and public is still very big. To get the government to go along with the idea, we had to build our credibility. Our credibility grew as a result of

the association we have with World Bank and the money we receive from numerous foundations. That is how the government began to look at us as something with which it might be worth partnering. Right now, most of the Community Learning Centers that we have are in partnership with the government, especially with the Ministry of Social Development in Mexico. As you can see, we have come a long way, and we are beginning to use these centers for many things. Once a village or town has this Community Learning Center, the community can use it in any way they want. You can have ten computers in a very isolated place and link it to high speed, 128K, Internet, which is very high speed for these communities. As a result, the community begins to really change and transform. Once a community begins to transform and change, eventually they can receive even undergraduate or Master's degree programs through the Community Learning Center.

In conclusion, close to 250,000 people have been involved with programs of the Monterrey Tech Virtual University. We continue to develop and spread our programs with the same goal we had when we began -- to offer quality education using a student-centered model, collaborative learning, and advanced technology in order to continue the development and advancement of Spanish-speaking communities.

Open and Virtual Learning for Cross-Cultural Bridging:
The Arab Open University Case

Presented by Dr. Said Hammad Jahama and
Dr. Abdel-Elah Al-Ayyoub
The Arab Open University
Amman, Jordan

This talk will be divided into two parts. First, I will talk about some general aspects of the Arab Open University (AOU), and then Dr. Abdel-Elah Al-Ayyoub will discuss specifics. The Arab Open University is a new pan-Arab, non-profit university with headquarters located in Kuwait. Already, six Arab countries have joined the initial project, and we will have more branches opening soon. I believe that this university is a unique experience in that it is regional, cutting across national boundaries. The main goal of AOU is to provide higher educational opportunities to students who might otherwise miss their chance.

Organizationally, while the main headquarters are in Kuwait, there are regional branches in various countries, such as Jordan, Saudi Arabia and also Kuwait. Then there are centers working out of each branch. Each regional branch has some specific features, resulting in the fact that AOU is not just one homogenous entity. Now let me turn to the relation between headquarters and the branches. The headquarters contain the deans whose basic duty is to overview the courses and the program offerings. The faculty members are spread throughout all branches, and they maintain constant contact with their corresponding deanships

One unique feature of the Arab Open University, compared to other open universities, is the fact that there is a mandatory, face-to-face element of it. Students have to attend actual classes, and the reason for this has to do with the regional nature of AOU. This university involves six Arab countries, and if accreditation from the various ministries is needed, then there needs to be a face-to-face component. However, this face-to-face component is much less than that of traditional universities. For example, for three credit hours, you would need one face-to-face hour per week. Despite this component, we still have standard course offerings across the regions. A course spread out to all the branches from the headquarters in Kuwait is the same course, with the same schedule, set of tutor marked assignments, TMAs, and exams. I believe that even with this face-to-face restriction, we are still much more inclusive than traditional universities. In other words, we include many elements of distance learning, such as student/ faculty communication and online tutoring.

Now I would like to focus on the online courses. Not all of our courses can be seem as online courses, but that is one of our future goals. Now we are uploading our own courses and we are developing the components of online courses such as conferencing, group discussion,

electronic testing, and electronic assignment handling. We believe that the most important element of an online course is the tutor. A tutor has to conduct weekly face-to-face tutorials in groups of 20-25 students, as well as grade assignments and give appropriate feedback. In addition, he has to moderate online group discussions when applicable. Furthermore, the tutor is charged with monitoring the TMAs, the grading and feedback. In addition a staff tutor might write quizzes and exams, and help in course authoring. As I said, right now we are not at the stage of course authoring, but hopefully in a year or two we will be doing that. Still another role of the staff tutor is to coordinate, regarding any of these matters, with the corresponding deanships in the headquarters.

Now I would like to turn to a discussion of the four online programs we offer. One is an education program that is purely in Arabic and purely homemade. The other three programs have been borrowed entirely from the United Kingdom Open University (UKOU). We made the decision that this was a good way to start -- to turn to an already established institution and use their programs. These UKOU programs are IT, English, and Business Administration. In our curriculums, we exactly follow the UKOU core courses of these programs, but we also add certain elements, such as Arabic or some culturally sensitive courses. Our agreement with UKOU also has another element, which is a validation service on their part to guarantee quality. As part of this, we take courses and then we have some validation services that help us monitor the quality of our courses. We feel that this quality control is very crucial for the AOU at this early stage. Even in the future when we are developing our own courses, we may want to maintain this validation service with UKOU.

Now I would like to move away from the Arab Open University briefly to discuss two regional initiatives that combine two or more countries at the same time. First there is the AVICENA Virtual University project. The goal of this initiative is to develop a consortium of universities and institutions from many countries, including Algeria, Cyprus, Egypt, France, Great Britain, Italy, Jordon, Lebanon, and Malta. The long-term objective of AVICENA is to create a virtual campus that spans all of these universities and institutions. I personally worked as a consultant with a Jordan team from Philadelphia University; I tried to help them develop some of the courses that they were supposed to develop. Each institution is supposed to produce or adopt online courses, and in doing so, the authors need to be sensitive to all cultures included in the consortium. Such an initiative, if successful, will offer many benefits, including the transfer and exchange of technology and experience throughout the region. The projected time of completion for this initiative is three years, starting in 2002.

The second regional initiative that I would like to mention is the MERC proposal. It is a proposal that seeks to join two countries, Israel and Jordan, in developing a shared online program of higher education by

combining the resources of institutions in both countries. Of course, you are all aware that there are some political issues right now, and therefore, we are not sure what will come out of the proposal. However, Jordan does have a peace treaty with Israel, and the proposed initiative, in addition to promoting education, will hopefully also promote greater peace. When students participate in the same program and, through that program, are able to discuss issues together, then perhaps there will be more understanding of each other's positions.

The program proposed by this MERC proposal will require two things. First of all, an environment must be created that is conducive to producing online courses and one in which students will want to study these courses. The second requirement is to produce the actual courses. The objective in the proposal is for the initial production of ten online courses. Yet I think the more significant and difficult goal will be to create an environment conducive to virtual higher education. The request for funding has been submitted to the USA program called Middle East Regional Corporation, and that is why we call it the MERC proposal. There is a great need for such virtual learning in our region of the world. Surprisingly enough, the need is not so much in Jordan or Egypt, which have numerous educational institutions, but rather in the Gulf area. While the Gulf area is still lacking in these resources, recently there have been many institutions popping up in that part of the Middle East. For example, Cornell has a new campus, as does the University of Texas. As you can see, there are many educational initiatives underway in the region.

Now let us return to the AOU, and I will give you my realistic opinion of what happened during the first two years. One of our concerns is that while there was considerable interest at the start of this educational initiative, now we are suffering from a considerable dropout rate. One issue that I personally feel is lacking is online group participation. As we all know -- since yesterday many speakers touched on this very issue – it is very important to have online group discussions, and we have been lacking that. The lack of this element in our programs may be caused by our requirement to have mandatory face-to-face discussion. It is possible that this face-to-face element might affect our success in having online group discussions. We need to do much more to encourage students to participate in these virtual discussions.

Now what are some other reasons for the dropout rate? The most obvious reason is the English language barrier, since many students have trouble with English, yet all of our programs are English language programs. In addition, some students underestimate what is involved in studying at AOU, and unfortunately, I think that we are not providing enough of a student orientation. Our students do not know exactly what they are getting into! Finally, we are applying the UKOU standards in all our courses, and it is possible that these are not the right standards for our students. Along with this, there are some cultural issues.

Now why is it important for the Arab Open University to succeed? I think it is very important to succeed because when you look at the students, you realize that they really need the education. Also, when you look at the grown ups who have been deprived of studying, you understand that now they really want the opportunity to study. Of course, we really do not want to fail them. At the same time, we must deal with many skeptics in our region who claim that distant/virtual education is not the way to go. We feel it is important for us to adopt this methodology and to introduce it into our region and community. To succeed at this, it is imperative that such an initiative has a well-defined structure and goals; in addition, it should produce high quality programs with valuable content and effective tutoring. We also believe that other educational alternatives need to be introduced in our region. Such alternatives would involve combining traditional classroom learning with distance/virtual learning. This might be the way to go, especially as a transitional phase. It would ease the physical restrictions, thus including more students while not producing significant of resistance - especially if these programs are offered by traditional well-known institutions. At this point, I would like to introduce my colleague and co-presenter, Dr. Abdel-Elah Al-Ayyoub

In this part of the presentation, I will talk about the current system for supporting online courses at the Arab Open University (AOU), with emphasis on learning systems and learning content. First, I will present the current e-Learning set-up, how it works for the AOU, and what are the limitations. I will conclude the talk with a discussion on the AOU's approach for developing an integrated virtual learning environment in support of its open learning model.

Our current e-Learning system is sort of temporary. It uses six components, three of which are customized versions of systems being used at United Kingdom Open University (UKOU), while the other three have been developed at the AOU. At the beginning of a course, the students receive a so called "course package" which necessarily contains some of the learning contents as well as other important starter documents such as a welcome letter, the course guide, and so on. Most of the learning materials come in a form of interactive and dynamic websites where the students can browse the contents of the course, take notes, make progress, and do activities. These website also enable the tutors to track their students' progress. In addition to the website, the AOU courses often include audio visual materials such as audio cassettes, films, interviews, simulators and many other types of materials.

The current temporal e-Learning set-up uses a system called FirstClass to offer several types of computer-mediated communications in support of distant tutoring. This system provides primitive communication services including email, text-based conferencing, chat, notice boards, and online polling. The FirstClass system also provides a placeholder for teaching and learning material for the tutors, including, for instance, the tutor guides, assignment solutions, etc.

As my colleague and co-presenter Dr. Hammad mentioned, most of the AOU courses are adapted from the UKOU. By adaptation we mean harmonizing the courses with added tutoring (namely the mandatory face-to-face tutorials) and assessment tools so the resulting courses can fulfill the local accreditation criteria. The UKOU courses do not impose tests; rather they use a form of take-home assignments as the sole assessment method. In our adaptation of the UKOU programs, 50% of the assessment goes into controlled tests – both written and online tests. The different branches of the AOU have chosen different solutions for testing. In Jordan branch, for instance, a third-party solution is being used. The Saudi Arabia and Lebanon branches develop their own e-testing systems for both mid-term tests and language proficiency tests.

Accreditation in most of the Arab states requires a certain amount of face-to-face interaction. Therefore, the AOU requires a minimum of 25% mandatory attendance in prescheduled face-to-face tutorials. The number of tutorials in a course depends on the number of credit hours for that course. The prescheduled tutorials have a predefined scope and sequence that is defined in a document called "weekly study guides." The purpose of these guides is to maintain a certain level of consistency across presentations in different groups. The weekly study guides necessarily describe a list of activities that should be performed by the students, and in this way, the tutor will be able to define milestones for progress assessment. Of course, an important activity that should take place during face-to-face tutorials is the exam (both written or online).

For the written assessment, the AOU uses a system of equally weighted components: formative and summative assessments. The evaluation system requires students to attend mid-term and end-of-course written tests. In developing these tests, questions are initially suggested by the tutors, negotiated at the branch level, and then between branches. Finally, the course coordinator finalizes the versions of the tests that are then sent to the Dean for production and distribution. The exams take place simultaneously in all branches at the same time. Most of our final exams are conducted on paper, rather than online, although some of the midterms are done online. However, the finals are never conducted online due to technical limitations.

The last form of evaluation is rather formative, where students collaboratively develop a solution for a problem and receive feedback from the tutor and from each other in developing further enhanced solutions. Assignments and feedback are handled through FirstClass using some sort of virtual drop-box. The tutors mark the student submissions and offer feedback using a standard form called "PT3 form" which is sent using email (a rather time consuming activity). Unfortunately, the system (the virtual drop-box in FirstClass) is loose in the sense that it does not enforce deadlines nor provide an exact place to which the assignment should be sent. We often have students submitting assignments after the deadline and to the wrong place. Furthermore, the system does not

support archiving facilities, and therefore, the tutor has to manually archive all the assignments along with feedback, which is again time consuming.

In an attempt to overcome the shortcomings in the present e-Learning setup at the AOU, we are developing an integrated virtual learning environment. The approach in developing this environment consists of three phases: develop the learning management system; integrating it with the existing systems; and finally, add courses to the system. To achieve this objective, we first need a learning management system that provides the basic services. It cannot be just any learning management system, but must be tailored for the AOU's unique pedagogical model. Linking the learning management system with the existing university's systems is a bit involved, yet doable. The last phase is a long-term process. Now we have over 128 courses that need online support. You can imagine the amount of time and resources that would be needed to put all these courses online. We are at the very beginning and we are optimistic! Currently a comprehensive framework for adapting/developing AOU courses for online presentation is under aggressive discussion!

Formal Higher Education at the Virtual University of Pakistan

Presented by Dr. Naveed A. Malik, Rector
The Virtual University of Pakistan
Islamabad, Pakistan

Today I am going to present the Virtual University of Pakistan (VU). This was briefly touched upon at the LINC seminar last year, but then the focus was more about the state of higher education in Pakistan. This time it will be about the Virtual University itself. I have structured the talk to give you a brief background, first in terms of Pakistani higher education, and then a history of the university. We are not very old, having a long established history of just two years! In fact, today is precisely our second birthday. Therefore, we are just an infant as far as universities go.

First of all, let us look at the problems that Pakistan faces, especially in terms of higher education. We have a population of 140 million people, and the sum total of all university graduates annually in the country is about 130,000 -- a figure that is really dismal. Professor Larson mentioned this morning that in many developing nations, only about 4% of the student-age population is able to attend college. However, in the case of Pakistan, it is even poorer, only about 2.5-2.6%. When we look at the conventional Pakistan universities and other training institutions, we see that they are full to the brim. There is no additional capacity in the existing institutions. This is a pretty common problem for all developing countries, and we all know what the problems are. The next major problem is lack of qualified faculty. This, again, is a pervasive phenomenon in the sense that I do not think that there is any single university in Pakistan that would boast a full complement of qualified individuals in any single department. This situation is even more of a problem in Information Technology or Computer Science departments where there are very few qualified people.

However, if we look at the whole of Pakistan as a single university, then we have enough faculty -- except that they happen to be scattered all over the country. There might be two people at Karachi University and maybe one at Quaid-e-Azam University in Islamabad, etc. Yet most of the time, the teaching is taken over by part-time teachers. An example of this is a teacher with a briefcase and a motorbike. He delivers a lecture at institute A, then packs up his papers and rushes over to institution B to deliver a second lecture. As a result, the lecture is delivered, but there is no interaction between the students and the teacher, and the quality of the lecture itself is poor. Another factor of concern to Pakistan, and of concern to other countries in the developing world, is the fact that higher education happens to be fairly expensive. It is not really within the reach

of the common man. The public sector institutions are of course priced reasonably because they receive government support, but in the private sector, education turns out to be very, very expensive.

When we look at the population of Pakistan, we see that it still is running primarily with an agricultural economy. We have a population that is scattered in the hinterland, with the majority of the people not living in the big towns and cities where the universities are concentrated. Also, there are a very small number of higher education institutions, including about fifty-two or fifty-three public sector universities and an equivalent number of chartered private sector institutions. As mentioned before, the enrollment capacity of these schools is about 2.5% of the total college age students, with all of these institutions being filled to the brim.

Related to this, there are social issues to deal with. For example, what happens when a student from a small town completes twelve years of education and wants to get a university degree? Such students normally have to travel to the big towns, compete to be one of the lucky few who get admissions, then spend the next four or five years either living in hostels or with some relative. This situation is a tough call from both the financial implications as well as from the dislocation points of view. Over the long term, however, this is part of the migration towards the big city phenomenon where the talented student population moves to the big cities and then stays there. They do not return to the hinterland to contribute to the economic development of that area.

Now I would like to turn to the approach that we have taken at the Virtual University. We operate on the concept I mentioned earlier that if you look at the entire country of Pakistan as a single university, then, yes, we do have the faculty. We have the Database expert sitting out in Karachi and the Data Structure experts living in Lahore, etc. They are not concentrated in any single city or institution, and the concept underlying the Virtual University is as follows: why not use this dispersed talent to deliver education to students around the country? So we target highly qualified individuals and we use them to develop excellent content for our courses. They prepare the lectures, and we work with them on how the lectures should be designed for virtual transmission. Our model is really hybrid, and we deliver the content using television broadcast while interacting with students over the Internet. We are not entirely web-based. We do use broadcast television, and there are some limitations with this medium, but they are rapidly decreasing.

Let me give you a brief history of our Virtual University. As I said, today is our second birthday, so we started operations on the 23rd of March, 2002. Currently we have a single, four years bachelors program that we are running with thirteen different majors. We began with a Computer Science and Information Technology major and by now we have spread out to sociology, psychology, economics, business, public administration, etc. Right now we are close to 3000 students and we have over 150 centers in about 65 cities of the country. While we do have a

study-from-home option, this is not an option that we encourage because we are talking about formal education for kids who have just graduated from high school and are going on to university. Again, this is a cultural issue because these students have been spoon-fed and hand-held over the first twelve years of their education. To suddenly throw them into an environment that says, "here's a TV, here's a computer connected to the Internet, now we expect you to graduate," would be a tough call. We have already removed the professor from the classroom, but we do not want the students to be isolated. For these reasons, the preferred model is for students to study at learning centers on a campus.

The methodology that we follow is basically to develop video lectures. However, this is not a camera in the classroom approach. In this regard, we did some early studies and made a decision. We would rather see a video of a person who is addressing the television audience rather than make the television audience an onlooker in an interaction between a professor and an actual class. Instead, we want the professor on television to be addressing the distant learning students. Therefore, the lectures for our courses are done in full-blown audio and video, produced in a professional studio environment. We develop the lectures and broadcast them over free-to-air television. Originally this was done over Pakistan Television, our national television broadcaster, but we had a limited amount of airtime. We are changing this now, and I will talk about that change a little later.

The entire interaction with the students happens over the Internet so we have deployed a learning management system (LMS). The Virtual University is also connected to another Pakistan government enterprise called PERN (Pakistan Education Research Network), which is the university intranet, providing a broadband connectivity to all the universities throughout the country. Our servers also happen to be on that intranet but this system is still in the roll-out phase, so at the moment we are using the public data circuits.

As I mentioned earlier, the preferred mode of education of the Pakistan Virtual University is that students should go to a campus to study. We call that location a "virtual campus," which basically is an infrastructure provider. Our model is quite similar to that of the African Virtual University except that our television broadcast is one- way, since we are not using V-SATs or videoconferencing in a two-way technology. To receive the video lectures, we have a television reception apparatus with either a multimedia projector or a big screen TV. Students sit in the 'virtual campus" and listen to lectures. They have received conventional lecture notes beforehand, and those notes are also available online. After the lectures, the students will interact with Virtual University faculty over the Internet, so all question/answer sessions, assignments, handouts, submissions, etc. happen over the Internet.

The VU campus, or the "virtual campus," is basically established in an existing educational institution, with existing Internet connectivity.

We add a television reception/recording facility, and we call it a "virtual university campus." The reason why I included the words "existing institutions" is that when we first started out, we were originally known as the Virtual IT University. This is what we were supposed to be in the initial concept of a study carried out by the United Nations Development Program (UNDP). However, even by the time we got our charter, the concept had already evolved, and IT education was not the focus anymore. What was needed was broad-based higher education, and therefore VU was developed to cater to all disciplines. However, at the height of the IT hype, scores of IT training institutes had cropped up all over Pakistan. There was a mushroom growth, and people were setting up these computer labs and offering certificate courses. Although a very doubtful quality of education was being imparted at these places, the infrastructure of these schools had been developed, and these places found themselves essentially without business when the international IT bubble burst.

At the time, VU was able to jump in and develop relationships with these institutes that had campuses and existing infrastructure. All that was necessary was for the school to add a television reception apparatus and become a partner with the Virtual University. This approach allowed us to spread across the country very, very rapidly, in   an excellent example of a public/private partnership. As a matter of fact, all of the "virtual campuses" are in the private sector and do not belong to VU. The institutes simply have agreements with us and receive a share of the tuition fee. The Virtual University itself has so far set up two campuses, both in the province of Sindh, in remote areas and in remote little towns in the middle of this province. While VU does intend to set up more campuses, currently most of these campuses happen to be in the private sector.

I have already mentioned that our focus is on formal education. We are talking about relatively young students who have just completed high school and are coming in for a university education. We have taken the professor out of their classroom, so the philosophy was "let's leave the classmates there." We want to put them in a classroom environment and let them interact with their peers, even though the professor happens to be on screen. Although all of the interaction with us happens over the Internet, we have been surprised and pleased by the development of an excellent community interaction. We have developed a discussion board on the learning management system, which we call Hyde Park Corner. This discussion board is open for students' comments and is their vehicle for lively interaction. Another interesting discovery that we have made is that the students tend to identify with their individual centers, and there is a spirit of competitiveness developing among these various centers.

