

# **Online Learning Tools and Technologies**

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## **Abstract**

Online learning has become the standard form of delivery for distance education programs in a number of post-secondary institutions in more economically advanced countries. This article looks at the extent and range of online learning, the reasons why some institutions have adopted this strategy, and also why other institutions have moved more slowly. Lastly, the author speculates as to the appropriate conditions for successful use of online learning in Chinese distance education.

## **Introduction**

Online learning or e-learning is perhaps one of the hottest and most controversial developments in post-secondary education. It has both strong advocates and strong critics (see, for instance, Peters, 2002, and Noble, 2003). Unfortunately, much of the discussion around online learning is highly emotional and ill-informed.

In this article, I will try to provide an overview of current developments, placed within an historical context, and in particular I will discuss online learning as one of several options open to distance education. The value of online learning depends on a number of different factors, and therefore the article will focus particularly on the appropriate conditions necessary for the successful use of online learning in distance education.

## **Historical developments**

The first teaching online started in the early 1980s, based on the invention of computer conferencing by Murray Turoff in 1970 (Hiltz and Turoff, 1978, p. 43). Computer conferencing or computer-mediated communication (CMC) enables asynchronous communication between dispersed individuals. Asynchronous means that the user can communicate at any time, because messages from all participants are centrally stored, ordered and accessible on demand. Early computer conferencing depended on local computer networks, usually within a single institution.

One of the first institutions to offer teaching through computer conferencing was the New Jersey Institute of Technology in the USA. Using specially designed computer conferencing software called 'Virtual Classroom', between 1985 and 1987 Roxanne Hiltz and Murray Turoff constructed 'a prototypical virtual classroom, offering many courses fully or partially online.' (Hiltz, 1990, p. 134).

One of the first institutions to use online learning for students who were completely off-campus was the British Open University. In 1988, it offered DT200, 'An Introduction to Information Technology: Social and technological Issues', to over 1,500 students. As part of the course, students were sent a computer, modem and printer (which they had to learn to connect). Students were expected to discuss issues online with local tutors, using software called CoSy developed at the University of Guelph in Ontario, Canada (another early pioneer in computer conferencing). However, for DT200, computer conferencing was a supplement to the Open University's more traditional media of printed texts, broadcast television and radio, and audio-cassettes.

These early developments required special software programs such as Virtual Classroom or CoSy, and were limited to short, typed online communication between students, and similar communications between instructors and students. Although this was a major advance in distance education, the lack of common technical standards, the need for core content to be handled mainly by other media such as print or broadcasting, the need for

distance students to network over slow and expensive long distance telephone lines, and the lack of user-friendly tools meant that computer-conferencing was limited to a relatively few enthusiasts and pioneers until the mid 1990s (for a good overview of this period, see Harasim, 1990).

The big breakthrough for online learning came with the development of the World Wide Web, and the consequent rapid spread of the Internet into many homes, offices and most universities in more economically advanced countries. The first Web-based university courses started appearing around 1995. The University of British Columbia, in Vancouver, Canada, offered its first credit courses delivered entirely over the Internet to distance education students in 1996. At the same time, the University of British Columbia also developed a software package called WebCT, specifically designed to enable Web-based courses to be offered over the Internet. WebCT became rapidly popular, and by the year 2000 there were over one million student licenses in over 80 countries. Its main competitor is Blackboard Inc., although there are many other course management/course authoring tools on the market or developed by institutions for their own use.

WebCT and similar tools are easy to use by both students and instructors, and are highly reliable. By using local Internet service providers, telephone line charges for students are low (local calls are free in Canada and the USA, and Internet charges may be as low as US\$30 a month). In Canada and the USA, more than two-thirds of homes now have Internet users.

Consequently, particularly in North America, there has been a rapid expansion of online learning. According to a recent survey in 2002 (Allen and Seaman, 2003), over 1.6 million students in degree-granting higher education institutions in the USA took at least one online course in the fall semester of 2002 (11% of all U.S. higher education students), and over 500,000 took all their courses online. These figures are expected to increase by 20% by fall 2003.

