

Educational Technology: The Promise and The Myth

Roger C. Schank¹

Schank Learning Consultants, Inc.²

**School of Computer Science
Carnegie Mellon University**

June 25, 2001

¹ Author can be reached at schank@cs.cmu.edu.

² 166 everglade av Palm Beach, FL 33480.

Executive Summary

Advances in software for educational purposes have led to the establishment of the field of e-learning. Corporations and schools want to get in on the action in distance learning. Teachers want to learn to use technology, universities want to offer on line courses, and corporations are interested in moving all their training on line. This paper was written to help the World Bank think about these issues and its potential role in the development of new educational technologies around the world. The premise of the paper is that the educational methodologies and subject matter people seek to put on line was designed for a different venue. On line education demands learning by doing and rightfully should teach subjects that are doing-centered. Before investments are made in getting students able to use computers, it is important that there be sufficient high quality educational software available to justify the expense.

Not so long ago, educational technology meant showing film clips on projectors. Later it meant putting computers in classrooms, then wiring up schools and now we hear a great deal about distance learning. With all these technological changes classrooms don't look very different than they did fifty years ago. Around the world, classrooms are still centered on teachers, books, and more kids in the room than one teacher can easily attend to. New technologies haven't changed that much. Personal computers in classrooms tend to be used en masse when there are sufficient numbers of computers. All too often teachers show things to the students on the computer, standing in front of the classroom. Students are not encouraged to go in their own direction on the computer because this takes the teacher out of the equation for the most part and school systems resist this. Students are allowed to go their own way when there are only a few computers available. But, in that case, whatever they do is considered to be extracurricular because the teacher is not in charge.

Distance learning has been around for a long time. Originally it was just a book in the mail. Later there were correspondence courses. When computers became available, educators became tempted by this new means to deliver education at a distance. Today, what was once an obscure side bar to education, has become big business. People now talk about e-learning, but they still mean distance education. Distance education has, for the most part, not been seen as a great advantage where it has been used. It works to certify students, but it is actually quite difficult to learn on one's own with just a book. A great deal of education involves interacting with others and this aspect has been lost in distance education. To the extent that distance education has allowed a student to test his ideas and get serious answers to serious questions, to get into a dialogue, it has been successful. E-learning is just beginning to experiment with a way to do this.

The value of the computer may seem at first to be its ability to deliver information anytime anywhere, but its value in education is potentially much more important. When the air flight simulator was invented, what was important about it was not its ability to be used in any remote location. Rather, it enables one to learn to fly without risk, to accumulate the experience but never to be harmed by the experience. It was the beginning of simulated experiential learning.

It has been understood for a very long time that people learn by doing and that other kinds of learning don't really work all that well. John Dewey created a learn by doing school in Chicago, but it was hard to find things that kids could do that weren't very simple and very practical. Real world experience is hard to find for children and often quite dangerous. Nevertheless, no one would willingly get on an airplane flown by someone who had only heard lectures about flying and passed some written tests. We know that it is experience that teaches best.

In school today, experiential learning, learning by doing, is hard to find because it is so hard to implement. The paradigm of a classroom of thirty students and one teacher does not lend itself to allowing much doing. Telling is what is easiest in such a situation. No educational theorist really believes that telling is the best means of education. Learning is an emotional experience, a social experience, an experience that requires the learner to express his ideas and to defend his point of view. While a great teacher can make learning exciting and dynamic, typically the classroom inhibits rather than enhances the social and emotional aspects of learning. It is so much easier for a teacher to simply tell the right answer than to be truly Socratic in style.

Classrooms are often barriers to proper teaching. There are so many minds to feed, each going in a different direction with different needs and different concerns. Teachers must maintain discipline in a classroom and this goal is almost antithetical to the free form spirit of an exchange of ideas and the use of trial and error. Children tend to ridicule other children who make mistakes and this is simply terrible for learning given that real learning almost always depends on a failure of some sort, a mistaken way of viewing things or repeated attempts to accomplish something that went wrong. People are ready to learn when they realize that they don't know something they needed to know in order to accomplish a goal they wanted to accomplish. Having someone publicly tell you that you are wrong has never been a good way to get someone to experiment with new ideas and new ways of doing things, But it is precisely this kind of experimentation that is so critical to learning. Viewed in this light, it seems obvious that attempts to simulate the classroom on a computer are terribly misguided. Further, the idea that wireless access to information is an important issue in learning misses the problem entirely. It is not information that is lacking in the classroom; it is the acquisition of important experience that is missing.

Distance learning is only important to the extent that it can change the paradigm of learning from a telling model to a doing model. John Dewey called for this in 1916 but he didn't know how to do it. Benjamin Franklin called for this in 1745 but he couldn't find a way. Now we have that way. The computer can supplant the classroom with simulated experiences that allow the student to learn by doing. That is what the air flight simulator did for training pilots and what SimNet did for training tank operators (www.sisostds.org/webletter/viso/iss). In both of these cases, the US Defense Department thought that these were important things to spend money on. Whether any other government or organization will choose to spend serious money on building effective simulations remains to be seen. But the educational value of these simulations has been proven. This is why distance learning matters. Experiences can be provided to students that never could be provided before. Which experiences should be provided? That is an important issue for the future planners of education. The technology to do this has been available for some time (the flight simulator has been around for more than thirty years). Now that computing has become so much cheaper, the possibilities are endless.

It follows that much of what is called e-learning is a complete waste of time. Most e-learning is an attempt to put books on a computer interrupted by a multiple choice test. E-learning advocates have not spent much time trying to understand how the new medium changes the educational experience. They are merely trying to replicate what is there now while leaving out some of the important parts (like a teacher who can answer a question). The new medium allows for the creation of powerful new learning devices rather than being a way of replicating what has already been done and what has already failed.

As long as there have been computers there have been people touting their value in education. But, most of the software that has been produced for education has invariably been a dull approximation of the existing school system. Educational software meant drill and practice software for much of the early years in computing. These were called instructional learning systems and although big companies (like IBM) touted their one-on-one instructional benefits, they have never caught on because they were so tedious and so entrenched in the idea that there is a right answer and a student's job is to know it.

Now educational software means taking dull educational materials and putting them on a web page. Companies have begun to implement e-learning seriously of late because of the economic advantages rather than because of the educational advantages. You save a lot of money if you don't have to fly your employees to a training site. Interactivity in the e-learning environment has meant clicking to see what you want presented to you at a particular time. The results are less than compelling.

