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EDITORIAL

The integration of telecommunications and computers for educational purposes provides institutions with powerful tools not only for delivering courses to distant students but for enhancing classroom learning. There is a growing interest among administrators and individual faculty members for developing online courses. These new communications technologies present challenges for teachers and course designers in the presentation and distribution of online materials as well as in the development of dialogue between teachers and learners and among learners.

In this issue of DEOSNEWS, Morten Flate Paulsen presents a framework for an online teaching system. He discusses the elements within the system environment and examines the teaching process and how the elements are related. The framework provides a guide for improving online teaching. This article is based on the doctoral thesis Mr. Paulsen is developing on teaching techniques for computer-mediated communication. As part of his thesis, he is conducting an international survey of teachers who have online teaching experience. If you are interested in taking part in this survey, please refer to the note at the end of the text of this article.

THE ONLINE TEACHING SYSTEM

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INTRODUCTION

This paper establishes a theoretical framework for online teaching systems that identifies elements of importance to the online teaching process and explains how these elements are related. The system environment is discussed with regard to constraints, demands, and choices. Within this environment, teaching methods, teaching devices, teaching techniques, and teacher functions are introduced together with learners, teachers, course content, and learning resources as presented below in a representation of figure 1.

Teacher functions

TEACHER(S)

Methods Techniques Devices

LEARNER

LEARNER LEARNER

Learning resources Course content

Figure 1. Model of an Online Teaching System

The students are central in this model. The learning resources, the course content, and the teachers are at their disposal. To facilitate learning, the teachers have teaching methods, teaching techniques, and teaching devices at their disposal. Among the components presented in the model, the most pivotal for this article are the teacher, the teacher functions, and the teacher application of methods, techniques, and devices. Each of the components is, however, discussed in the following paragraphs.

THE SYSTEM ENVIRONMENT

Teaching takes place in a system environment where choices define the teaching context. Focusing on adult education, Donaldson discussed the environment in view of constraints, demands, and choices. He argued that program administrators should seek to ". . . push back constraints, and work to have demands relaxed, thereby increasing the quantity, improving the quality, and expanding the types of choices available to them" (Donaldson 1990, 11).

Constraints

There are many constraints that limit the opportunities for online utilization. Among these are the type of institution, geographical issues, equipment, resources, course time frame, course workload, communication pattern, and the financial health of the program provider. The program must comply with the rules, regulations, and policies of the institution, and these may vary considerably from a private to a public institution and from secondary education to universities. A program is often confined to a certain geographical area such as a campus, a community, a state, or a nation. With regard to online programs, these restrictions are more often due to policies and legislation than to technical limitations. Lack of computer resources, such as hardware, software, and communication networks, is, however, an important limitation for many online programs. The institution's time tables could pose several restrictions on an online course. It is not always convenient for an online course to follow a university semester or term plan. Similarly, requirements of a weekly course load could constrain a program. Some institutions may also require some sort of synchronous communication that further constrains a program.

Demands

National legislation and parent organizations form policies and procedures that cannot be ignored. There are demands for flexible learning, quality programming, and healthy finances. Employers may have changing expectations regarding technology-based learning, and students may have changing learning preferences as they begin to have experience with online courses in non-instructional environments. Further, the local community, faculty, staff, and students all have demands on the program. These demands may, of course, be more or less rigid, but together they are an important element of the system environment.

Choices

The choices define the context in which the teaching takes place and set the premise for instructional

design and teaching techniques. Baath (1983, 272) identifies five factors to be considered in distance education courses:

Course budget

Course accreditation

Single mode or mixed mode course

Subject nature

Target group's age and educational level

Harasim et al. (1995, 141) state that designing "an online educational environment involves structuring conferencing by type of task, size of group, duration of task, and scheduling of task." Building on Baath's factors and Harasim's design issues, this study suggests that the choices presented and discussed in Table 1 below are crucial to the teaching context.

