

Effective Educational Delivery Tools Using Multimedia and Distance Learning

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Abstract

Distance learning, or the delivery of educational programming to remote sites, has recently come in vogue again as a hot topic, although it is far from being a new subject. There are many world remote areas and sites consisting of a single individual, a whole classroom, or a corporate training center. Existing delivery methods are the Internet and the World Wide Web (WWW), emails, hardcopy documents, disks, CD's, teleconferencing and desktop videoconferencing, and mailing of videotaped or audiotaped classes to off-campus students. This paper presents existing educational delivery methods at various institutions using various educational delivery tools effective to people who work full time or having no access to large institutions offering the courses they need to enhance their education.

I. Introduction

A young professional engineer who has been in the work place for two years and has a bachelor degree now finds that he needs a master's degree for career advancement. He doesn't want to leave his employment to enroll in a two-year master's program and his work schedule includes evening and weekend hours, making it difficult to work full time and participate in a traditional degree program. Distance learning allows him to complete a degree program, whether from a local university or an institution anywhere in the world. For earlier generations, typical audiences of distance education were adults often seeking advanced education and training at home, or on the job, or people whose physical circumstances prevented attendance at a traditional institution. Now, anyone of us is potentially a distance learner. The concept is the same as earlier on, but the idea is successfully spreading to reach further than handicapped people. The increase of interest is related to a student population that is increasing in age and has increasing off-campus demands on students' schedule. The main reasons for this success today are probably the rapid development of the multimedia, with mainly, the Internet, and the need for such a practical, cost-effective, convenient, and "fast" method of education. In order to create a successful remote education solution, universities need to consider the needs of students such as interactivity, instructional feedback, elimination of time constraints, and motivation.

II. Course delivery using multimedia

Multimedia application can enhance students' learning. Active learning indicates what percentage we remember: 1) 10% of what we read, 2) 20% of what we hear, 3) 30% of what we see, 4) 50% of what we hear and see, 4) 70% of what we say and 5) 90% of what we both say and do ¹.

The application of multimedia in a live classroom setup expedites the course delivery which allows time to interact with students and opportunity to hear what they say, question-answer sessions and also for them to see what is said in class ². Ferguson used multimedia resources through example problems pointing the demonstration of complex engineering concepts and mathematical equations. He uses sine and cosine series by computer graphical presentation depicting complex vibro acoustic measurements and plate theory. He uses multimedia environment which allowed the whole class, including those involved in distance learning to observe how interactive environment enhance learning ³. This may fit in that 50% of what we hear and see concept of active learning. We need to enhance the process to 90% of what we both say and do.

2.1. The Internet and the World Wide Web (WWW)

Educational uses of the Internet are burgeoning. At any time, learners may access to the site and download or use online the electronically stored information. Advantages of delivering distance learning on the Internet include the following: time and place flexibility, number of people reached and potential to reach a global audience, ease of use and of updating of content, expanding range of applications, extensive information resources, and lower development and operating costs. Some disadvantages are limited bandwidth and slow modems that hamper delivery of sound, video and graphics ⁴. However, these limitations will certainly vanish with improving technologies.

Distance learning on the Internet usually takes one of the following forms: electronic mail (for delivery of course materials, sending in assignments, getting/giving feedback, using a course listserv, i.e., electronic discussion group), bulletin boards/newsgroups (for discussion of special topics), downloading of course materials or tutorials, interactive tutorials on the web, real-time interactive conferencing (using Multiuser Object Oriented (MOO) systems or Internet Relay Chat (IRC)), "intranets" (corporate websites protected from outside access), or informatics (use of online databases, gopher, websites, and library catalogs) ⁴. Emails could be used to send graphic and textual information to learners, receive information from learners, and communicate with a personal tutor. Email, voice mail and faxmail are simple tools that may not be sufficient if used alone, but they may be very effective in providing materials and communicating with learners if combined to other more advanced tools.

2.2. Teleconferencing and desktop videoconferencing

Teleconferencing and desktop videoconferencing may not be the most popular forms of distance learning yet, but they are becoming increasingly common. Broadcasts are the most common forms of teleconferencing today, but software and hardware have made desktop videoconferencing possible and increasingly more affordable and user-friendly. As more software becomes available to assist educators/trainers and learners in conferencing "face-to-face" via computers and telephonic technology, this option should become more popular. Furthermore, it creates a sense of community and allows more personal interaction among participants ⁵. A videoconference or teleconference can be used by individuals or groups of learners for a discussion or forum and enables them to see the presentation of educational or

training materials in real time. A session can bring groups together to share materials gathered earlier in the course or to discuss projects they may have completed individually.