## **Definitions**

With this rapid expansion of online learning has come a rapid expansion of different forms of online learning. Online learning and even more so 'e-learning' are often used to cover a wide range of different uses, so some form of definition is necessary.

From about 1996 onwards, regular classroom teachers started to incorporate the Internet into their teaching. This occurs in a variety of forms. Web pages may be used as illustrations in face-to-face classes or lectures. Online discussion forums can be used to continue discussion after class or the lecture. Students may be asked to do Web searches or use recommended Web sites as part of their studies, either in class, or outside class. Textbooks have started to appear with dedicated Web sites, which provide student activities and tests based on the textbook. The development of software platforms such as WebCT and Blackboard has encouraged instructors and teachers to create their own Web-based learning materials. Hybrid, blended or mixed mode are all terms used for integrating the Web into classroom teaching. I prefer to call this type of application though web-enhanced or Internet-enhanced classroom teaching.

In general, these Internet-based activities have been incorporated into regular face-to-face classes. However, in still a few rare cases, instructors have reduced (but not eliminated) the number of face-to-face classes to allow for more online learning (hybrid, blended, mixed mode and distributed learning are all terms used for this form of teaching).

It would not appear to be a big step then for a classroom instructor to move to a class that is entirely delivered online, that is, to create a distance education course as an extension of their classroom teaching.

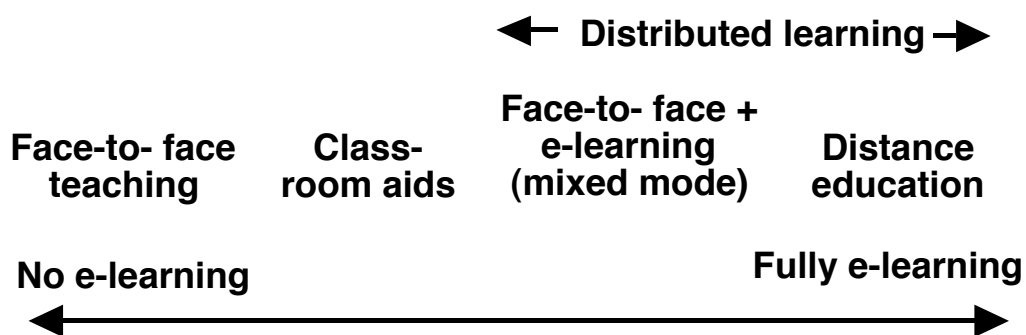
At the same time as classroom teachers were moving to online components of their teaching, so too were many print-based ‘correspondence’ distance education operations. Many institutions started adding e-mail, online web articles and online discussion forums to their already existing print-based correspondence courses. Often these additional online activities were optional, so as not to reduce access to students without Internet or computer facilities. This is true for instance of the British Open University.

Very few higher education institutions though have moved all their teaching to fully online. **The Open University of Catalonia in Spain and Athabasca University in Canada, and the privately owned University of Phoenix Online in the USA, have just over 20,000 students each, and most of the courses from these three institutions are fully online.**

Several ‘dual-mode’ institutions have also moved over to fully online delivery for all new distance courses, although often carrying a large backlog of older print-based courses at the same time. Thus the Distance Education and Technology unit at the University of British Columbia has been creating all its courses fully online since 1997, and now has 60 of its 110 courses fully online.

Bates and Poole (2003) have described these developments graphically (see Figure 1).

Figure 1: The continuum of e-learning in formal education



A number of conclusions can be drawn from this analysis:

1. Online learning is not necessarily the same as distance learning. Indeed, WebCT estimates that over 80% of users are using WebCT to enhance their classroom teaching rather than delivering whole courses online.
2. There are many other ways of delivering distance learning besides online learning. Although online learning is becoming more common in distance education, the most predominant use of online learning in distance education is to enhance or supplement other media or technologies, such as print or broadcast television. Online learning is still a minority medium in the majority of institutions offering distance education.
3. Even distance education courses that are delivered 'fully online' often incorporate other media or technologies, such as textbooks.
4. Quite often 'traditional' instructors experimenting with online learning drift into distance education without understanding or being aware of the specific requirements of distance learners.
5. Even more significantly some university administrators as a result are thinking that distance education is just an extension of classroom teaching, rather than a specialist area of expertise, and can therefore be 'decentralized', i.e. given to the regular academic departments to deliver, if they choose.