It is easy to find exemplars of bad e-learning. They are everywhere. Here is one I found³ by looking at a course in leadership on Cisco's site (a company hailed for innovation in e-learning):

GEO Leadership (<http://www.geolearning.com/main/promotions/demos/leadership/index.cfm>):
 "The leadership decisions you'll make in the exercise may differ somewhat from your real-life circumstances, but most of the principles and ideas can easily be transferred and applied to your job."

In the exercises, you have a simulated team, with pictures and descriptions for each—that's not bad. The introduction says that the exercises focus on 2 types of leadership styles—task behavior and relationship behavior. It gives a chart showing how these styles fit together.

<p>QUADRANT 1</p> <p>HIGH TASK, LOW RELATIONSHIP</p>	<p>QUADRANT 2</p> <p>HIGH TASK, HIGH RELATIONSHIP</p>
<p>QUADRANT 3</p> <p>LOW RELATIONSHIP, LOW TASK</p>	<p>QUADRANT 4</p> <p>HIGH RELATIONSHIP, LOW TASK</p>

The strategies become very vague and high-level (in task 16, I chose "Present the new project to the team and tell them to accept the assignment"). Here's what a choice screen looks like:

³ What follows was taken from my forthcoming book, *Designing World Class E-Learning* (McGraw Hill), November 2001.

Introduction Overview Instructions Results

Week 1 -- Situation

This is your first day on the job with your new project team. A good strategy at this time would be:

<p>Q1. Have a meeting with the team to outline your objectives, performance standards and working guidelines for the project.</p>	<p>Q2. Call a meeting to introduce yourself and brief the group on the project objectives. Answer any questions and then solicit the team's ideas on how the project should be handled. Try to incorporate their thinking into the project plans.</p>
<p>Q3. Don't take any action. The team has been briefed by memo on the job, and if the team wasn't highly motivated, they wouldn't have been selected in the first place. Don't get involved until problems arise.</p>	<p>Q4. Motivate the team. Have a meeting to kick off the project with a flying start. Forget the nuts and bolts and concentrate on personal benefits, the challenge, opportunity for growth, teamwork, etc.</p>

Select one of the choices to check your answer.

All rights reserved.
Copyright © 1998, [GeoLearning, Inc.](#)

The system includes 16 exercises, divided up by week. Each exercise is a summary of a situation and choices on how to strategically act. You get points depending on what choices you make—5 points for the best choice, 2 for the second best, none for the other two.

One big problem—you get tutoring for all the choices at once. Though the directions at the beginning encourage you to read all of the tutoring, you don't get a chance to try again and see what happens if you choose something else—it tells you what's right or wrong about all of them right away. The tutoring itself isn't horrible; I've seen worse. Here's what the tutoring screen looks like:

● Introduction ● Overview ● Instructions ● Results

Week 16 -- Evaluation

The project is reaching completion, and your boss has shared with you that he is very pleased with the overall effort and the results your team has produced. He's further indicated that he has another challenging assignment that he feels the team could handle, independent of your leadership. You feel this is the best compliment you could receive, and very much want the team to take on the project. He emphasized that it would be up to you to present the assignment to the team, and up to the team to decide whether or not to accept the challenge. You should:

<p>Q1. Present the new project to the team and tell them to accept the assignment. _____</p> <p>This is not your best option. Even though the potential rewards of taking on the project are great, telling the team to accept the assignment is not appropriate.</p>	<p>Q2. Discuss the situation with the team members and "sell" them on the opportunity. Then work with the team to set objectives for the new project. _____</p> <p>Here you are trying to satisfy the needs of your boss and push for results that could benefit the organization. While your actions are noble, there are other parties involved here. You must first recognize that it is the team's decision and if, for whatever reason, their hearts are not in it, the project could fail.</p>
<p>Q3. Present the opportunity, but do not interfere with the decision to accept or refuse the assignment. The team has proven themselves capable, so their own personal feelings, expectations and plans must be considered the most important element in this decision. _____</p> <p>This is the strongest option. It is in the best interest of the project.</p>	<p>Q4. Let the team decide if they want to take on the new project and then do what you can to be supportive of their decision and solidify their feelings. Let them know how you feel about the project, and if they still don't want to do it, offer to explain this to your boss. _____</p> <p>While this may sound like you are trying to help the team, your</p>

After each exercise, there's a narrative bridge telling you how the project's progressing and setting up the next choice. The flow is pretty jumpy (e.g., from exercise 1 to 2, I went from deciding how to start the first day with the team to having to deal with an employee who's taking on too dominant a role).

But the main problem here is that there are no consequences for the choices you make—your decisions don't play out. You get general tutoring on why something might be a good or bad idea but no resolution to the conflict you were trying to fix. This is frustrating, doesn't drive any lessons home through results, and takes away one of the main ways people learn. Also there's no way to ask questions to explore a mistake deeper.

You do, on the other hand, get a score which tells you how you did and what kind of leader you are. Good for people who believe that multiple choice tests are part of the high art in educational design.

Computers won't begin to have a real impact on education until they begin to be the means of teaching subjects that could not have been taught before, using methods that could not have been implemented before, and providing access that could not have been provided before. Computers ought not be a new means of producing a slide show. Power Point ought not be an educational tool, although it is in great use in classrooms. If you give a teacher a computer and a teacher sees himself as a presenter of information, then it is not surprising that the teacher will want to make better presentations. Teachers are not innovators in education, they are practitioners within a given paradigm. Computers have the power to alter the very nature of education, to transform

what is taught and how it is taught, but will not do so unless those in charge of the larger system of education see the need and the opportunity.

Today, most university courses are lecture courses. Lectures are evidence of the inertia that exists in education that still reflects ancient educational considerations. When the ancient Jews wanted to educate the masses, they read to them every Saturday from the sacred scrolls. This made sense because most people couldn't read and there were very few scrolls. Today everyone can read and there are lots of scrolls. Why hasn't the method of instruction changed? Because we somehow have gotten it into our heads that the means of instruction available in 1500 BC was right.

New online courses need to be about doing, employing the power of the computer to evoke simulated experience. One should learn to run a business by running it rather than by reading or hearing about how to do it. One should learn psychology by practicing it rather than by writing a paper about what one has read. These things are possible in this new medium. Possible but, on the whole, not done because the changes they portend might wreak havoc on the existing system and threaten interests vested in the old way of doing things.