Teleconferencing refers to either long-distance courses in which the educator/trainer presents information that is uplinked and downlinked, sometimes via satellite, among remote locations, or short-distance courses in which information is presented in a closed "local" system. The technology allows real time interaction, which may be especially effective for some types of instruction (e.g., demonstrations, workshops, discussions) or subject matter⁵. In addition, teleconferences can be video- or audiotaped for later reference or use. People who miss out on a teleconference or who want to review a class session may borrow or buy tapes. Teleconferencing has some limitations to effective viewing and communication as for the number of sites with the available technology or the number of participants that one or a few educators/trainers can work with effectively at one time. But despite those limitations, one educator/trainer still can serve more learners, in widely separated geographic areas via teleconferencing, and create a "real" classroom by "virtually" being in several places at once⁵. The author provides a suitable example as he deals with teleconferencing. He combines both the "real" and the "virtual" classroom, and all learners attending the lecture "virtually" or "really" can interact with him.

Desktop videoconferencing, also known as online classes or electronic seminars, is solidifying as a technology. It encourages exchanges and interactions among individuals as well as with the instructor. Students from diverse backgrounds formed groups and personal relationships interacting altogether. Thus, greater arrays of opinion are encountered in such diversified groups than in a typical classroom. In desktop videoconferencing, the course session is conducted online through personal computers installed at participants' homes or offices. Through a video window on their computer screen, they may share online documents or even send email messages to each other, unlike in a teleconference. The distinctions among participants by race, age, disability, and sometimes gender were imperceptible, or if known, were more easily forgotten in the computer conferencing medium. The students who primarily took distance courses remarked how this new medium suddenly increased the perspectives and relationships they could have during their studies, but unfortunately, online relations were not meant to last, but to fulfill important needs of the moment. Desktop videoconferencing shares several key features as asynchronicity (the ability to be involved in the same online conversations at different times), structured communications, multiple sites, interactivity, text-based environment, group involvement⁵.

The convenience of videoconferencing from a home or office computer and its affordable cost usually make up for the low-end technology in the video or audio quality but this imperfection shall not be a source of worry for a long time as we know that technology is rapidly evolving. Learners don't have to travel to a predetermined site to participate in the teleconference but may use desktop videoconferencing from their home or office. Since videoconferencing does not require reserving a room equipped for broadcasts, videoconferences may be scheduled more quickly⁵.

Various configurations of communication technology are available and they are used in the applications described as follows⁶:

Synchronous mode:

1 way audio	Radio program
2 way audio	Telephone conferences, radio talk show
1 way audio / 1 way video	Television program and video tape distribution

Asynchronous or Virtual Classroom:

2 way audio / 1 way video	Distance learning transmitted over a high quality analog satellite to multiple sites over a vast area
2 way audio / 2 way video	Video conferencing with compressed digital over telephone lines.

III. Active learning

The need for students' active participation as opposed to their passive attendance is the basis for the cooperative learning. In an analysis of 120 studies of cooperative, competitive, it was found that cooperative learning promoted greater individual achievement ¹. Todd lectured on new material in every of his class, but all of the in-class problem solving were performed by the students. The students were assigned to teams of three, and much of their cooperative experience was to take place outside the class as they worked on assigned problems together. This process will work if team members are self-disciplined and when they solve the problem in the class, they should be able to create interaction with students and be able to demonstrate all issues related to the assigned problem. The instructor must also participate in the process to improve the class understanding of the problem and he/she must dramatize key points in the problem to stimulate student interest.