Table 1. Choices to be Made in Teaching Systems

Choice of target group (age and educational level)

Choice of subject nature (subject area and accreditation type)

Choice of enrollment scale (small scale or large scale student group)

Choice of study location (home, school, work)

Choice of communication mode (synchronous or asynchronous communication)

Choice of scheduling (start-up and pacing flexibility)

Choice of media (single mode or mixed mode course)

Choice of Target Group. The use of teaching techniques may depend on the program's actual target group. Important target group characteristics are age, educational level, and student aptitude. The target group could be on primary level, secondary level, undergraduate level, graduate level, training level, and professional development or continuing education level. With regard to student aptitude, the group's knowledge, motivation, financial status, and experience with computer-mediated communication (CMC) and computers may vary considerably.

Choice of Subject Nature. Important aspects of the subject nature include the program discipline and subjects, such as science, arts, or business related subjects. Of further importance to the program objectives is the formal character of the program; it may be a diploma course, a credit course, a vocational course, or a purely informational program.

Choice of Enrollment Scale. The group size may vary from one to more than one thousand participants, but very few online courses have more than fifty participants. Thus far, we have very

limited knowledge about how computer conferencing can be applied to mass education. We know, however, that computer conferencing systems can handle thousands of users.

Peters' (1983) applications of industrial theory led him to conclude that the structure of distance teaching is determined, to a considerable degree, by the principles of industrialization, particularly those of rationalization, division of labor, and mass production; the teaching process is gradually restructured through increasing mechanization and mass production. At first sight, the theory of industrialization does not seem to apply to computer conferencing. Bates (1991) states:

"Third generation technologies (computer conferencing) are particularly valuable where relatively small numbers of students are concerned, since they avoid the high fixed production costs of the industrial model, but they do not however bring the economies of scale of the industrial model, unless the opportunities for interaction for an individual student are dramatically curtailed" (p. 13).

Choice of Study Location. The first of Keegan's (1988, 30) major elements for defining distance education deals with the separation of teacher and learner. This separation does not necessarily imply much freedom of study location. Many distance education programs, for instance those taught by videoconferencing, require students to attend classes at fixed locations. Further, Keegan concludes that distance education may include occasional face-to-face meetings. Distance education programs may allow students to choose where they want to study. Some students may want to meet in a classroom with their peers, while others prefer to study at home, at work, or wherever a busy life situates them.

Choice of Communication Mode. In computer-mediated communication (CMC), one must distinguish between synchronous and asynchronous communication. In asynchronous communication, the message is stored in the communication medium until the receivers find a convenient time to retrieve it. Synchronous communication, on the other hand, is inflexible with regard to time, but allows people to communicate in real time, as they do face-to-face or on the telephone. Scheduling of synchronous communication varies in flexibility. For example, a telephone conversation can be initiated without any prior schedule, but a videoconference must often be scheduled months in advance.

Distance education programs may allow students to communicate whenever it is convenient for them. Students may prefer to study during the weekends, after their children have gone to bed, during regular work hours, or whenever they have time available.

CMC could be completely independent of time. Ideally, it is available twenty-four hours a day, 365 days a year. It gives instantaneous access to information whenever it is convenient for the user, and there is no need to synchronize the operation among communication partners.

Choice of Scheduling. Pacing implies meeting deadlines for starting a course, for examinations, and for assignments. Deadlines, however, can be flexible or rigid. They are flexible when students can set the deadlines or select one of several deadlines. One example of extreme pacing flexibility is seen in correspondence courses that allow students to start and finish at any time. A more moderately flexible example is a course with multiple starting dates that allow students to enroll at a convenient time. Shale (1987, 32) asserts that ". . . standardized treatments [of pacing] could be applied to all students on an individual basis." He also suggests possible justifications for rigid pacing:

To make the administration of a distance-learning system tractable,

To express a commitment to a collectivist philosophy,

To guarantee the credibility of examinations,

To enhance student motivation through group activity, and

To avoid procrastination. (Shale 1987)

Based on a study of students who took the same course, either by correspondence or by computer conferencing, Rekkedal concludes that "the correspondence students consider individual pace of study to constitute a large advantage of correspondence studies, while the EKKO [computer conferencing] students give more varied viewpoints" (Rekkedal 1990, 91).

