The Role of the Internet in Creating and Sustaining Distributed Learning Environments

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ABSTRACT

Key-words: Educational models; distributed learning; internet.

Educational models evolved from those that focused on the individual learner (the craft or apprentice model) to those that focused on providing learning opportunities for an increasing number of students. All too often these so-called industrial models become passive for both the instructor/tutor and the learner. Assessment has become rather perfunctory and focuses on grades rather than suggestions for improvement. A Distributed Learning model offers a framework within which attention is once again focused on the individual but now in a collective environment. This paper explores the role that the Internet can play in creating and sustaining Distributed Learning environments.

RESUMO

Palavras-chave: Modelos educacionais; aprendizagem partilhada; internet.

O papel da Internet na criação e manutenção de ambientes de Aprendizagem Partilhada. Os modelos educacionais têm evoluído daqueles que se concentravam no aluno individual (o modelo do aprendiz ou artesanal) para os que se concentram em proporcionar oportunidade de aprendizagem a um número cada vez maior de estudantes. Com demasiada frequência, estes modelos ditos industriais tornaram-se passivos tanto para o instrutor/professor como para o estudante. A avaliação tornou-se bastante superficial e sobretudo orientada para a classificação, em vez de fazer sugestões para melhoramento. Os modelos de Aprendizagem Partilhada (Distributed Learning) oferecem uma estrutura dentro da qual a atenção é novamente focada no indivíduo mas, agora, num ambiente coletivo. Esta palestra explora o papel que a Internet pode desempenhar na criação e manutenção de ambientes de Aprendizagem Partilhada.

INTRODUCTION

Mike Fitzgerald (1999), former Director of Studies in the Faculty of Social Science at the Open University, argues that there have been three main models of higher education and that we are moving into a fourth.

His first model is the one-to-one relationship between a student and a tutor - the craft model or Oxbridge (Oxford and Cambridge) Model in the United Kingdom. Once a topic for an essay or project was agreed upon, the tutor would advise the student on the resources that were available. These might have included the library, workshops, formal lectures, experiments, to name but a few. Throughout the course of study the student and tutor would meet periodically to review progress. The tutor would make suggestions and evaluate the work undertaken. This forced the student to become an active learner and assume responsibility for his or her learning. The tutor would quickly learn if the student had accomplished very little since the last meeting.

In the United States the Oxbridge Model could be referred to as the Mark Hopkins Model. Hopkins, the longtime President of Williams College, taught a highly regarded senior capstone course in moral philosophy. Someone once remarked that the ideal setting for higher education would be a student at one end of a log with Mark Hopkins at the other.

The craft model is expensive given the one-to-one nature of the model and the likelihood that each student would be working on a unique assignment at a pace determined by the tutor and the student.

As higher education evolved it developed into what Fitzgerald calls the industrial model in which a faculty group decide what will be offered (the curriculum), what
content will be included, what special facilities will be provided and the timeline that will be followed. The educational process was redesigned to accommodate the increasing numbers of students and the increasing enrollment was needed to provide additional funding. Thus a vicious cycle was set into motion. Assessment became a post-course process in the industrial model. This was especially true in the U.K. model in which an intense examination period followed at the end of each course of study. In the United States and elsewhere, the industrial model evolved to include examinations conducted during the course of study. Too often these are mass produced and utilize machine scored examinations to be able to handle the large enrollments. This is particularly true in large freshman and sophomore-level courses. What is often missing is the opportunity for one-on-one interactions on a periodic basis leading to an ongoing assessment. At the University of Houston, for example, a doctoral candidate is teaching a course in College Algebra in which there are 300 students in one section and this instructor is teaching three such sections! If five minutes per week were devoted to individual assessment, the instructor would spend some 75 hours per week in this activity alone. Thus the industrial model reversed the sequence developed in the craft model in which assessment was ongoing.

The Open University, in Fitzgerald’s (1999) analysis, became the post-industrial model in which assessment once again became a major vehicle for teaching and learning. Each student has a tutor and the student has access to a wealth of information in a variety of formats. The ongoing assessment package, in Fitzgerald’s opinion, is the binding agent that holds the process together. Students meet with their tutor, produce essays or evaluations or projects and have their work evaluated. In addition to receiving a grade, students receive a critical assessment of what they could have done to improve. Several attempts have been made to introduce the Open University concept into the United States but to date such attempts have had little impact on large numbers of students and institutions.

