AKADEMIE ZUM DRITTEN JAHRTAUSEND,
Burda Medien

Envisioning Knowledge -
from Information to Knowledge

February 3rd - 4th, 1999
Munich

THE IMPACT OF NEW MEDIA ON ACADEMIC KNOWLEDGE

Dr. A.W. (Tony) Bates,
Director,
Distance Education and Technology,
Division of Continuing Studies,
The University of British Columbia,
Vancouver, B.C.,
Canada V6T 1Z4

Tel.: (1)-604-822-1646
Fax: (1)-604-822-8636
e-mail: tony.bates@ubc.ca
Web: http://bates.cstudies.ubc.ca

Abstract

New media, such as the Internet and CD-ROMs, are opening up new ways to deliver education and training, especially to new markets such as those in the work-force. However, to what extent, if at all, do these new media change the forms and nature of knowledge? It is argued that the new media will profoundly change the nature of knowledge, what is considered authoritative, and even on what is considered valid knowledge. It will certainly lead to major changes in the work of teachers in higher education. Above all, it will have profound impact on the nature of academic organizations. These changes will not be necessarily better or worse than what exists at present, and they will not happen quickly, but they will certainly lead to something very different by the end of the twenty-first century.

Introduction

Developments in the Internet, in particular the World Wide Web, and developments in multimedia technology, are resulting in new approaches to designing and developing teaching and learning at a higher education level. Some of the characteristics of such developments can be described as follows:

- increased flexibility and access to learning, resulting in new markets being reached, and in particular, the lifelong learner market
- the use of multimedia to develop psycho-motor and intellectual skills development, including problem-solving and decision-making
- the use of Internet technologies to develop knowledge management and collaborative learning skills,
- the use of the Internet to develop global, multi-cultural courses and programs.

As the use of such technologies become more prevalent, it is important to ask the following questions: to what extent, if at all, will such developments change the forms and nature of knowledge? In order to answer this question, I will describe some of the developments at my own institution and my understanding of how these developments relate to the question of the forms and nature of knowledge.

Using technology for teaching at the University of British Columbia

The University of British Columbia (UBC) is a typically large, publicly funded, campus-based research institution in Canada, with approximately 35,000 students, of whom approximately 10,000 are graduate students. It has approximately 8,000 distance education enrolments, and has been offering distance education courses for nearly 50 years. However, the bulk of its teaching is campus-based.

Media enhancement

In the last five years, there has been a rapid growth in the number of professors at UBC using technology as part of their teaching. Since 1994, when the university started giving grants to support campus-based use of technology, approximately 600 projects have been funded. Of these about 75% have been Web-based, and of the remainder, most have been multimedia applications using a variety of development software. This use of new technologies can be found in every Faculty and indeed in almost every teaching department. These technologies have been used mainly to supplement face-to-face teaching. Students access the multimedia learning materials either from campus-based computer laboratories or increasingly from home, as a support to their face-to-face classes, or as courses completely available in a distance format. Over 75% of all UBC students now have an Internet account.

Technology is now used in a wide variety of ways at UBC. PowerPoint presentations are perhaps the most common use of technology, providing clear lecture notes that increasingly incorporate graphics and sometimes multimedia clips. Increasingly, instructors are moving their notes to a Web database that students can access outside the face-to-face lecture. These notes are supplemented by links to other relevant Web sites in the subject area. Also common are course bulletin boards on the Internet, where students and the class instructor can post their own comments, or on-line discussion forums, where the class instructor can post questions or topics for discussion, and students can add their own comments or ask questions. These forums are usually asynchronous, in that each comment is added later to previous comments, although synchronous "chat" forums may also take place when more than one person is logged on at the same time. Lastly, a Web site may contain a list of other sites relevant to the topic that can be accessed by clicking on the name of the site.