Now I would like to discuss the salient features of the Virtual University's program. The concept of VU is to supplement the capacity of the existing conventional universities in Pakistan. We borrow faculty from the conventional universities to develop our courses and then we

send those individuals right back. We do not steal them because there are not enough of them to go around anyway! The lectures we broadcast are free-to-air, so they are available for anyone to receive and make use of. These lectures are delivered on a specific set schedule as in a course schedule here at MIT. Right now we have a variety of formats. Apart from being delivered over broadcast free-to-air television, the lectures are also put on multimedia CD's. These are rather nice because the video part of the lecture is accompanied by power point slides, and a student has random access into a lecture, and is able to highlight a particular topic and review it repeatedly.

These CD's are very inexpensive and are popular with the students. We do not make money on them and actually deliver them at cost since we are a public university. A typical CD, containing about six lectures of a course, would cost 40 Rupees or about 80 cents. A three-credit course includes forty-five lectures over fifteen weeks, three lectures per week. Therefore, we are looking at six to seven CD's per course. The lectures are also available on VHS tapes, which we normally recommend for the host institutes. This allows them to hook up a VCR to a multimedia projector, and the VHS quality is full screen video, far superior to the postage stamp-sized video on a CD. Of course, the users of these CD are largely the home-based students, but the CD's are also open to the general public or to students from other universities. As a matter of fact, they are becoming pretty hot stuff and are being picked up by students from other universities. Our objective is to deliver education. If it helps somebody else to learn, all the better.

These CD's highlight another salient feature of the VU program – flexibility. Our students have a 24-hour window of flexibility in viewing a lecture, starting from the time the lecture is given. Therefore, if a student misses the television broadcast lecture, he can always watch it on the CD in the afternoon. The limit of this flexibility, of course, comes with assignment deadlines. Lecture notes, as I mentioned, are printed and dispatched beforehand. These lecture notes and handouts are available on the website in the learning management system. However, it turns out that whereas Internet access is available in almost every city and town throughout the country, there is an issue of bandwidth and quality of service. If we put a large handout on the LMS, not all students will be able to download it. The majority of our students do not own a computer at home. They have to go to the center to study, and that is where the infrastructure is provided. It is better if we can deliver the handouts and lecture notes to them at the start of the course, so in that sense, they have pre-read the material for the lecture before they attend it.

As far as interaction between students and teachers is concerned, that activity is accomplished completely over the Internet. There is no face-to-face interaction, and to keep this whole approach scalable, we do not have any chat tutorials because we are dealing with a small number of tutors versus a large number of students. However, we have had to

examine how to deal with academic questions that arise as the education is being delivered. For this reason, we have developed some software that we call a moderated discussion board for student/teacher interaction. What we have developed is much more of a form-based approach rather than the team-approach that Dr. Aviv was talking about, and we have had very good participation on these moderated discussion boards. We also use this as a graded discussion board to initiate instructor-led discussions. For example, a really good point made by a student on the discussion board might be worth five points, whereas for a student who abstains, it is a zero. Such a system provides an incentive for the students to participate. How it works is that for every course, for every lecture, there is a question/answer board. After every lecture, a discussion board is opened for that lecture within the course, and at the end of two days or whenever the next lecture is due, this board is closed and the next one is opened. The earlier boards, of course, remain available in read-only form to the students all through the course, so they can come back just before the final exams and look at the interactions on individual lectures. At any one time, there will be one discussion board open in a lecture.

Now I would like to talk a little bit about assignments because this is an important part of the VU program. Again, we have developed some special software for this purpose. This software helps the students download the assignment, upload his or her submission before the due date, and also verify the submission. We have a brand new capability that allows the student to review his or her graded assignment. Previously students were shown simply the grades they had obtained on their assignments, but now they are able to see exactly what mistakes were made.

Examinations at the Virtual University are formal, proctored events. They are usually electronic, but are not yet administered online due to issues of electrical supply or Internet connectivity. The examination file is delivered electronically and is encrypted, so the examiner must use a password to decode it before installing it on the local network. After the exam, the answer files are sent back to the University for grading. The exams are electronic but not online, and the process has proven to be fairly efficient. We are doing a couple of exams on paper at the moment. For example the students did complain that in Calculus 2, multivariate calculus, they were having a hard time composing the responses online. The VU examinations are not multiple-choice questions, by the way, but include a full spectrum of essay, draw the diagrams, do the circuit analysis, etc. Everything is the same as a non-virtual university examination, except that these students have to do their work on a machine. The Virtual University appoints its examiners nationwide from faculty borrowed from other institutions, and they need not be domain experts. For example, an examiner could be a professor of Economics who is proctoring the examination for a course on Data Structures.

Finally I would like to tell you about some exciting developments that are about to take place. VU is already linked up to PAKSAT-I, Pakistan's first communications satellite, and through that hook-up we have two TV channels. The university owns those channels, and they are dedicated to education. These channels are in the testing phase right now, and hopefully, within a week to ten days, they will be on air. You would not be able to receive them here in Cambridge because the footprint is from northeastern Africa to Bangladesh. These channels will give us a lot of flexibility, and one of the changes we are hoping to make is in the area of tutorials, again from a scalable perspective. We would like to be able to look at the lecture question/answer boards to determine the most common questions on a lecture. Then, if enough students were involved, the professor or an instructor would go live to expand on the material already delivered. We have our own production/broadcast studios, and this would all be done in-house. VU has many exciting possibilities with these new, dedicated channels.

Now for a preliminary assessment. First of all, education is being delivered. If I look at one of the assignments or at the work of these VU students, I feel fairly comfortable that they are learning. However, a huge amount of self-motivation is required on the part of these students in distance learning. They are coming into a brand new, completely alien environment. They have been hand-held all the way through school, and suddenly we have thrown them into the deep end of the pool - not just the deep end, but a deep end with sharks! We tell them that the only way to interact with teachers is through the computer. Yet some of these kids may not have even seen a computer in their lives. We will need to build in a higher level of interaction during the early years, and the University is planning to do this by instituting a system of Teaching Assistants who would be senior VU students at the same virtual campus. Such incremental improvements will go a long way in improving the quality of the Virtual University's offerings.

**Distance Education in China and at Tsinghua University:
Current Situation and Future Development**

**Presented by Prof. Aimei Wang
Department of Distance Education,
School of Continuing Education
Tsinghua University
Beijing, China**

My speech is about e-learning at Tsinghua University, both on-campus and off-campus, but mainly focusing on off-campus e-learning. Our on-campus e-learning started in 1997. As the university in charge of constructing China's Education & Research Network, Tsinghua University has one of the best information infrastructures in China. In 1997, the university initiated its e-learning program by offering 10 courses via the Internet. The courses were welcomed greatly by the students. By 1998, we already had 137 web-based courses, including, for example, a Java programming course that had 975 registered students. Since then, e-learning on campus has developed rapidly. In 1999, Tsinghua University established an on-demand courseware system, a web-based testing system, and the Tsinghua Web School. In Oct. 2001, the 2nd edition of Tsinghua Web School was opened to all teachers and students. By 2002, Tsinghua Web School was offering 1014 courses via the Internet.

In the 21st century, distance education has grown rapidly in China, and people in China are in great need of opportunities for tertiary education. This need has accelerated the build-up of modern distance education in the country. In February 1996, the President of Tsinghua University, Prof. WANG Dazhong, first put forward the suggestion of developing a modern distance education program for off-campus learning. At the beginning, Mr. Cao Guangbiao's financial support guaranteed the smooth construction of the new program

To date, Tsinghua University has constructed a distance education transmitting system covering the whole country, combining the Internet, satellite digital network, and cable TV broadcasting network. Tsinghua's On-line Lyceum is the platform used for on-line activities such as registration, course selection, answering questions, courseware loading and assignment submission. Via satellite, ISDN, and IP wideband, the Lyceum is able to transmit lectures given at the University to Tsinghua's off-campus teaching centers nationwide. In this way, real time, two-way communication is conducted through "virtual" classrooms. More than 100 off-campus learning centers have been set up in 31 provinces, autonomous regions and municipalities nationwide, including the Hong Kong Special Administration District. Via distance education, we offer postgraduate courses, undergraduate courses and short training courses. For

postgraduate courses, we have several majors, including business management, computer applied technology, civil and commercial law, education economics and management, criminal law, and so on. For undergraduate courses, we have several majors, including economics, computer science, English, law, arts, etc.

In China, economic development is very uneven in the different regions. There are 592 very impoverished counties in 12 provinces in the western areas of China with under-developed economies and inadequate educational resources. In 2003, Tsinghua University launched a project to develop distance education facilities and educational resources in some of these poor counties. The university plans to set up 200 distance learning centers by the end of 2005. This program is sponsored by Tsinghua University and managed by the School of Continuing Education. In 2003, we launched the project, making full use of our educational resources and spreading badly needed scientific technology and modern management knowledge free of charge to poverty areas in order to improve the development of local economies. Our partners in these efforts include: Service Center of China's Poverty Alleviation; UNESCO; World Bank Institute; etc. We hope to get more support from home and abroad.

To undertake this important work, an organization was established jointly by Tsinghua University and Service Center of China' Poverty Alleviation. Vice President of Tsinghua University, Prof. Hu Dongcheng, is the leader of the group. In this program, we offer distance learning courses including law, teacher training, agriculture technology, public health and nursing, business & management, English, computer competency, etc.

In addition to this poverty alleviation program, Tsinghua University has initiated several other important training programs via the Internet. To fulfill higher requirements for judicial staff of the legal system in China's market-oriented economy, we have run legal training courses for administrative staff for judicial departments, lawyers, consultants in enterprises, judges, and policemen. Our partners in this program are Chinese Supreme People's Procuratorate and Judiciary PRC.

Over the next several years, China will host the 2008 Olympic Games in Beijing and the 2010 Exposition in Shanghai, as well as enter the World Trade Organization. All of these activities make English training a tremendous need in China. To meet the need, we have established the Tsinghua International English Training Center in cooperation with the Australian Center of Language (ACL), and also launched English training programs for university teachers in cooperation with Cambridge University.

In the area of corporate training, Tsinghua University is offering an LMS for Enterprises, designed to develop more highly skilled management training programs and introduce excellent educational resources for businesses worldwide. The courses cover IT, Financial and

Actuary, Urban Planning, Project Management, Management (MBA & MPA), etc.

The programs at Tsinghua University described above are key research projects enlisted in China's tenth Five Year Plan. These programs are administered by the School of Continuing Education of Tsinghua University, in partnership with the university's Computer & Information Management Center and the School of Information Technology. Working together, these partners aim to establish a comprehensive system of cyber university, including development of a platform for web-based teaching, discussion, questioning and answering, assignment, examination, etc. These partners are also working to support web-based educational administration, promote and improve web-based distance learning, and encourage the application of Chinese standards for web-based education. Their program, which will be completed by July, 2004, will have several web-based subsystems, including:
- •Live Teaching System
- •Courseware Order System
- •Resources Management System
- •Assignment Management System
- •Questioning and Answering System
- •Test and Assessment System
- •Quality Evaluation System
- •Educational Administration System
- •Settlement on Account System

In the future, we will promote the web-based distance education off-campus. According to market needs, we will offer more programs for teacher training, English training, corporate training, government officers training, etc. More courses will also be developed to improve education in the impoverished counties. In these continuing endeavors, we hope to work together with universities and organizations from around the world, insuring the bright future of e-learning. In closing, I would like to announce that the 2004 APRU (Association of Pacific Rim Universities) Conference on Distance Learning and the Internet will be held at Tsinghua University in October, 2004.

The Syrian Virtual University:
One Year of Successful Operations

Presented by Milad Sebaaly, Provost
The Syrian Virtual University
Damascus, Syria

Today we have heard about many different distance learning experiences, and I believe that the experience I will be talking about is similar in many ways to other virtual universities around the world, while at the same time, different in many ways. First I want to provide an overview of my university, the Syrian Virtual University (SVU) and then explain the different problems and obstacles we have had to overcome during the implementation phase. Finally, I will review where we are today and discuss the learning model we employ in teaching our different programs.

The Syrian Virtual University is an initiative that was begun by the Minister of Fine Education in Syria, and it is the fifth state university in Syria. Until 2002, Syria only had public universities, but now there are four or five private universities that are designed in the conventional way of teaching. However, the Syrian Virtual University used to be the first, and only accredited, full-fledged virtual university in the Islamic world. Now, however, there is the Pakistani Virtual University and a few similar initiatives. SVU was launched in September 2002, starting out with 500 students the first year, and today we have over 1,000 students. SVU was founded to serve the large number of Arab students graduating from high school each year. This number is increasing year after year because the Arab countries are youthful societies with more than 50% of the population age 21 years old or less. The pace at which the number of students is increasing is far higher than the capacity of Arab universities to educate these students. In addition, there are no lifelong learning or continuing education programs in the existing, conventional Arab universities.

As a result of these limitations, every year there is a growing number of students that have no place at a university. For example, in Syria in 2003, we had 133,500 students passing the high school exams, while the capacity of all existing universities, excluding SVU, was only 80,000. This leaves more than 50,000 students with no place at the university. Those students do not have many choices. Some of them will go to Lebanon or Jordan for study, while others will travel to Europe and the U.S. Of course, there are many others who will stay in Syria without educational options. In order to increase the chance of peace and prosperity in the region, it is important to educate these students so they will not follow the fundamental option. This is why we began to look for

unconventional educational initiatives, and virtual education - like that at the Arab Open University - was one of these unconventional initiatives.

The Syrian Virtual University is a state university and it is an accredited university of higher education not only in Syria, but also in other Arab countries because these countries have an agreement to accredit each of their state universities. SVU is unique in that it is a tuition-based university, while all the other universities in Syria are for free. A critical feature of SVU is that it provides both international and local programs. From the beginning, we decided that we did not want to reinvent the wheel, especially since our university, and the region, are not completely ready to go online. For this reason, we decided to use whatever programs exist internationally, in order: 1) to provide immediate solutions; and 2) to provide new programs which otherwise would require a lot of preparation time. As Dr. Larson said yesterday, we can quickly construct the external buildings, but we need a lot of time to establish the internal schools and departments. This is why we can benefit from already established online university degrees in specialties like bioinformatics, energy management, or any number of new online degree programs.

We also realized that a large number of students in Syria and in many other Arab countries do not speak English, since they have been studying in Arabic all through high school. We realized that they would need at least one or two years of language study just to get up to speed in English, which means they would spend three years of their lives just waiting to begin the actual degree programs. For this reason, we introduced several undergraduate programs where the students will study the first two years in Arabic, with parallel study of the English language. After two years, they will receive an associate degree in Arabic and, upon completion of the language program, another degree in English. We believe strongly that if they do not know English, they cannot keep upgrading themselves and continue their lifelong learning process.

SVU offers different types of certificates and degrees, and at different levels, in collaboration with international programs. The graduate degrees are all conducted in collaboration with international universities, while, at present, the undergraduate programs are developed locally, although based on international curriculums. This combination provides a wide variety of options, and we are targeting two types of people -- high school graduates and working adults. At the moment, the higher percentage of students is for high school graduates due to the fact that their need is immediate, and, unfortunately, the culture of lifelong learning is not yet mature in that region of the world. Among the 1,000 SVU students, there are 65% undergraduate, 18% graduate, and only 17% non-degree certificate programs.

At SVU, we are trying to develop this culture of lifelong learning as a part of the long term human resource development and economic development processes in Syria and in other Middle Eastern countries. In

this regard, we are currently preparing to launch a very big project, which is to upgrade the education of schoolteachers. There are 100,000 schoolteachers in Syria who have two-year degrees, and our goal is to upgrade them to bachelor degrees. Starting next fall, SVU will begin working with three groups of teachers in a three-year program to earn a bachelor's degree in Education.

As I said before, when you talk about educational capacity limitations, there are physical limitations but the greatest limitations are in the area of specialization - building new faculties and expertise, which we cannot attract to our market. Even when we send people to study in the U.S., we must compete with U.S. universities and companies to get them back once they graduate. This is a very difficult competition not only in Syria. I used to be the Dean of IT at the American University in Dubai, and we would pay very good salaries -- even 1.5 times more than those in the U.S. However, good professors would not go to Dubai, where there are only teaching universities, because of the lack of a research environment. Due to both outdated local curricula and to an increasing demand for international education, lots of Syrians who are going to study in Europe or to the U.S. are not coming back. Yet those Arabs who are still living in the West can contribute to virtual universities, as they are doing now with the Syrian Virtual University. We have a virtual committee of 500 professors of Arab origin living in the U.S. and Europe, and they provide economic advice and academic support to our students, even though they cannot leave their jobs in the West and go back to the region.

Turning to the second goal of SVU -- lifelong learning – we hope to upgrade and update the Arab workforce in different sectors, starting with university professors. A large number of university professors in different Arab countries graduated from universities in the Eastern Block, and they have not had a chance to upgrade their expertise for the past 20 years. Therefore, particularly in many fields related to technology and business, the Arab professors are completely outdated and in need of an upgrade. In addition, we need international expertise, which we cannot attract to the region. However, with virtual education, we can have students studying in international programs. For example, at SVU we have several students enrolled in Master's Degree programs at Georgia Tech and at the University of Michigan, as well as at other universities.

In the Arab world, Internet usage is very low and most people have not heard of virtual education. Furthermore, many who have heard of it have lots of misconceptions. This is especially a problem due to the Arab language. In Arabic, the term used for "virtual" university means "assumed" university. In one of my live interviews, one of the parents called me and asked the following question. "If I assume that my student is a doctor, would you give me a degree from SU?" As you can see, there are lots of issues here! In order to clarify all these issues, we initiated a massive public education program using different types of media. We

have visited many places, delivered lots of informational seminars, and so on, as well as organized visits by high schools and parents to our offices and to our centers. We also have participated in numerous international exhibitions, etc.

Another very important issue for us is credibility. Unfortunately, there are many spam emails circulating that claim you can get a Ph.D. over the Internet in two days for, say $4,000.00. People in our region become confused between the virtual university concept and those people. In many Arab countries, this is an unknown mode of education, and the PC itself it still a luxury item or simply a tool for entertainment. For this reason, parents regard the Internet as a medium for fun rather than for education. Furthermore, some parents are aware of the known problem of isolation in virtual education. Finally, this region of the world has not had much exposure to many unconventional educational methodologies, and for this reason, open education and distance learning are not very popular. For example, here in the U.S., virtual education online was a natural improvement from the traditional distance learning of television transmission, etc. In our region, we have had to jump from conventional education to online education without passing through the different, natural stages.

In order to address this issue of credibility, we have had to develop a high level of accreditation and we are fully accredited. This accreditation was especially critical since we have faculty members from different universities, and, let me say, the harshest attacks came from these university professors and also from our international partnerships with well-known universities. For example, many people worried that a student would bring his girlfriend, or whatever, to take an online exam on his behalf. So we have had to highlight the fact that all the examinations are taken in centers authorized by SVU in different locations throughout the region.

In developing the Syrian Virtual University, one major problem has been the lack of a strong telecommunications infrastructure throughout the region. Of course, this situation differs from one country to another, but all in all in the region we do have some countries with very weak infrastructure, such as Syria, and some parts of Saudi Arabia, the Gulf States, Egypt, Sudan, and of course, Iraq. For example, in Syria, we only have a dial-up Internet connection and thus there is very low PC penetration. To solve this, we have had to build different community centers in the different regions of the country. Those centers have temporarily solved the issue of connectivity because any student present there gets free access to the Internet. An added benefit to this system of community centers is that through them there has been created a kind of physical community for the students. Although the students might not be enrolled in the same program at the same center, they do become part of a regional community through their presence at the center. This helps them

through the transition from a class-based teaching model into a fully online teaching model.

Another issue that SVU has had to deal with is regional resistance to any kind of change. The virtual university model requires change at the educational level. As I am sure you all know, professors in the traditional classroom setting feel like superstars, able to transmit whatever they want to the students. However, they believe that they lose this status with online learning and continue to argue that face-to-face learning is much better. This resistance of professors to virtual education is strengthened by the fact that many of them do not use computers regularly.

There is also administrative and cultural resistance to online learning in Syria. Syria is an ex-socialist country with lots of bureaucracy, making it difficult to be as flexible as you want. Added to this is a cultural inflexibility. For example, up until one day before the launching of the Syrian Virtual University, any email going in or out of Syria used to be monitored, and it might have taken one week for mail to go in or out. Finally, the President announced that the system had to open up. Suddenly, the people were told that they could go to 200 universities, choose whatever program they wanted to enroll in, discuss whatever they wanted with one of their colleagues, and perhaps even have a colleague from Israel or other different countries. However, if you are discussing political or cultural issues, you might still have a problem. It was a huge cultural change, and therefore, we had to regulate during this transitional phase.