The coming years will see the creation of educational technologies by those few people who understand both computer science and education. Instead of reading and listening, students will be doing. They will use software that enables them to run the economy, run political campaigns, run businesses, investigate cures for diseases, practice being a doctor, and go back in time to remake historic decisions. The computer will make people understand that the mark of an educated person is not the ability to spout little known facts, but to have had a variety of experiences in simulated worlds that prepare one for decision making in the real world.

What is preventing this change? The primary thing that is missing is the understanding of the possibility. Most people cannot envision what this new kind of educational software will look like and what it means. And, there are powerful forces that do not want change. Teachers are not really the problem although they certainly are anxious about change. There are many vested interests in the current system: book publishers, testing services, and certifying authorities. Even universities oppose change. They prefer test scores and grades from applicants to the statements of (virtual) accomplishments that would accompany a learn by doing based system. Universities themselves are run by faculty who have no interest in changing the way they teach or the economics of the way the university functions. However, the biggest issue is money. Redoing the curriculum would be expensive. High quality educational software costs at least \$20,000 for each hour of instruction and can run as high as \$80,000 per hour depending on what is being taught. For the most part governments and businesses have not wanted to invest serious capital in education.

Online Delivery of Courses Will Drive Change

The primary driver of change in the 21st century education system has already been created. Online courses will first be developed for the university and continuing education marketplace, and from there they will gradually be adopted in secondary and primary education venues. Whereas the greatest need for online courses is probably in the lower grades, since businesses are

leading the charge, they are going where the money is, not where the greatest value to society might be. The opportunities in the lower grades are very interesting for that reason. This will be discussed in more detail below.

It is important that we don't get confused by what these courses look like today. Now we are seeing the equivalent of the filmed plays of the early movie making era. This will not be the case for long. Soon there will be high quality major productions. The bottom line is that traditional academic courses (biology, physics, history, economics and so on) are no longer going to be taught by local teachers. The computer will allow the creation of learn by doing courses rather than learn by telling courses. The computer will allow the designers of these courses to be the best and the brightest in any given field. Moreover, these courses will be very engaging, non threatening, diverse, and fun. Once the very best physicists in the world sit down and create a learn by doing, engaging and exciting physics course, there will be little use for local physics teachers. The same will be true for every academic subject and for many subjects that are not now seen as academically relevant. Teachers will continue to play the roles they have played only insofar as their subjects are not being covered better online. The role of teachers will have to change so that they become mentors rather than providers of information or experience.

Because eventually, companies will create courses and guarantee employment to those who pass them there will be a push about who exactly is in charge of the educational system. There will be arguments between government, business, and academics about what should be taught. Business has, for the most part, always lost these arguments but as they begin to usurp the credentialing, this will change. When Microsoft certifies an engineer, he is immediately hireable, regardless of the what schools or governments have to say about it.

New role for teachers

The teaching of traditional academic subjects, first in universities, then in high school and later in elementary school as well, will be increasingly done via online courses. Once the initial set of these courses becomes successful, there will be more of a push to make the technology available and people will be increasingly accepting of them. Eventually what you'll have in school is a library of hundreds of these courses. The teachers are going to have to do things that the teachers themselves are better at doing than the computer. What can they do better? What they can do better is personal one-on-one tutoring; or helping children learn how to work in a group trying to accomplish something; or teaching crucial interpersonal relationship skills. They can facilitate discussions. They can serve as mentors (online and in school).

The teacher of the future will look a lot like the teachers of our dreams rather than the teachers most people really had. The value will be their ability to nurture, motivate, and deal with personal issues. It is this latter issue that clarifies what we must do now before all this software becomes available. Teachers need to be trained to be more like counselors, offering help and guidance, and more like seminar facilitators, helping people express themselves and confront others with their ideas. As they cease to be information providers they should become what many of them wanted to be in the first place: trained mentors. They must learn to help in areas that are inherently human where children and adolescents really need help. How to get along with each

other; how to communicate better; how to deal effectively with stress; how to function in a complex society.

The role of teachers is going to evolve away from being the local expert in math, science, and other subjects. We've been evolving that way for a long time. Today, most high school teachers could hardly claim to be the expert in physics or history or literature in their communities. In the future, the best minds in the country, in the whole world, will be sitting there at your desktop.

Centralization of curriculum and instructional development and academic tutoring

The advent of ubiquitous networking technology will lead to the centralization of key functions in the education system, just as it has in the business world.

First, the delivery of education via online courses will change the entire landscape of course development and control of the curriculum. Each academic field will supply its experts to help create the courses in that field. Employers will create courses for those they wish to hire. Governments will create courses that capitalize on local expertise as a way of exporting local knowledge and gaining revenue and prestige from the exportation. Consortiums of academic experts, educational technologists, and businesses will work to develop, update, refine, and improve these courses. We will be able to realize tremendous efficiencies by developing these top-quality courses only once.

In addition to eliminating the redundant effort of reinventing the same courses across the world, we will also realize a tremendous improvement in quality control of the courses. The era where we have countless numbers of students who have been turned off of physics, math, chemistry, or literature because of poor teachers teaching bad courses in these subjects will be over. Every student in the world will be able to select from a wide range of top-quality courses in any subject that interests them.

Second, the fiction of local control of education will become evident. While it seems that each school district can decide what to teach and how to teach, in fact none can decide to stop teaching mathematics, for example. A panel of education experts instead of local groups of well-meaning, but uninformed, parents or governments will develop the curriculum in concert with those who are footing the bill. What will be the point of local school boards arguing over which courses should or should not be offered, when every imaginable course is available. The students themselves will determine which courses best suit their needs. When success in a given course is itself a credential that employers value, local credentialing authorities will lose their power.

Third, the advance of technology, in particular live videoconferencing, will lead to the creation of a centralized pool of tutors for various subject matters. Just as today's companies have centralized phone centers where customers can call in for service, we are beginning to see the creation of one-on-one tutoring services provided via live videoconferencing. Having trouble with some calculus problems? Just connect to the calculus tutoring center for a face-to-face session with an expert tutor. These learning service centers will provide students around the

world with access to the best coaches available to help them with their work in the online courses.

How it will happen

These changes will happen gradually. But the seeds of these changes have already been planted. Universities, and their partners, are beginning to develop online courses. Increasing sums of money are being spent on these courses, and we will soon see a fair number of online courses. However, the impact of these online courses will soon begin to be felt at the secondary, and eventually, the primary levels too. How will this happen?