Developing high-level learning

Professors are also developing multimedia virtual laboratories that require learners to examine data of various kinds and draw conclusions or solve problems. Other multimedia developments include complex decision-making games and simulations. A CD-ROM will contain data organized into many different variables, which are related to each other in some way. The professor's expertise is used to estimate the effects of changing one variable on all the others. Users are then asked to input their own data and/or make decisions, and the software will calculate the likely outcome of such decisions.

Distributed learning

The vast majority of applications of new technologies are used to supplement or enhance regular classroom teaching. Slowly, though, the added flexibility and the additional functionality of the new media are resulting in more innovative ways to organize teaching and learning. Lectures may be reduced in numbers, students are encouraged to work collaboratively on projects or problems outside of the classroom, or to research sources on the Web and in the library. The instructor becomes more of a tutor and a guide, and less the main source of information. Finally, an increasing number of courses are being delivered entirely at a distance, using the Web and / or CD-ROMs.

Distance education

Distance education is not new. Indeed, the University of British Columbia, which for many years was the only university in an area the size of Germany and France combined, has been offering undergraduate courses at a distance since 1949. Today, we offer 124 undergraduate and graduate distance education courses in all Faculties. In the last three years, nearly all new course development has included the World Wide Web as a main teaching component. Increasingly, the courses are being targeted not just at students in British Columbia but throughout the world.

There are special challenges in delivering programs throughout the world. We began through a partnership with the Monterrey Institute of Technology in Mexico (ITESM). They asked us to develop a set of five courses on technology-based learning that could form part of their Masters in Educational Technology. ITESM is a large, prestigious private university in Mexico, with 24 campuses across Mexico linked by satellite and Internet communications.

These courses are also offered as on-line electives (optional courses) to UBC on-campus students taking a conventional, classroom-based Masters of Education. In addition, those who do not want to take a full masters program, or who do not want to become a full-time graduate student at UBC, can take the courses individually. Lastly, students can earn a post-graduate certificate from UBC if they successfully pass all five courses. Lastly, those who do not want to do all the work for a course, for instance assignments, can take individual courses as an audit student. However, audit students cannot obtain a certificate.

The core of each course is its Web site (see http://itesm.cstudies.ubc.ca/info/ for more information). This is used to provide guidance on how and what to study within the course, original text created by the instructors, links to on-line articles, journals, and other relevant Web sites, and on-line discussion forums. The Web site also includes a number of different online services, such as links to the UBC on-line library catalogue, a service for getting copies of articles from the UBC Library, and advice on how to use the Internet for research purposes. In addition, there are at least two text-books required for each course, plus a set of printed articles bound together and mailed to students. For the ITESM students, there are also three satellite broadcasts by the UBC instructors per course, who are linked by dial-up video-conferencing facilities from UBC to the satellite transmission site in Monterrey. Students submit assignments on-line, and one feature of all courses is that at least one assignment is done collaboratively, with three students or more from different countries working together on-line.

ITESM pays half the cost of developing the courses, and in return has the rights to offer these courses throughout Latin America. It recruits, registers, tutors and assesses its

own students, and retains the fees from students. ITESM has been registering between 100-260 students per course.

UBC has the rights to offer the course in the rest of the world. UBC has between 25-80 students per course, with students registered in over 25 different countries, besides Latin America. Of the first 40 students to take the courses from UBC, six already had a Ph.D., and another 12 a Masters, in education. About 20-25% are UBC graduate students. Most of those taking courses for non-credit are professionals working in the field.

One of the major challenges in implementing this program was adapting the UBC's administrative systems to meet the needs of international students. An on-line registration system had to be developed, because the Registry did not handle non-credit students, and the university on-line registration system could not handle registrations for distance courses at a masters level. The university bookstore did not have a system for tracking orders, which was critical for the international students. We also had to work with the Finance Office to enable students to pay electronically. Lastly, we had to re-organize the payment of fees and the delivery of materials, so that students now receive a one-stop service. Consequently, students now pay only one fee covering tuition and materials, and have one contact point for all services.