Another problem we have had to confront is the fact that many people cannot afford to pay. Therefore, we have had to develop low tuition programs locally in order to avoid international pricing. For this reason, we have different types of international partnerships, resulting in higher and lower fees for students. In some of the partnerships, the international partner will teach and provide the content, providing most of the education. These programs are more expensive, and the student will receive two degrees, one from us and one from the international partner university. The locally developed programs are less expensive and in them, we do develop and provide most of the education, basing that education on content from an international program. These students will receive our degree, along with some kind of certification stating that the program is according to the curricula of such and such partner university. Currently we are expanding into the Gulf States and into several other places. Next month we are launching our Dubai offices. In these moves to new locations, we have to implement certain change management theories in order to deal with inflexible bureaucracies, laid-back attitudes, etc. In addition, there are different types of cultural issues we have to adapt to, particularly when designing our learning model to these new locations.

In terms of the SVU learning model, we believe that in conventional education there are five major components: the students; the

teachers; the content; the interaction among the three; and assessment. In this traditional model, the content is static, and the interaction between the student and the content is inactive. In that model, the material is transmitted to the students in a face-to-face session, and usually this transmission is a one-way exchange. It is this component of content that is different in the SVU online teaching model. The content is very, very important because it is not sufficient merely to have the material printed online. In our model, the content has to play an active role and has to be designed in an interactive manner that can lead the student to a specific learning objective and also communicate with the learning management system to provide tutors with feedback on the student's progress. Learning management systems are a very crucial part of organizing and administering the educational delivery, as well as tracking a student's learning success.

At SVU, we also had to decide how much communication we wanted between the teacher and the students in the virtual learning community. In our region, let me declare that email and discussion forums would not be sufficient. People in that region are not used to self-learning, not used to time management, and not used to self-motivation. They need to be in a classroom setting. This is the area in which we did considerable research in the early months, and we realized that we needed a virtual classroom solution in order to initiate, let us say, the first phase of SVU. We have also had to work hard with the teachers to train them how to teach online. They always have the tendency to teach in a virtual classroom the same way they do in a conventional classroom – simply by straight lecturing for 80 or 90 percent of the time, leaving only 10 percent for discussion. So we told them -- "okay, stop doing that." We encourage them to pre-record for the online content whatever they want to say to the students in a session, thus saving the very expensive one or two hours of discussion exclusively for discussion and for the exchange of ideas with their students.

The Necessity of E-Learning for Palestine

Presented by Dr. Fouad El-Harazin
The Gaza International Foundation for Peace on Earth
Gaza City, Palestine Authority
Palestine

First of all, I would like to express our deep gratitude to our host, MIT and Learning International Networks Consortium (LINC), for providing us with the opportunity to come together and focus our attention on action to achieve sustainable development in Gaza in the area of e-learning technology. By helping university students complete their higher education through MIT's Learning International Networks Consortium, you will make an important contribution to Palestinian society at a time of unprecedented need. Palestinian students are eager for knowledge and eager to be active members of a national and international society. E-learning will help to support the peace process and the social development of Palestinian society.

A prolonged political crisis in the occupied Palestinian territory has led to deterioration of civil services and the quality of civilian life. It is a gross neglect of fundamental human rights. Literally thousands of students are calling out for the financial help that will enable them to continue their study. Sadly, many of them have already left the universities, and the number is growing due to the continued political and economic situation.

My affiliated organizations, Al-Azhar University and Gaza International Foundation for Peace, cannot allow this to happen. We are committed to overcoming these challenges facing Palestinian education. We are committed to establishing a system of comprehensive e- learning, one that will deliver a high quality of education through promotion of digital literacy and the culture of lifelong learning. Needless to say, education is a fundamental human right. Such an essential social infrastructure must remain in place and be developed further, not only through e-learning, but through a culture of lifelong learning. We can introduce e-learning to Al-Azhar University by using a computer-based format with several steps, including: an analysis phase; a design or development phase; an implementation phase; and an evaluation phase.

The Gaza International Foundation for Peace, in focusing your attention upon the ongoing crisis faced by Palestinian university students, can help raise awareness of their plight within the international community with the aim to provide those students with financial assistance. In this way, your support to individual students through MIT and Learning International Networks Consortium will eventually allow Palestinian higher education to survive its current predicament.

An improved quality of higher education in Palestine is very important to the peace process. For this reason, my colleague, <u>Dr. Hazim Eakeek,</u> and I have developed a model for developing electronic learning in Palestine, in cooperation with <u>Al-Azhar</u> University and the Gaza International Foundation for Peace. Palestinian higher education has suffered dramatically as a result of the occupation. A major problem is the difficulty of students physically traveling to the university for their education due to checkpoints and other shutdowns. E-learning would do much to overcome these limitations. An example of this would be a web page-based technology for teaching physics, while at the same time establishing an electronic learning unit to improve the distance teaching in the university.

As you may know, Gaza is 32 kilometers from the area of <u>Rafah,</u> which is between the Palestinian territories and Egypt. Most students come to our university in Gaza from <u>Rafah,</u> and the trip takes about 20 minutes. However, sometimes it takes three days! This is why I am here to give you an idea of how difficult it is to attain higher education in Palestine due to this situation that we call the <u>deficient</u> process.

In the Palestinian territories, we have a total of ten universities, and in Gaza, we have three of them. These three are <u>Al-Azhar</u> University<u>, Al-Aqsa</u> University, and Islamic University. As a mater of fact, in the case of one of these universities, <u>Al-Aqsa</u> University, I personally donated the equivalent of $3 million. For example, I traveled around the U.S. to obtain <u>80,000</u> books and some computers for this university. Originally this was a high school that was established by my family. The high school grew into a university and was incorporated with the <u>Ain-Shams</u> University in Cairo. We graduate Ph.D.'s and Master's degrees. That is what the peace is. All of this was built from scratch. Originally, we did not have a university but since its start in 1999/2000, we have built up to 70,000 students. In that regard, we do have enough students but we still need to be able to educate more students.

Unfortunately, our students have many problems. The faculty and student attendance at the university continues to be severely affected by the presence of the Israeli checkpoints. This is very important. We would like everybody to know that and to understand that without peace, the Palestinians cannot educate themselves. The long- term affect of this academic situation will be very negative for the region. For example, Gaza is split by a section of Israel. Therefore, to go from the north side of Gaza to the south side can sometimes take 20 minutes, or all day, or one week, or sometimes even longer. Thus, you can imagine what we are suffering at this time.

Together <u>Al-Azhar</u> University and the Gaza International Foundation for Peace are seeking to develop a comprehensive integration of e-learning and traditional education and training. The goal is to create a flexible infrastructure that will make e-learning available to all Palestinians. We are trying to promote digital learning among Palestinians

and to create a Palestinian culture of lifelong learning. These goals are crucial to the development of quality higher education in Palestine. In order to meet these goals in Gaza and in the West Bank, and generally in all the Palestinian universities, we need to ensure that the entire population achieves a high educational standard in order to respond to evolving economic requirements. However, these goals are not easily achieved given the erratic social, economic, and technological changes taking place in Palestine. There must be a renewed urgency to find solutions to the Palestinian problem in order to secure a new culture of peace and stability. Young Palestinians must be given access to the digital information age that is now changing the world.

Al-Azhar University was founded in 1991 in order to meet the demand for quality higher education today. It is one of the largest Palestinian universities, with an academic staff of about 322 members and an administrative staff of 234. The student population is around 12,000. The university is made up of eight separate schools, including: medicine; pharmacy; applied medical science; agricultural science; education, computer/ information technology, economics, and management. The difficulty for the university started with the students from the southern part of Gaza, in the Rafah area. On a good day, about 25 to 30 percent of the students are unable to attend classes because of the checkpoints. It is for this reason that Dr. Sakeek and I concluded that e-learning was a solution to this difficult political situation. What we have initiated already is just an e-learning model, not a program. We have been able to use email for giving tests to students unable to get to the university. Of course, this is not really a program. Hopefully somebody, some foundation, will help us to create the kind of e-learning educational system that can assist Palestinian students complete their higher education degrees despite the checkpoints.

Technical and Pedagogical Initiatives at
L'Universite de la Formation Continue
To Insure that Distance Study Programs Are Open to All

Presented by Mr. Abdeldjebbar Lemnouar (President) and
Mr. Khaled Kaid (Assistant Director, Distant Teaching)
L'Universite de La Formation Continue (UFC)
Alger, Algeria

Today I will present a discussion of the technical educational system that has been put together for continuing education in Algeria. First, however, I would like to give you a quick overview of my university, *L'Universite de la Formation Continue* or the University of Continuing Education of Algeria (UFC). It was created on May 26, 1990 and now has 52 resource centers throughout the country. The university provides an a la carte education for private enterprises and offers evening courses, distance education and on-site education for these enterprises. We have 56,000 students, and 17,000 of these are in distance education. UFC has forty-eight full-time teaching staff and 2700 part-time teachers. Distance courses are offered via two media outlets, television and radio, and also via a website that was created in 1998. We have partnerships with organizations and corporations within the country and also internationally.

The mission of *L'Universite de la Formation Continue* is to provide knowledge and know-how along with cultural and personal confidence to professionals who are young adults already engaged in their professional lives. We also provide diploma and degree programs in both a face-to-face and distance educational environment. To sum it up, the mission of our university is a dedication to lifelong learning.

At UFC, we have held two colloquia and several workshops on distance education and the virtual university. Our goal has been to teach teachers how to use the new computer-based tools as well as how to navigate and search on the Internet. Just to summarize, we have been trying to de-mystify for teachers all the web-based tools, e-mail, and other computer platforms.

In order to standardize our distance education system within the larger university system, we decided to produce some reference documents for our distance users with prerequisite information models, protocols and frameworks for their use. Among these documents are a set of guidelines that guide the administrative side and the pedagogical side of student management within distance education. This document clearly sets forth the expectations placed on teachers and course designers, along with a guide on how to prepare written courses for distance education, a

guide for facilitators of small groups within continuing education, and a guide to advise students who are taking a course in distance education.

There is a significant imbalance between the number and quality of teachers and the size of the territory of Algeria. UFC has been challenged by the limited distribution of its resource centers, the continuous growth of its student body, the real lack of welcoming infrastructure, and the increasing demand for education in Algeria. So, to face this challenge, UFC has chosen to modernize its pedagogical practice through the use of computer-based and web-based tools. Originally, back in December 1990, UFC initiated distance education in the form of correspondence education by printing the courses and sending them through the mail. Later on in the1990's, we introduced a course from the department of business law onto the website of the university. Then in October 2001, we began to produce diskettes as a new pedagogical support for distance education students. Finally, in 2002, UFC began using CD-Rom technology to send courses to students in Word or HTML.

Still striving to introduce new technologies for communications, we recently have acquired four video set stations for our original UFC distance learning centers, and because these video conferencing systems provide a lot of autonomy, they respond to precise objectives. One of these objectives is access for teachers and students to share sparse educational resources that are not available locally. The video conferencing systems also allow UFC to provide uniform management of the 52 resource centers scattered throughout the Algerian territory. In addition, these systems   make up for the lack of high quality teachers and administrators, by allowing transference of knowledge from one center to another.

First among the future goals of UFC is to make internet and other technology- enhanced pedagogical resources available to a large number of teachers and students at the university's resource centers, at cyber cafes, and also at home. Currently, some of our web-based video conferencing courses are recorded on cassette and distributed on demand to teachers who are then facilitators within the resource centers. Behind all of these efforts is the major goal to democratize postgraduate education in Algeria and to distribute resources more equitably. .This will only come about as we develop more high-speed Internet connections. Through this enhanced technology, UFC will save time and money, as well as adding value to the rest of its educational system.

Therefore one of our most pressing goals is to create a fixed procedure for developing distance-learning courses that can be distributed via some form of computer technology. In order to achieve these e-learning goals, the university has begun to commit itself to putting all of its courses on a computer platform. The platform we use has an authoring system within it that provides templates for building courses, for modularizing courses and for presenting courses via media. With it, the course author can add pictures to the text and make the course interactive

and multimedia. So far, six teaching modules about business law have been designed this way. Eventually, UFC will transform all its courses, allowing us to offer high-level courses to all our students, available to them on the web.

We are in the process of developing an Intranet that will connect all the resource centers to the center at the main campus of the university. In the first phase of this process, four regional centers will be connected through this Intranet system. This will be achieved via the V-Sat stations that are already installed. The idea is to have one central server and four mirror servers that will lighten the load that we expect to have on the central server. This system will fulfill two goals: 1) to provide a home for the distance-learning platform; and 2) to serve as a relay for the sharing of large files. This system will also insure a uniformity throughout the country for student evaluations and for the validation of student educational programs by allowing the central university to use its own programs to monitor administrative and pedagogical management. In addition, this nationwide system will allow bi-monthly pedagogical supervision of distance learning students, as well as formative evaluations of those students throughout the semester and summative evaluations of their work at the semester's end.

SECTION FIVE

ICT IN AFRICA:

CHALLENGES AND ACHIEVEMENTS

Partnership for Higher Education in Africa: Using Information and Communications Technologies for Teaching, Learning, and Research

Presented by Lisbeth Levey, Facilitator
Partnership for Higher Education in Africa
New York University Steinhardt School of Education

What I have been asked to do today is to speak specifically about what my organization, the Partnership for Higher Education, is doing with ICT in Africa. My presentation is based on several reports in which I was involved. One is called "Rowing Upstream; Snapshots of the Pioneers of the Information Age in Africa." There are also two reports from my work with the Partnership. One is on a workshop I led on using ICT for teaching, learning and research, and the second, and most recent one, is a study on bandwidth that was coordinated by the University of Dar Es Salaam. So as you can see, my remarks here this afternoon are going to focus very heavily on nitty, gritty technical issues.

Before getting started, however, I would just like to continue with what Ahmed Bawa said. For anyone who is interested in getting additional information about higher education issues in Africa, the Partnership has been supporting a number of case studies both on the national level and on the institutional level. Three of these have been published -- one on Uganda, one on Tanzania, and one on Mozambique. In addition, a case study on South Africa is currently at the press, and additional studies are underway for Nigeria, Ghana, and Kenya. These studies are available on the Partnership website.

I wanted to give you just a little bit of background information about the Partnership. It is important to remember that the Partnership only works in six sub-Saharan African countries, and those countries are Ghana, Mozambique, Uganda, Tanzania, Nigeria and South Africa. We do not support projects in any other country, although we do support a number of pan-African and some sub-regional activities. When the Partnership was established in 2000, the six Presidents of these countries committed themselves to an investment of $100 million dollars over five years, and most of that money has been committed and distributed. There have been $92 million dollars' worth of grants; $84 million was for direct support to institutions, primarily in Africa, and the remaining money was used to support analytic work, including the case studies I just mentioned. ICT is a theme that has been identified as critical by the Partnership because of its cross-cutting nature, and also, because bandwidth is a major issue in Africa. Therefore, the Partnership is focusing its immediate attention on bandwidth, together with ancillary issues that are related to bandwidth.

Now let me give you just a little bit of information about what the Partnership's sponsoring foundations, and the Partnership itself, have done in the area of ICT in Africa. Here I should emphasize that the largest

percentage of grant making within the Partnership consists of individual foundation grants for activities -- whether it is capacity building in an institution or support for a library. Each of the four foundations has been involved in grant making of this nature. Institutionally, for example, the Carnegie Corporation of New York has been making major grants to Makere University and the University of Dar Es Salaam. Carnegie has also funded efforts to promote a network within the historically disadvantaged universities in the western cape of South Africa, enabling them to work with the historically advantaged universities. The Rockefeller Foundation has been very involved in helping get Information Access issues placed at the forefront for Africa. They supported the creation of an electronic library on CD ROM of essential agricultural literature and of the broad-based agricultural sciences. They also have been working to extend this service online. The Ford Foundation has been carrying out activities in a number of countries in the area of ICT, primarily focusing on institutional capacity building. The Partnership has had several joint activities with them. We collaborated with them and the UN Economic Commission for Africa on a workshop for ICT for higher education. Also with them, we have supported the Dar Es Salaam bandwidth study, and are providing support to the Association of African Universities for the creation of a database of African theses and dissertations. This provides you with a small sample of how these grants work.

Now I want to provide you all with some context that I think is really important. There is much talk about the digital divide, and I know that Africa has been on the losing end of this divide. However, I also believe very strongly that Africa has been making great strides. Therefore, I put together a little bit of history, and most of this information comes from the publication, "Rowing Upstream," that I mentioned above. The first CD ROM drive in an African research institution was installed in 1987 in a sub-Saharan African research institution outside of South Africa, at a place called Chutedze Research Station in Malawi. It was followed in 1988 by more CD ROM capacity at the University of Zimbabwe. Just think of it - 1988 was the first year that Africans were accessing research information electronically outside of South Africa, and they were using CD ROM.
In 1990, we conducted a survey of computer capacity. We surveyed 100 major sub-Saharan research libraries. Only 48 of them had computers, and 16 of them had CD ROM capacity. So that is the time context in which we must view Africa.

In 1987, WorkNet was established in South Africa, and that was one of the first networks. It focused on providing connectivity to NGOs working against apartheid. In sub-Saharan Africa, and, I think, in most of Africa, the NGO community understood the importance of e-mail before any other institution. In 1991, the International Development Research Center (IDRC) inaugurated the first academic e-mail network. By 1992, there were 16 African e-mail nodes between Algeria and Zimbabwe, and most of them were using FidoNet store and forward technology.

Of the African countries that were first to have any kind of Internet connectivity, that connectivity was almost entirely e-mail, and very little of it was full Internet capacity, hardly anything more than 64 Kbps. A few years later, by the end of 2000, 54 countries and territories in Africa had permanent connectivity. Furthermore, that connectivity was going from capital cities to secondary cities around each individual country. African newspapers also have gone online. The first one was *South Africa's Mail and Guardian*, but all of Kenya's major newspapers are online today, and some of them even have excellent archives.

However, all this requires bandwidth, and that is very expensive in Africa. The prices for bandwith range from as little as $2,000 for a minuscule amount of bandwidth, to something like $27,000 or $28,000 at Makere University, an example of the highest quality bandwith. Now I would like to report on an e-mail that I received from F.F. Tusibera at Makere University in response to my questions about bandwidth purchasing and capacity. He had several important things to say on this matter. He wrote that at Majere they get capacity from two providers as a matter of policy, to minimize the risk of total shutdown. Then he went on to say that both providers are national operators, licensed to deliver all telecom services. However, he reported that both of their service providers have been penalized in the last year because they did not deliver the bandwidth for which they were contracted. One concludes from his email that here we are dealing with both expensive and unreliable bandwidth, not only because the electricity may go out or the wires blow out at Makere University, but also because the Internet service provider itself is not providing a guaranteed service. So these are some of the bottlenecks with which our partner institutions in Africa are dealing.

In preparation for this talk, I did some comparisons with Internet II costs in the U.S. I looked at what Internet II costs in the United States, and those prices range from $50 per megabit to $250 per megabit, depending on the region in the United States where the bandwidth is purchased. That is far less than what the African universities pay, and far more than what they get for their money. I also tried to look at other developing regions of the world. In Chile in 2003, the Chilean National Academic Network was charging its members $1,000 for a megabit of Internet II bandwidth a month, which is higher than the states, but a lot lower than in Africa. While in Singapore, the Singapore Academic Network was charging about the same amount of money.

So why does Africa pay so much? It pays a lot because they are still getting bandwidth via satellite. They have only recently begun to deregulate, and the more bandwidth you buy, the cheaper it gets. There is power in numbers, and I can offer some examples. TENAT, the Tertiary Education Network in South Africa has been acting as an agent for South African universities to negotiate with South African Telecom on cheaper bandwidth. And their efforts have been successful. The African Virtual University, about which Peter Bateman spoke at lunch, is in the process of negotiating a

very cheap bandwidth rate for its learning centers, and they are talking about securing dedicated bandwidth. The Network Startup Resource Center (NSRC) is working with a consortium of equatorial universities to help them get reduced bandwidth costs. Right now, each university is buying bandwidth, and they are not aggregating. Collectively they are spending almost $100,000 a year, some of them just for dial-up connections.

So where does that leave the Partnership? We have completed the bandwidth study. We believe that for the short-term, our universities are going to require bandwidth via satellite. We know that it is more expensive, and we also know, from what our African colleagues have told us, it is not managed appropriately in every case. For these reasons, we are working to help them get cheaper bandwidth and to develop more efficient bandwidth management practices. The latter includes the application of bandwidth to teaching, learning, research, and management because bandwidth must be viewed as the means to an end. It should not be technology-driven.

