The Future of Online Learning

Stephen Downes
Assiniboine Community College
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Introduction

Online learning is in its infancy. As pioneers struggle with new technologies and new practises, the discipline evolves almost daily. An online course that was considered state of the art twelve months ago is today considered to be out of date. Technology employed only by early adopters last fall is this summer in wide circulation and in danger of becoming obsolete by the fall semester.

Yet despite the rapid change, trends may be identified, trends which point to the future of online learning. What will be is not as radically different from current models as may be conceived, however, some significant shifts in the nature of online learning, and learning in general, may be identified.

This Essay does not attempt to describe what ought to be, but rather, what will happen. Although I am a deep supporter of online learning for many reasons, I have chosen instead to focus on prediction rather than prescription.

The reason for this is that, if we are aware of where the field will take us, we are more able to shape the manner in which we will travel and the environment in which we will reside. Knowing the future helps us to a significant degree become shapers of the future.

Future Technology

Technology, they say, should not drive content. However, when technology is the bottleneck through which instruction must be delivered, then technology, if it does not drive content, most certainly limits content. Today, institutions offering online learning must live with the reality that instructional material must be delivered through narrow pipes to underpowered computers running dubious software. In the future, this will all change.

Bandwidth will in the future be essentially unlimited. By bandwidth, we mean the amount of information which may be delivered from a server site, such as an educational institution, to a receiver site, such as a student's computer. Today the standard falls at around 28,800 bits per second, or in other words, roughly a page of text, a medium sized image, or a few video frames. Bandwidth limitations preclude the use, in many settings, of innovative Java applets, multimedia, video and videoconferencing.

This will change, and it will change sooner rather than later. In many Canadian and American cities, high speed access is offered by cable television services. Telcos are responding with better data compression technologies, such as ADSL. In the last year, networks of LEO (Low Earth Orbit) satellites have been launched. Towers supporting digital wireless internet are springing up. It is not

unreasonable to state that, in the face of these innovations, that bandwidth will be ubiquitous and cheap.

Computers will become more reliable and will look less like computers. This development will be driven on two fronts. First, processor and memory speeds and capacity will continue to increase. The present doubling of capacity every eighteen months or so shows no sign of abating. Your Pentium 75 computer, which was state of the art just two years ago, is now a candidate for replacement. The next significant change in computer technology will occur in a year or two with the introduction of 64 bit processors - gaming systems, such as Sega or Nintendo, already employ these high capacity chips.

And second, computers will become more reliable because they will become more specialized. Today's desktop computer, which does everything from word processing to internet access to graphic design, will gradually fade out of existence, as more specialized machines designed for particular applications will come to the fore. Computers will become appliances - some already have, such as your digital alarm clock, microwave timer, and programmable VCR. In the future we will see specific machine for specific tasks. Already we see Apple computers employed increasingly in niche markets, such as graphics and video design.

This trend will accelerate in the future. The phenomenon of *embedding* - that is, placing computer support in traditional appliances, is already well documented. Additionally, new appliances for new tasks, such as word processing, web surfing, or game playing, will rise to the fore. We see this already with the development of such tools as Web-TV and Sega Gamestations. This trend will accelerate because the resultant systems will be faster, more reliable, and cheaper.

Operating Systems, such as Windows 95 or Unix, will fade to the background, out of sight for most users. The current trend sees operating systems doing more and more for the user. Windows 98, for example, introduced an internet browser to the suite of operating system features. This trend will reverse, not because the United States Department of Justice disapproves, and not because computers cannot handle such large and complex programs. The trend will reverse because such systems are *inflexible*.

Current operating systems exist because today's computer programs are *task based*. For example, one program acts as a word processor, another acts as a spreadsheet calculator, and so on. The operating system is required to help users launch these programs and to help these programs work with each other. First you start the operating system. Then you use the operating system to start the program.

Computer programs of the future will be *function based*. They will address specific needs, launching and manipulating task based applications on an as needed basis. For example, the student of the future will not start up an operating system, internet browser, word processor and email program in order

to start work on a course. The student will start up *the course*, which in turn will start up these applications on its own.

The operating system will not be needed to control these applications because the course software will do that. Except for a slim menu which allows you to start your course, the operating system will fade into the background, broken into component parts. These components would be run only when needed by an course or an application started by the course.

There are two reasons why operating systems will evolve in this way. The first is the demand by users for *simplicity*. It will be seen as absurd that a user needs to learn how to use Windows before being able to send a postcard to Grandma. And second, operative systems and task based programs will need to fade to the background because they are *constantly changing*. It is absurd to expect a user to relearn the operating system and applications every six months or so.

New Technology in Education

To identify trends in education, perhaps the best methodology is to identify trends which work well today, whether technologically-based or not. In other words, identify the tools people actually *use* today, and examine how computers of the future will evolve these tools for use in the future.

And the tools most widely used in education today are remarkably simple, having remained unchanged for the last several centuries. They include books, notepads or paper, writing implements, blackboards, and teachers. Of these, obviously, the role of the teacher is the most complex and will have to be discussed in detail. The remaining tools, however, will be absorbed by the new technology in a very straightforward fashion: the PAD.

The PAD (Personal Access Device) will become the dominant tool for online education, combining the function of book, notebook, and pen. Think of the PAD as a lightweight notebook computer with touchscreen functions and high speed wireless internet access. The PAD will look like a contemporary clipboard and will weigh about as much. Its high-resolution screen will deliver easy-to-read text, video and multimedia. The PAD will accept voice commands, recognize your handwriting, or accept input via a touch-screen keyboard.

Various PADs will evolve, depending on need and application. Small three-by-five folding PADS will fit easily into a jacket pocket and will be taken on business trips or vacations. More standard eight-by-eleven PADs will be the workhorse of educational institutions, businesses, and the home. Large-screen WADs (Wall PADs) will hang from walls for home entertainment, business presentations, or education.

The use of PADs in education will have two major consequences. Education will become truly personal, and it will become truly portable. Personal, because the PAD will serve as an individual student's primary educational tool. And portable, because PADs are portable. PADs are about five years away. Their development, and emergence into common currency, will occur in a fashion

similar to the emergence of the cellular telephone today. They will cost about three hundred dollars.

Presentation software will become full-featured and easy to use - but not design. The glory days of do-it-yourself HTML, if they ever existed, will wane as greater bandwidth and capacity greatly enhance the designer's ability to present learning materials. Just as today few instructors produce their own instructional CD-ROMs, so also in the future instructors are unlikely to produce their own instructional websites.

This is not to say that the instructor of the future will not produce his or her classroom materials, just as the emergence of video recording or CD-ROMs does not preclude an instructor from photocopying a class handout. But like class handouts, the content of such material will refer students to more full-featured instructional materials, just as today class handouts refer students to texts, videos or CD-ROMs.

Educational software of the future will include every feature present in video games today, and more. For a good example of the sort of learning environment which will become widespread in the future, look at products such as Sim City or Sim Earth, from Maxis. The point of educational software will not be so much to present a stream of information to a student as it will be to place the student in an environment where the information needed for success in that environment will be actively sought and learned.

All the essential tools for multimedia educational software either exist now or are in early stages of development. Products such as Powerpoint and Director have evolved into richly textured multimedia containers, moving from page to page either *via* preprogrammed settings or user input, presenting graphics, video and sound, responding to student choices, and connecting to other resources.