The program is a good example of a niche market. UBC and ITESM have identified a fast growing area of expertise for which there is limited but specific demand on an international scale. The target group, because of the subject matter, is more likely to have access to the technology and to be skilled and comfortable in using it for their studies. Because most students are already working in a professional area, they have been able to find the money to cover the full costs of the course. Nevertheless, this

approach and, in particular, our use of technology will not be appropriate in many other contexts. It needs thoughtful market research, strong institutional support, and adaptability to local needs. Nevertheless, if these conditions can be met, delivering international programs online can be a most satisfying experience for students and teachers alike.

The impact of new technologies on knowledge

The UBC / ITESM courses reflect a growing trend in lifelong learning. Learning in the twenty-first century will be increasingly bound up with work and everyday life. It will be required on demand, and organized in such a way that it fits the lifestyle and needs of individuals. Learners will seek education and training from a wide variety of suppliers, and will seek it globally. In particular, learners need the opportunity to interact not only with their teachers but also with fellow students, even if they are continents apart. They need to be able to challenge and question what they are being taught, they need to be able to draw on their own knowledge and experience, and they need to be able to adapt what they learn to their own particular circumstances. In other words, education for lifelong learners needs to become more learner-focused.

Teaching and learning are two complementary aspects of education. Within learning, there are two key elements: content - the "what" of learning; and skills, which describe the application of content to specific tasks, or the "how". These two elements are mirrored in teaching: the curriculum and syllabus (the "what"), and the teaching methodology (the "how").

Multimedia technology impacts on both aspects of teaching and learning. It does this in three ways: how it presents information; how students interact both *with* the medium,

and *through* the medium with the teacher and other learners; and the way knowledge is structured within multimedia.

Presentational qualities

Multimedia can represent knowledge in more ways than text or speech can. Multimedia combines text, audio, visual, graphic, and dynamic elements, such as animation and video. This presents learners and teachers with unique learning resources that can be used in a wide variety of ways to stimulate various forms of learning.

The most significant feature of the multiple forms of media is that they allow for the presentation of knowledge in a variety of ways. Thus students can learn about abstract principles through text, and see the application of those principles through an animation or a video example. This presents the opportunity for deeper levels of understanding, particularly if the presentational qualities are fully and deliberately exploited to achieve this purpose, and are combined with the potential for learner interaction (see below).

Well-designed applications of multimedia then can do two things: they can enable learners to come to understandings more quickly than through more conventional classroom or textual media; and perhaps more significantly, multimedia can change how we come to know or to understand, and hence what we know and understand. In other words, a learner may have an image or a mental "construction" that is far richer than an abstract verbal understanding. From an educational perspective, it is essential that learners can move confidently between concrete and abstract understandings, and not become locked into one or the other. This does not happen by accident. Multimedia needs to be carefully designed to facilitate the development of this kind of thinking.

Thus the role of the teacher is by no means diminished; indeed such design requires highly skilled teachers working in teams with multimedia producers.

Interaction

Interaction is another term much beloved by multimedia designers but very rarely adequately defined or understood in an educational context. There are basically several kinds of interaction.

The first is the interaction of the learner with the machine. As the sophistication of multimedia design has increased, so have the types and forms of interaction, although they have so far been rarely exploited in an educational context. The most dominant physical form of learner-machine interaction today in education is a very old-fashioned operation developed in the nineteenth century, and requiring a high level of prior learning and dexterity: typing. Another primitive but very dominant form of interaction, especially on the Web, is the use of a mouse to click on "active" buttons. However, other forms of interaction possible with a computer include drawing, speaking (voice recognition), gesturing, and singing. It is surprising that these other forms of interaction are still so little developed, as they would be especially useful for computer applications in schools.