Todd plan was to answer questions related to homework and lecture on the new material. He then formed teams of three or four students in the classroom and assigned a problem for the students to work on until the end of the class period ¹. This method is interesting as long as both instructor and the graduate assistant are working and observing team members' progress and answering any questions they may have. This arrangement may not work in distance learning environment. However, if such arrangements are through the interactive Intercampus or outside campus system, then the instructor can see and hear all of the students at both sites all of the time on television monitors. Students can interact with the instructor, ask any question and receive immediate response. Many campuses are operating this way and constantly improving their existing system. Future technology of such system can be enhanced and instructors can allot time in their office hours through their office PC hear, see, and interact with off-campus and on-campus students on their office PC monitors, see students receive their questions and respond back wherever students' destination are. This arrangement may even provide opportunity for those on-campus students who can not attend the class for some reason or other and they still can participate and receive class lectures at their destination through their personal PC connected to the system. Todd in his combined cooperative and distance learning through intercampus telecommunication found the methods very useful and he believes the process require additional innovation for a better successful outcome ⁷.

The distance learning through personal computer is also important for busy executives who need to be educated in order to meet the ever changing global market competition. Every year, more adults are pursuing formal education programs in spite of full-time employment, marriage, childrearing, and community activity. Some seek degrees, having only limited access to institutional resources because of remoteness or schedule conflicts ⁸.

Particularly with significant changes occurring in the economy, many industry executives need personal development to be educated in advance, since business practices are at an ever increasing rate. United States must compete in the global market, then emphasize on corporate excellence, continuous learning and worker development, essential through distance learning deliverable by high tech communication ².

The author developed 226 pages of class notes for his construction method and management undergraduate senior civil engineering students. The material is HTML-based Internet applications easily accessible by his students. The material is constantly updated and instantly distributed over the Internet. The HTML-based Internet is very efficient and increases the productivity and effectiveness of the multimedia educational material. His classroom setup is such that he connects to Internet immediately upon his arrival to the class and the material are projected on large screen which enables him to retain the attention-span of students and use his time effectively for the question and answers sessions. He opens the dialog with his students on class issues to serve and to stimulate student interest, improve student understanding of course material, and he dramatizes the key points ².

IV. Distance learning challenging the traditional learning system

Universities are faced with a number of major challenges if they will continue to follow the traditional approach in delivering education. They will incur the cost of building new physical infrastructures, such as campuses, dormitories, and libraries and maintaining the existing ones. Another key challenge is the increasing cost of education, as tuition is constantly on the rise. A third problem is the declining interest of some segments of the graduating high school population in obtaining a college education. Hence, universities are forced to compete in order to attract graduating high school students. A fourth problem is the increasing budgetary constraints facing the government at the federal and state levels ⁹. Universities cannot hope to maximize the benefits of automation without attacking those problems through specific distance learning applications.

By implementing distance learning solutions, a greater number of remote classes can be created, giving education providers the opportunity to generate more revenues per teacher or to reduce the tuition per student. Moreover, a university can differentiate itself from other universities by being at the leading edge of technology.

Florida Engineering Educational Delivery System (FEEDS) is an excellent example of offering off-campus engineering courses throughout Florida to full-time engineers working with public, industry and private consulting companies. FEEDS was developed in response to the needs of engineering graduates working in industry for access to quality programs and

extended studies in engineering ¹⁰. FEEDS courses are offered by many Florida universities including University of Florida (UF) and University of Central Florida (UCF). In these institutions, FEEDS courses are held in special studio classrooms equipped with televisions, ELMO (an electronic projector for pictures, newspaper slips, any written material, etc...), electronically connected slide projectors and computer facilities projecting any software generating results including power point presentations, etc... The setup is such that live audience (students) in classroom and other students at remote sites receive the lecture through FEEDS and through live television transmission. Students receiving lectures through live television transmission are able to see the class, the instructor and they interact with both group by asking questions and answers. The remaining students receive videotaped classes by express-mailing. Colorado State University offers videotape-based engineering degree program ⁷.

The course syllabus, handouts, and all course material are regularly delivered through FEEDS to off-campus students. Same textbooks are used, and it is the responsibility of off-campus students to contact university bookstores and order a text copy. The educational standard, course content, homework, assignments, and tests are kept the same and instructors' expectations from off-campus students are the same as on-campus students. The Internet is becoming an attractive tool to many on-campus instructors. For example, instructors incorporate their prepared lecture notes in to the Internet for students to obtain access under the designated course. The instructor can also provide the copy of a course class notes in the college bookstore or through student chapter organizations for a minimum purchase price. The instructor can also deliver his class notes through e-mail to students or through Internet for students to access the class notes. The author uses all methods above and delivers all his graduate and undergraduate classes through FEEDS and Internet. He also communicates with his students through e-mail for homework, questions, his teaching performance, questions on students learning, etc...