Virtual reality and simulations already exists to a great degree of sophistication for military and aeronautics applications, and this technology will move to the personal computer interface level with the development of more powerful PADs and intuitive manipulation devices, such as the data glove. Even more sophisticated total immersion simulators will be available at community learning centres and will be for a variety of skills based learning activities.

But not just that. To give a student an idea of what the battle of Waterloo was like, for example, it is best to place the student actually *in* the battle, hearing Napoleon's orders as they become increasingly desperate, feeling the recoil of one's own musket, or slogging through the mud looking for a gap in the British cannons. Virtual reality already exists to a high degree in such games as Doom and Quake, Microsoft Flight Simulator, and a variety of other games. It is only a matter of time before similar products are designed with educational objectives in mind.

Educational software will differ from contemporary gaming software only slightly, and at that, mainly behind the scenes.

Interaction and Online Conferencing

Online conferencing will be a major tool used in education and almost all other areas of
endeavour. As such, conferencing will be used in education for both discussion of the subject area, and also to teach students how to use online conferencing. For the effective use of online conferencing will be a skill as important in the future as are the social skills
taught in schools today.

Probably the most significant decision made by distance educators today is in the choice of conferencing tools to use in support of distance courses. Institutions are spending tens of thousands of dollars on teleconferencing bridges, interactive television, and internet conferencing suites. These investments are for the most part misplaced. In the future, online conferencing will be easy and cheap. The expensive purchases of the past will be scavenged for parts, if they are hardware, or discarded, if they are software.

Synchronous conferencing is conferencing which takes place in real time. For example, a telephone call, classroom lecture, or conversation is a synchronous conference.

Today, interactive television (ITV) is the synchronous communications medium of choice for many distance education institutions. It will be obsolete within five years. Internet video conferencing will take its place, not only because it will be cheaper, but because a system which can transfer data as well as video will be preferred to a system which can transfer only video.

Synchronous conferencing systems of the future will consist of a basic platform from which users can opt to conference using a variety of tools: video, audio, text based chat, and whiteboard. Additionally, such systems will support file transfer, remote launching and control of applications, and more. These systems already exist; what is lacking is only the bandwidth to use them effectively.

Asynchronous conferencing is conferencing which does not take place in real time. A letter, a notice posted on a bulletin board, or a message on an answering machine, are all examples of asynchronous conferencing.

Today, most asynchronous conferencing is text based. In the future, asynchronous conferencing will evolve from being text media to full multimedia. Already, video email clients are available, and most online technology newsletters are published in full HTML format. Students, equipped with multimedia messaging clients, will be able to embed sound, images and videos into their messages.

Conferencing standards and protocols. Today's commercial online conferencing tools are (a) expensive, and (b) proprietary. Online educators who

select Lotus Notes, First Class or Web Crossing are committing themselves to that product for the foreseeable future. This is because educators must commit themselves to purchasing entire *systems* which cannot be used in conjunction with other conferencing systems.

Conferencing and multimedia standards are being developed today. Examples of this include SMIL (Standardized Multimedia Integration Language, pronounced 'smile') and the H.323 voice-over-IP standard for video conferencing. These standards will allow developers to introduce *components* of online conferencing systems, such as clients, which can work with any conferencing server.

Good examples of this already exist. Terminal emulation (or *telnet*) was developed in order to enable remote access to mainframe computers. Telnet standards, such as VT100, were developed. This enabled the development of a wide range of telnet clients which now allow any user on any system to access any remote mainframe.

Another good example is the world wide web. The web is based on a set of communications standards, called HTTP (Hyper Text Transfer Protocol). This allowed the development of independent clients, called *browsers*, to access any web server from any other system. Indeed, it is the very existence of HTTP standards that allows us to turn televisions, airport kiosks, or any other device we can name, into a web browser.

The same will happen with online communications. When a student wishes to post a message to a discussion board, for example, a standardized multimedia messaging client will launch and connect with the discussion board. The student will create the message, then sign off. When other students wish to view the message, they will use a standardized viewing tool (formerly called a *browser*).

Personalized Education

Imagine the best desktop computer you can imagine, slung over your shoulder like
a slim handbag, connected to the billions of resources available on the internet, supporting instant multimedia communications anywhere on the planet, and you have a picture of the tool available for education within the next decade. The development of such a tool makes it not just possible, but inevitable, that education of the future will become deeply personalized.

Education today, from the kindergarten level to PhD seminars, is based on the model of the *class*. At the early levels especially, classes are organized not by the learning needed by the student so much as that student's age. In post-secondary education, age becomes less of a factor but education is still fundamentally time-based and depends on standard curricula for groups of students. The model is that of a group of people starting at the same time, studying the same materials at the same pace, and ending at the same time.

This model of education was adopted because it was the most efficient. It is heavily dependent on the teacher, and the teacher in turn is responsible for assembling, and often presenting, the materials to be learned. For the most part, customization and personalization are not practical, because personalized teacher-led instruction is not practical. It is much more efficient to deliver the same content once to a group of students than it is to deliver the same content thirty times to individual students. Given the technology that we had, the class was the only practical solution.

Education in the future will be much less class-based, and much more topic-based. This already is the model being explored by such alternative educational models as programmed learning and constructive learning. The idea is that learning is not paced so much by the teacher as it is by the student's own capacity to acquire the material. Additionally, the topic selection for an individual's education will be based on that student's need, not the preselected curriculum for a particular class. Any given student may at any time be taking any given topic, and progressing at a pace through that material appropriate to his or her learning ability.

What will make this possible is the development of Educational Delivery (ED) technology. The primary purpose of ED will not be so much to *teach* as it will be to *manage learning*. Individual students will be served by ED along a variety of dimensions:

Topics will be selected student interest, student aptitude and educational level, and societal need. The menu of available topics presented to any given student will be determined by the student's demonstrated prior learning, by parent input and control, and by legislation governing education in that student's political jurisdiction. Selecting an educational topic, for a student, will be like selecting a channel on television. A student's daily menu will be varied and constantly changing, building on each day's achievement.

This model for the selection of educational activities - I call it the *Quest Model* - has worked well in gaming environments. As various people log on to an online game, they may be at different levels, have different inclinations, and have different abilities. The game presents a variety of quests for them to fulfill, based on their level, and they select from these quests based on their inclinations. As they select a quest, they are joined by fellow-travelers attempting the same quest (for often, a group is required for the successful completion of a quest). Some quests may be short - just a few minutes - while others may require a sustained commitment over several days.

Although unusual in institutional settings, except at the very coarse course-selection level, the menuization of educational topics is common in business settings. My first experience with this occurred in 1981 with Texas Instruments. In addition to two required courses, I had a wide range of options to choose from as supplementary learning (I selected *MVS-JES3, a processing language,* and *On The Way Up*, a communications course). Learning was self-paced, supported by manuals and videotapes (state of the art).

Today's internet is offering adults especially more opportunities for topic selection than ever before. There is a proliferation of online courses - some short and to the point, such as those offered by Ziff-Davis, others long and involved, such as those offered by Athabasca University. Potential students now typically access course indices, such as offered by Tele-Education new Brunswick, and select the learning which suits their needs.

But these are merely *course* selections. The prominence of the course is based on the class-based learning model. As *classes*, in and of themselves, fade from the scene, the selection of learning will drop to a lower scale, with topics selected in hourly or daily increments. This trend I describe as the *modularization* of learning, and is discussed below.