A distance education program could allow students to choose the pacing they prefer. If they resent rigid pacing, they should be allowed to spend the time they require to complete a course. Other students would like to choose when to start a course and how fast to progress in it.

Wells (1992) identifies three pacing techniques available with CMC. The first technique is group assignments that urge coherent pacing within groups. The second is gating, a technique that denies a student access to information before he or she has completed all prerequisite assignments. The third technique is limited time access to services such as conferences, databases, and guest speakers.

The previous discussion shows that computer conferencing courses can be paced to a greater or lesser extent. Meaningful group communications -- perhaps computer conferencing's major advantage -- may, however, be hard to accomplish in an unpaced mode.

Choice of Media. Distance education programs could provide students with access to several media or sources of information: print, video, face-to-face meetings, computer conferencing, etc. This approach will support different learning styles and prevent exclusion of students lacking access to or knowledge of high technology media. CMC can easily and favorably be supplemented by or integrated with textbooks, audio and video conferences, computer-aided instruction, etc. To some extent, the decision about how much a course should rely on CMC for communication and content delivery is an administrative one.

LEARNERS

In discussing the learner's perspective, Mason and Kaye (1990, 25) argue that ". . . growth toward autonomy and self-directedness in learning can be radically enhanced by CMC." On the other hand, Houle (1984) states that education is a cooperative rather than an operative art: it implies voluntary interaction among individuals during learning. Even solitary students guiding their own programs without the help of an instructor seek help and encouragement from others. In a social setting, those who take part in an educational activity should have some sense of collaboration in both planning and implementation:

"At one extreme, this sharing is so complete that it requires a group to decide everything that it does

together. At the other extreme, the sharing may be implicit in the teaching-learning situation, as when many people flock to hear a lecturer. Those who attend vote with their feet, as the saying goes, and one cannot assume from their physical passivity and silence as they sit in the auditorium that they are not cooperating fully in their instruction" (Houle 1984, 45).

Cooperation can be hard to achieve in distance education. A major problem for many students is the loneliness that results from limited access to student peers; the urge for individual freedom may intensify the problem. However, group communication technologies such as audioconferencing, videoconferencing, and computer conferencing have been devised to facilitate cooperation at a distance.

Many students have full-time jobs and families to take care of and many are reluctant to participate if it means relinquishing high-quality family life and job achievements. They need flexible education -- education that allows them to combine job, family, and education in a manageable way.

It might be said that one person's freedom ends where another's begins, that one person's freedom to act infringes on the freedom of another. As Burge (1991) points out in relation to computer conferencing, "One person's time flexibility is another's time delay." The truth of this statement is hard to refute, but such negative consequences could be mitigated by reducing dependence on individual students and instructors. Co-teaching, for instance, could reduce the response time, since several teachers can access the system more often than one teacher can.

COURSE CONTENT

To date, relatively little pre-produced course material is developed for online courses. Even though more and more content is developed for the World Wide Web (WWW), much of the content material is adapted from existing face-to-face or correspondence courses. More work must be done in the future to produce tailor-made material for online courses. Information technology allows the course content to be distributed and presented via CMC. Distribution via the WWW could be cheaper and more efficient than shipping course packages by land mail. Further, the Web provides hypermedia and multimedia aspects that could give easy access to external resources and enhance learning.

The course content could be developed by a course designer or by the teacher. Either way, it is considered as proactive workload, and one may assume that the course design will be of importance to the interactive teacher workload. Of special interest to this study are student assignments. The assignments are important tools to introduce the chosen teaching techniques. In presenting the assignment, the course designer or the teacher could explain whether the assignment, for example, is a search of online databases, an e-mail based correspondence study assignment, a case study, or an online debate.