Christensen and Barnett at UCF developed an Internet home page for students access to: Syllabus, frequently asked questions, grading policies, assignments, handouts, lecture notes, practice exams, helpful hints, list of links to WWW resources pertinent to the course guides and course student teacher evaluation. They also compared final grade of off-campus to on-campus students and grades were almost the same; an indication of an equal amount of learning. The UCF authors believe that FEEDS can be offered cheaper through Internet ⁷.

Meanwhile, the spectacular growth of the distance learning market is likely to be slowed by a number of teacher-related factors. The first is "technophobia", or teacher's fear of dealing with new technologies. The second is computer illiteracy in a portion of the teacher population. The third is teacher's reluctance to switch from traditional methods of teaching to technology-oriented approaches, a switch that sometimes requires a significant amount of effort. Furthermore, teachers' unions, eager to protect the interests of their members, fear that such growth would result in the reduction of teaching jobs ⁹.

V. Conclusion

Course delivery using effective tools such as multimedia and electronic communication will enhance students' learning on-campus and off-campus. The HTML-based Internet applications are effective tools that can be used to both on-campus and off-campus students. The Internet and the World Wide Web are burgeoning. Advantages of such system are many and to mention a few will include mainly time savings and place flexibility. Putting the material on CD's and videotapes to be delivered to remote areas are also effective tools. Education can be delivered long distance to remote areas, homes, corporate offices, and specifically to a global audience. Teleconferencing and desktop videoconferencing as an aid for online classes or electronic seminars are also solidifying as a technology. Those two methods of educational delivery do not require traveling to a central location, but many would rather stay at their homes or offices. Interactions among students and instructors can be accomplished among diverse groups exchanging points and counter-points. These methods offer to participants active learning which enables them to retain 90% of what they learned. Teaching/learning is a continuous process and one needs to be very creative and must use innovative practices in course design. The computer technology must be enhanced to the point that videoconferences are offered more economically to remote areas where a PC can be connected to any classroom setup and individuals could receive and interact constantly with both the instructors and live audiences. Distance learning is seriously challenging the traditional teaching/learning system. It is envisioned that in the next decade there will be a significant expansion in the distance learning education at a global level. Universities are forced to adopt this new system in order to compete and survive. People will learn at their own pace without having to relocate. They will take courses at their homes or offices having full interaction with instructors and students.

Bibliography

1. Todd, Beth A. Cooperative Learning in a Distance Learning Environment. Marietta, GA: 1997 ASEE Southeastern Section Meeting (1997).
2. Najafi, Fazil T. & Maalouf, William M. Multimedia and Electronic Means to Enhance Teaching Effectiveness and Delivery to On-Campus and Off-Campus Students. Clemson, SC: Submitted to ASEE Southeastern Section for the 1999 Annual Conference (1999).
3. Ferguson, Gregory L. Using Multimedia Resources for Demonstrating Engineering Science Concepts. Marietta, GA: 1997 ASEE Southeastern Section Meeting (1997).
4. Kerka, Sandra. Distance Learning, the Internet, and the World Wide Web. Columbus, OH: ERIC Clearinghouse on Adult, Career, and Vocational Education (1996).
5. Porter, Lynette R. Creating the Virtual Classroom: Distance Learning with the Internet. New York, NY: J. Wiley & Sons (1997).
6. Kumar, Sameer, Walker, John, Jalkio, Jeffrey A., & Rehn, Robert A. Distance Learning, an Enabling Approach in Academia/Industry Partnerships. Seattle, WA: Proceedings, 1998 ASEE Annual Conference & Exposition (1998).
7. Christensen, Kenneth J. & Barnett, Andrew J. Using the Internet to Enhance Off-campus Engineering Education. Marietta, GA: 1997 ASEE Southeastern Section Meeting (1997).
8. Eastmond, Daniel V. Alone But Together: Adult Distance Study Through Computer Conferencing. Cresskill, NJ: Hampton Press (1995).
9. Minoli, Daniel. Distance Learning Technology and Applications. Boston, MA: Artech House (1996).
10. University of Florida. Florida Engineering Education Delivery System (FEEDS). Gainesville, FL: University of Florida (1998).

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