What are the Partnership's next steps? We are looking at how to get cheaper bandwidth, and have begun to talk with the AVU about the possibility of working with them. We are looking at what it would require to establish a sustainable bandwidth consortium for Africa and what are the major commitments at the university and the national leadership levels? In addition, we are thinking of working with our African partners to organize a meeting on these issues of vice chancellors and other relevant leaders within the African university structure. This conference would be on bandwidth, but also more broadly on ICT. Finally, we want to consult and activate strategic linkages with other partners, both inside and outside of Africa.

I want to conclude very quickly with some examples of how bandwidth is already being used in Africa. I think it is important to give credit to the organizations and the people who have been working hard, for not much more than a decade, to accomplish something significant with what they have. The first two I will mention are Partnership examples. One is the Database for African Theses and Dissertations. AVU is working with 11 universities and the Pan-African Social Science Consortium, to help them collect, manage and make a very complete online bibliographic database of all of the theses and dissertations they hold. This database includes very full abstracts and will be made available on CD ROM for African universities, because those universities do not have sufficient bandwidth to go online. However, the database is now available online by subscription through the AVU Website. A second example, the African Economics Research Consortium (AERC), was created to improve teaching and research in the economic sciences in Africa. Their Website is a treasure trove of information. There you can find the full text of AERC reports and all of its working papers. A final example I want to mention is a women's network in Uganda. They are doing extraordinary things, working with Ugandan women to increase their capacity to communicate using ICT's and also to lobby effectively on issues that are pertinent to their interests.

The Partnership for African Higher Education and
The Challenge of Increasing Participation Rates

Presented by Dr. Ahmed Bawa
Program Officer for Higher Education
The Ford Foundation
South Africa

It certainly has been a fascinating day and a half. Above all, for the reason that here we are at MIT, one of the world's leading science and technology centers, and we have spent the bulk of the time talking about how we can use learning networks, learning technologies, etc. for developing countries. This conference sends a singularly important signal about the power of the responsible use of technology in development. For this reason, it gives me great pleasure to be here today and to have shared this experience with you. My task is to tell you a little bit about the Partnership for African Higher Education and to share with you some of the processes that the foundation is actually engaged in. I also want to discuss with you what has emerged as the set of strategic thrusts for the Partnership.

The Partnership for African Higher Education works in sub-Saharan Africa. First of all, I want to introduce you to the major issues in education on the continent. The fact of the matter is that for most of sub-Saharan Africa, the participation rates of 18 to 24 year olds is in the region of 1% to 3% in each country. There are some exceptions, of course. In South Africa, it is 20% of 18 to 24 year olds in higher education and close to 30% in some type of post-school education other than higher education. In Namibia, I understand it is something like 5% to 6%, but one has to remember that Namibia's population is very small. However, if one takes Mozambique, for example, the statistic is 0.3% of 18 to 24 year olds in post-secondary education. So there is an obvious dilemma. How do we get more young people into higher education?

A second important issue is the fact that the research capacity in most systems of higher education in Africa is under-developed. In many countries, it is actually non-existent. Even where there are some nodes, if you like, or some clusters of excitement around research, the effort is usually very isolated.

The third important issue, of course, is the usual one -- the chronic lack of resources on the continent, including financial, physical and human resources. This is something that has been present from the point of independence of these countries from the 1960's onward. However, this lack was hugely exacerbated through the 1980's and later with the structural adjustment programs of the World Bank and IMF that forced African governments to cut back on their funding of higher education, and also on the investment in basic education. That withdrawal of funding from higher

education on the continent has caused almost irreparable damage. It is going to take us a long, long time, as a continent to reinvigorate the higher education system.

The fourth important issue is one of brain drain, and actually, there are different kinds of brain drain in Africa. There are people who leave the continent to come to the U.S. and to Europe. These people are usually the best scholars. Then there is the brain drain from north to south, where South Africa has now emerged as a place where people can carry out some level of research and some level of decent teaching, etc. There is still another kind of drain, one that takes people out of academia into government, civil service, or into the private sector, largely because the conditions of service in higher education are so uncompetitive.

Finally, added to these problems is the constant pressures faced by African universities from governments, industry, and international funders. The universities are under constant pressure to become much more relevant and product-laden. This pressure has had both positive and negative effects upon higher education in Africa.

Having just reviewed some of the really critical issues that are faced by higher education on the continent, I am very pleased to say that we are at the confluence of some very powerful positive streams there. First of all, I think it is fair to say that there is considerable progress being made in the democratization of countries and nations in sub-Saharan Africa. Of course, there are some reversals as well. The obvious one is Zimbabwe at the moment. However, if one looks across the continent, across the sub-Saharan African context, there is enormous progress being made in freeing up the societies and in the establishment of democratic systems. What this has meant, essentially, is the opening up of policy space -- that is, the ability of universities to begin to engage with governments on the policy terrain that deals with the higher education sector. This phenomenon has been a really important new development. For example, many of the higher education systems with which the Partnership works are now beginning to engage with issues around the development of governance systems that are autonomous from the government – to begin to shape governance systems that are hinged on institutional autonomy and academic freedom. Several universities for the first time have been able to appoint a vice chancellor outside of the customary governmental process.

This process of democratization is extremely important because it opens up the space for new innovations, new ways of thinking about higher education in society, etc. Above all, it provides the space for these higher education systems to engage with the government in more interesting ways. As a result, one is beginning to see some very interesting and innovative approaches emerging. For example, the way in which these higher education systems are funded is now being re-conceptualized, and in the process greatly transforming the systems. Furthermore, within the context of the exploding information society, the network society, globalization, etc., there are growing national understandings of the critical importance of higher

education in development. Another example of this process of liberalization is a literal explosion of private sector providers of higher education. Even more importantly, governments are coming to understand that higher education is essential for the production of high-level human resources and for the production of new knowledge, in terms of locating their nations within a global context and to be globally competitive.

I have mentioned already the global and national liberalization processes, and the significant impact they have had upon the reorganization of higher education in Africa. The global liberalization processes can have both very positive and very negative outcomes for those higher education systems. The general agreement on the global trade of services, which includes higher education as one of the services, means that those African countries and their higher education systems have to cope with massive competition from institutions in the North. This is already beginning to happen. Many of the systems are very fragile and are not consolidated well enough to be able to enter such a competitive race. Thus, they are placed in a very difficult position. Of course, within the context of global forces around these liberalization processes, there is no possibility that individual governments can fight off these powerful processes. This is a very difficult situation. On the other hand, however, these liberalization processes open the way for fairly massive possibilities with regard to the widening of access to higher education. As you can see, there are both positive and negative implications.

Another significant development is the emergence of innovative higher education leadership on the African continent. Of course, this is due in part to the democratization process that is occurring. In addition, however, one sees on each of the campuses where we work that there is a new generation of educators and higher education leaders who are taking their universities in interesting directions. These people are leading reforms and leading transformative processes, thus opening the way for more innovative and nuanced approaches to developing higher education in Africa. At the same time, there is a very interesting shift in direction from the World Bank in particular, but also from other multilateral organizations, with regard to their commitment to higher education on the continent. One sees, for instance, that there has just been a World Bank loan of $160 million dollars to Mozambique for the development of the Mozambique Distance Learning Network. There is also a similar loan to Nigeria that is in process. Finally, there is a loan to the Ugandan government for Makerere University, as well as various other instances of increased funding for African higher education. Thus one can see that in fact there are powerful streams that have opened up, which point us towards the possibility of a strong resurgence in African higher education.

So that brings us now to the Partnership for African Higher Education, which involves four foundations: the Ford Foundation; the Rockefeller Foundation; Carnegie Corporation; and the MacArthur Foundation. These four foundations, under the guidance of their presidents,

decided to come together as a partnership so as to build coherence in their work with higher education programming on the African continent. This is a very difficult process because it is a process that brings together four foundations, each with its own traditions and its own programming lines. Of course, each program officer has a budget, and now we are saying that we must build a coherent program with all of these resources. However, I am very pleased to say in fact, that over this period of four years, we have been able to find ways of working effectively together. We have evolved a strategy, which brings us together, that I will describe a little later.

At the start of the Partnership, we began to think about how to engage with the continent's higher education systems. However, before I get to that point, let me just say that there are some fairly obvious understandings that we were able to arrive at. The first was that African higher education really does need a kind of new, post-colonial vision of itself. One quickly comes to this conclusion upon visiting African universities, including the universities in South Africa, which are in a very different place in terms of research. Visiting African universities, one immediately comes to the obvious conclusion that very much of African higher education is still driven by a colonial understanding of higher education. Here let me just give some examples.

The first one is that none of the universities in Africa have really conceptualized themselves as centers of knowledge production. They have always seen themselves as being important research centers, but are limited by only seeing themselves as supplementing what is going on in the North, rather than as complementing research in the North. Instead of this limited perspective, they need to take responsibility for the knowledge produced at their universities and for the building of knowledge that relates to Africa.

A second example is the fact that the emphasis in African higher education is primarily on undergraduate education, and it is primarily around production of doctors, lawyers, teachers, etc. This emphasis is a very typical set of activities espoused by colonial education. South African universities are divided into two large sectors; the one of historically white universities, and the other sector of historically black universities. Within this South African context, the historically black universities were created to produce the professionals, the civil servants, the teachers, etc.

Given all this, it has been quite clear to the Partnership that we have to take a systemic approach to all of our activities. It is clear that we have to develop policy and governance frameworks, and that we have to work simultaneously with the governments and with the institutions. First of all, the Partnership is working to develop the knowledge building roles of the higher education systems. It is also working to widen access through a massive scale-up. Here it is not just a question of increasing the numbers by 100 or 200. The central issue is to insure the connectedness with the modern African context, so that these are really African institutions, working within the African context. Beyond all of these endeavors, the Partnership has to

help African institutions to leapfrog into the knowledge era, this modern networked society.

So the five key activities that the Partnership has decided to engage in are the following. We will help to build higher education studies as a field. We will help to build research networks across the continent with the idea of drawing together scattered capacity for graduate studies and collaborative research. We will focus grant making on higher education leadership development and management training. We will find interesting ways to work with ICT, but in the short-term, we will focus on affordable international bandwidth. Finally, the Partnership will convene regular forums of higher education.

In conclusion, I want to emphasize one final point. I want to emphasize that this issue of widening the access to higher education must be done in a systemic way. It cannot be done with a project here and a project there, etc. It is okay to do some pilot studies, but if we really want to make an impact, then it has to be a systemic approach to building the capacity of the systems to widen access. In Africa, we are really talking about making a 100-fold change, not a two-fold or a ten-fold change. Such change can only take place in a system wide set of activities.

Global E-Quality: Lessons from NetTel@Africa

Presented by Dr. Maria Beebe
Director of Global Networks at
The Center to Bridge the Digital Divide
Washington State University
Spokane, WA

Since most of the speakers this morning have laid the groundwork for me, I will be able to race through my presentation. I will start with a short introduction about what I mean by "global equality," move on to discuss the challenges facing NetTel@Africa, and also present lessons from the trenches. Finally, I will outline the way forward in terms of formulating a Global Equality Alliance.

What I mean by "global equality" is simple parity of access to quality education, including e-learning. The NetTel@Africa vision is to empower people, communities, and institutions through knowledge, communication, and information technologies. The network itself, NetTel@Africa, is a nickname for Network for Capacity Building and Knowledge Exchange in the Telecommunications Sector. It is a mouthful! There are at least four components of this network. The first is a training component to develop courses for a postgraduate and masters degree program in ICT/telecoms policy and regulation. A second is a peer-to-peer, regulator-to-regulator component. These are regulators of telecommunications services. A third component is research in the areas of ICT's and telecommunications, with that research feeding back into the training component. The fourth component is ICT applications, as in e-learning.

 I will just focus a little bit on the ICT telecom's policy and regulation course development and e-learning delivery. This is the way we envision the network. At the top is the vision that citizens will be using ICT's. That could be made possible with good policy from the public sector and with infrastructure provided by the private sector – as long as there are competitive prices. We want to make sure that regulation is fair, transparent and predictable. Critical pieces of this network are the researchers and academics that provide the network with content and delivery. Closely related are some of the research issues, requiring a complicated network that includes many key players, multiple leaders, and various tasks.

First, I would like to summarize a little bit of what has already been said. It is sort of like good news and bad news. The bad news is that 52% of people in Africa live on less than $1.00 a day. Here we are not talking about one country; we are talking about different countries with diverse characteristics. These countries all have to face the global forces, which we have been talking about yesterday and today. These forces have been redefining education the way we know it. There are networks that are

starting to emerge in Africa, although they have not fully made use of the online environment. The challenges, which other speakers have already discussed, include policy/regulatory issues, human capacity issues, infrastructure issues, and bandwidth issues.

Enough has been said about bandwidth, except for saying that part of the problem is policy with regard to re-selling the bandwidth to various retailers. Our network of organizations is trying to let the Partnership deal with the bandwidth issues. On the other hand, we work with policy makers and regulators of ICT's and telecommunications. There is research to show that privatization, along with an independent body (usually a regulatory body), and along with competition, does, in fact, improve telecommunications performance measures. Such measures include increases in per capita usage, in number of main lines, in number of pay phones, etc. as well as decreases in price of local calls. There are policy objectives with regard to the African telecommunications sector, and I am not going to go through each of them here. One objective is increased telephone penetration in expanding the market. Another is movement away from monopoly and duopoly towards some competition in Africa. As you go to the newer technologies, the sector is more competitive and this transition to open competition is a part of what we are envisioning.

At the same time that we are dealing with policy issues with regard to telecommunications, there are also policy objectives related to the education sector. As a matter of fact, there is a strong similarity between the two. They both want to improve quality, increase efficiency, etc. The question is -- can we harmonize those two policies? Part of the telecommunications objective is universal service obligations. This certainly has implications or consequences for the other sectors. It has consequences for the education sector. So the question is -- is it possible to harmonize the policies with regard to the telecommunications sector, and the policies with regard to education? At this point of course, you have to think about some of the other policies that come into play, like trade policies. For instance, if you bring in spare parts of computers, you still have to pay duties, etc. Thus all of those types of policies need to be considered when dealing with ICT/telecom issues.

So what are the lessons from all of this? Now I would like to discuss some lessons from the trenches with regard to dealing with the lack of capacity in policy and regulation, particularly in the telecommunications and ICT sector. One of the parent activities of NetTel@Africa is Knowledge Exchange and Learning Partnership (KELP). The idea of KELP is to move away from one-way technical assistance with regard to African partners, towards a more equitable partnership. This equitable partnership would encompass knowledge generation, codification, validation, etc. It would also include the formation of learning partnerships that are Africa to Africa, as well as Africa to the U.S., at different levels.

The objectives of KELP were to increase the leadership role of African and American institutions in sustainable development. This would

be achieved through the integration of information communication technologies, as well as through an increased flow of knowledge and experience between centers in Africa and the U.S. The key operating principles are that it should be African led and there must be mutual benefit. The Americans must see why they should be working with Africans, and there must be shared objectives. In terms of the Network for Capacity Building and Knowledge Exchange, I just want to highlight a few lessons with regard to content, the use of a platform, and the pedagogy. The initial focus has been on ICT telecom policy and regulation. The thought was that if we built the capacity of regulators, practitioners, and policy makers, then maybe they would make better policies, and maybe they would improve their regulatory capacity -- so that ICTs would actually be deployed out there. Currently under development and discussion are issues of ICT applications, e-education, e-government, etc.

In order to develop course content, we asked the African regulators:-- "what is the knowledge base you require of regulators and policy makers?" They replied that they wanted the engineers to understand why they are making policy and wanted the policy makers to understand the technical aspect of the policy they were making. They also wanted both sides to understand the financial implications of their technology choices and their policy decisions. Subsequently, we came up with this menu of courses, which then the various African partners developed. In order to insure quality, the process was led by the African academics and there was a supportive role by the U.S. academics. We also had practitioners and experts from Africa and the U.S. to identify the knowledge requirements. They were involved in the pilot testing and peer review of materials. They are also involved as online guest experts and as mentors in the process. We are paying attention to the quality on the line benchmarks. A lot of the universities still need work on their quality on the line benchmarks.

In this e-learning process, we are using a platform called Knowledge Environment for Web-based Learning (KEWL), developed in Africa by the University of Western Cape. It is Open Source, and some of the universities who were already using Web CT are saying that they do not want to pay expensive licensing anymore. They have asked for a ride on KEWL since it is free, based on the principles of free speech.

In terms of pedagogy, we start out by defining e-learning as an effective teaching and learning process created by combining digital content with local community end-user support, along with global community engagement. The learning theory we espouse is away from the traditional mode of teaching and learning. Each course has course objectives, e-lectures, learning tasks, and learning assessments. There is an e-library for each course, and as we were developing the content, we were also enhancing the capacity of each individual institution and the over-all institutional environment.

Now I would like to go back to what I meant by "parity of equality." That refers to a parity of access to quality education, including education and

e-learning. The purpose would be to develop global educational policy by developing an educational experience that calls for equality at home, along with simultaneous global equality. There would be outcomes at the individual level. There would be benefits at the institutional level. We would hope this would lead to African ownership, peer to peer relationships, engagement of expert practitioners from public sector, regulatory bodies, and private sector quality assurance, open source for online learning management systems, open content, and network thinking.

Perhaps the overriding principle of an e-quality alliance would require local leadership with global engagements. There must be mutual benefits. There must be shared objectives, mutual respect for one another, some way of defining e-learning. Similarly, principles of teaching and learning good practice must be there, and coordinated quality assurance. As global educators, we must provide leadership in how people and technology intersect, advocate for open access to knowledge skills and ideas, and make this available to everyone. There is a need to balance commercial transaction with reciprocal exchanges, and I appeal to the private sector particularly on this particular point -- link learning communities -- Africa to Africa, Asia and America and so on, and then use ICT to acquire and act on knowledge for sustainable development.

SECTION SIX

NEW TECHNOLOGIES

IN DISTANCE LEARNING

iLabs: Performing Laboratory Experiments Across Continents

Presented by Dr. Jesus A. del Alamo
Professor of Electrical Engineering
MIT

   This talk is a continuation of a talk that I gave here last year on iLabs. The subtitle is how to perform laboratory experiments across continents. So the statement of the problem has already been phrased. There is clearly enormous value in doing laboratory experiments in science and engineering education. However, conventional labs, as we know them, are expensive and have complex logistics in terms of the space needed, staffing requirements, safety issues, equipment costs, etc. In addition, conventional labs do not scale well since they cannot easily be shared. Therefore, all institutions must own just about every kind of lab. Obviously, this is not a good model, and many of us in engineering education believe that this model results in the situation that we do not actually have enough labs in our curriculum.

   A partial solution to this problem is online labs. Now let me define this concept. Online labs, which we also call iLabs, or WebLabs, are real laboratories that are accessed through the Internet from anywhere, at any time. Here I must be careful about the definition. Online labs are not virtual labs, which are usually referred to as a set of simulations that you can access remotely, that provide some kind of description of a physical system. iLabs are not "canned" experiments that are all set up for you to just click and then watch the results. This is an actual physical system that offers you the opportunity to interact with it in a rather rich way. We have been working at MIT now for over five years on a variety of online laboratories in various disciplines, and we have come to the conclusion that online labs can indeed deliver many of the educational benefits of traditional labs in science and engineering education.

   Now I would like to describe some of the iLabs that we are pursuing here at MIT. For example, in the campus' main court, the Killian Court, there is a very large flagpole with the U.S. flag on top. The flagpole is instrumentalized with sensors so that students can watch remotely the real time vibration of that flagpole in response to wind conditions monitored at a neighboring weather station. Another example is a Chemical Engineering iLab involving a polymer crystallization experiment in which students can remotely melt a polymer, and then watch in real time as the polymer recrystalizes. They are able to watch, in real time, the formation of the crystallites and the growth of the various crystallites. Another iLab involves a shake table in Civil Engineering, in which students can observe the response of civil model structures to various vibrational patterns that are applied to the table. You can, in fact,

load an actual earthquake waveform onto the table and then watch how a model building responds to that specific earthquake. We also have a Chemical Engineering iLab that works with a heat exchanger, allowing students to examine the dynamics of heat flow between two closed loop circuits of water.

Now I would like to describe my own iLab, the Microtronics Device Characterization Test Station where students can take the current voltage characteristics of transistors and other microelectronics devices. The user interface of this test station enables students to set up an experiment using the circuit language of electrical engineering. The transistors appear connected to various ports of an instrument. Then the students can program these ports by turning them into voltage sources or current sources. The results are presented in a rather rich interface that affords a number of ways to graph the data. Of course, this data can also be visualized and downloaded for further processing, and the set-ups can be saved and then retrieved at later times.