Initially, progress will be slow. For example, right now a physics professor who wants to put their introductory physics course online usually just puts his or her lecture notes and some quizzes or tests online. That just makes the on line course a poor cousin of the real thing. But, eventually the online course will surpass the original in quality. Physicists and educational technologists will sit down to redesign the physics course and ask important questions. For example, what should physics be teaching you? What should an everyday person know about physics? Why? We will see the best and the brightest design these types of courses and – with enough money, maybe more than \$1 million per course) available – you will have some phenomenal learn by doing courses published online. There may not be much in the way of competition in these courses. They are very expensive to build and it may well be that no one decides to build introduction to economics a second time after the field of economics has decided that a given course is satisfactory.

Would the best and brightest in a society come together to do this? I think so. Within each academic discipline there are those who are quite frustrated with how things are taught to young people, but they see no way to change the system. Chemists wonder why the pre-meds in their courses have to learn chemistry they will never use. Economists know that their students really want to learn about how to function in the business world. Our⁴ experience is that more than half of the famous professors we have contacted for help agree. They expect to be paid for their time, of course. High quality courses can be built with the help of the best and brightest.

After they are made available at the university level, these courses will find their way to the high schools. Why? The most in-demand courses in universities today are the big freshman introductory courses: calculus, biology, physics, economics, psychology, etc. These high-enrollment courses are likely to be the first online courses that get developed. But it is these same courses that students are taking as Advanced Placement (AP) courses in American high schools. So, once these online courses are created, why wouldn't high schools want to adopt them? This will be especially attractive to those schools who cannot offer all the AP courses their students wish to take. Eventually, when enough of these online courses are out there it would be possible to take your entire first year of college in high school and receive college credit. Once this happens, the AP system as we know it will disappear. There will be no need to have an arbitrary test determine whether or not you get credit for a course, you can just take the same course college freshmen are taking and get college credit directly.

⁴ Cognitive Arts, a company I founded in 1994, has been building courses with Columbia University for the past year and a half. The courses built for Columbia utilized faculty from around the U.S.

High School will become college. What is a high school physics course and how does it differ from a college physics course? The differences aren't that profound actually. More importantly, the intent of these courses is not different at all. Typically, they are meant to be terminal. Very few people take them intending to become physicists. They are intended to familiarize rather than to teach what someone really needs to know. The high school courses exist almost as a vestigial organ, reminiscent of a time when students didn't go on to college. In the US no one takes high school physics unless they intend to go to college, so there really is no reason for this course to exist. When a good college course exists online, the high school version will cease to exist. This will happen in so many academic areas that high school students will be able to become college students (without leaving home) by the age of fifteen.

A good student in Africa can take online economics offered by Harvard University when he is 12 years old, if the authorities in his country permit it, if there are connected computers that are accessible to him, and if he can afford it. Should he be taking such a course? For some students such a course will not be too difficult. If these courses are designed properly they won't assume knowledge that such a student doesn't have and will offer help for those areas that are initially too hard. It is really not at all unrealistic to imagine that this 12 year old is capable of doing this kind of thing.

None of this works if there is no electricity or no computers. None of this works if the government does not support it, allowing students out of regular classes to do this work and agreeing that they get credit for what they do. This is a question of easing governments into the idea of all this, teaching them what can be done and providing help in setting up a system that will absorb this new educational possibility.

A high school principal anywhere in the world will soon be able to say, "We don't have any new teachers for our business course, so we'll take the college level business course, which Columbia is offering." Or, "We have never been able to offer a course in psychology, but now there is a college level course in psychology that we can let our students register for." Perhaps initially, high schools will allow students to take one course a year online. At first they will be for electives or optional courses. Students will soon be questioning why they can't take two courses online, especially if they are better than the existing courses. These students will want to take the college level courses because they can get college credit. No high school can sit there and say you can't do it. They're available. Students who are determined to take these courses can do them at home, independently of their high school's policies. The availability of online courses in high school is going to happen slowly, but it's going to happen.

The high school curriculum in the U.S. was established by a committee of university presidents in 1892. That curriculum has remained virtually unchanged since that time. Many countries have either adopted wholesale or imitated greatly, the U.S. curriculum. Unfortunately that curriculum was designed for helping students succeed at entering Harvard. What was important at Harvard in 1892 ought not determine the education of today's student, but it does. The British system is not terribly different from the US system because the US system was based on it originally and the British system has been influenced by the US system subsequently. There is, in fact, not an educational system in the world that does not emphasize mathematics, literature, science,

language and history and do so in a way that is primarily by learning what the teacher has told you about these things. Of course, various nations have various pretenses about how they are different. Italy, for example, has a picture of Maria Montessori, the great educational innovator, on the 1000 lire note. It is interesting however, that there are very few Montessori schools in Italy (there are many in the US) and by and large she had little or no impact in the higher grades in Italy or anyone else's educational system.

High schools have, for many years been teaching what basically are watered down college courses. Once authentic college courses are available to high school students online, the entire content of the high school curriculum will be called into question. Of course, the college courses aren't necessarily teaching the right stuff either. This too shall change. Competitive forces will cause more practical and relevant courses to be built and soon college introductory courses will focus on how to run a business rather than the theory of micro-economics or how to use chemistry as a doctor rather than principles of organic chemistry. Students have not been able to choose the particular version of something they wanted to study. The best they could do was choose a different school on the occasions when that is possible. In the online world, the choice will not be around schools but around courses and courses will be chosen the way movies are chosen, by recommendation of those who have had a positive experience. However, there is another factor operating. Success in particular courses will open particular doors. Certain courses will be required for entry into school or work. It will be up to the developers of those courses to show that they are more valid than whatever competition may exist.

Critical on the path to change, and the real value of the computer in education, is the creation of anytime, anywhere education. This will manifest itself in the creation of Virtual Universities (VU). These are beginning to be created now, but for the most part the courses in them are lifeless and uninspiring. The California State system tried it, Western Governors is trying it, and the University of Phoenix has had a form of it operating for some time. These ventures lack good content, however. It is simply a matter of time (and money) until there is good content. The current offerings are not really vehicles for change. They are meant to more widely distribute the status quo. This will begin to change as soon as better alternatives are available.

At first glance, the idea of the VU replacing dear old State U seems frightening indeed. College is a time of great joy and excitement for the young. It is often the best time of their lives. But it is not necessarily the highlight of their personal education. Very few people learn what they need to know in life in school. Students are often frustrated by the tedium that goes with an education at dear old State U.