The Presentation of Material will occur automatically, powered by the ED system, based on the students' progression through the topic. While the presentation of material will in some cases be linear (as it is *always* in a classroom), such as *via* video presentations or text-based reading, in other cases choices will have to be made, while in other cases the presentation of material will be *multi-threaded* (that is, material on two distinct subjects will be presented simultaneously, as for example is common in music videos or on internet chatlines).

As students progress through a topic, material will be presented to them dynamically, according to one of the following mechanisms: (a) *student-selected*, from a library of background information on the topic in question (for example, the student reads a description of the quest from a scroll); (b) *event-driven*, by the system, when the student reaches a particular point in the course (for example, upon reaching Athia, the student encounters a shopkeeper with a tale to tell); (c) *time-driven*, by the system, after a certain time has elapsed (for example, after an hour, it rains, and the writing on the sheepskin is revealed); or (d) *instructor-driven*, by the instructor, as additional information is requested or volunteered.

The personalization of education just described will be adopted - gradually, as traditionalists fade out of the scene - not because it provides better educational results (this has yet to be proven, although it is likely) or because students prefer it (this again needs to be proven, but is again likely), but because it is more efficient. Classroom education is in many ways wasteful. Material is reviewed for thirty students when in fact only five need review. New material presented is absorbed by half the students, but is beyond the capacity of the other half. That time in class which is spent by a student *unproductively* - either waiting for an instructor to address another student's question, discipline problem, or other need - is eliminated through personalized instruction.

Or to put the point another way: so long as the *class* remains the dominant paradigm of education, the potential for improved efficiencies inherent in the new technology will remain unrealized. Only when the capacity for new technology to customize and personalize education are employed will the efficiencies begin to show.

Learning Styles employed by online learning systems will be tailored to individual students as well. Different students learn in different ways. Online

learning systems will identify individual students' preferred learning styles, and present educational materials accordingly.

Thus, for example, students who learn best by *exploring* (for example, learning software by trying every command to see what happens) will be presented a variety of options they may pursue, while students who prefer ordered, linear presentations may be presented with a video stream covering the same material. Students who learn orally may watch and listen to a taped lecture, while students who learn visually may be presented with graphical representations of the concepts being covered.

Learning styles exist across a number of dimensions, and designers of educational systems will need to, first, prepare materials appropriate to each of these dimensions, and second, incorporate a method of selecting materials from different dimensions. Learning style selection may be enabled via (a) a *testing mechanism*, which sets a system's default values, (b) *student selected*, via a set of sliding scales for each dimension, or (c) *instructor selected*, to satisfy desired learning or learning style criteria.

Recording and tracking student progress, currently a time-consuming and dull job for instructors (often still accomplished in course gradebooks they way it was done in the fifties) will to a large degree be handled automatically by the system. While the instructor will still have an essential role in monitoring and evaluating student progress, the computer will compile the data required for reasonable and efficient monitoring and tracking.

Most people when they think of automatic monitoring and tracking, think of two things: first, auto-marked tests and exams, and second, progress logs. Each of these will have a role in the future, but a much smaller role than might otherwise be assumed, because of the wealth of data available to the online instructor.

For example, an online test might measure a student's (current) recall of physics, but often of more interest to the instructor is how that knowledge is *used*. Since all the student's interactions online can be logged and recorded, and since intelligent searches can locate instances of particular terms or concepts in a body of data, an instructor can identify when, if at all, a given concept was used during the course of studies.

Or, for example, the results from a student's work with a simulator (in crop planning, say), may be fed directly into the student's course database. For example, suppose a student, based on the available data, decides to grow wheat and oats, applying pesticide and fertilizer to the crop at appropriate times. At harvest, the simulator would calculate the resultant yield, and feed this result to the student's database, where, if appropriate, completion of the simulation would be graded and the mark applied to the student's overall result.

Such dull tasks as recording grades, monitoring attendance (or participation) and progress, and the like, will all be performed automatically, the results presented in intuitive and informative graphics or charts.

What will *not* happen is this: students will *not* be summatively evaluated by the online learning system. In the end, insofar as they are graded, they will want to

be graded by a human. The reason for this is much more psychological than it is practical. People will not react well to being graded by a machine. They will not like the automatic no-appeal-possible quality of such a system. Even where all inputs to the system automatic, students would want the final result consulted by, evaluated by, and awarded by, a human being.

Time and Place Independence

Online learning is in essence distance learning, and distance learning in turn is characterized by time and place independence. Today's online learning, while clearly time independent, is not so clearly place independent, as students are tied to a computer terminal and internet connection. The emergence of PADs will change all that.

Time independence is often characterized in terms of a student's working hours. When characterizing time independence, for example, writers often point to a student's ability to study in the evening, or to study weekends. In a rural environment, where one's time for study is dependent on the crops and the weather, time independence is often characterized in terms of being able to work on rainy days, or after the crop is in for the winter.

Time independence in online learning is all of this and more. The best way to characterize the change is to say that time in online learning *ceases to be* an objective standard which applies to many people at once, and instead *becomes* an individualized standard, against which personal learning and achievement are indexed. This is seen when we look at how time is employed as a (relatively constant) variable in traditional learning, and employ it as a (relatively flexible) variable in online learning.

In particular, the following time-variables may now be adapted to individual needs: daily start and end time, hours of work, break time, time per lesson, time per activity, time per test, days of the week, month or year worked, hours per week, month or year worked, start date of a course or other educational activity, end date for course or activity, number of courses in a week, month, or year. Etc. Each of these variables may be set *individually* for each student, where time, rather than being a static backdrop against which learning is conducted, becomes a dynamic resource allocated on an as-needed basis.

A word about pacing is needed at this point. One reason the traditional class model is favoured by so many educators is that self-paced learning is regularly effective only for highly motivated students. Where motivation is lacking, or where other factors, such as job or family responsibilities, intervene, self-paced learning is less effective. The low completion rate often associated with self-paced distance learning is evidence for this. Especially with younger or more at-risk students, pacing is necessary.

So it should be clear that time independence does *not* entail self-paced or non-paced learning in all circumstances. A variety of methods can and will be employed in online learning systems to ensure a regular and orderly progression of students through their coursework. What distinguishes online learning is that this mechanism for pacing may be applied at the *individual*, not the group, level. Moreover, pacing, in an online learning environment, is determined by a wide

variety of factors, and not the more narrow range of factors which influence pacing in traditional classrooms.

In online education, the parameters for pacing will be set based on input from the learning system, from the instructor, from parents (where applicable), from the student, and from the educational jurisdiction in thigh the learning takes place. Each of the parameters listed above will be set according to these inputs, so that each student has a clear (and individualized) set of temporal parameters associated with his or her learning. These parameters in turn form the basis for time-driven system events such as the presentation of materials, testing and evaluation, and deadlines.

Place independence does *not* mean studying at home, although it does not prevent this. Place independence means that students are not tied to any particular location as they conduct their learning activities. Traditional and even contemporary distance learning is not especially place independent. True place independence will revolutionize education is a much deeper sense than has perhaps been anticipated.

Traditional education is, of course, not place independent at all. This is the case because, first, students must be assembled into a class at some particular location, and second, because they must be located where the learning resources (the teacher, the library, etc.) are located. Thus in traditional education, students assemble at a certain place - a school, college or university - each morning and stay there until the day's learning activities are complete.