We have done a number of experiments using this lab and I am referring specifically here to my own microelectronics iLab, which went online first in 1998. Since then, it has been used in graduate and undergrad classes at MIT in microelectronics. The lab itself sits in building 38 at MIT, but students typically use it from the institutional clusters at MIT or from the residences in Cambridge and across the river in Boston. We have also had this iLab in use by students around the world. In the Singapore-MIT Alliance, students in a graduate program in Advance Materials have been using this lab to carry out experiments for four years in a row. That involves about 25-30 graduate students.

Our biggest iLab experiment to date has been from Chalmers University in Sweden, which is six time zones away. In Chalmers, about 350 students in a junior level electronics course have been using our lab to take measurements on various transistors, and they have done this now for two years in a row. So all together, between MIT, Singapore and Chalmers, this iLab has supported 1900 students since 1998 in assignments for credit -- assignments in which the students will receive credit that contributes to the final course grade. You can see that the responsibility on us to make these experiments educationally worthwhile is clearly there.

Through all these experiments over the last few years, we have learned quite a bit about the unique properties and characteristics of iLabs. Now let me summarize a few. On the pedagogical front, there are clearly numerous advantages that iLabs have. First, iLabs create laboratory experiences in subjects that did not have them before. As a matter of fact, that was our motivation in creating these labs -- we were frustrated that our students could not do these kinds of lab experiments. Now they can. iLabs also enable the experiments to be offered to the students at the moment in their studies when it is most effective. Traditional science and engineering curriculums limit laboratory experience to laboratory courses,

so there can be a difference of timing. With iLabs, you can ask the students to do the experiments just when you are studying the material in class, which is a significantly more effective learning model. iLabs also allow the students to perform experiments from pleasant environments, at times of their own choosing, and that really makes a big difference in terms of the effectiveness of the experience. Furthermore, iLabs minimize frustrations with the hardware since the experimental set up is working and debugged. While the students still can experience a rich set of interactions with the iLab system, most of the wiring and set up is already made for them so they can focus on the educational experience that the teacher is trying to have them focus on. In addition, iLabs allow students to work in a stop and go mode, so that if they are tired or hungry, they can stop and come back later to continue. They can save their work and retrieve it later.

Turning to the logistical side, there are also a number of unique characteristics of iLabs. iLabs can be located in places that are inaccessible to students, in situations that are not possible for us today. I can see how in the future there will be labs, for example, in the North Pole, at the bottom of the ocean, or maybe even flying up in space. It is also true that iLabs hold unique scaling characteristics. They can be used around the clock; since once you put them online, they remain online. Students in different time zones can use them, and as a result, the user-base is anywhere around the world. So you can see that all this radically changes the economics of the lab experience, with revolutionary implications for science and engineering education. The future as we see it is a future in which -- through iLabs -- there will be an order of magnitude more laboratory experiences available to students at the precise time in the curriculum when it makes the most educational sense.

With iLab technology, we will be able to afford very sophisticated labs because we are going to pool them broadly around the world, with advanced instrumentation involving rare materials or involving unreachable, dangerous locations. In addition, iLabs will come embedded inside rich educational platforms that will contain graphing tools, simulators, data processing tools, and so on. These labs will also involve collaboration with other students doing the same experiments, along with remote tutoring as students seek help in real time. We envision that communities will develop among iLab users -- communities of learners who will share not only the labs, but also the educational knowledge and content that has been developed around the labs. Today, as I make my lab available to other colleagues around the world, I also give them all the assignments for the lab that any of us here at MIT have developed. Those distant colleagues can just go ahead and copy them, or perhaps adapt them to their own courses.

An important goal of my talk here today is to discuss how, through iLabs, institutions in the developed world will be able to support the educational programs in the developing world at a marginal cost because

our labs are basically always online once you place them there. Therefore, for the rest of this talk, I want to tell you about a feasibility study that we are carrying out right now for iLabs in sub-Saharan Africa under the sponsorship of the Carnegie Corporation of New York. This involves three foreign universities working with us here at MIT: the University of Dar-es-Salaam in Tanzania; Makerere University in Kampala, Uganda; and Obafemi Awolowo University in Ile-Ife, Nigeria. The goal of this project is two-fold: first, to assess the potential of iLabs to enrich the curriculums of these institutions in developing countries; and second, to identify the barriers that prevent the realization of this potential in developing countries.

We have selected two labs at MIT to participate in this feasibility study. One is my own Microelectronics lab in Electrical Engineering to test microelectronic devices remotely. The other is a heat exchanger lab of my colleague, Clark Colton, in Chemical Engineering, where students can study the dynamics of heat flow between two closed loops of water. The process of this feasibility study which is currently underway involves the following five steps: to establish linkages with the three foreign universities; to visit them; to study their information and communications technology infrastructure; to connect with their faculty; and to understand their curriculums, their programs, and their lab situations. Once these steps are completed, we hope to carry out some educational experiments, hopefully involving the students and faculty at these three universities.

Now I would like to summarize for you some of my preliminary findings from my early visits. I did find a good match between the engineering curriculums at these institutions and our curriculum, meaning that their educational content was similar to ours and could then be enriched by the use of our labs. There is also, not surprisingly, a dearth of labs at these universities. Certainly, since we did not have these specialized labs at MIT in the first place, it is not surprising that these institutions do not have them either. Thus, there is clearly a need for these two lab experiences at the universities, and there is also a great deal of enthusiasm among my African colleagues to capture such experiences through our online labs.

However, there are a number of barriers that have been identified, and today I will mention just three of them. First, there is limited access to network computers on the part of the students since the computer clusters are open typically 12 to 14 hours a day and closed overnight. Furthermore, there is negligible student ownership of PCs, in sharp contrast with MIT, where I believe over 90% of students own their own PCs. In addition, there are no network computers in the student residences. Thus, while there are network computers in institutional clusters in the academic buildings and in the libraries, there are none in the student residences. So over the evening and nighttime hours, the students really do not have anywhere to go. They cannot use the network computer. That is the first significant barrier.

The second issue is a sense of limited computer literacy on the part of the African students. Now these are engineering students, and they are perhaps the most technologically savvy students that you can find in these three countries. Y et in spite of that, their exposure to computers has been very limited. In fact, there is limited awareness of the computer as a versatile engineering tool that engineers use to do design, to control instrumentation, to do complex simulations, etc. These students use computers to email, to surf the web, to prepare reports, but not to perform those engineering tasks that are very common over here. As a matter of fact, you can detect a certain degree of computer phobia on the part of the students -- even Electrical Engineering students. I heard that the students in electrical engineering tend to flock towards electrical power engineering because they perceive it to be an area where there will be no computers. So clearly, they have not been exposed enough to computers in their childhoods, and somehow they have developed a degree of phobia towards them. This is clearly a problem and, of course, a great opportunity as well.

Finally, there is the bandwidth barrier. Let me sketch for you the bandwidth situation in a typical institution such as Makerere University in Kampala. The university has a single mode optical fiber network that runs at two gigabytes per second basically throughout the campus, though it skips the student residences. Most buildings are networked at 10/100 megabytes per second, similar to what we have at MIT. The problem comes in connecting this campus-wide network to the rest of the world. This is done through a metropolitan network with a total bandwidth of two and a half megabytes per second at a monthly cost of $28,000. This connects to the two ISPs that the country has as a duopoly, and they link through a satellite to the rest of the world through, I believe, an ISP in Norway. For reference, the total bandwidth of Uganda is 25 megabytes per second, so therefore Makerere University actually is using 10% of the entire bandwidth of Uganda at a significant cost.

This situation clearly is a big problem, but why is it so? If you look at a map of the submarine optical fiber network system around the world, you can see a huge gap here in east Africa. You can see how the nearest fiber drop is in South Africa, and then you have thousands of kilometers of the East African coast that are not served by a direct connection to the rest of the world. You can also see that there are no fibers laid out inside Africa. So each country in East Africa, in fact, is an island in the global Internet. One important consequence of this is that it would not be effective to set up a regional center in Africa to disseminate the educational content in the neighborhood, because they would still have to go through a satellite. Thus, it really does not make a difference whether the content comes from say, South Africa, or from the United States since you have to go via a satellite either way.

In fact, the situation is even more dire. In a country like Uganda, for example, different cities connect to the Internet separately through the

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satellite because there is no optical fiber system that connects these cities together. Therefore, if you want to have educational resources say, in Kampala, being shared with students in Entebbe which is just a few miles down the road, you still have to go up to the satellite and down again. This means that each city actually is an island in the global Internet, and that again, it does not make sense even to have national educational centers for educational distribution.

At this point, I would like to put the numbers in perspective with what we are accustomed to here at MIT. For example, at Makerere University, the Campus Gateway, the university's Internet connection to the rest of the world, is two and a half megabytes per second, whereas at MIT it is 2.3 gigabytes per second, about a thousand times higher. The Campus Gateway costs the university about $28,000 per month. While the actual figure for MIT is confidential, I have been allowed to put a ballpark figure at about $80,000 per month, three times higher. Of course, these costs have to be put in perspective by considering the GDP per capita which gives you a relative sense of how painful it feels as a result of what you are paying. Here, there is a factor of 30 between Uganda and the United States. So altogether, this adds up to a cost of bandwidth relative to the GDP per capita, which is a factor of ten thousand between Uganda and the United States, between Makerere University and MIT.

A factor of ten thousand in relative cost is very large. This difference is bound to have huge implications, which I am just starting to consider. First, it seems to me that technological solutions developed at MIT, such as our own iLab technology, might not be a good match for the needs of developing countries. This is because they are developed in a milieu that is bandwidth rich with plenty of high performance computers but they are going to be deployed in an environment that is bandwidth starved, and where computers have much less capabilities. This became clear to me as I was running real time demonstrations of all our experiments at these universities and I could see that the experiments really felt very different. In fact, I think even the pedagogy is likely to be very different in bandwidth starved situations because the attention span of the students and the responsiveness of the system is likely to be very different from the situations for which it was designed. Finally, it is clear that we really need to deploy the educational resources locally as much as we can, inside that two gigabyte per second optical fiber system where they can be accessed in a very fast way. So, while there are challenges, I am confident that there are also technical solutions to these problems.

As a matter of fact, at MIT and under iCampus sponsorship (MIT-Microsoft alliance), we are working on what we call the iLab Shared Architecture. This is a new architecture for online laboratories that addresses these problems to a great extent. This architecture introduces a middle layer that we call a *service broker*, which handles many of the routine transactions, such as user management, data storage, authentication, etc. It pushes all this to a separate entity that we call the

broker, and this broker could be placed locally at the African campus, as opposed to being located on this side of the world. In this way, the architecture minimizes much of the traffic that is just about authenticating users, giving passwords, storing data, reloading data, etc. and causes that traffic to remain local. As a result, the Internet is accessed only for the very essential traffic, which is to carry out experiments and retrieve data from those experiments.

In summary, we believe that iLabs will enhance science and engineering education around the world. iLabs and their educational content will be widely shared around the world. In fact, iLabs will provide a path for the developed world to help in achieving educational goals in the developing world. As I have suggested, there are unique challenges to the use of iLab technology and pedagogy in the developing world. However, I believe there are technological solutions, and in fact, our iLab Shared Architecture has significant potential to address the problems. In that spirit, I will leave you with our motto: "If you can't come to the lab, the lab will come to you."

The eGranary Digital Library: Providing Inexpensive Access to
Educational Information Available on the Internet

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

Today I want to talk about two things. Very briefly, I want to start by talking about our WiderNet Project because this topic lends some context to the meat of my conversation, which is going to be about our eGranary Digital Library. We have been working on the WiderNet Project now for four or five years. We are partnered with a number of universities -- mostly in Nigeria, some in Ghana -- and we are working on broaching the so-called "digital divide."

Our philosophy focuses around people-centered communication. We think very little of this has to do with computers. Maybe here at MIT, you actually compute with computers, but this technology is all about communication. All the wires, all the satellites, everything – there is not a whiff of processing power in any of that. It is all about our human need to communicate and to tell our stories from generation to generation.

So in the WiderNet Project, we focus on the communication capacity of these technologies. We are looking for practical ICT solutions because, long before there was a digital divide, there was an economic divide, and that still exists. Therefore, the solutions that are going to work in most of the developing countries are completely different from those that are going to work here. We focus on productivity -- on getting people productive in doing what they are meant to be doing -- teaching, administrating, or studying. We focus on those things before we focus on the idea of computer technology or Internet connectivity.

All our projects involve partnerships, getting people to buy in, finding out what people are able to contribute to the goal, and then bringing in various partners to make it all happen. The underlying element we are looking for is participation; none of these technologies work very well unless a lot of people have access to them. It is a communication technology. Everyone has communication needs. Everybody has a communication budget. Our goal is to get as many people participating as possible, making "Stone Soup" out of what each party can bring to the table.

That being said, we have a rather holistic approach to this. We have programs for coaching decision makers. For example, we have close to 500 vice chancellors, deputy vice chancellors, librarians, and bursars of universities that we are working with. They go through a training program in which they get introduced to these new technologies and how the

technologies are being used at universities around the world. We also have a program for training technicians and have had 2,500 people go through this program in Nigeria and Ghana so far. Most of this training is "on seat" (on-site) instruction: we take computer-based training materials there and set up certification programs for the technicians. In addition, we are helping the universities to develop strategic ICT plans. While we are not entirely responsible for this success, I am happy to report that six of the Nigerian universities that we are working with now have multi-million dollar grants. We have played a role at most of these universities in helping them to define their proposals. We also work to secure donations of hardware and software. We have collected and upgraded over 750 Pentium-class computers and shipped them to our partner universities. Added to that, we have obtained almost $2 million dollars worth of new hardware, software, and volunteer effort donations for our partner universities.

As part of our holistic approach, we put together the eGranary or eDigital Library (which is what I will demonstrate next.) We even teach a course called Internetworks and International Development. We have been doing this for four years now, teaching it simultaneously at the University of Iowa and at the University of Jos in Nigeria. My students in Iowa have access to my website, with links to thousands of resources on the Internet that they can use for doing their research. Since my students in Nigeria have infrequent and inconsistent access to the Internet, they receive a CD that has all of my course materials, not only including links, but also about 4,000 books, journal articles and web sites. In developing this CD, we have gone out and received permission from the authors to distribute their material. Thus, for fifty cents, the students have all the materials they need to conduct their term in the course.

To do all this, the WiderNet Project has support from a number of organizations, cobbling together donations from wherever we can gather them. Microsoft, RedHat and others have been particularly generous in supporting our work. This project is really all about people -- about building the human capacity to wire up networks and get this digital infrastructure built so we can start doing the work we really want to do. That work is teaching and collaborating.

Now let me jump into explaining the eGranary Digital Library. Essentially there are billions of documents on the Internet that we want to make accessible to people at universities in developing countries. We have this incredible opportunity, with the flip of a switch and the application of a hundred thousand dollars or so, to plop a satellite dish into any university and give people at that university immediate access to these billions of documents. However, it is not as simple as that.

Here I want to make a distinction between our library and other libraries: most digital libraries currently out there operate on the "come and get it" model. They say -- and they are very generous – "we have this material that we sell to people in the West, but we are making it free to

people in developing countries." This surely is a wonderful thing, except that people in the developing countries have to come and get it. However, that "come and get it" part presupposes the fact that potential users have things like functioning networks, consistent electricity, and trained staff to keep the networks up and running.

Unfortunately, those pieces are just not there. As a previous speaker has explained, Internet costs in developing countries are exorbitant. Most universities that I work with charge their staff and students to be on the Internet, sometimes as much as ten cents a minute to be browsing over a very slow connection. In addition, once these universities get their ICT staff trained and ready to run the systems, those staff members move into the private sector for ten times as much money: their personnel get "poached" and the university is back to square one.

With the eGranary Digital Library project, we are trying to address these issues. We want to increase access to these billions of documents, and we also want to get broader participation and wider disseminate of information. We believe that the best use of money for these universities is for building their local-area networks and communicating with each other. This is an important thing. I was recently looking at some numbers at the University of Iowa. Ninety percent of the network traffic generated at the University of Iowa stays within the University of Iowa system. There are students registering for classes, going to their course web server, etc. About 80% of the e-mail generated on our campus is to other people on our campus. So the best way to use these technologies is to build them and use them locally where the bandwidth is free. Part of our project is to train African librarians to digitize their materials to make them available to each other.

As Jesus del Alamo has pointed out, the great problem that we deal with is bandwidth. There just is not enough of it, and it is not simply a matter of getting things from one point to another. Rather, the type of bandwidth you have determines what kinds of things you can do on the Internet. Therefore, at places like the University of Jos, people rarely listen to music or try to download a video, etc. Even going to JStor to look at a journal is a painful experience and here is why:

- You type in the URL, push a button, and five minutes later you get a screen that asks for your login name.
- You type in your login name, push a button, and wait five more minutes until the next screen pops up.
- That screen gives you a menu and you push another button.
- Finally, the first page you receive is the front piece of the article, and by then you have already wasted half an hour and spent half a day's salary!

At our partner African universities, we are trying to encourage them to build up a local-area network so they can start handling their internal

processes and their internal communications first. The cost of setting up a local-area network is remarkably small. The computers that we donate -- which are upgraded with network cards from 3-Com and contain as much memory as we can stuff into them -- wind up costing the universities about $20 a piece. Therefore, from that point the universities can start building out local-area networks. For example, the University of Jos now has 300 computers hooked up on their network and is moving on from there.

The eGranary Digital Library is essentially about replacing bandwidth with "storewidth." We find people who have content-rich websites and ask their permission to replicate it for use at universities in developing countries. Seventy percent of the people we ask say, "yes." By now we have a system set up where we scrape the site and put it on a hard drive -- a simple hundred dollar device in which about three million documents can be stored. Our current collection has about 1.5 million documents, and that includes audio, video, books, and all kinds of media. This collection has been installed at 17 institutions in Nigeria and well across Africa now. When I am heading to Africa, I will burn a half dozen hard drives and take them along to get them distributed. For example, a university might have a six-month-old copy of the eGranary, but every six months or so somebody comes along with a new update.

Awash in all the bandwidth here at MIT, the eGranary Digital Library may not look very impressive to those of us in this room. However, when I give this presentation in Africa, people are stunned because they do not expect things to pop up on the screen very quickly. I will admit right off the bat: this has largely been a volunteer effort up until the past few months when we got some funding. For this reason, volunteer librarians and graduate students have been pitching in to pull all the information together.

When you click on, for example, a particular scientific journal, it looks just like a standard web browsing experience, except that all the information is coming off a hard drive and is popping up very quickly. Of course, as with everything, the eGranary Digital Library is not perfect. There are some things that go missing. With a collection of 1.5 million documents, it is not easy to sort through it all and make sure everything is functioning.

Yet in some cases, the eGranary Digital Library is able to deliver things that would be impossible over the Internet. For example, there is a tutorial on the bones of the skull that we tried downloading at the University of Jos. There they have a 128K satellite connection and about 200 computers on the network at the same time. We tried to download this from the original server and were not able to because the power kept failing. However, with the numbers that came up, we realized it was going to take us a day and a half to download what can be opened from the eGranary Digital Library in a matter of seconds. So now at the University of Jos, they have fast and free access to this wonderful tutorial for teaching

the bones of the skull, a tutorial now used at numerous medical schools around the world.

A couple of months ago, I had a wonderful experience. I was at a dinner at the University of Jos and met a woman who did not know until much later in the dinner that I was the person responsible for the eGranary Digital Library. She nearly jumped out of her chair when she found out! It turns out that she teaches English Literature, and had found the eGranary on the university network. She had copied all the works of William Shakespeare onto a CD, together with some of the critiques and commentaries that were in the collection. She copied these onto CDs, and for 50 cents was able to give each of her students the entire works for that semester -- something inconceivable otherwise.

Another example of what we are doing is our work with a professor at the University of Nigeria who was trying to pull together a math curriculum. One of our graduate students went out and found about 60,000 items for teaching math. Some of them were books, some of them were videos, and some of them were tutorials and exams. The professor and the student went through this collection and identified the parts and pieces that they would need to put together a curriculum. Their end products are three extensive syllabi that draw entirely on elements in the eGranary Digital Library. In a sense, we have created a forest of information, and then by building this curriculum, have developed a pathway for students to follow through the forest.

Our next challenge from here is to go one step further. Instead of my carrying hard drives around Africa, we are experimenting now with using radio broadcasts so that we can have needed changes to the system sent out via radio. Ideally, we are looking at five million documents inside the university, with a 10 megabyte update going out to the system every day to keep those documents up-to-date.

In closing, there are many ways in which we are looking for help. We are looking to create a consortium to keep the Granary Digital Library going. We are looking to be a delivery platform for programs that you are delivering as well. So there are a number of ways that you can participate -- by either donating your own materials, suggesting other people's materials for the collection, or helping to collect items. We have a web interface for editors to use, and I am working hard to get this collection out to other institutions in Africa.