The Virtual University will replace an inherently passive venue (the classroom) by an inherently interactive medium (the computer). Courses that emphasize doing are a lot easier to design and run on a computer than they are to design and run in a classroom. Suddenly doing will dominate education and education can emphasize learning about the real world. It will be possible to learn job skills, life skills, as well as academic skills. One-on-one education will replace mass education. Students will be able to shop all over the world for the best courses. They will be able to learn when they are ready to learn, rather than trying to learn after an all night party before a football game. They will learn what they need to learn, rather than what some faculty members thought every student should know because they happen to teach it. They will learn from the best

teachers, not from the guy who just happened to be assigned to teach a class in a subject he doesn't even like. And they will learn by doing rather than by listening. E-learning will radically reconfigure education as we know it. It will cause us to ask why we get an education and to question what we should be teaching and learning. The general idea that education is a good thing and everyone needs one will be supplanted by the idea that one needs to be educated for a set of particular skills and then enable the student to satisfy whatever particular need they might have. They won't go to school and take whatever they have to offer any more.

Most people, in the end, think you should go to college to get a job. Expecting college professors to help your son or daughter get a job, or to teach them what they need to get a job, is like expecting good sex counseling from a priest. There may be some opinions to offer, but really it is not their particular field of expertise. Maybe one goes to college to learn things one will need in life and some of what one learns may help one get a job. While the best colleges employ brilliant men and women in many different fields, the professors a student meets are unlikely to teach them anything practical that they need to know. Professors can occasionally be cajoled into teaching something practical, but for the most part they resist this request. What professors know best, and what they want to teach the most, is esoteric knowledge of use only in their particular academic field that has little relevance to what your son or daughter might care to know.

Maybe college isn't about getting a job. Maybe it is about opening student's minds and teaching them to think. Certainly this view of college is closer to the one held by the faculty of most colleges. But is this what students can expect in college? No, not really. The dirty little secret of the most elite universities is that they are really about job training after all. The job they are training your child for is the one they have. They are training their students to be professors. If a student isn't professor material, there is a good chance their needs will not be taken seriously by the faculty.

Harvard and Yale established the model, and others have copied the model. There is no need to change. There has been some competition, Antioch College (www.antioch-college.edu) and Goddard College (www.goddard.edu) offered school experiences combined with work, Hampshire College (www.hampshire.edu) tries to offer a more creative individualized college experience, but their views haven't affected the mainstream. There has been no need to change, so colleges haven't changed.

It may seem that what I say here seems to be too great an indictment of the elite universities. The problem, of course, is not the elite universities themselves. They do a fine job of educating those who want to pursue an intellectual path in life. Unfortunately, the number of intellectuals is small and the number of colleges who have copied the Harvard/Yale model is large. Most students don't attend college to become intellectuals. This fact has been ignored by most universities.

Virtual universities will force a radical new conception of college and what it means to be educated. Virtual courses will, although not at first, cause our whole conception of knowledge and what it means to be educated to change radically.

Every year in the U.S. thousands of parents agree to pay large sums of money to send their sons and daughters to college. They want the best, of course. They want Harvard or Stanford or

Swarthmore. Actually they don't just agree to send their children to these schools, in most cases they cajole, encourage, and fret about this for years. Getting in to a good college can be a theme in some families that takes up years of dinner table conversation. What extracurricular activities should their child engage in? What AP courses should he or she take? Will what they do in the summer look good on their record? All this in the name of getting into a good college. But why do these people try to send their children to a good college?

Most people have the idea that one should go to college to get a job. Around the world, students wish to study in the U.S. because they feel that a U.S. university degree is their ticket to employment. In some cases, they are right. Degrees from high quality universities do help in gaining quality jobs. But, this is not because college typically teaches employable skills.

If the degree is supposed to have something to do with job readiness it is not unreasonable to think that job skills ought to be part of the curriculum. Certainly, this not what we traditionally associate with the idea of a university degree, but when skilled people are produced by VUs, employers will hire them. This will induce change on a massive scale.

A student who majors in economics, for example, usually does so because he wants to go into business. Economists don't know much about business and what they teach is only vaguely related to what you might need. Most top colleges won't let your child major in business. Business is considered to be too practical and not academic enough. So, students study economics, from people who, for the most part, don't even like business every much. How about psychology? Perhaps a student wants to be a psychologist, or just wants to know what's wrong with him, what's wrong with his parents or just how to get along better with other people? Psychologists at the top universities are experimental psychologists. They teach students how to design an experiment, or how to use statistics. Most top psychology departments consider the practical psychology to be beneath them, and hardly worthy of serious academic consideration.

How about computer science? Surely one can get a job after being a computer science major. Yes, indeed one can. Companies hire computer science majors willingly, because programmers are in very short supply and they feel very confident that their majors know something about programming and that if they don't they can be taught. Are they taught how to program in college? They are sometimes but for the most part computer science departments hate teaching programming. It is not considered to be science. Computer scientists hate it if what they are doing isn't considered science.

Do students know all this? Yes, they do. But, for the most part they don't care. In America, Mommy and Daddy are sending their progeny to a four year party, a vacation before the real world starts. Why should they argue? Anyway, they know that a Harvard degree opens doors, which indeed it does.

One question is why it opens doors if the students who go there don't learn much of great value. Another question is how this situation of college being irrelevant to real life came to pass. The latter question is easy. Harvard and Yale were always like that. They were set up as Divinity Schools and they were intended to produce ministers. Ministers should know the classics and be generally educated. They need not function in the real world. Harvard and Yale were never about

the real world. As they became playgrounds for the sons and daughters of the rich, they had no need to become more practical. Daddy would teach his son about business, Harvard should just keep him occupied until he grows up.

Big companies know all this, but they feel there is little they can do about it. They are forced for the most part to attempt to hire the best and brightest and then to train them themselves. Company after company has established a so called university on their own corporate campuses to teach the things that universities should have been teaching their new hires in their view. The problem is not only that this is a costly operation to run but also that it isn't all that effective. Students who have just graduated from top universities are usually not all that interested in going to school all over again. And, even if they are willing to do this, they have developed a set of habits in college that are about getting the right answer to impress the professor rather than about real learning. Corporations for their part are not necessarily employing the best minds in the world to develop curricula or to teach the classes in their corporate universities. Further they are not always sure what subjects to teach, and some very important stuff continues to be left out of these curricula because there isn't time or money to do them. Lastly, corporations can't seem to help copying the university model when they open their own corporate universities. They try to imitate what universities do despite recognizing that the university system is by and large ineffective.