In distance learning, the materials are brought to the student. Thus the teacher is presented to the class either via audio or video conferencing, or mediated via print or electronic instructional materials. Yet even this form of learning is not especially place independent. Although it is true that print materials may be read anywhere, except perhaps in the shower, students otherwise must be located by a computer, telephone, teleconferencing facility or ITV classroom in order for instruction to occur. While *less* place dependent than the traditional classroom, students nonetheless do not have the full mobility that deep place independence implies.

Online education will in the future be place independent in a deep sense, because the student's primary learning tool, the PAD, will be highly portable. Just as today a student could teleconference from anywhere using a cellular telephone, students of the future will be able to learn anywhere with the PAD. One can picture students snuggling under the covers reading Descartes or watching Macbeth, lounging in the park working out geometry problems, or sitting in their living room practising their French.

Moreover, as educators realize that students are not bound by any particular location, instruction of the future will *encourage* mobility. Political science students, for example, will be *expected* to frequent City Hall or the provincial legislature. Forestry students will work *in* the forest. In the future, education will not be an activity conducted in the cloister of a separate building. It will be common to see groups of schoolchildren visiting shops to learn about budgeting and economics, visiting clinics to learn about first aid, visiting retirement homes

to learn about history. Education in the future will move from the school into the community.

For adults, education will be an activity engaged in on a regular and routine basis, much like reading or watching television today. People on the job will spend slow time brushing up their skills. Commuters will work on their classes on the buses and rails. Saturday mornings will begin with breakfast, the morning paper, and a quick history lesson. Many adults already do this today, except it's called *reading*. In the future, reading will become interactive, and a student's reading and interacting will count as an educational pursuit, and rewarded as such.

The School of the Future will not look like today's institutions, which dominated by classrooms, lecture theatres and libraries. All of these facilities will not be used even remotely to the degree they are today. Schools will be converted into meeting facilities, for face-to-face interaction, and laboratories, where workstations and specialized equipment are available for student use. The lecture theatre will not disappear completely; it will be used for special events and gatherings. Libraries will evolve, coming to resemble museums, housing one-of-a-kind documents and other rarities. But the concept of the school itself as a place where learning is conducted will become obsolete.

Schools will become much smaller, both in terms of size and of populations served, and will become highly specialized. Community schools, once on the wane, will re-emerge as community learning centres, serving a student base of about 200 students and a community of no more than 500 people. Cultural schools will abound; some schools will incorporate chapels and religious training, while others sweat lodges and powwows. This will occur because, as learning is individualized, the economies of scale which propelled the construction of massive regional schools, will no longer apply. Larger schools, to which students must travel a half hour or more, will be seen as inefficient.

Computers, in general, will bring community back into our lives. That sounds ironical and even implausible, but it is inevitable. For the least expensive thing to move is information; the most expensive thing to move is people.

Convergence. The evolution from traditional classroom based institutions to online learning based institutions will be gradual, and characterized by an increasing convergence of methodologies and technologies employed by both online and classroom instructors. While today it makes sense to categorize learning as either *on-campus* or *distance*, in the future this distinction will become harder and harder to draw.

We can see this phenomenon in classrooms today. Increasingly, instructors are depending on learning tools, such as CD-ROMs, videos, and other multimedia tools, to support and enhance learning. Additionally, thousands of instructors have started to place their class outlines, background materials, and other materials on class websites. The tools and techniques of online learning are being found increasingly in the classroom environment.

Critics complain that this amounts to no more than an offloading of printing costs from the institution to the student. This argument would hold more weight were

students not typically charged for photocopying expenses. But in the long run, as the PAD becomes easier to use, students will rely less and less on printing and more on online reading. Moreover, material placed online also has the potential to become more interactive. One could print a self-test quiz, for example, but what would be the point? Students are much more likely to take the quiz online.

As with any convergence, there will be no point at which we can say definitively that classroom learning has effectively merged with online learning. Probably the institutional structures which marked the delineation will long outlast the practical distinction. Already traditional classes exist in which there is no formal lecture or meeting time, the interaction between instructor and student being handled entirely online and through meetings with individuals and small groups. We have passed the leading edge of this wave.

Learning Communities

Humans to a large degree are social animals, and consequently, the most important of our needs are served by communities. This is why, even when travel is difficult, we tend to cluster in cities, towns and villages. It is why, when you look at children playing in the schoolyard, they are not dispersed, but clustered. Why bars, clubs and recreational facilities attract us. And so too with learning. Education is not merely the acquisition of new information and skills, but a social activity, where knowledge and skills are demonstrated, criticized, or merged.

Education is a social activity, and that is why the picture of distance learning wherein each person studies from their own home, supported by a personal computer and desk videophone, is wrong. To be sure, there is room for home study, but people, and especially children, need community as well. It is because of this that online learning in the future will emphasise community much more than is perhaps imagined today.

Two major types of community will rise to prominence over the next decade or so: the topic or interest based community, and the physical or peer based community.

Interest based communities are collections of people who, although they may be geographically dispersed, share a common location on the internet. We see these emerging already. Gardeners hang out at gardenweb. Computer geeks hang out at Wired. Distance educators have found a home at the Node. Across the internet, thousands of topic-specific communities have begun to emerge.

The existence of online communities has drawn a lot of commentary over the last year or so. This is in part because of their proliferation, but also because the dynamics of an online topic based community are singular. From time to time we read about the close and intense relationships developed by members of online communities, about the openness of communication in an online environment, about the degree to which people commit themselves to their online homes. All of this is well documented.

Online educators will find themselves building interest based communities whether they intend to do this or not, because the mechanics necessary for the

creation of an online topic based community are present in the structure of almost any online course. In order to create a topic based community, one only needs a topic, a group of geographically dispersed people interested in that topic, and a means of shared communication, such as a bulletin board or online chat.

What will change in the future is that online educators will better learn how to foster and nourish online communities. They will want to do this because, the greater the dedication to the community, the greater the dedication to learning, since learning is the shared experience which defines this community.

The factors which contribute to a successful online community are to some degree known, though that said much more empirical data needs to be collected. But in general, one of the keys is *ownership*. By that, what I mean is that the members of the community play a key role in shaping the community. For a community is not a broadcast medium. It is not a place where the organizer provides material and the members consume it. It is a shared and constructed environment, where the members along with the organizers play roughly equal roles in content creation.

In an educational context, what this means is that a lot of the learning - and learning materials - will be those constructed by the students themselves. We begin to see this with the use of discussion lists in online courses, but also in the creation of topic-based web pages (and other resources). Students online also tend to be very vocal in their criticism of the interface, of the instructor's tone, of the usefulness of resource materials, and of the colour of the background. As much as possible, these comments should be incorporated into educational materials; in the future, students will define these themselves (and criticize each others').

We have already entered the era in which lifelong friendships are formed between people on opposite sides of the planet. Online learning will inevitably tap into this trend, and because of the deep nature of the learning experience, will accelerate it.

Peer based learning communities by contrast almost by definition cannot be formed over the internet. They will exist because online friendships lack fundamental qualities that humans are unwilling to go without. People need a pat on the back, a (physical) shoulder to lean on, a drinking buddy, an opponent for squash, somebody whose physical presence, for one reason or another, *matters*.

Peer based learning communities are in fact the polar opposite of online communities. While online communities depend on a topic or area of interest to exist, peer based communities are topic neutral; one person may be a scientist while another may be an artist. While online communities consist of geographically dispersed members, peer based learning communities exist in some particular geographical location.