However, despite these tendencies, the most important trend is increasingly towards more rather than less online learning in distance education. There are powerful reasons underlying this trend, which will now be explored.

### **Why use online learning in distance education?**

There are several different if related reasons for the drive towards more use of online learning in distance education.

#### Increased access

One reason for its use in Canada and the USA is that most students now have access to the Internet. However, one must be careful in making this kind of assumption. The University of British Columbia, for instance, is a large public research university that requires very high grades from high school before students are admitted. Most of the students come from relatively affluent families and those that do not, have relatively generous scholarships available. Consequently over 90 per cent of students entering UBC already have a computer and Internet access at home. UBC is not an open university, and can therefore require students to get a computer, if necessary.

On the other hand, Vancouver Community College, across town, is also a publicly funded institution, but many of its students come from the poorer part of the city and home computer ownership and Internet access is much lower. It is therefore much easier for UBC to move into online distance education compared with Vancouver Community College, which does a good job in ensuring computer and Internet access for students on the college premises.

Concerns about access have slowed the adoption of online learning at the British Open University. Although one of the first institutions world wide to offer online teaching to fully distance students, the British Open University has very cautiously adopted online learning. Even in 2002, students were required to access a computer in very few of its courses (mainly in the technology area). This is because the value of open-ness to all students is more important to the British Open University than the benefits claimed for online learning.

Access remains a critical criterion for choosing technologies for distance education. The appropriateness of online learning will depend very much on the groups being targeted for distance education. If the target groups are mainly young entrepreneurs, people working in technologically advanced companies, IT professionals, or relatively affluent

middle class students (in for instance private colleges or universities), then online learning may be an option for distance education in even relatively less economically advanced countries.

If on the other hand the target groups are adults with low levels of literacy, poor industrial or agricultural workers, teachers in remote rural schools or in schools with no or unreliable electricity, or unemployed or low-income workers, then online learning is not an appropriate choice, unless special arrangements can be made to provide such learners with low cost or free access to computers and the Internet.

### Quality of learning

In most North American universities, increasing access to higher education has not been the main reason for adopting online learning, especially in distance education. The main driver has been to improve the quality of learning.

#### *The same but better*

There are two ways to improve the quality of learning. One is to enable more students to achieve the same learning goals to a higher level. Thus for instance if 75% of students passed a multiple-choice mathematics examination with an average grade of 75, and the introduction of online learning resulted in 80% of students passing the same multiple-choice examination with an average of 80%, then it could be argued that online learning has improved the quality of learning (provided the second group of students was of the same level on intake as the first group).

Certainly, Web-based online learning using platforms such as WebCT does allow for self-assessment, multiple-choice testing, and continuing revision, thus providing students more opportunities for self-study than in a traditional classroom. Where careful



comparative studies have been made, students learning at a distance through online learning do as well as students taking the same courses face-to-face. Also, experience at UBC is that course completion rates improve when moving from print-based courses to online courses (from around 80 per cent for print-based to 85 per cent for online courses. Face-to-face classes average 90 per cent or more). This improvement though is more related to online students having *less* flexibility, compared with print-based courses, in the time they have to complete an online course, because they have to study as a cohort, if the online discussions are to be meaningful.

### *Different and better*

However, there is little empirical evidence to suggest that online learning has resulted in the kind of quality improvement associated with doing the same thing better with online learning. The main educational argument for online learning is that it enables students to learn in a different way from traditional classroom teaching (or print-based distance education).

To understand this argument, a little history is necessary. Until the middle of the twentieth century, university education was available to a relatively small elite in most Western countries. For instance, as late as 1970, less than eight per cent of students leaving school in Britain went on to university (which is why the Open University was created). That figure is now nearer 33 per cent, and is expected to increase to over 50 per cent by the year 2010. In the USA and Canada, for many years over 50 per cent of all students leaving school has gone on to college or university.