Can corporations influence universities to change? They can try but they are unlikely to succeed. Professors hold all the cards at universities and they have no interest in changing what they do. Suggest to a developmental psychology professor that students really want to know how to take care of and understand their (future) children and the professor will insist that they learn about the current research in developmental psychology instead. No university administrator can change this. Child raising is considered to be too practical, not academic and thus it remains untaught. No one in high school or college will teach students such a subject (except perhaps in a class for delinquent unwed mothers) despite the obvious societal need for it. In matters of business or issues related to the concerns of business, the professor's reaction is likely to be even more hostile.

The question is what effect online education, or virtual universities, will have. It is clear that universities are afraid of this new challenge, but they still hold all the credentialing cards. The University of Phoenix found that there is money to be made in distance education and they are handling tens of thousands of students, but still there is much less perceived value in a University of Phoenix degree. The Open University in Britain has only gradually gained acceptance by employers. Students will go to Harvard to get the degree and as long as Harvard has a monopoly on the credentialing business, it will remain in business.

We may soon see the biggest companies in America get together with a major university to create a new on line university that has the express intent of creating graduates who are well prepared for living in today's world and immediately functioning in the business world. This online university would not be a business school. It would offer courses meant for living in today's world which would, of course, include the acquisition of a set of marketable skills. In the first two years, students might learn to communicate, to make decisions in complex environments, to handle people, to perform in group settings, to analyze what has been done and

make new proposals for the future and so on. Instead of studying the history of experimental psychology, students would study how to deal with people and how to understand human emotion. Instead of studying ancient history, students would learn how to make decisions citing precedents that they have learned about. They would learn these precedents when they had interesting points to be made to support or rebut their plans. Instead of English literature, students would learn to write and to make a persuasive argument. Those arguments would be about real world issues. Literature might well be cited as justifying their arguments, but so might a great many other things. Students would learn to read with a purpose. Students would learn the math and computer skills they needed while working on projects that required them. There would be no courses in mathematics per se. Rather math would be taught inside finance courses, inside engineering courses or wherever the math that was taught would be immediately put to use.

The world of education will change. The old model has been in place a long time. That model was based on conditions that are no longer valid. Experts aren't local any more, knowledge is too complex and diverse for the local teacher to fully deal with. Students needn't travel far to get an education, it can come to them. And, most important, the style of educational delivery, which depended on the old state of affairs, can now change. With it, the time has come to ask hard questions about how what we have always taught in school was influenced by previous states of the world that are no longer true.

The Big Issues

Technology in education is a red herring. It has always been that way. When television was introduced into classrooms it was supposed to revolutionize education. Even overhead projectors have been considered to be exciting new educational technology. The technology doesn't matter unless it can facilitate curriculum change. Even curriculum change doesn't matter if that change is only available to the select few.

Focusing on training teachers or deploying educational management systems is simply the wrong way to look at things.

So, first let's focus on what needs to be changed.

At the top of the list is the battle between the learning by telling and the learn by doing model of education.

Second, we need to worry about why people are being educated.

Third, we need to understand the relation between what we teach and the reasons we give in answer to the second point above.

Fourth, we need to understand the extent to which old "technologies of education" have influenced what was taught.

Fifth, we need to understand the role of teachers in the past and in the future.

Sixth, we need to understand how concepts of success, measurement, grades, credentials, and such influence what has been taught and how these things have been taught.

Seventh, we need to examine the “one size fits all” concept of education in light of new technologies.

Eighth, we need to understand the advantages that new technologies bring to developing nations that they could not possibly get any other way.

Ninth, we need to consider who will likely be the producing nations in the future of education and whether this can or should be altered in some way.

Last, we need to ask how to best overcome resistance to change that may leave some nations far behind.

Learning by telling vs. learning by doing

The battle between these two models of education was lost as soon as education became available to everybody. In order to learn by doing, one must be able to try things out, to do something, and hopefully to get some help along the way. In a classroom of thirty students this is simply not possible. It is much easier for the teacher to talk, or for students to read or write. For the most part this means that doing in terms of real live experiences that require thinking, planning, recovery from failure, self explanation, reasoning and so on, is not possible. So, despite the fact that educational theorists as far back as Aristotle have pointed out that one cannot learn what one has not personally experienced, the telling model has won in the schools of the world. The telling model brings many other problems with it. One has to teach things that can be told, and one has to test to see if students remember what they were told. So, despite the fact most people could not pass the tests they took the year before, we continue to have an educational system based on tell and test, and precious little in the way of real world skills can be taught.

Of course, the computer changes all this. A student can do things if high quality simulations are built for him to interact with. The best of these is still the air flight simulator. It is a very good way to learn to fly a plane. We are really happy when we fly that our pilot wasn't trained by the tell and test method.

Putting high quality simulations in the hand of students is a very important next step in education.

The learning by doing method works well at any age. Small children learn their language by trying to communicate, failing, and trying again. Small children rarely say a proper sentence in their own language until quite a few years of practice. The primary school could adopt learning by doing methods rather easily. Children are being taught to do things at home all the time. In school they are taught to know things most of the time. However, there are many exceptions to this (a school play, learning to play a musical instrument, learning to read, learning to play a

sport). In general there is more innovation (and thus more doing) in the primary schools, or at least there has been until the current testing mania has begun to take hold.

International financial institutions, such as the World Bank, could encourage new projects in education that relate to doing rather than knowing. Ask the question: what will the child know how to do (that he couldn't do before) after completing this course? If what the child now knows how to do is valuable then the course is valuable. (Doing, in this context does not mean memorizing or writing reports, both of which may be valuable skills but they don't lack coverage in the school system.) These projects can be in software or not. Software projects have the advantage of once they are completed being able to be used by many people for many years to come. They have the disadvantage of being expensive.

Why people are being educated

It is so normal for people to go to school that we often forget to ask why they are there. It is an important question. The easy answer is reading, writing, and arithmetic. This is not a bad answer except that that kind of basic training is done by the fourth grade and there is a tendency for people to stay in school much longer than that. We really should know why they are there.