A peer based learning community will be that group of people attending a particular school or learning centre (as discussed above). People become members of the community because of a shared location, workplace, cultural

background, religion, or language, and because of shared experiences in online learning. While people in a topic based community, for example, will discuss this or that monograph or expert in the topic, people in a peer based learning community will discuss this or that institution, interface software, or community events.

Peer based learning communities are vital to learning because they provide a safe environment in which to learn. A person does not feel cast adrift on the sea of the internet when working in a community of people facing similar needs and challenges. Though each may be pursing a different educational goal, their overall objective and means of travel is the same, and thus they offer mutual support, encouragement, and reassurance.

As with online communities, we are beginning to see peer based learning communities emerge in all manner of locations. From personal experience, I can cite the learning centre in Fort St. Jean, in northern British Columbia, shown to me by the people at Open Learning Agency, or the fishers' retraining centre, a block away from the urban aboriginal training centre, fostered by the New Westminster School Division. Or the South West Indian Training centres in Sioux Valley and Waywayseecappo, in rural Manitoba. Or even the group of people in Brandon and area studying instructional design from Athabasca, who one after the other all seemed to show up in my office.

The existence of, and need for, both interest based and peer based learning communities will have a significant impact on the design and delivery of online instruction in the future. Much of what follows is based on the assumptions stated in this section.

The Triad Model

The triad model identifies three key players in online learning: the student, the instructor, and the facilitator. The existence of a new player - the facilitator - is necessitated by the distance between instructor and student, and the need for a peer based community as well as an online topic based community. Many of the tasks assumed by instructors in traditional education devolve to the facilitator in online education.

The Instructor in online learning may be located anywhere. In most instances, the instructor will be located at some distance from the student. Working with the ED system and communicating directly with the student online, the instructor plays three major roles: (a) as a facilitator of learning, (b) as a content-area specialist, and (c) as an evaluator.

As a facilitator of learning, the instructor provides instruction and guidance on the use of learning materials. For the most part, this involves the sequencing of learning materials and activities, monitoring pacing, and where appropriate, communicating directly with the student, the on site facilitator, or parents. The instructor also fosters student interaction and supports the development of the online community which will arise surrounding his or her instructional content.

The instructor's primary role is as a content-area specialist. It is expected that an instructor in a given field will have possess qualifications and credentials in that subject area. The instructor is not expected to provide lectures - this sort of instruction is provided in the course materials. But the instructor is expected to respond to student queries in an informed manner or to offer new or additional information in the subject area.

As an evaluator, the instructor tracks student progress and receives student assignments and exams. These assignments are either graded by the system or graded by the instructor, with the results in all cases returned to the student online and entered into the student's ED records.

The Facilitator is located in or near the student's home community, generally based in a community learning centre or school. While the instructor communicates with a student from a distance, the facilitator will generally communicate with a student in person.

The facilitator is responsible for the provision of technical support in the use of computers, internet, on-line course materials, multimedia materials, and other technology. He or she also acts as a mentor, provides study skills and time management training, if required, and supports and encourages the student, and acts as an advocate for students, helping them navigate through the admissions process, course registration, and other administrative functions.

The facilitator is not expected to be a content-area specialist. The facilitator does not teach course materials and does not grade or evaluate students in any way. Rather, just as the instructor is expected to foster the interest based community, the facilitator is expected to foster the peer based community. For this reason, facilitators will most likely be drawn from, and hired by, communities rather than institutions.

The Online Learning Host/Provider Framework describes the institutional support for the triad model.

In traditional education, the host and the provider are the same institution. That is to say, the same institution which produces the instruction is also the institution attended by the student. For example, if I say I am taking a course from the University of Calgary, what I mean is that the course instruction is being delivered by the University of Calgary, and also that the University of Calgary provides the facilities where I receive that course instruction.

In the future, host and provider institutions will increasingly be different institutions. One example of this is course *brokering*, wherein the course I am taking may have been developed by, and even instructed by, a University of Calgary instructor, but is being delivered at Red Deer College. Thus, when I take the course, I use Red Deer's classrooms, computers, and facilities even though the course is a University of Calgary course.

Host institutions will be by necessity geographically - and community - based. They will be the small, specialized schools described above, staffed by facilitators, and housing meeting rooms, laboratories, virtual reality simulators,

and other tools too specialized or too expensive to be purchased by individual students.

Provider institutions, by contrast, may be located anywhere. With no time or location constraints, it will become increasingly common for provider institutions to service a global audience. We are seeing this trend develop already. Even today, I see course announcements posted almost daily on distance learning list servers such as DEOS or WWWDEV. It is now possible to take a course on almost anything from almost anywhere in the world. And although such course offerings are not always attractive, because of bandwidth limitations and pedagogical factors, these limitations will disappear as the field matures and the technology evolves.

Potential students will shortly be faced with a dizzying array of educational opportunities. Indeed, one of the primary tasks for host institutions will be to select and menuize course offerings. Typically, a host institution will support only a small subset of available educational opportunities, selected primarily by political and economic considerations. For example, government funded host institutions in Manitoba, such as schools or employment centres, are more likely to support courses and programs offered by Manitoba schools, colleges and universities.

But there will be a general fuzzing of traditional boundaries, especially in jurisdictions where the host and provider institutions are not governed, or at least associated, under an umbrella organization. For example, if host institutions in Manitoba developed onsite support facilities independently of the colleges and universities in that province, then they are far more likely to offer a menu of courses and programs from national and international institutions, and not primarily Manitoba institutions.

Provider institutions will find it essential to develop and nurture networks of host institutions, if only to secure a long term market for their course offerings.

Accreditation

The mishmash of host institutions, provider institutions, and umbrella organizations is going to result in an increasing debate over standards and testing. It is going to get worse before it gets better. It probably won't get better.

One of the consequences of online learning is that anyone with a computer, a modem, and a little knowledge can set up shop in the Cayman Islands and call themselves a university. Examples of such institutions already abound and are well document as, for example, in *Bear's Guide to Non-Traditional Learning*. It will become increasingly relevant, standards bodies aside, to ask whether a graduate degree from Walden University is equivalent to one from the University of Manitoba, particularly when the latter suffers from underfunding and crowded, impersonal classrooms.

There will be no easy resolution to the debate over standards because there will be no widely accepted standards bodies. Because education is in many ways a culturally bound phenomenon, residents of one culture are not going to accept the verdicts rendered by representatives of another culture. We see this even

today in the area of alternative religion-based schools. Graduates and diplomas are recognized in the religious community, but not generally in the secular community.

Learning, and the assessment of learning, will diverge. This trend will distress instructors who feel that class participation is essential to the learning process (and therefore must be evaluated), however, employers and standards bodies will become increasingly reluctant to recognize learning which is quantifiable by an index known only by the instructor. Independent standards based testing will be required for an increasing number of job or educational placements.

There is no reason why testing, in addition to instruction, may not be conducted online, and it is likely that host institutions will interact with testing bodies in the same manner as they interact with provider institutions (often, these will be the same institution). The host institution will be an essential component of online testing, because it will not be possible in the short term (or even the medium to long term) to verify a student's identity for the purpose of testing.