As a result, over the last thirty years there has been a huge increase in mass higher education in the Western world. For economic reasons, though, this has not been matched by a comparable increase in research professors. In the USA and Canada, the increased number of students has led to ever increasing class size, the increased use of unqualified

graduate teaching assistants, and contracted instructors. The pressure of numbers has led to greater emphasis on lectures, rather than small group seminars and discussions, especially for first and second year undergraduate programs. The use of large lectures in turn has resulted in heavy emphasis on the transmission of information, and quantitative, multiple-choice testing (even in the humanities).

In a highly industrialized economy, relatively few 'leaders' are required who can think creatively, solve problems, and take initiative. These can be segregated early and sent to elite institutions (e.g. Harvard, Cambridge) where the impact of mass higher education is lessened. Thus it did not matter so much in an industrialized society if the bulk of higher education was based on the transmission of standard curricula and 'approved' knowledge. Research and 'new' thinking was reserved for a privileged elite (even in Western societies).

However, in a knowledge-based society, there is a great need for very many individual entrepreneurs, innovators, risk takers and problem-solvers. The training for such workers requires a different approach to education, based on workers able to continue to learn both inside and outside conventional higher education institutions. Such learners must be encouraged to analyse and criticize, to offer alternative solutions and approaches, and to take risks. This cannot be easily done in large lecture classes (see Bates, 2000, for more discussion of this issue).

As a result, in North America particularly, there was a growing reaction in the 1990s to what was called the objectivist approach to teaching and learning that was then predominant in North American universities, at least at an undergraduate level. 'Objectivists' believe that there exists an objective and reliable set of facts, principles and theories that either have been discovered and delineated or will be over the course of time. This position is linked to the belief that truth exists outside the human mind, or independently of what an individual may or may not believe. Thus the laws of physics are

constant, although our knowledge of them may evolve as we discover the ‘truth’ out there.

This view of knowledge (or epistemology) was challenged by those who might be called ‘constructivists’. Constructivists believe that knowledge is essentially subjective in nature, constructed from our perceptions and mutually agreed upon conventions. According to this view, we construct new knowledge rather than simply acquire it via memorization or through transmission from those who know to those who do not know. We construct meaning by assimilating information, relating it to our existing knowledge, and cognitively processing it (i.e. thinking about it). Social constructivists believe that this process works best through discussion and social interaction, allowing us to test and challenge our own understandings with those of others. For a constructivist, even physical laws exist because they have been constructed by people from evidence, observation, and deductive or intuitive thinking, and, most importantly, because certain communities of people (in our example, scientists) have mutually agreed what constitutes valid knowledge.

It is no co-incidence that online learning arrived at a point in time when constructivist approaches to teaching were at the height of their popularity in North American universities. For constructivists, reflection and discussion are key activities through which knowledge is constructed. The asynchronous nature of online teaching, enabling students to control to some extent the pace and timing of their learning, allows for and encourages reflection. Online forums provide the opportunity for students to test ideas, and build and construct knowledge through collaborative learning. (For more discussion of this issue, see Bates and Poole, 2003)

*Distance education and the quality of learning*

Thus online learning was seized upon as a way of teaching *differently*. Certainly, the weakness of print-based or broadcast-based distance education was the lack of opportunity for discussion *between* students. Expensive and optional arrangements had to be made through local study centres for face-to-face interaction, and in practice these were often used by local tutors for more lecturing, rather than group discussion of the printed material.

In any case, print-based or broadcast-based distance education has tended to take primarily an objectivist approach to learning, so it is not surprising that local face-to-face tutorials merely reinforce the transmission of information. Thus just adding an online discussion component to a print-based course designed on objectivist principles will not make much difference, because the discussion forums will correctly be perceived by students as adding nothing that will improve their examination scores.

Online distance education programs designed to constructivist principles start from a completely different premise. The online discussions are the ‘core’ of the course. The content is merely fodder or manure for the discussions. The academic goals are critical and creative thinking, knowledge construction and collaborative learning.

Thus there is an important relationship between beliefs about the nature of knowledge and knowing, the skills needed in a knowledge-based society, and online learning. Online learning though can be used both to support more traditional, objectivist approaches to learning, and more modern, constructivist approaches. The popularity of online learning in North America though owes as much to its semi-democratic, inclusive and populist approach to learning as to its technological glitz and glamour.