Research over the years though has improved the design of computing systems to take account of the way humans like to interact with a machine. A critical part of the design of educational multimedia is the interface. A well-designed interface is intuitive for the learner, in that the learner can navigate easily, knows immediately what he or she is expected to do, and allows the learner to make responses that are appropriate to the learning context. Virtual reality offers much more profound changes in the way

humans can interact with machines, and at this stage we cannot accurately identify the potential (and dangers) for education of virtual reality.

Human-machine interaction though is only the basement or foundation of interaction for learning. What matters to educators is the development of intellectual skills. Indeed, there is a distinct hierarchy of skills. In a limited number of subject areas, such as mathematics and engineering, where there are clear right or wrong answers, or clearly better answers, well designed multiple choice questions can be a useful means of testing for knowledge. In general, though, multiple choice questions serve the lowest level of understanding, comprehension, and do not allow generally for perfectly legitimate alternative explanations or answers not previously considered by the designer of the multiple choice questions.

Consequently, a more common form of response is the use of words or phrases, usually typed into the machine. Some teaching materials are programmed so that the computer can recognize key words or phrases and provide feedback. This can be particularly useful in language teaching. Increasing sophistication in computer-based syntax analysis and translation will result in more machine-read analysis and feedback, but the problems are challenging and have taken longer to develop than originally anticipated.

On the other hand, virtual laboratories, computer simulations, and expert systems can demand from the learner much higher levels of interaction, such as analysis, problem-solving, decision-making and evaluation. Nevertheless, in many areas of education, learners still need to discuss and argue, to challenge and question, what they have learned. Humans still are much more able than machines to deal with uncertainty, value-laden decision-making, and complex decision-making. Thus, it is essential for

educational purposes to combine both human-machine interaction with human-human interaction. This too can be facilitated through computer and communications technology, such as the Internet, and I will return to that shortly.

Structure

The third element of media, and the least researched or understood, is its impact on the "structure" or organization of knowledge. Both speech and text are linear in sequence. Even in text, though, structure can be complex. For instance, parallel actions in a novel may be written about in separate chapters, or the linear or time sequence may be deliberately interrupted by the author to provide tension or incongruity in the reader's mind. The important element of text is that the writer controls the structure. Novelists and text-book authors give a great deal of thought to the sequence and structure of their work. The reader can of course ignore the structure, and read "out of sequence" or selectively, but that may result in a tension between the ends of the writer and the results gained by the reader. One feature of a good teacher is the ability to re-structure and re-organize knowledge to suit the needs of individual learners. One feature of an outstanding teacher or researcher is their ability to identify patterns or structures in what otherwise would appear to be random or chaotic elements. One possible goal for teachers is to develop the ability in their students to find their own structure or understanding of the organization of an area of study.

Multimedia provides an opportunity to offer a variety of different ways of structuring knowledge. A CD-ROM or Web site can be structured in a linear manner, just as a text-book. Thus, a narrative text or lecture can be accessed sequentially through a CD-ROM or Web site. The medium used in the CD-ROM or Web site could be text, speech or video, but the structure would still be linear.

However, most educational multimedia designers would feel that this is not the best use of the technology. Multimedia offers more complex and interesting ways of structuring and accessing knowledge. For instance, the World Wide Web is based on hypertext, which links pages together. Different pages may rest on different servers around the world. Thus while a learner may start to work through the Web materials in a linear manner, at various points they can "take off" to other sites, and explore these, then return to the main or "home" site. In educational terms, the home site acts as a study guide, with links to many other sources of information. The learner retains more control over the links to follow up, and indeed, the teaching may be designed to encourage Web exploration, so that the teacher cannot predict where the learner will go.

Multimedia materials can also be organized in an algorithmic or "tree" structure. Learners have to make a decision, and as a result of that decision the computer directs them to another area of the CD-ROM. This enables the teacher to control the sequence in which learners access materials. This can be useful if dealing with a large and complex area of study that needs to be broken down into more manageable "chunks", and prevents the learner from being overwhelmed by the large amount of detail to be covered. Furthermore, teachers can "share" this structuring of the area of content by providing a " hot" index, or visual of the links between different sections of the CD-ROM. Learners can then choose where to start in the structure, and the sequence to follow.