Tests quantify in ways project based or constructive learning do not. In an environment where everyone gets a pass or fail, it is not possible to distinguish between gifted students and those who succeed through endurance. Where opportunities narrow, as they do in higher education or entrance into the workforce, some quantification is required. The easiest, and fairest, way of reaching this determination is through testing. So while a constructive learning environment may get you through History 40S, it won't graduate you from high school, much less place you in the university of your choice.

Prior learning assessment and self managed learning will flourish in this environment, propelling to an even greater degree small, independent learning agencies which prepare students for testing but which do not themselves provide accreditation. Traditional institutions which accept such learning run the danger of relegating themselves into the role of testing agencies only, particularly if their fees are not competitive or their education substandard.

Successful educational institutions in an online environment will be those that realize that the fees they charge are for providing an educational *service* rather than for the distribution of information. Information, in an online environment, is cheap - many argue it is, or should be, free. With the increased emphasis on testing, students will not be *required* to attend a college or university to obtain post secondary certification. And unless colleges and universities offer something over and above mere information, they won't *want* to.

Education as a service, not a product, will be the dominant catchphrase of the early years of the next century. Already we are seeing this trend as institutions become more and more 'student focused'. But this mantra, now more a slogan than an operating principle at most institutions, will become essential for institutional survival. For without service, institutions will offer their students nothing over and above the *Online Interactive Encyclopedia Galactica*.

At present, few, if any, institutions are focusing on this aspect of online learning, so lessons must be drawn from traditional institutions which excel in student service, and online agencies which excel in user service.

The former tend to be small, specialized and personal institutions noted for a high degree of staff-student interactivity. Good examples to look at in Canada include Mount Allison and Queens University. These are institutions which focus not only on learning, but also, in the fostering of a learning community. They offer a nurturing and supportive environment in which student participation is actively encouraged. Their quality of instruction is excellent, not so much in the material presented (since, after all, calculus is the same everywhere), but rather, in the way it is tailored to individual student needs.

Few online agencies yet exhibit similar standards of service. Internet services have yet to move *en masse* from the dominant metaphors of catalogues or magazines to the emergent metaphor of the online community. Those online services which are successful - including *Yahoo*, *Infoseek*, and *Firefly* - offer a high degree of customization, comprehensive (and again, customizable) indexing, and many opportunities for interaction. These are again sites which provide a community for online users, but also which provide a wealth of partially digested and timely information.

Successful online educational institutions will probably combine these characteristics. They will likely be small, specialized, and personal. Even where institutions are large, success will depend on their ability to subdivide into small, community-sized units. Successful institutions will provide a supportive and nurturing community, and at the same time present educational materials and activities in a highly customized and student-centred manner.

Modularity

Modularity is the idea that an entity we consider to be a single unit is in fact composed of separate and independent parts. For example, computers are to a large degree modular. Various components can be plugged in, switched, swapped, or replaced with better parts.

In the same manner, online courses will be modular. A course - especially from the designer level - will no longer be seen as a single unit, but rather, as a collection of component parts, each of which may be replaced or upgraded as the need arises.

The predominant model for course design will resemble the architecture of contemporary computers. There will be a *backbone*, analogous to the computer's motherboard, which establishes the basic structure of the course. Into the backbone will be plugged in various *learning modules*, *communication tools*, and *student information systems*.

Customized courses will be the first major application of a modular approach to course design. In the first instance, customized courses will be designed to meet the needs of particular clients. For example, a college offering a selection of business and computer courses may assemble a customized package for a corporate training client.

Suppose a Business course consists of modules on Business Writing, Financial Accounting, and Customer Service. And support a computer course consists of modules on Word Processing, Email, and HTML Design. A new course could be constructed by selecting desired course modules, say, a Corporate Communications course consisting of modules on Business Writing, Customer Service, Word Processing and Email.

As custom course design hits its stride, the demand for *individual* courses will arise. Students may need supplementary material in areas where they are week, or additional material matching their interests or aptitudes. Abridged courses may be offered to people with strong backgrounds in the field. Variations on the same course may be used for students working in different disciplines.

Menuization, a concept today employed primarily in the area of *course selection*, will in the future be employed in the area of *course construction*. Students or other training clients, perhaps working with an educational consultant or designer, will assemble courses, and programs of courses, from a menu of course components.

Indeed, the concept of the *course* itself will gradually be seen as an arbitrary division. The primary unit of instruction will be the module, and programs will be seen as large collections of modules. Viewed in this way, it may be seen how a program could be highly individualized.

Modules themselves will be modular. A learning module will essentially consist of a collection of educational materials, mechanisms for communication and interaction, and an assignment or evaluation component. Module design will consist of two major tasks: the *selection* of module components, and the *ordering* of module components.

The idea here is that a module is best thought of as the assembly of a sequence of educational activities. For example, a student may be required to read some material, engage in a simulation, write a report, participate in a discussion and complete a quiz. Each of these activities in turn requires the support of some educational materials. The task of the module designer will be to select those materials, and then to present them in a sequence.

Distributed design. Because the internet will support high speed data transfer, there will be no requirement that instructional components reside on the same computer - or, for that matter, in the same country - as the course being offered. For example, suppose there exists a high quality multimedia dissection of a business letter at an educational web site in Singapore. The module designer will have the option of plugging that resource into the online course.

This is already happening. Educational resource sites are springing up across the internet. The best example of this is Canada's Schoolnet, which provides a comprehensive set of media resources. *Virtual Frog*, a pioneering internet effort, is used in biology classes worldwide. My own *Guide to the Logical Fallacies* is widely used in logic and rhetoric courses.

Not only content based sites are employed in online courses. Companies such as *Hotmail* offer free email addresses, which are used by students worldwide. Online communities such as *Geocities* provide free web space, most of which is used by students. Chat servers, bulletin boards, personal pagers: all of these are available from suppliers who willingly allow their use in online courses.

What has not yet happened - but which will, in the future - is that these resources will be added to online courses in a *formal* manner. By that, I mean they will satisfy *educational object protocols*.

Educational Object Protocols are the rules which govern how educational objects will interact with each other. The development of these protocols is already under way, led by the Educom/NLII IMS (Instructional Management System). Of interest for course and module developers are two major components.

First, all educational resources will be accompanied by *metadata*. Metadata is data about the data. For example, an article about Saturn would contain data about Saturn - it has rings, it is a gas giant, and so on. Metadata would be data about the article - it was written by Fred Jones, it is located at saturn.com, and so on.

Second, educational resources will be written in *XML* (eXtensible Markup Language). XML is similar to HTML, but while HTML concerns itself mostly with how a document is formatted and displayed, XML is used to indicate the *role* of document components. Thus, authors, for example, will use XML to identify questions, asides, definitions, or any of a variety of other structural definitions.

Metadata and XML will be enormously useful for intelligent search agents, and these agents will be used increasingly for a variety of purposes: assembling specialized data, compensating authors, monitoring student progress - in short, anything which requires a structured retrieval of data from a variety of online sources.

Of concern to educational software developers will be the standard set of *function* or *object protocols*. These will determine what information an educational object requires in order to be invoked by a remote system, and what information that object will return to the remote system. Consider, for example, how a user logs into the educational system. A student login would be handled by a *login object*, which expects as input (from the student) a user name and password, and returns (to the system and to the student) a *user object*. The *user object*, in turn, based on student or system input, interacts with other system objects to produce on screen displays, update student records, send messages, and a variety of other educational tasks.