### Costs and benefits

Another group of reasons for the popularity of online learning are economic. There was a strong belief in the USA at the end of the 1990s that e-learning was a major new business, and in particular would lead to the privatization of much of public education. This is partly the reason why distance education was included as one of the four areas in opening education to the international world in the negotiations with China about its entering into the World Trade Organization in November 2001.

Experience has suggested though that the Americans were wildly over-optimistic about the potential of e-learning for generating business revenues. Although some new initiatives have been clearly successful in terms of sustainability and market penetration, others have been nothing short of a disaster. In particular, some very prestigious universities got it badly wrong in their attempts to cash in on the e-learning bonanza. Projects involving Columbia University, New York University, Temple University, the University of Chicago, the University of Melbourne and the British Open University in the USA each lost at least US\$10 million in trying to set up for-profit e-learning operations.

More fundamentally, the institutions that lost money did not really understand the business of e-learning and the underlying cost structures of quality distance education. All the institutions that lost money were new to distance education (except the British Open University, making its third unsuccessful attempt to establish itself in the USA). The main misunderstanding was to believe that e-learning was primarily about packaging and selling content. Although content is important, it constitutes probably less than fifty per cent of the operational costs of a successful high quality online distance education operation. In particular, interaction between students and teachers is essential (and indeed a primary objective of online learning in a knowledge-based economy). The costs of learner support seem to have been under-estimated in the business plans. Also, the market is limited when even countries such as the USA have a well-established and prestigious public higher education system.

Furthermore the business models of the prestigious universities were developed on the basis of keeping their main operation, and in particular their tenured research faculty, isolated from distance education, what one might call the quarantining of distance education. Students seemed to recognize this, and steered clear of these at-arms-length organizations

On the other hand, the highly successful University of Phoenix Online, a private for-profit university, has been in distance education for over ten years, and has focused on a particular niche market (working adults in middle range IT and management jobs), providing consistent and high quality learner support. However, although the University of Phoenix Online has been very successful, its operation is still quite small at around 20,000 students, and publishers such as Harcourt and Thomson have either lost money or are still waiting to see a return on their investments in the university e-learning sector.

The e-learning market is going through a traditional high-tech cycle of boom, crash and recovery. There is a small but important and growing market for commercial or for-profit online distance education. The University of British Columbia has been running successful online degree programs that fully recover all their costs (including full overheads) from tuition fees. These are graduate programs aimed at continuing professional education, usually developed in partnership with a foreign university, to share costs, to limit risk, and to widen markets. There is also a stable and successful market for corporate e-learning. However, undergraduate distance education still needs substantial government funding to cover its costs, at least in Canada.

There is a great deal of optimism about the Chinese e-learning market. The development of a growing and prosperous middle class, and especially the growth of private education, opens up a potentially huge market for e-learning. However, this market is much more

likely to be successfully developed within China itself, rather than by foreign providers, although foreign partners may provide added value to Chinese-based organizations.

The main challenges are cultural and epistemological. The 'same but better' approach of building on traditional models of knowledge transmission may work best initially, but may fail to meet the needs of a growing knowledge-based economy. Chinese organizations that develop a conscious strategy of gradual transition from knowledge transmission to constructivism, combined with a well-developed business plan based on careful market research and a good knowledge of the costs of distance education, are the ones more likely to succeed in the long term.

## **Conclusions**

Online distance education is an important development, but is not a panacea for all forms of distance education. There are specific markets or target groups for online distance learning, and especially in a country such as China, these markets are growing rapidly.

However, for distance education aimed at the masses, and in particular those excluded from traditional forms of education, broadcast-based and print-based forms of distance education are likely to remain important for many years to come.

Perhaps more importantly, there is a strong link between online learning, new ways of thinking and learning, and a knowledge-based economy. In a country such as China, where agrarian, industrial and knowledge-based economies all exist side by side, no single approach to distance education will be satisfactory. However, as the knowledge-based economy grows and becomes more important, so too will the need for an effective and modern online distance education system.

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