Another structure that offers interesting educational possibilities is the idea of indexed but independent learning objects. A learning object can be anything from a single graphic or log, a single slide of a physiological cell, up to a simulated laboratory

experiment. As well as the object, a whole set of other data will be "tagged", such as verbal descriptor, a small fee for accessing the source, copyright holder information, financial transaction operations, etc. For instance, a CD-ROM may be developed that contains a comprehensive collection of thousands of separate but computer indexed examples of different insects. The same CD-ROM can then be combined with different Web sites and used for quite different purposes. A course on parasitology, for instance, may draw on part of the CD-ROM, while a course on organic farming may also draw on other parts of the same CD-ROM, and in some cases may share some of the same images. Such resources are being created and stored more and more on remote servers, and accessible over the Web. A course designer then would build a teaching program with many such links integrated within the overall context, and pay a very small fee (electronically) each time the learning object is accessed.

Another way of structuring multimedia is to develop a problem-based approach where all the materials students need to solve problems are provided, but the material is organized in such a way that students need to search it out and combine it to answer problems. Thus for a forest ecology course a CD-ROM might start with a virtual walk through the forest, with several questions or problems posed. The students have to search the CD-ROM database to find the necessary information to solve the problems or answer the questions. This material may be structured under discipline headings in a logical and clear way, but in order to solve the problems the students need to combine information from different disciplines.

Differences in structure need to match the inherent requirements of a subject area. In addition, materials can be structured so as to suit different approaches to learning. Lastly, students' learning is likely to be influenced and guided by the structure of the materials, whether or not this is intended by the teacher or multimedia designer.

The Internet: interaction and power

For many teachers, the most important element of the Internet is the ability to bring isolated learners and teachers together for discussion and analysis. Thus, interaction is not so much *with* a machine as *through* it, using the technology to link people together. This enables teachers to raise topics for discussion, allows students to work collaboratively online, and to submit assignments and get feedback from an individual tutor. In this context, technology does not change the nature of learning or knowledge; it does however make it available to those separated by time and place.

Secondly, the Internet can change the balance of power and control between teachers and learners. Teachers are no longer the gate-keepers to knowledge. This shift is as profound as the impact of books on the Catholic Church. It moves communication of learning from an authority figure informing those less powerful and informed, to a context where knowledge can be shared and re-constructed amongst equals. Individuals can interpret and apply knowledge to their own contexts, and can share their experiences with others.

The negative side of this is the challenge to authority and experience. Knowledge is not evenly distributed. The teacher will know more in some areas that each individual student, and in some circumstances more than the sum of all students in the class. This then raises the question of the validity and authority of knowledge gained over the Internet. How can the learner be sure of the sources of information? Even where quality and consumer control measures are in place, the game has changed, and the questioning of authority in terms of who "owns" knowledge is now a fundamental issue.

Knowledge in the future

The future by definition is uncertain. There are though three possible scenarios for the future of knowledge and education.

The teacher in control

In this context, teachers and subject experts regain control. This is quite likely to happen as the Web moves from primarily a textual and graphic-based medium to a multimedia medium, as bandwidth and computer power increases. Teachers can then start delivering lectures over the Internet. However, this is likely to be a short-lived triumph, as learners will be able to choose from alternative methods more suitable for distributed and lifelong learning.

The technology in control

This would be the final triumph of artificial intelligence. Computers will diagnose student learning problems, direct them to appropriate sources of information, select appropriate teaching methods, provide feedback, and assess students. This is unlikely to happen in my view, because someone has to program the computer in the first place, and knowledge is not only expanding more rapidly but is also becoming more distributed, thus making it difficult for artificial intelligence to exert control.

The learner in control.