Case Study in Learning from a Distance:
How New South Wales, Australia, and San Diego County, U.S.A.
Are Improving Education Via Interactive Distance Learning

Presented by Jim Moriarty, Senior Vice President, Marketing
OneTouch, Inc.
Soltana Beach, California

Raise your hand. How many of you have taught children? How many of you have taught children how to count to five, let us say? How many of you have taught children to count to five when that child is 5,000 miles away? How many of you have taught children to count to five when they are 5,000 miles away and they are speaking in a different language? Those are the kinds of things we are going to be talking about today. Our company interacts with universities and post-graduate schools, but today I am going to talk about two case studies that are in the area of K-12 or kindergarten through twelfth grade education. Specifically I am going to be talking about a case study in Australia, and another one in the United States, in San Diego County.

I think we are all pretty familiar with this, the challenges in distance learning. Limited resources. We just heard of two examples in Africa of how do you get all the information, the intelligence, the content from here or from anywhere to there? It is very, very difficult. Even in the United States, we have similar problems, and many times it just comes down to money, the human resources, and then the spanning of various geographic challenges. Yet at the same time that you are dealing with these challenges, you also must focus on the central challenge, the central questions. How do people learn? How do they achieve? How do they go through educational milestones, etc.? At OneTouch, we feel very strongly that the social interaction of learning is a critical element of any educational experience. Rather than simply posting things somewhere and hoping someone will come and learn, we want to know throughout the educational process that students are actually learning. This is what I am going to be talking about here today.

Everyone is familiar with the continent of Australia and with the country of Australia. It is basically a landmass about the size of the United States, but everyone tends to live in Sydney or on the eastern seaboard. In the 1950's, the Queen of England put into place an educational program called School of the Air, to teach all subjects to children in grades K-12. This program involved shortwave radio and essentially consisted of a teacher in one location sending out a radio program to kids throughout Australia. That design changed last year, and how it changed is what I am going to talk about. Specifically in the New South Wales area territories, they had this traditional radio program that

was severely limited. Probably the biggest limitation was in the area of interaction, since there was no feedback loop. All this education was sent out, but no one ever knew if students were really learning. It was kind of like television; you know that you get something out of it, but you do not really know just what. So the question in New South Wales was obviously, how could they overcome those challenges of geography?

Now I will jump over to the problem in San Diego County, California. I am going to try to set up these two situations in parallel, to talk about the problems and the challenges. There are some similarities and some differences, and I will talk about how these two locales are solving problems in different ways. Many people do not realize how geographically close San Diego is to Mexico. The city of San Diego is about 15 minutes from the border, and the nearby communities of Mexico and California essentially merge, more or less, into the same community. "ESL" stands for English as a Second Language, and to put the situation into context, a fifth of students in San Diego County are ESL learners. This means that they do not speak English as their primary language, but are just learning it. Therefore, teaching all these ESL students is a huge challenge, and there are many programs put in place to deal with the challenge. They have specific teachers who are experts in specific subjects, and who also have the ability to teach a course in another language, or in a blended approach, where it is half in English and half in Spanish. With these specialized teachers, the idea is that they are not only teaching a course, but they are also teaching a language, which is really a big challenge for them. To sum up this situation in San Diego County, you have a huge county with a very small number of resources, in terms of teachers specialized in this type of educational process.

Returning to Australia again, it is a huge undertaking to reach out across this large landmass to essentially an audience that spans grade school through high school. Within this context, the one single phrase that we hear most often from Australian educators is "the feedback loop." This is the piece that has been missing in their School of the Air, and this is the piece that we have begun to help them with. With our Interactive Distance Learning (IDL) technology, teachers can ask a question as the class starts in order to gauge the level of what students do or do not know. In fact, at that point, a teacher might change the class plan to address a common academic need. Teachers can ask a question, for example, "how many of you know polynomials, etc?" and then, given the responses, gauge how to take the class in that direction. We also believe that our IDL technology actually becomes transparent and is not the issue at all. Instead, the content and the learning experience are the real emphasis, while our technology is simply an enabler in the process.

San Diego County's problem is similar, but there we are addressing the ESL students. In that project, we have been focusing on a very specific initiative for seventh and eighth-grade math. Specifically, there are ESL students in San Diego County who are falling further and

further behind in math. The problem is not that the county does not have some resources to apply to the problem, because they actually have excellent teachers who can teach math effectively to ESL students. However, the problem is that there are not enough such teachers, and these excellent teachers just cannot be in all the different parts of the county. Therefore, that is why they are using the IDL technology. The skilled teacher is in a centralized location, and the ESL children are wherever they are located in San Diego County.

Looking ahead to future uses of our technology, one of the largest uses is usually teacher training -- bringing them up to certification or recertification, and sharing best practices, etc. I should say here that OneTouch's core market actually is not education. Our core market includes corporations and government organizations. So for G.M., Pfizer, and for other large, global, multi-national organizations all over the world, OneTouch provides solutions for communications, collaboration, and learning. Educational organizations use these tools as well, and that is what we are talking about here today.

At OneTouch, we do believe that video is a big piece of communication. However, I totally understand that it is difficult to get video into many regions due to bandwidth issues. We do have one-way video, two-way audio, two-way data -- for polling, testing, etc. -- to make sure that the process is of the highest quality from beginning to end. In some instances, our clients have installed two-way video or selective two-way video, which can be delivered via satellite. It can be delivered via terrestrial, via CD ROM, via a business television network - basically any way, any flavor. There are a large number of different ways to get data from one place to another.

We always say at OneTouch that we are second best. We all can agree that the best thing would be to have the teacher and the student interacting together in a room. A face-to-face meeting is always the best thing. However, that is not always possible or scaleable, so this is what we are competing with. I mention this because it is that interface and that social interaction that means so much. Where you can actually tell if someone is smiling, or whether they understood the last concept you talked about. So in Australia, we do this down to the P.C. You saw on the video the little eight-year old girl with pigtails who is, I believe, in a town called Ayrs Rock in the middle of Australia. She is thrilled because, for the first time in her life, she can actually see her teacher. She has never been able to see her teacher, and before that teacher was only a voice on a radio. Now she can see her teacher, and she thinks her teacher sees her, but in fact the teacher cannot. In the video, you could see the teacher counting to five, and the girl is literally doing the same thing. It is just amazing to see in real life.

Because of the highly distributed nature of Australia, delivery of education is made via computer to both rural community centers and also to homes, depending on the local capacity. The government provides all

technical gear. In Australia, there are five broadcast studios, so they try to leverage teachers from all over the country. These teachers may be in Sydney, Brisbane, Melbourne, etc. Course content is delivered either on a scheduled basis or on a flexible schedule basis. For example, the course on counting to ten is scheduled to happen at 8 AM, but it will be captured and can be offered at a later time for those who miss it. Just like at a session here today, in most cases we would capture on video my presentation, the Power Point slides, the questions and answers, etc., and then we would post that out.

In San Diego, we are not using P.C.s. While we all talk a lot about P.C.s and about the role of technology, etc., it is important to remember what some people have touched upon today -- a kind of computer phobia and the challenges of computers in different cultures. In San Diego County, which is very high tech, we are not using P.C.s, and that is the reason why we have classrooms throughout San Diego County with these keypads. In this locale, we do not want to have children on the Internet, having access to Internet sites. Instead we are creating at each seat one of these keypads, which has two-way audio capability and enables the students to take tests, to answer with their voices, to participate in polling, etc.

We also use this same kind of setting in a lot of adult communities where adults or seniors do not have the computer skills, nor do they have the interest in having those skills. From an impact and results standpoint, you can understand that this solution scales really well. However, what it also does -- potentially more important than scaling well – is that it measures the effectiveness of the learning process every step along the way. We know exactly how many students started. We know exactly how many students answered question one. We know exactly how many students were there for question 30. We know over a course of ten weeks, exactly what happened to those questions, to those same students, etc. With this keypad technology, you have data throughout the entire process. In most corporate settings, those data are tied to compliance or certifications, perhaps government run, so these can be very tightly managed metrics.

SECTION SEVEN

ADDITIONAL MIT INITIATIVES

IN EMERGING COUNTRIES

Developmental Entrepreneurship

Presented by Dr. Alex "Sandy" Pentland
Toshiba Professor of Media Arts and Sciences
The Media Laboratory, MIT

I co-direct a program here at MIT called Digital Nations, which is a consortium of people interested in technology and its effect on development broadly. That mandate includes initiatives in education, but it also includes work in health, economic development, e-governance, etc., and as part of this effort we have done a fairly large number of projects in many different countries.

Today I would like to focus on a particular project, which we are trying to convert into a distance learning initiative. As part of Digital Nations, we have created a class called Developmental Entrepreneurship, which I co-teach along with Joost Bonsen. It turns out that there are a very large number of foreign nationals who are graduate students at MIT, and many of them intend to return home and do something there. A lot of them are in the Sloan School so they are business students, and there are also technology students, of course. The idea is to harness these two talent pools, to come up with ways in which innovation – something at which MIT is presumably very good - can make a change back in these students' home countries. A lot of the students are very passionate about that. So as part of this class, Developmental Entrepreneurship, we bring technology and business students together with entrepreneurs who have been successful in the past. We introduce the students to people who have started endeavors in other countries, and who have wrestled with corruption, with the World Bank, and with all the sorts of challenges you can possibly imagine. The main thrust here is to introduce them to a wide range of the kinds of resources they will need to put together a plan for themselves for when they return home. Above all, we want to give them the tools they will need to execute their particular plan. This class is part of the OpenCourseWare initiative, although only part of it is up online as of yet.

As already stated, the outputs for this class are business plans. Not all of these plans are for profit, and as a matter of fact, many of them are not for profit. Some of them are government business plans; for example, the student wants to start a new department in his/her city government. However, in our course, they put together business plans for their not-for-profit proposed initiatives. These plans are put together with the intent of being able to mobilize the technology, the resources, and the people to make the initiative happen. Some of the students have been fairly successful, and I will talk about four plans that I think are particularly interesting.

I will start with Way Systems. Way Systems started with some Brazilian students who were concerned about the inability to get financial transactions in poor, rural areas. The group came up with an idea to take a cell phone, which does work in most parts of Brazil, and to use that for a secure financial transaction device. This would allow the people who own the shoe store, or the tailor, or any other small businessman, to accept debit cards, which are quite common in Brazil. Such a system would promote an easier type of financial transaction, and would also allow a type of on-the-spot micro-finance - essentially treating those debit cards like credit cards. These Brazilian students came up with a business plan, filed some patents, made a company, and created a product that now sells in Brazil. However, their business has really taken off in China. There the government has gone ahead and issued half a billion debit cards, even though there are less than a million debit card readers in the entire country. So Way Systems makes a $40 device that fits on the back of your cell phone and allows you to do secure financial transactions of a wide variety. Their product works with the cell phone that the Chinese businessman already has. The business has really taken off, and has attracted a wide variety of investors. So there you have it, and it is pretty cool. It takes a simple idea, some technology, and an analysis of the problem. The thinking involved in developing a business plan is what actually enabled these students to execute their plan.

Another successful student project is Dimagi. This for-profit initiative started off looking at rural health care. Many parts of the world have nurse midwives who go around house-to-house, particularly for prenatal care, but also for TB and AIDS care. These midwives are not very educated people, with education levels ranging between sixth to tenth grade depending on the country. What they do in their job is actually a rather contorted process of filling out forms, making reports, and transcribing all the patient's information. Typically it takes many months for this information that is collected to make its way up in the central government. This means that when the governmental officials ship drugs out, for instance retroviral drugs, they do not have accurate knowledge of how many people they need to treat. They can only make a guess, and typically they make the same guess for every province, packing the medicines in a big crate and sending them out. Unfortunately, in the provinces I have looked at, up to 90% of the drugs are wasted because governmental officials do not know who is sick, when they need to get treated, or how many drugs are required. There is no surveillance of what is required, and there is no supply-chain management.

To change this situation, the students in my course put together a PDA system and a back-end server, that allows these nurse midwives to go out into the field and answer a set of questions rather than fill out paper forms. Actually, these midwives can answer the questions more effectively because there is a little expert system. For example, if you answer a couple of questions, and it looks like the interview is going in a particular direction,

then the PDA device can change the questions dynamically. It stores all the input on a database of up to about 30,000 people as the mid-wife travels around. In addition, the answers reach the central government almost immediately. So within a few days, in some cases, government officials can actually get a good sense of what is happening in terms of a disease outbreak. For example, working through HealthNet Uganda a similar system was deployed in one province in Uganda where we were surveying for TB, measles, and malaria. The total amount of time required for the survey was one-tenth of the traditional method, and the cost, including the cost of the equipment, was one-tenth of the paper cost. HealthNet Uganda is now rolling out something like 6,000 of these PDA units in Uganda, which will cover the entire country, except for the places where the guerillas are operating.

My personal favorite of these initiatives is First Mile Solutions. This company developed out of our realization that the first thing necessary for distance education is to get people connected so they can receive bytes of information. How do you do that? It is just too expensive in isolated, rural areas - right? A few years ago, when I was setting up some laboratories in India, some colleagues and I began thinking about this problem. We realized that in most places in India, like most places in the world, there is a bus that goes by every day. Why not have this bus carry the bits? It would be free because the bus goes by anyhow. Therefore, we took a bus and equipped it with a little antenna, a small wireless transmitter and a disk. This equipment costs about $400. As the bus goes by from town to town, village to village, it drops off papers, MPEGs, DVDs, and any sort of digital information. In addition, it picks up digital requests along its route. The equipment includes an asynchronous communications manager that manages the fact that the communication is intermittent. If you make a request for something that is cached locally, you get the answer immediately. If it is not cached locally, then the next time the bus comes by, the request goes on the bus, and it returns the next day. This is a pretty good system that costs, as stated before, about $400 on the bus side. It is actually good to use this same type of system on the receiver side because the system is very low power. Therefore, in areas where you have intermittent power, you now have a reliable, high bandwidth communications system for $400 on the bus side, and $400 on the server side. So this system, operated by First Mile Solutions, is now a telephone company, and it is operating in Cambodia, hooking together schools in the northern part of that country. It is operating also in India, performing government services, and in Nigeria, hooking together schools and also some Internet cafes.

Another company I would like to discuss is BlueEnergy, which is a not-for-profit Nicaraguan company. The Nicaraguan students were concerned about the fact that in many villages, the inhabitants do not have a power supply or clean water. However, these villages are too small and too poor to afford something large. The MIT students were engineers from the Mechanical Engineering department. They had been working on an unusual

type of air turbine that was much smaller than traditional wind power turbines, and, as a result, was far less expensive. They developed a scheme whereby the air turbine pumps send clean water up whenever the wind is blowing. In addition, their air turbine product generates power as the used water runs out, providing villagers with power in the evening. BlueEnergy has just incorporated at this point, and is already conducting several pilot programs in Nicaragua and discussing pilot programs in neighboring countries.

One point of pride is that each year the Developmental Entrepreneurship class has produced at least one plan that won a $1k cash award in the first stage of the famous MIT $50k competition. Plans from the class have also won a variety of other awards from other business plan competitions. We are showing that one can address the needs of underserved communities in a sustainable, grassroots manner.

In closing, I would like to speak briefly about some of our plans for the future in this area of developmental entrepreneurship. We would like to be able to train more people in this area. Such students would need some policy education and some business education. However, they could certainly do that coursework in their own countries, and it would not be necessary to bring them here for that. One possibility is to do the policy and business piece via distance education. Yet it would still be important to bring them to MIT for about four months, where they could go through the process of meeting people from other countries or from their own country who are thinking about similar challenges. While at MIT, they could talk to the faculty and to the capitalists, and then put together a plan for what they are going to do at the end of their entrepreneurship training. This is the general idea, and we are in a situation now where we have a lot of partner universities who are interested in this, both in the north and in the south. In addition, we have a number of funding agencies that are interested in the concept, but no one has really come forward yet. We are still working the streets in that regard. However, if you are interested in this program, and particularly if you have your favorite in-country funder who might get excited about that this sort of thing, we would be very happy to talk with you and see what we could work out.

A New Model for Sharing: MIT OpenCourseWare

Presented by Anne H. Margulies, MIT OCW Executive Director

MIT OpenCourseWare (OCW) started in Fall 1999 when our president, Charles Vest, and provost, Bob Brown, appointed a faculty committee to answer the following two questions: How will the Internet impact education, and what should MIT do about it?

That year, 1999, was really the peak of the dot.com bubble. Many of MIT's peer institutions had already announced the creation of distance-education initiatives, many of which were designed as for-profit, revenue-generating initiatives.

The MIT faculty committee conducted a very thorough data collection and research process. They spent a year looking at what other universities were doing, as well as talking to many of their peers on the MIT Faculty. Then one year later, in the fall of 2000, they went to President Vest and Bob Brown with what they thought might be considered a crazy idea. What they concluded was that because MIT's mission is to advance education and to serve the world, the best way to do that, while taking advantage of the Internet and new technologies, would be to give away the course materials that are created here at MIT. So they gave President Vest and Provost Brown a one-page memo that said "We think we should publish all of our course materials on the Web for free, and that is the best way for us to advance education, as well as further our public service mission."

Chuck Vest and Bob Brown embraced the idea. Through a series of departmental meetings, they met with all MIT faculty members and found that there was a genuine consensus that the idea of "OpenCourseWare" was the right thing to do. So in April 2001, the MIT OpenCourseWare (MIT OCW) initiative was announced. At the time, Chuck Vest said that this initiative looked "counter-intuitive," and it certainly did considering that everyone else was planning how to make money on the intellectual property that was coming out of universities. But MIT OCW was innovative, and expressed MIT's belief that education should be advanced by constantly widening access to information throughout the world.

Shortly after this announcement, the Hewlett and Mellon Foundations both very generously stepped forward to fund the pilot phase of MIT OCW. During this pilot phase, we met our goal of publishing 500 courses openly on the Web by September 2003. By the end of this month, March 2004, there will be an additional 200 courses on MIT OpenCourseWare, bringing the total number of courses to 700.

What is MIT OCW?

It is important for people to understand what MIT OCW is. Since the initiative was announced, there has been quite a bit of confusion about it, and we receive a lot of email messages from people telling us they want to

"register" for MIT OCW. Many others write to tell us that they are very excited because they have always wanted to "get an MIT degree."

Of course, you cannot get a degree, and MIT OpenCourseWare is not an MIT education, and it is not intended to represent or replace what happens here on campus. We do not even consider it a distance-education initiative because you cannot receive any credentials after working through the materials published on the MIT OCW Web site. You also cannot have any interaction with our faculty.

The best way to think about MIT OCW is as a very broad-based publication of the educational materials that are created here at MIT. It is the raw materials that educators around the world can use to teach, or students can use for their own self-learning. What is also unique about MIT OCW is that it is open and free to the world. Furthermore, MIT has made a long-term commitment to make this a permanent activity at the Institute.

So why is MIT doing OpenCourseWare? It is because MIT OCW is consistent with MIT's fundamental mission to advance education, and because our faculty share this common value in teaching and contributing to their disciplines. MIT OpenCourseWare is possible because of the generosity of the MIT faculty and because of their collective commitment, not only to educating MIT students, but also to furthering the advance of education around the world. In creating MIT OCW, we also hope to counter the trend that certainly was coming on strong throughout the dot.com era, which is to make intellectual property available only to those who can afford to pay for it. So we hope to counter that trend by encouraging other institutions to make open knowledge available to everyone. For this reason, there are actually two parts to the MIT OCW mission. The operational facet of our mission is to publish virtually all of MIT's courses over the next four years. That involves getting up to 1800 courses online. But the second half of MIT OCW's mission, which is every bit as important as the first, is to do it in a way that enables other schools and universities to do what we are doing. We are hoping that MIT OCW will not be an initiative only here at MIT, but that it will become a movement, and that there will one day be many "opencoursewares" at other high-quality educational institutions.

We are still very early on in the journey of MIT OpenCourseWare. The pilot phase of the project ended in December 2003 with the publication of 500 courses. We are now about to publish 200 courses this month and we will be publishing 200 more courses in September 2004. Then each year until 2007, we will be publishing 300 to 400 courses until we get to 1800 courses, virtually all of MIT's courses. At that point, we will be moving into a steady state, during which time we will be updating some of the materials that we have already published, and hopefully working with other universities who are doing the same thing.

What is Available on MIT OCW?

If you were to go to the MIT OCW Web site (online at http://ocw.mit.edu), or if you were to look at the complete list of over 500 courses now published, you could not understand what is really available on MIT OCW unless you were to go course by course. What you would find when you go course by course is that the content is highly variable. Some courses have immense amounts of material, and then others are somewhat thinner, which might be just the nature of the particular courses.