LEARNING RESOURCES

Every program that is offered online provides access to online learning resources. The resources are more or less judiciously provided to support the educational process. The online resources available could be internal, provided by the institution, or external, made available through other institutions. Whether internal or external, these resources could include people, information, and applications.

People

Millions of individual experts and thousands of online interest groups are reachable via external CMC networks. They constitute a tremendous resource for lifelong learning. Individual experts can be consulted and interviewed via e-mail. An online interest group (OIG) is a group of people with a common interest who convene via CMC. There are thousands of OIGs that can be accessed via international CMC networks, and it can be argued that they all have some sort of educational purpose. In the early nineties, Howse (1992) stated that more than 1,000 scholarly lists were distributed via Listserv on the Internet and that over 1,000 international news groups, carrying more than 250,000 items every day, could be accessed at Murdoch University in Australia. Internally, the institution could choose to provide access to local conferences and individual teachers, peer students, and support staff.

Information

A growing number of databases and electronic journals are available through external CMC networks. World Wide Web documents, catalogues, and search engines are growing rapidly in numbers. Online information probably covers most of the subjects that are taught in online courses. Online databases are organized collections of data that can be accessed via CMC. Utilizing these external resources, a course provider could maintain local databases or information services of relevance to the course. An easier solution, though, could be to provide links to external Web services or access to international databases. Online journals are periodicals that are distributed via CMC networks. They are increasingly important resources for information and learning. Supporting this statement, Strangelove (1992), in the early nineties, compiled a directory of about thirty-five electronic journals and ninety newsletters that were available via the Internet. Since then, the numbers have exploded. Local bulletin boards could be used to redistribute online journals as well as other local informa-tion.

Applications

An enormous number of software applications are available via external and internal CMC networks. Online applications are software programs that can be executed on a remote computer via a computer network. They include a range of applications from software development tools via specific applications for statistics and economic analysis to computer-aided instruction applications. Java applications that allow users to run remote software applications via their Web-browser have gained popularity and have an interesting educational potential. A related, but slightly different, approach is to establish a software library that allows remote users to download software applications from a host computer so that they can later execute the programs on local microcomputers. Such files are available from a number of host computers. The Internet provides a standardized file transfer protocol (FTP) for this purpose and a large number of PC based bulletin board systems have software exchange as their main service.

CMC TEACHERS AND THEIR FUNCTIONS

This section introduces teaching functions from both the teaching theory perspective and the teaching activity perspective.

The Teaching Theory Perspective. The way in which teachers conduct their teaching functions is

influenced by their philosophical orientation and theoretical position toward education. In discussing adult education philosophies, Zinn (1991) argued that a teacher's philosophy of education may be unrecognized, inconsistent, and only partially formulated, but that it still provides a basis for the teacher's facilitation of learning. She further distinguished among liberal, behaviorist, progressive, humanistic, and radical philosophies. These and other philosophies in adult education are presented in selected writings edited by Merriam (1984) and Jarvis (1987). With regard to distance education, Keegan (1988) identified three theoretical positions: theories of autonomy and independence, theories of industrialization, and theories of interaction and communication. In discussing these theoretical positions, Paulsen (1992) presented "The Theory on Cooperative Freedom," which is a first attempt to establish a distance education theory attuned to CMC. In summary, teachers will perceive their function in educational CMC in light of their basic theories and philosophies toward education.

The Teaching Activity Perspective. Mason (1991) identified three role functions that computer conferencing moderators must possess. Based on a literature review, Mason (1991) stated that "The advice on tutoring skills for educational computer conferencing falls generally into three categories: organisational, social, and intellectual." She mentioned, as examples of these three categories of teacher functions, respectively: to set the agenda for the conference, to create a friendly environment for learning, and to focus discussion on crucial points. In this paper, assessment is regarded as such an important teaching function that it is viewed as an additional fourth category.