This is perhaps the most likely scenario. Learners will take a constructivist approach to learning, seeking learning that meets their needs as the learner perceives it, in ways that are convenient, flexible and cost-effective. In this scenario, teachers will remain important as counsellors and guides, and perhaps originators of some of the new learning materials, but will become more like "hired hands".

There is a real danger in this. Learners effectively become consumers, with the risk that short-term gain will dominate long-term benefits. Perhaps more importantly, knowledge will become more subjective and value-laden (what people *want* to think), and less objective and rational-deductive.

A balanced future

The ideal future will be one where the role of teacher, learner and technology are all in balance and complement one another. Teachers and learners will become more concerned with the management of knowledge, rather than mastery of all areas. The teacher's role will combine guidance on appropriate areas of knowledge and subject matter, sometimes (especially but not exclusively in research universities) teachers will be the generators of new knowledge, and above all the teacher's role will be to challenge and stimulate the learner.

Conclusions

New technologies are fundamentally changing the nature of knowledge. Nevertheless, we still need to maintain a balance between teaching and learning done through face-to-face contact, and technology-based learning. Many skills cannot or should not be taught solely through technology, although the range of knowledge and skills that can

be taught effectively in this way is probably much greater than most teachers would credit.

The trick is to understand that there are many different clients, needs or markets for knowledge, teaching and learning. For some of these markets, technology-based learning and knowledge is perfectly appropriate; for others it is not. We will need to be selective and sophisticated in our decisions as to how we want to use technologies to learn and teach.

Secondly, the role of both learners and teachers will change, in order to exploit the benefits that technology can bring to learning. This in turn will have a major impact on our educational institutions.

Thirdly, as we move to representing knowledge in various ways through technology, it will change the nature of our understanding. This does not necessarily mean that our understanding will be better or worse; just different.

Thevariables of social media that may affect the studentsâ€™ academic performance are: access to internet; usage of social media; their perception on social media; and their frequency of using it. With these variables, the present study will identify the impact of using social media to the academic performance of the respondents and will be able to draw recommendations that may improve the learning process and reduce the negative impact of social media. 1.3. STATEMENT OF THE PROBLEM This paper aims to find out the positive and negative impact of social media on studentsâ€™ academic performance.Â This study will discover this information, giving the researchers an opportunity to explore and gain new knowledge. Furthermore, it can be used for future studies. â€¢ We must ground a theory of media in the cognitive and social processes by which knowledge is constructed. â€¢ We must define media in ways that are compatible and complementary with these processes. â€¢ We must conduct research on the mechanisms by which characteristics of media might interact with and influence these processes.Â to rely more heavily on pictures or diagrams to construct mental representations of new information.(18) Younger children, who may not have sufficient prior knowledge from which to generate elaborate mental models, may benefit most from pictures to aid this process.(19)The stability of the medium allows the kind of serial, sequential, back-and forth processing between specific information in the text. 1. The Impact of Social Media on Politics. A new study from Pew Research claims that about one in five U.S. adults gets their political news primarily through social media. The study also finds that those who do get their political news primarily through social media tend to be less well-informed and more likely to be exposed to unproven claims that people who get their news from traditional sources.Â Many studies suggest implementing social networks within the workplace can strengthen knowledge sharing. The result is to improve project management activities and enable the spread of specialized knowledge. Fully implementing social technologies in the workplace removes boundaries, eliminates silos, and can raise interaction and help create more highly skilled and knowledgeable workers. Social media has had a profound impact on education and this technology is only going to increase its influence on the educational system as time goes on.Â In todayâ€™s world of connected learning, the impact of social media on education is becoming a driving factor. The world is getting smaller, and through the use of technology such as social media, the way we deliver instruction is changing. Social media and education can complement one another if utilized effectively. The technology referred to here really transpires just social media technologies such as Facebook, Twitter, and Snapchat. The technologies that allow these platforms to function are also one of the driving forces behind the impact of this technology on education.