The way in which these objects communicate with each other will be standardized. This means that online learning systems of the future will be composed of separate, interchangeable objects, each dedicated to a specific task. And what will happen in practise is that various software vendors will market programs consisting essentially of sets of these objects. Thus, for example, Web Crossing will market an online conferencing system which

interacts with the remainder of an online course in a predetermined and structured manner.

Ownership and Copyright

Issues of copyright and ownership already play a major role in discussions of online learning. Most such discussion centres around the question of who owns course content. In the future, this question will not make sense because a course will not be seen as an individual entity which can be owned, but rather, a collection of entities, *each* of which can be owned.

This is in fact not so different from the system in place today. In a traditional course offering, various resources - such as textbooks, videos or CD-ROMs - are employed. Copyright for each of these individual entities is owned, not by the course instructor, but rather, by the publisher or author of the entity in question. Where material is reproduced, this reproduction is performed under license, either explicitly, as in the case of *CanCopy*, or implicitly, under the provisions of *fair use*.

The gray area will be in the case of materials which in the past were produced by instructors solely for their own classes, which in the new system, may be used by many other classes. For example, if a professor produces a set of notes on fallacies for his logic class, and this set of notes is purchased by another institution, the question arises: who gets paid, the professor, or his home institution.

This will remain a bone of contention for a very short time. The production of educational materials, now a relatively simple project involving a mostly rudimentary understanding of technology, will evolve into a highly technical discipline. Just as instructors do not typically create their own movies or videos to show in class, because they are too complex to produce on an as needed basis, so also instructors will not typically create educational resources for their classes.

Specialized Resources will be offered by large and small companies, targeting particular educational niches. For example, one company may offer a resource centred around the poem *The Road Not Taken*. This resource would include audio readings of the poem, video background information, multimedia analytical tools, discussion and criticism, and additional resources.

The task of the online instructor will be to review the material, link to it from the instructional module, and assign students particular tasks related to the resource. While many such modules will be offered for free to educational institutions, by government, charities or corporations, others will be offered on a fee-for-use basis. Because these resources are playing for a global audience, the fee-for-use will be very reasonable.

A blossoming of such sites has already occurred on the internet. What we will see in the future is an entrenching of a few authoritative sites in particular subject areas. Because these sites will be expensive to maintain and create, they will eventually seek funding, either from government, from advertising, from

the sale of information (for example, user demographics to advertisers), or by direct charge.

Online services will be offered by subject matter experts independently of any given institution. For example, leading authorities on *Descartes' Meditations* will provide an online resource, and in addition be available for consulting and discussion. It will be common for instructors to expect students to consult with online experts in any of a myriad of fields while preparing for assignments or doing background research.

Some online communities are already adopting this approach. A site called *The Mining Company* hires 'guides' to provide information and links in specific subject areas. At a site called *Suite101*, the same function is performed by 'contributing editors'. Both sites take a magazine-like approach to these subject areas, however, as technology and their understanding evolves, these sites will become more service oriented and less display oriented.

Schools will not be their only customers. Government and business often require research in particular subject areas. People also access such resources out of curiosity or interest. Most likely a multi-tiered pricing strategy will evolve, with varying levels of service. Agencies wishing a full consulting service, including customized research, will pay a much higher rate than the casual browser (who in most cases will probably pay nothing). Schools will fall into the mid range.

Instructional Management Systems

The task of coordinating student progress through various learning materials, tracking their grades, and facilitating interaction will fall to a class of software applications known generically as instructional management systems. An instructional management system *just is* the educational delivery (ED) system described above.

An instructional management system is the backbone or motherboard into which all educational components are plugged. It will be operated primarily by the course instructor, who in turn will configure custom course delivery for each student he or she manages.

Such systems are already in development and have gained wide acceptance in the online educational community. Examples include Virtual U, Top Class, Web CT, and many others. The systems just described differ from *conferencing* systems in that they *manage* online education, as opposed to merely facilitating some aspect of it.

IM systems will become as large and as important as Windows is today. They will be one of the major instances of computer specialization; they will be the engine which powers PADs insofar as PADs are used for education, and online educational services.

The development of open standards for IMS systems will have several consequences. First, the offering of available IMS systems will be split neatly in half, as those not meeting the standards will wane (much as Macintosh has waned). Next, a proliferation of IM systems and system components will occur,

as developers create their own versions of education-compatible chat engines, discussion arenas, and backbone systems. This will cause the price of IM systems to drop dramatically. One or a few inexpensive IM backbones will become ubiquitous, the character of an online educational offering determined by the selection of plug-in modules and the skill of the instructor.

Conferencing systems, now being touted as the solution for online learning, will be discarded as expensive and inefficient. In order to function as an IM backbone, a system needs to support a wide variety of educational objects. Conferencing systems accomplish none of this; they are in the end nothing more than tools used for distance communication.

As such they are great, but online learning - as instructors are increasingly discovering - requires much more support than a mere communications tool. For online learning requires a highly structured sequencing of learning activities and online resources, It is too easy to become otherwise lost or distracted in an online environment. Students, as mentioned above, will require pacing.

Producing that level of support on a case by case basis utilizing an online conferencing system will prove too taxing for even the most dedicated of instructors. Even though conferencing systems support document management and dispersal, they do automate such essential features as pacing, course structure, interaction with remote educational objects, or course customization.

Some online conferencing tools will evolve to meet educational needs, and will in the process become IM backbones. Others will not, and will be used primarily for groupwork and conferencing (the application for which they were designed in the first place). At best, conferencing systems will plug into and communicate with IM backbones. They will support online education, but they will not *deliver* online education.

Content Filtering will be one of the major tasks of instructional management systems. Surf Watch - and other programs of that ilk, such as CyberPatrol - are clumsy initial attempts to perform a task with will be required in the future: channeling children's browsing patterns into safe areas of the internet.

I say clumsy, because the methodology is clumsy. There are two major screening systems employed by such systems: first, (editable) lists of words and word fragments the presence of which in a website (or chat, or email) will prevent that website from being uploaded, and second, (editable) lists of approved and/or disapproved sites.

The method is clumsy because it often screens inappropriately (for example, most sites on breast cancer fail the test) and because it scans text only (thus allowing unwanted images, audio clips and videos through). Additionally, in places where filters have been employed in high traffic areas (such as Yahoo Chat), an alternative language quickly develops, one which circumvents the screening software. Thus, for example, one sees
chatters talk about cyber s<>x.

With the development of XML and online objects, websites of the future will become much more sophisticated, and so will the way in which the internet is used in schools. Clients used by students will not offer full internet access, the

way Netscape does today. Instead, these will interact directly with (thousands of) educational servers. The servers will not deliver web pages so much as they will deliver educational objects.

The primary motivation for the system just described will not be to restrict access to unseemly materials, but rather, to ensure that educational content developers are paid for their work. An educational client accessing an educational object will, in the process of that transaction, initiate a microbilling to the institution accessing the educational object. These systems, although they will use internet technology, and indeed be accessible
from the internet generally will nonetheless form a closed system.

In such an environment (and especially when the resources available number only in the tens of thousands, rather than hundreds of millions), content is easily assessed prior to use. Instructors will preview materials online, select those the content of which is appropriate for children (or young adults, or whatever), and link their courses into those materials.

Educational object metadata will probably include ratings, however these will be seen more as a guideline than a regulation. Educational jurisdictions, through their instructors and administrators, will decide for themselves what is appropriate for their students. Especially with the proliferation of private, religious and cultural schools, these standards will vary widely. In addition, parents will also be able to screen all materials selected for their children and opt to restrict resources or select alternatives.