For the most part students are there because someone is making them go. The governments that run these schools tend to mouth ideas about making students into good citizens and teaching them to think, but the truth is far from that. The history of why we teach what we teach in school is too complex for this document. A quick summary: the critical choices in American education were made in a dispute between the Common school movement (practical education – Ben Franklin the major proponent) and the Latin school movement. The Latin School idea (the winner of course) was based on the idea that education was about moral issues, making good citizens who knew the correct version of history and religion and, reading and understanding the classics (in the original typically which meant lots of Latin and Greek study). These goals were all tied together, based on the idea that the ancients knew it all and one had to learn it from them.

What is important to understand here is that education, under this view, was about indoctrination, not free and open debate, about memorizing right answers, not reasoning, and about preparation for a life of being a Minister or a gentleman, not someone who had to learn real world skills.

The ideas from this era have not changed much. Further, American (and British from which this was derived) education has influenced the world's view of what makes an educated man. This would be funny if it weren't so sad. Developing countries still follow the lead of people who were not in any way trying to build an education system that would help people function in the real world.

It is clear that there is a disconnect between what people are learning in school and what they need to learn.

The relation between what we teach and why students are there

Students are quite often very unhappy about what they are learning. They drop out of school because it seems irrelevant to them or they find school too difficult because it teaches things that are beyond their abilities or their needs. Why do schools emphasize mathematics, for example? Everyone learns the quadratic formula or the Pythagorean theorem and no one can remember why these things are being taught. No matter, everyone soon forgets them. Yet schools insist that math is very important. It is supposed to teach reasoning. If reasoning were important to teach one could of course teach that. It is hard to find a school with a reasoning curriculum, however, and hard to find a school without a math curriculum.

Schools teach what they always have taught. Schools teach what is easy to teach by lecture. Schools teach what is testable.

Students learn to pass tests and to memorize what the teacher said. And they learn not question why they are learning what they are learning or argue with the teacher.

How old “technologies of education” have influenced what was taught

Socrates said that he was against books because they just said the same thing to anyone no matter who was asking and then repeated themselves even if there was an interesting question. The technology of the printing press radically changed education from the Socratic method and the apprenticeship method to the lecture (literally “reading”) method. Schools are shaped by technology. New technologies that offer the old methods using new delivery vehicles are just a waste of time. Most of what is called e-learning is the attempt to put current educational materials on line. There is little reason to do this apart from saving trees. E-learning in that sense will not live long. The real question is what new educational methods can be delivered by new technologies.

International financial institutions should invest in people. The ability to create new educational experiences online requires training and experience. Helping countries learn to do this is very important but the work must be in areas that are unique to that country. Every country does not need its own online math course.

The role of teachers

Teachers learn to teach in a certain way and are not in general happy that their role might change. In recent years, in the United States, strict testing standards have made teaching a tedious affair of continual test preparation. Teachers are inherently conservative, wanting to teach the subjects that they were trained to teach. Whether or not the currently taught subjects are the right ones, teachers tend to remain committed to teaching what they know. They have a certain willingness to learn about technology, but in general resist the key advantage of computers: their ability to take the teaching away from the teachers and create a one on one student-centered doing-based experience.

Teachers will not be course developers. They need not learn to use technology. Their students can learn it easily enough without them. Attempts to train teachers in new technology are just attempts to keep teachers in control of a medium that is inherently about having them out of control. While teachers clamor for training in computers it may be hard to resist them. However, it is important to understand that the underlying idea in such training is that it is important to train students in technology. This is equally wrong headed. Computers are becoming easier and easier to use and require little training to get started. Students learn from each other. In any case, it isn't the computer itself that is the lesson. The computer is a vehicle for learning if good software is available. Good educational software does not require training to use.

Eventually we will understand that computers allow students to go wherever they want to go. Our job is to create interesting and valuable places for them to go. A teacher's job is to point out where they can go and to discuss with them where they have been. What teachers really need to do is focus on the human side, on what computers cannot easily do – hug a kid or understand his anxiety.

It is very easy to see the future and say there is no role for teachers in it. It is also easy to believe that countries that have a severe teacher shortage should immediately invest in making more teachers. This situation presents an interesting opportunity. Why not take the chance and invest in a new kind of teacher, one who is part of the change that will inevitably come as a result of high quality educational software becoming ubiquitous and is committed to facilitating that change. Teachers should be trained, but not as instructors, as facilitators and counselors. Why does someone need a college education to facilitate and motivate? Teachers of this new sort can be found more easily.

How measurement and credentials influence what is taught

It is important to understand that most students go to school because they want the credential that the school offers. It is also important to understand that to get that credential one has to focus on the standards of measurement that are in use and how to fulfill them. To put this another way, students learn how to get a good grade. Learning for its own sake is secondary in importance or completely unimportant to many students. For this reason most students view school in power related terms. They know the teachers hold all the cards and they spend a great deal of time trying to do whatever the teacher has asked of them. They memorize when asked to do so, write reports when asked, volunteer to erase blackboards, ask to earn extra credit and otherwise fawn in the face of authority. When testing is introduced everyone tries very hard to satisfy the test makers, usually without asking if the tests test anything worth knowing.

When schools say what combination of courses satisfies the requirements for granting a degree, everyone takes that as gospel. When you look closely, most schools have determined these requirements by attempting to satisfy various special interest groups without thinking about what kind of education is really needed in today's world. The students are rarely consulted. Contrast this with education that does not lead to certification (like music or art lessons). In those cases students study as long as they feel they are learning. The students determine their educational needs, not the faculty who want to make sure that everyone takes the courses they have always been teaching.

The new online world will bring with it a new set of credentialing issues. The credentialing authority will not be certifying its own courses in most instances. It is likely that governments will determine if a set of courses from a variety of places satisfy the requirements for certification.

International financial institutions could encourage the building of software that trains students in job skills needed by a country. Until now, such training has been the province of private enterprise. Schools run by governments have been primarily academic. Governments could be encouraged to build educational software that matters in their economic development. Schools could be encouraged to offer such software instead of more esoteric courses in algebra or literature. “Educated to do what?” is the relevant question. As long as our conception of an educated man comes from the British, French, and American versions meant for an elite class that didn’t have to work, we have serious problems. It is possible to be a worker and educated, but the education ought to be about something other than the classics.