Thus, one of the things that are unique about MIT OpenCourseWare is the breadth of what we publish. We include courses from all 33 of MIT's academic departments, across all five of its schools. So let me pick just one of MIT's schools, the School of Engineering, and one of its departments, Electrical Engineering and Computer Science, to demonstrate the depth and breadth of content we have published. Right now we actually have more than 68 courses available on the Web from this department. If we were to drill down to a particular course, say "Course 6170: Laboratory and Software Engineering," you could see that there are many components published with this course, from a syllabus and calendar, to lecture notes and related resources. If you were to look at what the lecture notes might have, this particular course has 20 lectures with it, and just one of those lectures is a PDF document that is 11 pages long. And that is just one course.

As you can imagine, transferring all these raw educational materials to the Internet is a huge undertaking. We sometimes receive the faculty's work in files and boxes, or are given boxes of slides, or photographs of notes on a chalkboard. That kind of transference requires quite a bit of work. Of course, some of the faculty's content comes to us as electronic files, but with every course, there is some work to be done. Before the course materials are published on MIT OCW, we have to scan them for intellectual property — that is, intellectual property that does not belong to the faculty. The individual MIT faculty members give us permission to publish their material, but as teachers, of course, they often incorporate materials from many sources in their teaching materials. For any materials that we publish, we have to obtain permission for such publication. Therefore, we have to scan all the materials and then we actually "scrub" them to address any issues surrounding content that might be sensitive or confidential.

What is the Impact?

Now I would like to turn to a discussion of the impact of the MIT OpenCourseWare initiative. By the end of January of this year, the MIT OCW site was receiving an average of 11,000 visits per day and since then, the average has risen to over 12,000 hits daily.

Forty-five percent of these visitors are from the United States and Canada, and 55% are from other countries, with China topping the list of countries that most visit the MIT OCW site for about the past four or five months. The Web site does receive traffic from almost every country and/or

territory on the planet, including Iraq, North Korea, Afghanistan, and even Antarctica.

Not surprisingly, the majority of visitors to the MIT OCW site are looking at courses from the departments that MIT is best known for. Therefore, Electrical Engineering and Computer Science has been our most visited, our most popular department, since the site opened in 2002.

All of this data comes from an extensive evaluation and measurement program we have implemented to track the Access, Use, and Impact of the MIT OCW site around the world. In November, we instrumented our site so that we could intercept one out of 40 visitors with a pop-up survey. We received a response rate of more than 6% to that survey, intercepting approximately 27,000 people. In addition, we drew responses from more than 1,200 visitors to a very extensive 40-question survey. As a result, we now have a substantial amount of data about who is coming to the site — whether they are educators, students, or self-learners — and what they are looking for when they access MIT OCW.

To give you some of the highlights, of all of the respondents to the survey, 92% said they were satisfied with the materials on the site. There were three categories of users: educators; students enrolled in an academic program; and self-learners. Highly motivated self-learners represent our largest audience, at 51%, and 80% percent of them report that they have come to our site just to explore new areas or to stay current on a particular subject in which they are interested.

The least satisfied visitors to our site are the enrolled students. They are less satisfied because they come to the site looking for something very specific: for an exam they are about to take or a paper they have to write. In fact, we recently received an email from one student who wrote, "I have a signal processing exam on Monday. Any chance you are going to be publishing that course by this afternoon?" So students are coming to the site, but they are looking for very, very specific materials.

The highest level of satisfaction registers in our primary target audience, which involves educators. Our data indicates that 97% of the educators that came to MIT OCW found the quality of the content to be extremely high. In addition, 95% percent of all the people who came to the site said they plan to come back, and 99% said they feel that the site has impacted them "extremely or moderately."

Even though faculty members at other institutions are the smallest user group, they still are represented by a very, very big number. So even at just 13% of our users, educators represent a large number of people coming to the site. Educators most often visit MIT OCW as they are teaching or planning a course, or are looking for specific content for re-use in their classroom. Forty-seven percent of the educators that came to our site said they are already using MIT materials in their teaching. Educators also report that they utilize MIT OCW to think about how they might teach a subject differently. In other words, they are looking for new pedagogical techniques

and methods, and are trying to understand more about how MIT teaches. We have email and survey respondents tell us that they are trying to look across the MIT OCW curriculum to understand what kinds of courses are prerequisites for other courses. In fact, 7% of the educators told us that they are using our site to show students more deeply what is involved in particular courses.

One more data point that I would like to mention is the MIT OCW monthly email newsletter. More than 20,000 people have voluntarily subscribed to it. We think this is a big number because they have all subscribed voluntarily, one by one. We did not start with any kind of subscription list or database. The fact is that, one at a time, more than 20,000 people have signed up to receive our email newsletter.

Another recent development is our partnership with Universia.net, a network of over 840 Spanish- and Portuguese-speaking universities that is headquartered in Madrid. Universia is translating our materials into Spanish and Portuguese, and when you go to our site, their course translation sites are directly linked to our MIT-based English course sites. To date, they have translated 30 or 40 courses, and their plan is to translate five courses a month until they have translated all 1800 courses. We are very excited about this development.

We were thrilled with all of this very positive data so early on in MIT OCW's development.

What does it Mean?

Many people have told us about "opencourseware" initiatives that they have started, and many report that they were inspired by MIT in developing their own OCW sites.

There is one in Vietnam, one in Germany, and one on the island of Mauritius. These programs are typically very small, usually comprised of just a small group of faculty, or maybe just one faculty member. However, the idea of open sharing educational content is catching on, and not only are some of these other opencourseware-like initiatives taking MIT's materials and translating them into their language, but they are adding their own materials and sharing them openly. This is very exciting because the real long-term vision of MIT OpenCourseWare is that this becomes a movement.

Furthermore, many universities here in the United States have contacted us for assistance in setting up an opencourseware initiative. Usually, it is passionate faculty members who approach us, wanting to learn how to move their university or college in this direction. As a matter of fact, we are now working with four schools, talking with them and helping them develop pilot sites. They have already gotten someone, either a president or a provost, on board and willing to champion the initiative. In the case of these four schools, they have even taken the step of bringing the idea to their faculty for acceptance. It is clear to us that there is a process a school must go through, just as MIT did, before the faculty will coalesce around the opencourseware idea. However, we are very optimistic that by the end of

this year, there will be a couple of significant opencourseware pilot programs in existence at other institutions here in the U.S.

We are still very early in this OpenCourseWare journey, but already we are moving at a pretty swift clip. Again, you will find 700 courses on our site by the end of March 2004. What we are learning from the data that we have collected is that today, three years after that original announcement by President Vest, there continues to be tremendous excitement about MIT OpenCourseWare. Now that we have been able to get close to 700 courses up on the Internet, we know that the wonderful vision of the MIT faculty is achievable.

MIT embarked on the OpenCourseWare project on a leap of faith stated succinctly in a one-page memo. When it was announced, nobody really knew how we were going to do it, but everyone knew deep down that it was doable, and in fact, it is. Finally, we have very positive indications at this point that the impact will be significant and that MIT OCW is, and will be, genuinely useful and helpful to educators, and students, and self-learners around the world.

The MIT Public Service Center: Students as Resources

Presented by Sally Susnowitz
MIT Pubic Service Center

I direct the MIT Public Service Center, and you will be happy to know that my talk is very short because although the Public Service Center has been around for 15 years, we have only been working with international development for the past two years. Today I am happy to tell you a little bit about the work we do. The thing I would like you to think about while I am speaking is how you can use MIT students in whatever projects you are working on. Also, I hope to get questions from you, so you can help me shape this conversation to fit those needs.

The MIT Public Service Center does more than just volunteerism. It is true that volunteerism is very important and lies at the heart of what we do. However, when we focused exclusively on volunteerism, we discovered that many MIT students could not afford to participate at the level of involvement we wanted. For this reason, we now do a lot more fundraising and, in some cases, actually are able to pay students to spend intensive time working on projects. This afternoon I will discuss some of the different ways that the funding comes into play, but also we are always looking for resources. Unlike some of the other MIT programs we have heard about this afternoon, the Public Service Center does not have a concrete set of relationships that are circumscribed to specific partners and countries. We are at the stage of looking for ways to evolve our program. Therefore, in talking with you, we are looking for ways that we can partner on enterprises around the world that help under-served communities.

We focus on helping MIT students to become active participants in public service projects around the world. An example is the participation of two students who worked in Nicaragua with the organization, Potters for Peace, to manufacture and distribute clay water filters for a water purification program. The two MIT students developed a new kind of clay filter for water purification, and the Potters for Peace are manufacturing it to make it something that is sustainable within that area. In addition, students from a Nicaraguan university have become involved in this undertaking. They are involved partly as a way to monitor the project, but also because we need to involve students from universities around the world in looking at innovative solutions to community issues.

The Public Service Center works within MIT's larger mission, and I thought you might be interested in learning about MIT's mission. I am not sure that you have seen this piece of it -"To develop in each member of the MIT community, the ability and passion to work wisely, creatively and effectively for the betterment of mankind." Reading this part of MIT's mission is the reason that I decided to take the job at the Public Service

Center, because it says that MIT is as much concerned with people, and with passion, and with creativity, as it is with technology and engineering. I think that is an important point we sometimes miss about MIT. This institute is all about innovation and about development. It is about looking at under-served populations of the world and educating MIT students to become functional members of a global community, not just engineers. We at the MIT Public Service Center feel very strongly about this process. We believe that our work contributes to an important part of the MIT education, in creating whole people, active citizens of the world, who are also proficient engineers.

The goals of the Public Service Center are narrower than MIT's broad mission, and these are the two main goals: 1) to develop a global perspective in the MIT engineers; and 2) to make sure that the service we perform is healthy for communities. We work to expand the breadth and depth of learning for MIT students by involving them with real issues and challenges through public service. We believe they learn most when they are being educated in things about which nobody knows the answers. This type of community service tends to increase their communication and teamwork skills, and also creates opportunities for leadership experiences. It further gives them the opportunity to examine the social, ethical, political and economic contexts of the communities in which they work. In addition, it enables them to practice and apply the highly specialized knowledge gained at MIT, while also learning strategies for complex problem solving. We believe it is very important work.

At the Public Service Center, we work hard to insure that a high level of public service takes place. We want communities to gain real benefits from the student work, while sharing resources and developing long-term relationships with MIT. We are not interested in supporting what may merely look like public service, and for this reason, we work hard to find the appropriate kinds of projects. We look for projects that the MIT students will be able to do within a workable timeframe and for which they will have adequate resources to carry out the job. We do not always accomplish every one of these goals, but it certainly is a good aim.

Another international project of the Center involved a team of students setting up an optical lab in New Amsterdam, Guyana, two years ago during a summer fellowship. The team traveled there and not only established an eyeglass dispensary and recycling center, but they also learned how to manufacture and dispense eyeglasses. While there, they dispensed several hundred pair. By the way, theirs was the only eyeglass- recycling center in the Caribbean at the time. This fellowship had an enormous impact on the team. As a matter of fact, one graduate student who went down there has since won an invention award. He won it for many reasons, and the invention has to do with a new way of creating optical lenses simply and easily. He agrees that this public service fellowship in Guinea helped him learn about the need for an inexpensive and creative way to develop lenses.

I would now like to highlight several of the major aspects of MIT's Public Service Center. Our main task is to serve as an information resource

connecting MIT students with people and projects in the greater community. Through our databases, publicity, and advising services, students can learn about, and acquire the resources to work in, a wide variety of projects around the world. For example, if any of you were to communicate with us about a potential project in your community, we can, in turn, communicate these opportunities widely to students at MIT. Our center is a good entry point for such potential projects, and we can try to help and see how we can work with other people at MIT.

A second objective of the Center is to put students in touch with funders and other resources that will assist them in pursuing a project they are interested in. For example, we had a team of students working on a water project in Bangladesh. The team developed a system that effectively removed both arsenic and microbial contamination from water, for which they just received a $115,000 award from the World Bank Development Marketplace Global competition. Now they are spending a year in Nepal distributing their arsenic bio-sand filter. I mention that award because it is an excellent example of the multiplying effect our MIT students bring to their projects. Often, these public service projects will start out as something very small, requiring maybe a couple thousand dollars of initial funding. However, with the ingenuity of MIT students and with the other resources with which we can put the students in touch, they are able to go out and raise enough money to create a large-scale initiative. For this reason, I think it is very important to look at the potential future fundability of these MIT students, rather than looking too closely at the small level of resources they may require to start a new project.

We also offer fellowships and grants to enable students to participate in these types of projects. Some students can afford to volunteer their time and spend a summer away, while others need financial assistance to be able to afford that time. Therefore, we spend a lot of time fundraising and creating partnerships that enable us to offer fellowships and grants for students to work intensively on community projects during semester breaks. We are still building this grants and fellowships program. Last year we had 16 fellowships that enabled students to work full-time on projects over the summer for periods from five to ten weeks long. Over the January semester break, 17 MIT students did four-week fellowship projects in the US and at international sites. Our grant program is also an interesting resource because MIT students have very creative ideas about things they would like to do, and sometimes a little money here and there patched together with our help is an enabling factor for them to do it.

I was interested in the remark from one of you earlier today that questioned the level at which MIT can contribute, given how many developing regions there are. Even though we do have a large faculty, its number is not endless, and these professors have much to do with their time. However, there are 10,000 MIT students, and they would all love to do these kinds of development projects, in various places, at various times of year. Sometimes they come up with these opportunities themselves, and other

times they look around for opportunities that people suggest. One thing that came to mind after that remark was made is the Ghana New Ventures Competition. MIT students love to teach entrepreneurship, and at MIT, we have the 50K Competition, which you heard about earlier from Professor Penfield. MIT students are delighted to consider how they can work with cultural factors in other places, to set up similar competitions at universities there. The Ghana New Ventures Competition consisted of some students who had participated in and helped run the MIT 50K Competition. They went to Ghana and worked with the university there, setting up a competition to encourage entrepreneurship by offering a thousand dollar prize. I believe they were fairly successful at sparking some initial entrepreneurial models among the contestants. Right now there is a team of students interested in working in the Philippines to organize the same kind of competition -- MIT students helping to encourage innovation among students and small businesses. These efforts are very exciting.

Service Learning was started in 2001 at MIT and enables faculty to integrate community service projects into their course curriculum. Since we began it a few years ago, we have found that it is growing very rapidly on its own. At this point, we have had about 56 faculty engaged in service learning in various classes, and we are still building the program. Currently in the spring semester, we have 18 service learning classes running. These are 18 classes where professors have integrated projects into their curriculum, or are looking for such projects, so that their students can work on them by doing their course work. It is a very powerful concept because when you have service learning in your class, you are extending the expertise of a faculty member, as well as other experts often, to assist with student projects that help communities. So there is a powerful resource base behind it. An example of a Service Learning project took place in a small town in Southwestern Kenya where MIT students helped to improve the science curriculum in a shelter for homeless children. Another example is a class taught by Professor Amy Smith called D-Lab. It is a yearlong course that encourages students to go overseas during their breaks to do the actual engineering projects they have developed during the semester. Of course, not all Service Learning classes travel. Sometimes they work on projects here that are used in U.S. communities or get sent abroad for implementation.

The final aspect of the Public Service Center that I want to talk about today is the IDEAS Competition. This competition, as the name suggests, encourages people to think about ways to serve under-served communities with designs and inventions. It is a very creative enterprise. It asks people to think about that which does not exist, in order to figure out the means to create it. The students work in teams, and the IDEAS Competition staff offers a support system to help them convert their ideas into reality. We also provide them with some funding through a series of development grants and final awards. One winner of this competition was the team of MIT students who worked on the Kinkajou Project. They developed a battery-operated

LED microfilm projector for use in areas of Mali that lack both books and electricity. The students were presented with this problem: how do you teach literacy in a place that has no electricity and no books? In response, they came up with the Kinkajou Projector idea. To start with, this project grew out of a Service Learning course, a senior Mechanical Engineering course at MIT. Later it became part of the IDEAS Competition. With the projector system that the students developed, the text is projected onto a wall so that a room full of people can read in the dark. The battery of the projector can be recharged with a simple bicycle generator. These students won the IDEAS Competition last year. They won a $5,000 award, and then they leveraged their winnings to about $22,000 through other sources at MIT, enabling them to field test the projector in Mali. Residents in Mali hope to make a cottage industry out of producing these projectors.

**The MIT International Science and Technology
Initiatives in Emerging Countries**

**Presented by Sean Gilbert
Director of Intern Placement
The MIT-China Program and the MISTI Singapore Forum**

I work for the MIT International Science and Technology Initiatives; otherwise known to students on campus as "MISTI." MISTI is MIT's international internship program, and it includes language training and course preparation. The concept of MISTI originated with the MIT-Japan Program in the early 1980's, but MISTI itself was not formally established until the MIT-China Program was founded in 1995. I direct the recruitment and placement of MIT student interns for the China and Singapore programs. MISTI now has eight country programs, including the MIT-Mexico Program, which was established a few weeks ago. There are also plans for a ninth program, an Africa Program. For emerging countries, we currently send students to China, India, and Mexico to work. More than 1,500 MIT students have participated in MISTI internships over the years, or about 170 students per year.

Since I am most familiar with the MIT-China Program, I will limit my presentation to China activities to illustrate how MISTI works in an emerging country. The China Program is organized very similarly to the other MISTI country programs in terms of language training and course preparation. For all eight of the MISTI programs, internship requirements are the same. We have G.P.A. and two-year language requirements. Interns are also required to take a course on the modern history, politics, or culture of the country they will intern in. Additionally, for the China Program, we require a three-credit "spring training" seminar, "Issues in Contemporary China," which helps prepare students to live and work in China prior to their departures in early June. Internships last between three months to a year.

The China Program offers a wide variety of internships. At one end of the spectrum is a panda conservation internship with the World Wildlife Fund. These interns spent six hours per day hiking in the bamboo forests of Sichuan Province in search of panda droppings. The goal of this effort was to find evidence of panda activity in order to create a G.I.S. mapping system to track panda populations. At the other end of the spectrum, most of our internships take place in large urban areas such as Beijing and Shanghai. MIT students generally prefer to intern at multinational companies in China because they want to establish careers with these companies upon graduation. We train students to work in companies such as Intel, Motorola, Microsoft, General Motors, and Kodak, and we would like to develop more placements in local Chinese companies, such as Lianxiang Computers or Haier Electronics. We also place students in scientific research internships at Tsinghua University, Peking University, Fudan University, and Taiwan

University. We have also established ongoing research projects at the United Nations Industrial Development Organization and the Asian Development Bank. Additionally, students have worked through the U.N. at the Beijing Olympic Committee on transportation logistics planning for the 2008 Olympics.

We also offer team teaching internships at high schools and universities through our China Educational Technology Initiative (CETI) program. CETI's mission is to bring Chinese and American students together by collaborating on technology projects. CETI was established in 1996 to help link high schools in Beijing, Shanghai, and Guangzhou to the Internet. More recently, CETI interns have expanded their curricula to subject areas such as architecture, biotechnology, physics, and web design, and are now teaching in rural provinces such as Sichuan, Shanxi, and Hunan, where there is a greater need for current educational technologies.

One of these new educational technologies is MIT's OpenCourseWare (OCW). One of our program's goals is to introduce OCW to universities in rural areas of China. Our first project will be this summer at Qinghai University in western China. Its partner university is Tsinghua University in Beijing, which is responsible for improving education standards in Western regions of China. The President of Qinghai University has informed us that Qinghai University faculty would like our students to introduce OCW listed courses in Computer Science, Distance Learning, Biotechnology, and Environmental Engineering. I have selected students with these academic backgrounds to go to Qinghai University to teach this summer. Over the next three months here at MIT, our students will correspond with Qinghai University faculty to develop their summer curricula and prepare for life on the Qinghai-Tibetan Plateau.

This year, in cooperation with the United Nations Development Program and the European Commission-sponsored Planet Finance, we are also organizing a student team to work on poverty reduction training at microfinance centers in rural counties of China. Our students are preparing Chinese training manuals for local microfinance loan officers in Hebei, Hunan, Sichuan, Shaanxi, Tianjin, and Jilin. These training centers attempt to establish links with micro-credit organizations to obtain small loans for Chinese farmers. The goal of these micro-credit agencies is to promote self-employed income generation in rural China. Our students will be assigned to work with organizations such as the Guangxi External Investment Management Center, the Tianjin Women's Business Development Committee, and the Fujian China Poverty Alleviation Foundation.

Before concluding, I would like to emphasize that the intern's experience does not end when the student returns to MIT. From MIT we are also able to develop an online learning community with our host organizations in China through frequent follow-up e-mails until the next group of students is ready to go to China. Our China *team* internship program, in particular, is becoming a very useful model that other MISTI emerging country programs may wish to emulate.

