

# Technology's Role in Distance Education

**Murray Turoff**

*New Jersey Institute of Technology, USA*

**Caroline Howard**

*Touro University International, USA*

**Richard Discenza**

*University of Colorado at Colorado Springs, USA*

## INTRODUCTION

Learning is enhanced by the physical and social technologies typically used in distance education. Students in distance programs typically have access to tools that allow them to repeat lectures and interact with their fellow students and faculty. Students in all classes, including face-to-face and blended courses, benefit from having similar tools and technologies available. This article will review common tools and technologies used in distance education, and demonstrate why they can facilitate learning and expand the educational opportunities for both distant and traditional students.

## BACKGROUND

For many years technologies have been used to facilitate learning. In the early 1980s a group of researchers at the New Jersey Institute of Technology (NJIT) realized the enormous potential of the technology to enhance learning when they used a computer-mediated system to facilitate a regular face-to-face class. The system was introduced to students in a number of Computer Science and Information System courses. Due to the amount of material covered in lectures, there was not much time for dialogue, and only a few students participated when there was a class discussion. The instructors introduced asynchronous group communication technologies to communicate discussion questions and assigned grade point credits for student participation. One hundred percent of the students participated in these discussions outside of regular classroom hours. The extent and depth of the discussions changed the nature of the classes. Most importantly, student contributions were comprehensive, with more well-thought-out comments, because students had the time to reflect on the ongoing discussion before participating. Also very significant was that students, for whom English was a second language, became equal

participants. They could reread the online discussion as many times as needed before replying. The computer-based activity monitoring and transcripts, electronic recordings of the discussions, showed that foreign students spent two to three times more time in a reading mode and reread many discussions, far more than the American students.

In addition, professors now have the ability to monitor activities and review the electronic transcripts of student involvement which gives the instructor insights into how students are learning. By reviewing the transcripts of the online discussions, it becomes obvious what and how students are learning. For courses with a high pragmatic content, such as upper-level and graduate courses in topics like the design and management of computer applications, students are required to utilize problem-solving approaches to evaluate the tradeoffs between conflicting objectives. In a traditional classroom environment, especially in large classes, it is very difficult to detect whether students are accurately incorporating the problem-solving mental models that the instructor is attempting to convey. When instructors review the transcripts of class discussions, they give insights into the approaches students are taking to master the material. Unfortunately, in the early 1980s few wanted to hear about a revolution in normal classroom teaching or were willing to expend the effort to dramatically improve classroom education. It was only the rise of distance education that generated interest in learning about the educational potential of the technology.

Hiltz (1994) performed quasi-experimental studies that compared a population of NJIT students (only familiar with face-to-face classroom education) to a population of students taking the same courses in pure face-to-face sections, with pure distance sections using only CMC technology. The students in the matched sections had the same material, the same assignments, the same exams, and the same instructor. They found no significant difference in the amount of learning or the rate of student satisfaction. This finding is much more significant than a determi-

nation based on a study that included a population of distance learners already familiar with traditional correspondence classes.

Two critical underlying variables driving the success of this approach were identified by Hiltz (1994). First, the role the instructor needed to take was different from the traditional classroom role. The instructor acted more as an active and dedicated facilitator, as well as a consulting expert on the content of the course, rather than traditional teacher. Second, collaborative learning and student teamwork were the educational methodology (Hiltz, 1994) shown in later studies to be a key factor in making distance courses as good as or better than face-to-face courses (Hiltz & Wellman, 1997). These results show that distance courses can be as effective as face-to-face courses when using any of the traditional measures, such as exams and grades.

Creative, interactive software programs accompanied by background tutoring can effectively teach students to master the skills currently taught in many undergraduate courses. When these courses are automated, the costs incurred are far below typical college tuition. In the future, colleges and universities will not be able to continue to charge current tuition costs for introductory courses that are largely skill oriented. For example, there are many stand-alone and Web-based software programs that offer introductory programming courses, as well as skills in many other areas. These courses are comparable to college courses and some are even based upon a textbook used on some college campuses. They are available for a few hundred dollars. The major difference is that they do not carry college credits.

The technology allows senior professors or department chairs to effectively evaluate and mentor all instructors of particular courses, whether they are teaching traditional classroom courses or distance courses. The ability to review whole class discussions after the class is over gives senior faculty the ability to evaluate distance instructors hired to teach previously developed courses, as well as to review on-site instructors and junior faculty. Thus, they can improve and extend their mentorship and apprenticeship relationships.

Today's technology for distance education allows faculty members to live anywhere they want to. Unique benefits will be available to outstanding teaching faculty. For example, one of the best full-time instructors for NJIT, which is located in beautiful downtown Newark, is a mother with two small children who never has to be on campus. She is teaching other instructors how to teach remotely. Similarly, a University of Colorado accounting professor, on sabbatical in Thailand, is able to teach a course in the Distance MBA program. There have been a few master's programs where some or all of the instructors

are located anywhere in the world. It is technically feasible for those wanting to escape winter cold to teach in places such as Hawaii that we could only dream about. The technology makes it feasible, but various administrative policies, unions, insurance companies, benefit programs, and so forth have not yet caught up to the technology. There is increasing emphasis by accrediting agencies on treating remote instructors the same as faculty are treated. This is likely to bring about a greater degree of equality between instructors and tenured track faculty. The outcome is uncertain, but it may mean that the costs for remote and traditional classes will equalize so that the profit margin in online classes will not be quite so high.

## **SPECIFIC FUNCTIONS OF TECHNOLOGY THAT FACILITATE LEARNING**

### **Asynchronous Discussions**

In the online environment, students can take as much time as they need to reflect on a discussion and polish their comments. This improves the quality of the discussion, and changes the psychology and the sociology of communications. Students can address topics in the sequence they choose rather than in a predefined order. This leads to the development of different problem-solving strategies among the individual members of the class. Sometimes courses include synchronous conferences, videoconferencing, and/or video presentations to supplement asynchronous discussions.

### **Instructor Control of Online Conference and Roles**

With online course conferences (many per course), instructors control the membership of each, assign roles, and enable other instructors to monitor conferences for joint teaching exercises involving more than one course. Groups within courses are able to set up private online conferences for team and collaborative work group assignments. Joint editing of items facilitates teamwork.

### **Question-and-Answer Communication Protocol**

Instructors are able to ask questions during discussions. They can control who views the answer and prevent other students from seeing the answer of the others or engaging in the resulting discussion until they have entered their answer. In studies of Group Decision Support Systems, it

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