Teaching Methods

Verner (1964, 36) distinguished between individual methods and group methods of teaching. Applied to CMC, one often encounters a more detailed classification of methods. Harasim (1989) distinguished among one-to-one, one-to-many, and many-to-many learning approaches. This author suggests that Harasim's classification should be supplemented with the one-online learning approach to support the four communication paradigms often used in CMC. These paradigms include information retrieval, electronic mail, bulletin boards, and computer conferencing; a classification derived from Rapaport's (1991) book. In this paper, the framework comprises the four methods: one-online, one-to-one, one-to-many, and many-to-many.

Teaching Techniques

A pedagogical technique is a manner of accomplishing teaching objectives. The techniques introduced here are organized according to the four communication paradigms used in computer-mediated communication. The foregoing considerations result in a framework of four methods and a number of techniques (see Table 3). First, the techniques classified as one-online (e.g., search of online databases) are characterized by retrieval of information from online resources and the fact that a student can perform the learning task without communication with the teacher or other students. Second, the techniques classified as one-to-one (e.g., e-mail based correspondence studies) can be conducted via e-mail applications. Third, the techniques discussed as one-to-many (e.g., publication of a lecture) will typically be conducted via the WWW, bulletin boards, or distribution lists for e-mail. Finally, the techniques presented as many-to-many (e.g., debates) can be organized within computer conferencing systems, bulletin board systems, or distribution lists for e-mail.

Teaching Devices

Verner (1964, 37) refers to "various mechanical instruments, audio-visual aids, physical arrangements, and materials" as devices that can enhance the effectiveness of an adult education process. Verner states, however, that television could be regarded as a device when used in a classroom and as a method when it is the primary medium used in a distance education setting. From this, one may argue that CMC could be regarded as both device and method. In this paper, however, CMC is viewed from the device perspective.

Using the CMC-classification derived from Rapaport (1991), there are four major CMC-devices: information retrieval systems, electronic mail systems, bulletin board systems, and computer conferencing systems. These four CMC devices correspond primary to the four methods: one-online, one-to-one, one-to-many, and many-to-many.

Building on these foundations, the framework established for the CMC-based teaching system is illustrated in the representation of Table 3.

Table 3. Framework for Teaching Methods, Devices, Techniques, and Functions

Teaching Methods - Teaching Techniques - Teaching Devices

One-online - e.g. Search Online Databases - Info. Retrieval Sys.

One-to-one - e.g. E-mail based Corres. Studies - E-mail Sys.

One-to-many - e.g. Publication of Lecture - Bulletin Board Sys.

Many-to-many - e.g. Online Debates - Computer Conf. Sys.

Teaching Functions

Organizational - e.g. To set the agenda for the conference

Social - e.g. To create a friendly environment for learning

Intellectual - e.g. To focus discussion on crucial points

Assessment - e.g. To assess multiple choice assignments

Note: A detailed discussion of these techniques is available at http://www.hs.nki.no/~morten /cmcped.htm

In "The Online Report on Pedagogical Techniques for Computer-mediated Communication" (Paulsen 1995).

CONCLUSION

This paper establishes a theoretical framework for online teaching systems that identifies elements of importance to the online teaching process and explains how they are related. It is this author's contention that course designers and teachers should be able to provide better online education by

applying all of these elements together in a holistic system.

NOTE

As a part of Morten Flate Paulsen's doctoral thesis on "Teaching Techniques for Computer-mediated Communication" at The Pennsylvania State University, he is conducting an international survey of teachers who have experience with online teaching. More than 100 teachers from about 20 countries have already taken part in the survey.

If you answer his web-based questionnaire, you will receive a password to his "Forum for Online Teachers," a web-based discussion forum for online teachers.

Both the questionnaire and the "Forum for Online teachers" are available via:

http://home.nettskolen.nki.no/~morten/cmcped/

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