The “one size fits all” concept of education in light of new technologies

Once upon a time there was a very good reason that every school child had to learn the same stuff, that there was a curriculum in the first place. There were only so many teachers. Electives, optional paths, alternative educational possibilities, these all cost money that few school systems have. The problem with the “one size fits all” theory of education is that not only does it fail to allow for individual differences, it also causes curricula to be developed that work to prevent those differences. So, if one child, in learning geography, gets fascinated by Africa, “well that’s too bad, we only spend two weeks on Africa.” If a piece of educational software allows children to travel to wherever they want to go to learn about a place, the school system will worry that each child might go somewhere different and then it would be very hard to test them to see what they have learned. In a test-oriented educational system, individual differences are hard to deal with.

On the other hand, in an online world, where students can take any course they want to, better yet, go in any direction they want within a course, new measures would have to be found. They would have to measure achievement: What did you do when you got there? What have you learned to do that you couldn’t do before? rather than measure fact memorization. Every child has different interests. Few are interested in algebra but we make everyone study it anyway and make up reasons about why it is really good for them when no evidence exists to support such reasoning. The new educational technologies allow for students to learn what they want to. This idea frightens educators. They have dreams that everyone will be goofing off and not learning real stuff. Actually children love to learn new stuff if you let them decide what they want to be able to do that they cannot now do.

The advantages that new technologies bring to developing nations that they could not possibly get any other way

Before we get too far in talking about developing nations we need to recall the old joke about the U.S. education system. What is the most common first name of high school physics teachers: Answer: Coach.

In many ways the U.S. shares a problem with the developing nations. It doesn't have the teachers it needs to provide a sound education to its students. In the average American high school, you can't learn psychology, anthropology, philosophy, Japanese, Chinese or any of another hundred subjects one could name. The possibilities for education in any nation are limited by what teachers know in the first place. This shouldn't be the case in the modern era. Everyone's answer has always been to train more teachers. It should be obvious by now that this can't be done. There will always be more subjects to learn than there are teachers to teach those subjects. There will never be enough teachers for the one on one attention that children need, nor for the intellectual diversity that children need. This was not the case when education was limited to the select few, but if we intend for everyone to get an education then we must find a new means of delivering it.

International financial institutions need to consider financing educational software projects that have the potential of providing key skills and income to developing nations. In addition, educational centers in developing nations that are fully wired and up to date that allow students to use software that is already available are needed. For example, degrees in information technology will soon become available online. A developing country can develop programmers very easily that way. Such programmers would be able to work for foreign corporations immediately and would be able to create their own IT enterprise eventually. This kind of training is becoming available.

Who will likely be the producing nations in the future of education?

It seems obvious that the U.S. will lead the world in producing and distributing the educational software of the future. It seems obvious, but it is not. High quality educational software, the stuff that seems like a movie-based simulation that allows real learning by doing, is very expensive to produce. Further, when such software is built it needs to be used, tried out in schools and absorbed into the existing system. The U.S. is unlikely to do all this because the labor rates are very high and because its government is not committed to educational change.

Countries that are technically sophisticated and who believe that the educational system they employ may not be the best for them are more likely to effect this change. Especially if they see this as the beginning of a revenue producing industry when they export what they have produced to the outside world.

What does it take to develop high quality educational software? The skills are diverse, but apart from the design skills they are readily available in any technologically sophisticated country. A typical project requires a team of graphic artists, video staff, programmers, and content developers. A content development team typically has at least one expert who really knows the

subject matter and a set of bright young people who can learn the subject matter. You can't develop a course in psychology without psychologists for example, but you don't need that many. The work requires people who can learn and work on details of that subject, typically new college graduates can be taught this skill. What are in scarce supply are designers, people who know what the stuff should look like and can supervise the projects. These are skills that can be learned over time with the help of those who already know how to do it. This skill is best learned in apprenticeship.

There is, of course, some very bad educational software out there. Simply setting up a group to produce it, without paying attention to the subtleties involved in designing it, usually results in software that looks like books or looks like tests and quizzes. Since everyone has been to school, it is quite natural for new designers to attempt to copy school. This is why we see so much bad e-learning. School wasn't that good in the first place and it really doesn't transfer well to this new medium in any case.

Good software cannot simply be built, it needs to be delivered properly. This means that were a nation to undertake it, it would need to understand how to ease what it has created into the curriculum, how to help teachers know what to do with what the students are learning, and how to help build curriculum around it that supports what they have learned. It is a complex process. Nevertheless, the rewards of an improved school system and a major export make it well worth it.

Although I have talked a great deal about Virtual Universities, the real opportunity, were a country to undertake this work, is in the primary schools. Reading, taught correctly by computer, for example, could be very valuable to a country and there is a big market for such software throughout the world. Practical basic skills are important, computers, writing, the basics of business, reasoning, basic science, argumentation. All of these would be good places to start.

The main reason high quality educational software is not available is that it is very expensive to produce. In countries where programmers and technologically sophisticated people are available, but where labor rates are not high (Malaysia, Pakistan, China), it would be possible to train teams to develop this software. This would be a major export. To work it would be necessary for the government to back the idea of the course being created. So, for example, suppose there was third grade physics course being built. No country has such a thing because no country has teachers who could teach it. Similarly suppose there were language courses for children being built (ones that are not easily taught now) or courses in practical things like electricity, running a business, or town planning. These courses would have to be part of the school curriculum, tried and used, in order to become marketable. Add reading or arithmetic courses to the mix, or better yet, create units that combine all these subjects and they will be easy to sell and create a major industry for the countries that do this.

How to best overcome resistance to change

The world is full of educational wannabees. Everyone wants to have Harvard or Oxford or Les Grands Ecoles in their countries. They all want them and they all seek to imitate them, but they are wrong. Those schools are vestiges of an elitist society that produced gentlemen scholars.

New countries and a new system of meritocracy demands new educational paradigms. No significant change will take place as long as the architects of that change believe that their Harvard education was really the best kind of education they could possibly have. The fact that a Harvard education prepares one to do very little in this world except be a scholar is lost on those who seek to imitate it. The new Virtual Universities will not look like Harvard. Let their creators beware.

Conclusion

We are entering a brave new world in education. Technology will lead the change. The issue is not to blindly fund developing nations in a game of technology catch up. Rather, there is a new opportunity to educate the world, to enable everyone to learn and to change what they learn from scholarly subjects to subjects that are relevant in their lives. As long as the goal of education is to produce scholars, we can let Harvard and Yale lead the way. The developing nations do not have that luxury. New technologies allow them to really educate their populace. International institutions could help by financing initiatives that will bring about the creation of high quality courses (or experiences), high quality developers, and teachers who can facilitate the use of these courses or experiences.