Malaysia University of Science and Technology:
A Challenging Project

Presented by Dr. Tajul Arus, Provost
Malaysia University of Science and Technology
Petaling Jaya Selangor, Malaysia

What I am talking about today is slightly different in context from what most of the speakers in this symposium have been talking about. The Malaysia University of Science and Technology (MUST) is not very much about distance learning, although there is an element of distance learning involved. It is more about something like a transfer of technology, and about learning from MIT how to create a university with the capacity to produce research that can be quickly utilized. It is not that Malaysia does not have universities; Malaysia has, I believe, more than twenty universities and colleges. I myself was involved in setting up a university beginning in 1996 and extending over a period of three or four years. However, Malaysia does not have -- and would like to have -- a university with the ability of MIT to produce a surprisingly high percentage of technological innovations.

With that as background, I will walk you quickly through some of the steps that we have gone through to date. The Malaysia University of Science and Technology is a collaboration with MIT. It is a private, not-for-profit university that is specializing for now in graduate education in the areas of science and technology. This university is research driven and will focus on research in science and technology that can be quickly used. We would like to work closely with industry in developing and commercializing technological innovations. This, of course, would require an entrepreneurial culture, which again is an element that we would like to copy from MIT. Our mission is to be a world-class science and technology university and a leader in the production of indigenous technologies. Malaysia produces a very small percentage of the technology it uses -- probably below ten percent. For a small country, I think it is not realistic to expect that Malaysia would have a technology balance. However, given its size and stage of development, Malaysia is capable of producing a much higher percentage of the technology it uses than it currently does. This new university also hopes to recruit international students who would go back to their own countries after graduation and promote innovation and creativity in those countries -- just as we would like Malaysians to do in Malaysia. In this respect, MUST is not just for Malaysia, but we hope that it will be a factor for education and development in the region. With this university, Malaysia is moving to become a center of excellence for education.

Development of this university was driven by the former Prime Minister of Malaysia, Tun Dr Mahathir Bin Mohamad, who stepped down at the end of October last year and handed over the government to his successor. In January of 1997, an agreement on this collaborative program was drawn up between MIT and the Foundation that directs MUST. Then in July of that year, there was an official invitation by the Minister of Education to proceed in the development of this new university. In August 1999, the Malaysian Federal Government Cabinet approved conditional grants that launched the university. In U.S. dollars, this amount came out to be a little bit more than $35 million. Approval of these grants was followed by registration of the Malaysian University of Science and Technology with the Ministry of Education. However, quite often there is a long gap between the approval and actual disbursement of funds, and the first $20 million of grants was not actually disbursed until January of 2001. Later in 2001, MUST moved into the present temporary campus that is located in Kelana Jaya, Selangor. In 2002, the Motorola Corporation funded a grant to MIT for sponsoring the U.S. cost of establishing MUST.

In August of 2002, we took in our pioneer group of 44 students, followed in July of 2003 with our second group of 68 students. The academic programs that we have currently are Master's level programs in five areas: Biotechnology; Information Technology; Systems Engineering and Management; Energy and Environment; and Transportation Logistics to be introduced later this year in September. The degree requirements for each of the Master's programs include three semesters of full-time study. Students have to take two to three university core courses and six to seven program-specific courses, plus they must complete a research-based thesis. The fundamental courses are basically foundation level programs to make sure that students have the right background for their programs since many students may not have a Bachelor's degree in the area of their Master's study. For example, some of the students who are in the Biotechnology Program might have a Bachelor's in, for example, Information Technology or Chemical Engineering. For this reason, we need to make sure that they have at least the minimum requirements in the area of their Master's degree. At the moment, MUST has three core courses including: Engineering Systems; Analysis for Design; and Systems Development Theories, Research and Policy. We have two academic centers of excellence – one, in Energy and Environmental Research and another in Photonics Research. In terms of the academic facilities, MUST has fully networked, high-speed Internet access, and some parts of the campus are equipped with wireless networking. We also have a large, highly digitized library.

We have a 12-member Board of Trustees, reflecting the nature of the not-for-profit university. It meets once a year, and we have an Executive Committee that meets quarterly. In addition, we have a typical university structure, again modeled not exactly on MIT, but certainly

influenced by MIT. The President/Provost is principally responsible for the university, while there is a Vice President for Finance and Business and a Vice President for Research and Resource Development. I would say that the main challenge facing MUST is financial, and this is partly because we have our financing secured only for the first five years. The Malaysian government has given us what is called a conditional grant, which is basically a launching grant. The deal is that -- for every student we educate -- we can offset the tuition -- which is $15,000 of that conditional grant. Thus, if we have a high enough number of students a year, then we do not have to pay back the government for that year's loan. Of course, it is not possible for the young university to have over 100 students in one year, and building up to that number will take some time. However, I am hopeful that the university will not have to pay any of the launching grant, because we hope to be able to increase our student body and also to reach a satisfactory arrangement with the government.

Another challenge pertains to one of the original models for MUST, which counted on a significant percentage of the university's operating expenses being covered by research contracts with Malaysian and international, multinational companies operating in Malaysia. This has proven to be a lot more difficult to realize than originally envisioned, and I have find that this may not be a unique situation. I recently asked a colleague in Hong Kong to inquire about the funding processes for the Hong Kong University of Science and Technology. He reported that the Hong Kong university was funded about ten years ago with a much more generous launching grant than ours. Yet even now, ten years later, they still depend quite a bit on government funding. Especially during the last few years, the economy of Hong Kong has not been doing so well, so this university has had its finances curtailed a bit. Also, while visiting here at MIT, I found it very interesting that in terms of research sponsorship at MIT during fiscal year 2003, 74% of that sponsorship came from the U.S. Federal Government -- from several federal agencies.

Another challenge we have faced is difficulty in attracting good students. For this reason, we are going to obtain approval to recruit additional international students. A final challenge relates to the transfer of MIT courses across continents, to be taught by Malaysian professors. This transfer has not been as easy as it might seem, as we work to take what we find most desirable in the MIT courses and adapt them to the Malaysian worldview and culture.

From the Stage to the Screen and Back:
Experience with Educational Technology at MUST

Presented by Dr. Scott Kennedy, Research Associate
The Technology and Development Program (TDP)
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Today I am going to talk about a project that is a collaborative effort between the MIT Technology and Development Program and the Malaysia University of Science and Technology (MUST). First of all, I want to give a little bit of background about this project and then talk about some thoughts and lessons drawn from our experience working on it. Generally, MIT's role is to support the establishment of a new, private, not-for-profit, post-graduate research university, which is the Malaysia University of Science and Technology located in Malaysia's capital, Kuala Lumpur. There are three primary aspects of this collaboration: first, to help set up the academic programs; second, to help develop research at the university; and third, to get the organizational machinery of the institution up and running, including many of the administration and policy issues.

Right now, there are five academic programs running, with two more to be added in September. The seven academic programs that we will have by the fall are: Information Technology; Biotechnology; Transportation and Logistics; Materials Science and Engineering; Construction Engineering and Management; Energy and Environment; and Systems Engineering and Management. Now let me say a little bit about my involvement. I am working with the Technology and Development Program to help develop the Energy and Environment Program at MUST, and in September, I will move to Malaysia to be a faculty member at MUST. As you can see, I am straddling both worlds a bit; working here at MIT to get the program set before I head over to Malaysia.

As stated above, one of the three main aspects of this project is to promote research at the university. We do this by means of a number of different mechanisms. One such mechanism is to encourage MIT faculty who participate in this program to get involved with faculty in Malaysia by working on collaborative research projects. Faculty at MIT who have participated in developing MUST's academic programs are eligible to receive some initial seed funding for these collaborations once they choose a collaborator at MUST. Another mechanism is to promote research by MUST 's students. While MUST will eventually have both Ph.D. and Master's programs, currently there are just Master's students. To obtain a Master's degree, these students have to write a thesis. At MIT, we have been working closely with the faculty in Malaysia to determine standards and policies for students' Master's theses. We have used this process as another avenue to promote research at the university. In addition, we have

been promoting research through proposing the establishment of Centers of Excellence at MUST. Examples of such centers are a Post-Harvest Research and Technology Center, Automotive Research Center, and an Energy and Environment Research Center. These are three areas in which we are currently developing initial ideas. A final mechanism through which we encourage research is by getting faculty at MIT and at MUST to work together through personal contacts. We are familiar with the faculty's interests both at MIT and at MUST, and we put them in contact with each other, while also providing seed funding for any joint collaboration. Generally, as I said, the goal is really to build the institutional structure and the human capacity necessary to develop MUST into a world-class research university.

Now the way that we help MUST to develop its academic programs is similar to what we have heard from other programs this morning. We are using actual MIT courses, as opposed to using course materials available on OpenCourseware. We enter into a relationship with faculty - as with Professor Larson here - who are willing to share their material with the university in Malaysia. These materials include not just all the content that would go on OpenCourseWare, but also videotapes of the actual lectures. The idea behind this is not that the content will be streamed via video directly to the students in Malaysia, but rather, that the video will be given to the faculty members at MUST to help them develop their own lessons. This course transfer process can work on both a simultaneous and a time-lagged system. By that I mean that the course can be offered at MIT and at MUST during the same semester, or a current MIT course can be offered at a future date in Malaysia. The simultaneous model requires a more efficient turn-around in terms of videotaping and material distribution.

Now, turning to the communication technologies that we use, I have to say that some are more effective than others. First of all, we have a course management system that performs a number of functions. It is a Web-based system that was developed as a useful tool for the faculty in Malaysia to organize their material. They also can use it to interface with the students. The students can submit assignments and messages through this management system. In addition, when all of the faculty at MUST use this course management system, it gives us at MIT a useful way to monitor the quality of a course from here in Cambridge - especially during the initial years. In this way, we are able to monitor whether or not high academic standards are maintained in each course.

Continuing with the technologies we employ, we also use document scanning and transfer, working with the MIT libraries to make sure no copyright issues are violated. E-mail is probably one of the most effective and frequently utilized methods of communication, while online chat is used occasionally. Of course, there are websites for posting information and message boards. Interestingly, the telephone, which would seem like a very good way to communicate, is used very rarely - probably due to the time-lag difference of 12 to 13 hours. However, we are able to have

videoconferences, as well as live Chat, with our partners in Malaysia. There is even one course we offer in Malaysia where the faculty member was actually mailing homework assignments to MIT to have a teaching assistant in Cambridge do the grading. This type of communication is what we might expect in the transition phase, but we do not see it as a very sustainable process! Yet it is an example of methods employed to help things get moving, especially since we did not have the human capacity in Malaysia that was necessary. Then, of course, there is always travel - which is extremely necessary, even though it makes us all weary.

Now, to get back to the title that I had for this talk – "From the Stage to the Screen and Back." There is a useful analogy that we refer to when we start thinking about how we use some of these communication technologies. The analogy is to think about some sort of theatrical entertainment and then examine how technology has moved it from the venue of a theater to the venue of a cinema. Now, this does not mean that we want to turn education purely into entertainment, but it is useful to draw on the analogy to see how the evolution of technology has affected education in different ways. One example is that for reasons of money, location, time, etc., people cannot go to a theatre but they can access theatrical entertainment either at the cinema or through DVDs. Some of these technological movements are fairly obvious, but it is interesting to see how we can make this kind of jump over into education. As we saw earlier in a talk about fun methods for learning, it is interesting to predict that many of the techniques used in either video games or in entertainment may have applications to education. Those virtual innovations are often at the forefront of new communication technologies, and one can assess how effectively they will apply over into education.

Now we can talk about how some of this relates to matters of education. We start out by thinking about how we can use these new communications technologies and in what ways these technologies will adapt the material? One example I can point to is a course in Environmental Policy and Economics that we will be offering. This is a difficult course to transfer because since it is taught here at MIT, there are going to be a lot of examples that have to do with U.S. economic and environmental policy. What is required is some sort of portable form of the course that can be sent over to Malaysia and adapted to their national and cultural reality. Through this process, an actual new product is created. We will have materials for the Environmental Policy and Economics course sent over to Malaysia in a form that is both portable and flexible. The portability allows it to be transmitted as a package, and the flexibility allows the local faculty to input culturally specific examples and make other adaptations. An example of a flexible format is when we transmit lecture notes in power point format. The faculty in Malaysia can rearrange the content, input background material that their students may be lacking, or find other ways to adapt the material quite easily. This flexibility is very important to help support the rapid development of courses at the new university. Another example of flexibility is the ability to support a variety of learning styles. Providing course videos as

supplementary material for the students can allow them to jump ahead in the course and then jump back, while others may want to get a quick survey of the course and then focus in on specific topics. With course videos, students have different study options, depending on their various individual learning styles.

As producers of these MUST courses, there are several issues we need to take into consideration, such as time of day. Some students are better at learning in the night, while others feel more able to learn in the morning. In a standard university situation, there are only limited options available. However, if you have some sort of packaged form in a course video, you can take any courses you want at any time of day. You are not going to have conflicts of scheduling. This flexibility is also useful for the producers of the course. A producer can essentially go back and re-edit a course after creating it, changing the order of lectures or going back to fill in sections. As you can imagine, this is all very useful for the course producer. This flexibility also helps a producer to reach the under-served in the same way that a cinema venue reaches out to the masses. This form of education enables the producer to reach out to the educationally under-served.

Now I want to spend some time talking about how we are applying this flexible and portable format at MUST. Basically, we develop three different types of courses that are located along a continuum of course types. First is a traditional course format, the lecture format. This type is very uni-directional, in that all of the objectives of the course are listed out ahead of time and are easily known. This type of course is very easy to package in a video format for mass production. For example, think of a course like Introduction to Statistics where there are many creative ways to teach the material, but it is also fairly easy to package it in a very uni-directional format, where you know before teaching the course all the steps along the way.

A second type of course is what we could call an exploratory course. This is a course where there is a lot more interaction with the students and it is very bi-directional. In this case, your objectives - your map along the way for the course - are known, but you do not know exactly what is going to happen in each course. This type of course gets to be a little more difficult to transfer. An example of this type that we are sending over to MUST is a course in Computer Systems Engineering. The challenge with this course is that it is a kind of a seminar format, and there is a lot of material that the students have to read followed by class discussions. This introduces more challenges around how we offer this effectively. You can still package it for mass production, but for the teacher to respond to questions and ideas brought up by the students it is necessary to provide some mode of feedback with the originator of the course. As we move along this continuum, from uni-directional to bi-directional and beyond, the actual producers of the material gain more benefit because they receive this feedback and are not as divorced from the actual teaching experience as with the traditional lecture format.

Finally, at the other end of the continuum is what you can call a research-oriented course. This is really project-based, and you do not know the outcome or even the path along the way. This could be an independent study course or the kind of course appropriate for when you have a student writing a thesis. While this format is even more difficult to transfer, there is even more exchange and more benefit given back to the originator of the material because it is much more of a partnership.

Now let us look again at these three types of courses along the continuum. First of all, a traditional course may be very easy to package, but a problem lies in the fact that the originator of the material becomes divorced from the educational exchange and is no longer involved in the process. In this case, the central issue is the choice of communications technology. Should the course be streaming video, a web-based interactive course, or some other form? The required human capacity for teaching (once the course content has been developed) is minimal. All that is needed is an intermediary who is responsible for the course transfer. However, if the course originator is no longer involved, the course content will inevitably stagnate. Furthermore, on the receiving end, this format requires less skill on the part of, say, a Malaysian professor, to interpret the course material for the students there. An institution that has been developed around so called "traditional" or uni-directional course transfers will likely remain biased towards this format since these courses are easier to transfer and the human capacity has not been developed to support interactive courses with rapidly changing content.

While working on development of the academic curriculum for MUST, we have noticed a bias towards choosing those types of courses that are easy to transfer, the traditional vertical form, primarily due to the technological and logistical challenges of establishing a more interactive format. When a very competent counterpart exists at the "receiving" institution, as is the predominant situation at MUST, the traditional course serves mostly as seed material for the MUST faculty to develop their own interactive and adaptive teaching styles. If, however, these materials were used directly to teach the students ("straight out of the box"), they would tend to limit the intellectual development of the students because the students have less exchange with the originator of the material and become only passive recipients. There is also little benefit and feedback returning to whomever produced the material in the first place. Examining the issue even more closely, we have found that a bias toward traditional courses may be especially strong when there is a presumed difference in the competency between two different universities. In a situation where it may be difficult to find skilled interpreters or skilled lecturers on the receiving end of the material, there can be a tendency to move towards the traditional course formats.

Related to this, we have found that having some sort of local expert to teach the course on the other side, is a critical factor - much more critical than having the right technology to transfer course material. Here let me

mention that the faculty over in Malaysia has the option to use the videos that they receive from MIT in any way they see fit. They do not have to show them to the students. They can have the students watch them in the library. They can put them up in the classroom if they want. In cases where we did not yet have the faculty capacity on the Malaysian end and therefore simply showed the students the video, then students have felt very short-changed as they have expectations of a strong interaction with a local faculty member. On the other hand, it could be that in another type of course where the students are expecting to have this type of passive exchange just with the video, then they would not experience a problem. However, when you set up the expectation that they are going to have a local expert, then they feel cheated out of the experience.

Therefore, when we identify a local expert to teach the material over there, it is a difficult challenge to figure out how much that expert should adapt the material. Many factors have to be taken into consideration, including the expert's level of competency as well as the nature of the course itself. For example, take this Environmental Policy and Economics course. If the Malaysian students participate in a course that is talking only about U.S. examples, then they are obviously going to lose interest. In this case, some adaptation is necessary. However, it can also happen that if the local expert gives his own spin on the material and that spin is different from what students see in the MIT video, then the students, without a deep understanding of the subject, may think the local expert is misinterpreting the original material. This is definitely another challenge to be aware of. When you have a very, very large difference between the original course material and the final actual presentation of that material, then the students may have different and confused perceptions.

We have also gathered some anecdotal evidence that graduate level courses may require more interpretation than courses at an undergraduate level. When you have new material with more recent English jargon, then the students are much less likely to be able to understand a video on their own. They require someone on that end to be a much stronger, capable interpreter, and it is the role of the local experts to interpret the material. Especially in the first year of the course, they must interpret not only the jargon, but also the material as a whole, in terms the Malaysian students will understand. Beyond interpreting, however, these local experts are also developing the course, and eventually it becomes their own.

Now as I mentioned before, it is really important to maintain high standards. We are using the course management system to help us monitor changes to course materials made by the Malaysian faculty. Here a key necessity is that capacity at the university needs to be developed rapidly. While we need to ensure standards, we do not want the faculty to feel that they are very constrained and must teach only what we are sending them. Therefore, we have developed a system in which, for the first year, they sacrifice some of their autonomy in developing the course material. However, after that initial year, they will be free to develop the course fully

on their own. Yet one of the challenges of this process is what occurs when you have an online course management system that is also used as a monitoring device. To ensure that standards are kept high, all faculty are required to use the course management system by updating on a course website any changes that they make to the material. Many of the faculty, out of old habits and their preferred methods of course development, do not like using this course management system. Subsequently, we lose any oversight over the people who are not comfortable using this course management system, and, therefore, it loses its effectiveness as a monitoring tool. Furthermore, the contractual arrangement that requires use of this particular course management system prevents the IT Services Department at MUST from adapting the software tool to the preferences and needs of the local faculty. The system then also loses its effectiveness as a course management tool. Therefore, we have run into some problems trying to use this technology for dual purposes, course management and monitoring.

Another challenge that I will mention here is the difficulty of achieving constructive dialogue between the people in Cambridge and those in Malaysia. We have found that it is especially difficult when we are talking about developing research. I call this problem, "Where is the water cooler?" In this long distance educational venture, there actually is no water cooler, no common point of informal discussion between people at MIT and those at MUST. We have found videoconferencing to be very awkward in the sense that faculty often complain that it feels more like a series of monologues than an actual dialogue. This has to do with the mechanism and with the technical issues, but also with the fact that you do not feel that you can have a very informal discussion with videoconferencing.

A final, interesting challenge we will face will be to see if there can be some sort of thesis supervision with, say a MUST faculty member and an MIT student? Could a thesis supervisor, separated by this great distance, still supervise a student? Now this is interesting in the degenerate case where you have a student that you really need to prod and move along. In the distant learning milieu, there is an easy place to hide. In a traditional university setting, there is a strong motivating factor when you are afraid to run into your advisor in the hallway or in the bathroom. It really makes you do your work! However, when there is a place to hide at such a distance, it is much harder to move along the student that needs a bit of prodding.

Finally, as I mentioned before, the highest benefit we have found is not simply by improving the technology, but more importantly, by investing in the best human resources and the best human capacity we have over there in Malaysia.