Fitzgerald’s (1999) fourth model is what he calls Distributed Learning in which the boundary between so-called distance and face-to-face models becomes very fuzzy. He argues that what we may be seeing is the “potential to recover the individual tradition which then gives you the opportunity to have people learning individually within a collective environment.” In this environment the focus will be on communications and networks and not as much on the technologies.

Can Mark Hopkins be replaced by a T1 line and a server?

THE POTENTIAL OF THE INTERNET TO DISTRIBUTE COURSE RESOURCES

The distributed nature of the Internet creates an as yet untapped potential for communication and the distribution of resources. The evolution of such resources into a system of Distributed Learning, however, remains to be satisfactorily demonstrated.

I experimented with the distribution and communication capabilities of the Internet while preparing a course in Physical Geology that I taught in the fall semester of 1995. What started out to be a few exercises on the Internet (an introduction to search engines and visits to Volcano World) soon evolved to more than I had anticipated. The reader has complete access to the set of course resources at: www.uh.edu/~jbutler/physicalphysical.html

Mechanically, it is relatively easy to produce Internet resources. Deciding how to take advantage of the Web and avoid a “broadcasting” or formal lecture style, however, proved harder than I originally thought. Part of the dilemma seemed to be tied up in the question of why should I bother to use the Web.

“Futurists” tell me that a 22 year old will face an average of 6 career changes in the next 42 years; career changes not just job changes. During the past 10 years I have written many letters of recommendation for former geology students who desired admission to law school, an MBA program, a teacher certification program, and so on. Many, but certainly not all, of these former students were faced with a career change. Will the 22 year old in 1995 attempt to earn a formal degree to make his or her career changes in 2002 or 2009? I don’t think that is realistic. Skills developed during formal and informal learning experiences will add flexibility but will that be sufficient? I believe that education will continue to evolve away from today’s norm and that the Internet (or the grand-daughter of the Internet) will play a prominent (if not dominant) role in its evolution.

Who will develop the content that can be distributed on the Web? At the present time examples can be found of a number of approaches that are being used. A partial listing is given at the World Lecture Hall: www.utexas.edu/world/lecture/index.html

This is a good first stop to get an appreciation for the variety of courses and the diversity in presentation style and format. Courses listed at the World Lecture Hall are nominated by their developers and thus represent a biased sample.

I began tracking Internet-based courses resources in the geosciences in August, 1995, as a way to get ideas for the courses I teach. About twice a year I use V. J. Ansfolds’ Directory of U.S. and Canadian Geology Departments www.usd.edu/esci/geodepts.html and examine the pages being produced. Many departments publish a page of courses with Internet resources. Others “hide” these resources on individual faculty members personal pages. In November, 1999, 219 departments were publishing 1,422 course resources. Given the procedure for locating these resources, these lists clearly are incomplete. However, the same search procedures have been used for more than 4 years and the following graphic gives a sense of the rate of growth of this use of the Internet in the geosciences. In general, these are not online courses. They are resources that the developer has produced for his or her face-to-face courses and thus may fit nicely into Fitzgerald’s (1999) Distributed Learning Model.

The average is about 6.5 courses per department (median of 4.0) in November, 1999. Approximately 43% of
the 477 Geoscience Departments in the USA and Canada with Internet home pages have at least one faculty member producing Internet-based course resources. However, I estimate that less than 5% of the geoscience faculty in the USA and Canada are developing such resources at this time. In many departments there appears to be one individual who continues to add course resources over time. In a very small number of cases (probably less than 10), a departmental commitment has been made to develop course resources.

I believe that the best way to get started is to review what your colleagues are using in their courses. Fortunately, most resources are open to outside review. However, questions of intellectual property ownership and copyright issues may be forcing such resources into a password protected medium. While perhaps understandable from the organizational perspective, this will have a negative impact on those who are ready to experiment with the Internet but not quite sure how to get started.

As evident in Figure 1, the number of course resources has increased from about 50 to nearly 1,500 in about five years. This does not count other resources of a more general nature which could be used in multiple courses.