Of more use to instructors will be metadata describing the resource's educational content, skill level, and cost for usage. This information will also help parents screen materials and select alternatives.

The question of what the 'censors' will allow students to read may have been applicable in the past, when all students used the same learning resources, and these resources were available in public forums such as the school library. But it will have no relevance in the future, where content selection will be handled on a case by case basis by parents, instructors, and educational institutions.

The Economics of Online Learning

Two different schools of thought dominate discussion on the economics of online learning. On the one hand, there is the hope that online learning will reduce costs by
increasing the number of students an instructor can manage. This would be accomplished by such means as auto-marking and automized record keeping. Additionally, on this
view, online learning would eliminate the need for expensive classrooms and infrastructure.

On the other hand, there is the empirical data, which suggests that online learning is
more labour intensive than traditional classroom learning, which drives costs up. Online

students typically interact to a much greater degree than traditional students, and they
tend to expect more detailed and individualized comments. Additionally, the cost of
developing online courses is high; it is not uncommon to see course development costs
in the range of $50,000 to $100,000.

These appear to be contradictory trends, however, the resolution of that contradiction may
be found in the following observations: first, while online learning will be more expensive in the short term, it will be cheaper in the long term, and second, while educational institutions will realize some savings by offering courses online, the greater share of the
saving will be realized by students.

In the short term, costs will be high. There is no getting around that. Significant startup costs may be identified.

The cost of internet infrastructure, including an internet server with software, and a high speed internet connection. These technologies are currently expensive, but will drop dramatically as computers and internet access become cheaper.

The cost of online course development is higher initially than in the long run. Even though course modules may be re-used, they must be created in the first instance of their use. Similarly, instructional management software must be purchased and designed, and configured.

The human cost, both as needed for course development, and also, as needed for training and learning how to work in the new environment, is higher at first.

Additionally, costs will remain high so long as the internet is used to provide course delivery as it is traditionally conceived. So long as students are grouped in classes, and offered standardized courses, costs will remain high because of the inefficiencies inherent in traditional course delivery.

Improved Automation will also result in savings, especially over the long run as automation improves, however again, automation will not result in the significant savings projected in some quarters, for the following reasons:

Instructors will still be needed - a lot. Although automation will make it possible to deeply personalize instruction, the *personal* aspect of personalized instruction will in the short term only be deliverable by the instructor, both because of students' psychological needs for human intervention, and instructors' superior capacity to communicate with humans.

While many proponents of automation are thinking in terms of auto-marked assignments, and while indeed some savings may be found in this area, auto-marked assignments are not the panacea they are often perceived to be.

Automation is not automatic. As institutions which have installed management systems have discovered, automatic systems need a lot of maintenance and configuration. Online tests must be designed and routinely evaluated to ensure their accuracy. Offline testing in skills development and higher cognitive achievements will still be required. Testing must still be proctored, at least for as long as no good means of establishing student identity can be found.

In the longer term, as online course delivery and internet technology matures, costs will drop dramatically.

Capital savings will be realized over the long term as classrooms need not be built or maintained.

High speed internet access and server computers will decline dramatically in cost.
Online course development will get cheaper as designers and institutions are able to use previously developed resources. Designer and instructor efficiencies will improve as they become more familiar with the online environment.

The cost of course offerings will decrease as courses are increasingly personalized, because instructor communications will become less frequent and more focused. The most significant savings will be realized as the class and course based models are abandoned.

Hiring and Payment for online instructors will little resemble the model in place today. This will cause a *lot* of controversy, especially among staff at traditional institutions.

As class based learning is displaced by traditional learning, instructors will no longer be assigned classes, but rather, individual students. Permanent, full-time staff will be assigned a teaching load consisting of a certain number of students. More common will be instructional contracts where the number of students is variable, and instructors paid according to the number of students they actually teach.

Staff at traditional institutions do much more than teach students. Especially at universities, but in educational institutions generally, they conduct research, prepare course and lesson plans, attend policy meetings, and participate on committees. Even in class, a significant proportion of their time is spent, not

teaching, but rather, attending to administrative and student management details.

All of these functions will be eliminated to a large degree from the duties of instructional staff. And while the rate of pay for teaching will remain high (in fact, it will likely increase), instructors will not be paid at that rate for time they are *not actually teaching*.

This will be only one consequence of the coming *fragmentation* of educational tasks. Some tasks, especially administrative tasks, will be handled by online systems staffed by clerical staff. Payment for research will be separated from payment for instruction; more research will be paid for directly though government or corporate grants, or conducted at separate research institutions.

Student payments of fees and other expenses will vary on an institution by institution basis, but several components may be identified.

First, students will be required to pay for local facilities, such as their community learning centre and facilitator. Models here will vary, tending from community supported facilities, paid for by government or corporate grants, to user pay facilities, paid for on an as used basis.

Students will also be expected to pay for their internet access, and their PAD.

As students sign up for instruction from provider institutions, they will be assessed fees comparable to tuition fees today. Typically these fees will be paid online or at the community learning centre.

Finally, built in to the cost of the course or added as a surcharge will be the cost of educational resources offered by private providers. For example, if they are required to use the *The Road Not Taken* resource, the cost for using this resource will either be charged to the educational institution, or charged directly to the student.

Student Savings. As mentioned above, the largest beneficiary of online education will be the students, for a variety of reasons.

First, students will no longer need to travel for education. This may be only a small savings if the institution attended may be reached by the crosstown bus. It is a significant savings if the student does not need to travel to, and find lodgings in, a distant city.

And second, students will no longer need to give up their earning potential while studying. Today, a college or university degree is a full time commitment, during

which the greatest expense is not tuition or even housing, but rather, the cost in lost wages. Online learning allows a student to continue to work while learning.

Finally, third, online educational offerings ought to get cheaper as institutions pass on the savings realized to students.

The Bottom Line for educational institutions is this: even though savings will not be as great as anticipated, it will be necessary for institutions to offer their courses online - and sooner, rather than later - because the costs of not doing so are too great.

As more and more courses are offered online at costs equal to or less than traditional delivery, community learning centres will begin to support these courses, and students will begin taking this. This will cause a drift in attendance from traditional classroom based course offerings. Institutions which do not offer online learning will lose a significant percentage of their student base.

It is easy to say - and surveys continue to reinforce - the idea that classroom based education is the best form of learning. As online technology improves, that will be increasingly less so, and as the savings *to the student* begin to improve, the classroom method will look less and less appealing.

Once committed to online learning, institutions will have to measure well against global competition. One factor in this will be cost, and it is for this reason the class-course model will be abandoned, as described above. And the other factor will be service. Students will want personalized, humanized instruction.

The Future

Today, and for the last century, education has been practised in segregated buildings by carefully regimented and standardized classes of students led and instructed by teachers working essentially alone.

In ten years, this model will be seen in many quarters to be obsolete, and a new model, where education is practised in the community as a whole, by individuals studying personal curricula at their own pace, guided and assisted by community facilitators, online instructors and experts around the world.

The educational experience will be rich and diverse, supported by interesting and engaging educational software, and enhanced by discussion and collaboration with people from around the planet.

Some instructors will form personal and supportive relationships with their students, acting as guides through the wealth of available material. Others will opt to become masters of their domain, acting as experts and resources, serving not only students but society as a whole.