The Good Practices home page of the Virtual Geosciences Professor: www.uh.edu/~jbutler/anon/coursesandresources.html has evolved over the past five years and offers one way to try and locate suitable resources.

The page begins with a survey in which the readers are asked several questions about their needs. Approximately 67% of more than 350 respondents (over the past year) have stated that their number one need is for access to specific resources arranged by subject matter. A nearly equal percentage note that the biggest deterrent to getting more involved is the enormous amount of time needed to produce and maintain such resources and the reward structure of their institution which recognizes research funding and refereed papers but has a hard time dealing with measuring effective teaching and assessing learning.

No attempt has been made to evaluate each resource on a quantitative scale. Rather, selected resources have been selected which are good places to start looking for ideas. Clearly this list is based only on personal opinion and the author assumes full responsibility for the contents. These good practices are divided into 12 major categories:

I. Analytical Resources
II. Course Resources
III. Data
IV. Departmental Commitment
V. Field Trips
VI. Handouts
VII. Homework and Laboratory Exercises
VIII. Image Collections
IX. Learning Resources
X. On-Line Geoscience Courses
XI. Resource MateriaIs
XII. Student Projects

As of November, 1999 more than 2,200 resources have been reviewed. All of these are housed in an Internet-accessible database at: 129.7.49.48/FMPPro?-DB=totalanon.fp4&-Format=anonfind.html&-View

A resource in one of the 12 broad categories given above is placed in one of 31 self-explanatory discipline-based subcategories - such as earth system science, physical geology, oceanography and so on. Thus, the user could request all homework exercises that relate to oceanography or all images that include information relevant to physical geology. The web pages that are produced are generated by the FileMakerPro database which has proven to be an extremely effective way to manage a growing set of information. This project will evolve based on the needs of the users.

THE POTENTIAL OF THE INTERNET FOR DISTRIBUTED LEARNING

As noted above, the Internet seems ideal as a mechanism for distributing information. How is information transformed into knowledge and knowledge into learning? The Internet may help with the "distribution" in the Distributed Learning model but what about the "learning" in the Distributed Learning model?

At onetime or another a professor or teacher has probably been asked to write the learning outcomes that he or she expects for a course. How do the instructor, the institution, the general public or even the students themselves know what has been learned? How can one measure the effectiveness of the course of study? What can the learner do with information gained? Can new knowledge be created? Can problems be both solved and recognized?
The lecture-driven model can be passive for both instructor and learner. Recall that the from my mouth, to your ear, to your hand, to your paper mode of instruction does not necessarily involve either your brain or mine. A student can attend a lecture and do absolutely nothing and the professor will drone on and on. The sad aspect is that the student may truly expect something mystical to happen and is truly frustrated when it does not. A lecture interrupted by an opportunity to challenge the learners or an opportunity to solve a problem, however, may be much more effective. Providing an environment where everyone plays an active role seems to be a critical element in Distributed Learning.

Education is something that you do; it’s not something that happens to you. Fitzgerald (1999) argues that learning is primarily a social experience. Students learn from each other as well as from the faculty but sometimes the roles reverse and the instructor becomes the learner and the learner becomes the instructor. Sometimes they learn by themselves. Sometimes they learn in a classroom. Sometimes they learn from their home or workplace. Can the Internet accommodate the diverse needs of such multilocational learners?

Thus, there are several components of a distributed learning model. There needs to be access to information. There needs to be a way to communicate - faculty to students, students to faculty and students to students. There needs to be a way to allow the student to learn by doing. There needs to be a way to engage the learner in gathering, interpreting and synthesizing information. There needs to be a mechanism for the tutor/instructor to periodically evaluate the learner and provide feedback leading to improvement.

The ability of the Internet to distribute information has been discussed previously and will be assumed to be widely acknowledged. In the remainder of this manuscript the other components will be briefly touched upon.

**THE INTERNET FACILITATES COMMUNICATION**

Threaded discussion groups have become popular mechanisms for facilitating written discussions. E-mail by itself seems to offer a “safe” form of communication between a tutor/instructor and a learner. I have had at least a ten fold increase in questions and comments using e-mail as compared to my offers to entertain questions in class or in my office. E-mail, however, is a directed form of communication and unless either I or the learner offers to share our conversations, no one else can benefit. Of course, some communications may need to be directed but totally restricting communication can deny learners (and the tutor/instructor) an opportunity to learn by overhearing. Listservs are essentially a mailing list in which a subscriber can communicate with all subscribers. Careful filling out the subject line allows following a complete discussion that includes many contributors. I will use such a list serve in the spring semester 2000 with an online course in Physical Geology. The list will be limited to the students in the class and will be available on the Internet to facilitate both following and contributing to discussions.

listserv.uh.edu/cgi-bin/wa?AI=ind9911&L=virtualcoffeeroom is an example of a threaded discussion group designed for geology instructors.

Colleagues who have tried discussion groups often complain that the students do not take advantage of the service spontaneously. Only if the instructor “grades” the contributions will the student participate. I have found that faculty are also reluctant to use listserv for discussion purposes. Project Sisyphus www.uh.edu/~jbutler/anon/projectssisyphus.html is an attempt to promote discussions of learning among about 200 geoscience faculty around the world. Most subscribers adopt a passive role in which they may read the comments but rarely, if ever, add their own contributions.

Perhaps this generation of instructors and learners have “forgotten” how to communicate in written form. This is an area where technology advances can provide opportunities in the future that are barely imaginable today.

**THE INTERNET PROVIDES FOR ACTIVE EXPLORATION**

The “what if game” can be a valuable component in distributed learning. Given a particular model or situation, what will happen if something changes. Allowing the learner to play an active role in this game offers a number positive benefits. First, the learner can self-assess his or her understanding of the topic. Second, the learner can begin to expand the model or situation as new topics are introduced. Many of today’s learners are visually oriented and interactive java applets are ideal for playing the what if game.

For example, the interactive gravity modeling applet, www.mines.edu/fs_home/tboyd/GP311/MODULES/GravityDESIGN/GravityForwardJava.html that is part of the Exploration Geophysics course at the Colorado School of Mines http://www.mines.edu/fs_home/tboyd/GP311/computes the gravity anomaly associated with a tunnel. The user can specify the tunnel fill (air or water, for example), its width, depth and diameter. What happens to the gravity anomaly if the tunnel depth is increased from 20 to 40 feet? The learner could be encouraged to respond to the question prior to running the new model or allowed to experiment with the model. At the end of the experiment phase the tutor could ask the learner to summarize the results of the set of experiments in written form. These could be sent electronically to the tutor who can assess and advise the learner and the process continues to the next phase.

**THE INTERNET CAN BE USED TO ENHANCE LEARNING BY DOING**

I have replaced more or less independent weekly homework exercises with two projects. Each project last about
2 months and consists of data gathering, interpretation, synthesis and written summarization. www.uh.edu/~jbutler/physical/projectii.html

The setting of the project is as follows. You are the Director of the Convention Bureau in San Diego, California. The mayor has asked you to prepare a statement to be sent to prospective clients who are wondering if they should plan a major event. The statement should be approximately 1000 words and include the following:

1. A brief statement on the geologic setting of this coastal city;
2. A summary of past, present and predicted level of earthquake activity in southern California;
3. A rational analysis of the probability of a magnitude 4.5 earthquake in the vicinity of San Diego;
4. Preparations that the city has undertaken to minimize risk;
5. Include 2 Figures from your work to illustrate your publication.

Note that there are two check points during the 8 week time period of the project. Students submit the results of specific exercises and begin to develop the framework of the project. These will be sent to the tutor/instructor by e-mail and will receive an assessment of their work to date and suggestions for the remainder of the project.

Internet-based projects involve the components of the Distributed Learning model as defined by Fitzgerald (1999 and I await an assessment of accomplishments when the course is offered in the spring semester of 2,000.

SUMMARY

Components of the Distributed Learning Environment include:
(1) the dissemination of information,
(2) a means of communication - both directed and group,
(3) a mechanism to insure that both the tutor/instructor and the learner are actively involved in the process, and
(4) a mechanism that provides for timely assessment throughout the process.

Personal experimentation to date suggests that Internet-based resources and other multimedia technologies offer the potential to create and sustain a Distributed Learning Environment. I look forward to the results of my own experiments as well as those of colleagues around the world.

REFERENCES