

VIDEOCONFERENCING AS AN INSTRUCTIONAL MEDIUM: ISSUES AND CHALLENGES

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ABSTRACT

This paper commences with a definition of distance learning and videoconferencing. The advantages and disadvantages of videoconferencing are also discussed. Then, the paper addresses several important issues that must be considered when providing on-line distance learning courses via the Internet. These issues include hardware equipment, software installations, network connections, support services, and instruction. The experiences – including the challenges – encountered by several instructors who conducted at least one distance learning course via the Internet, and an administrator who provided all of the support responsibilities, are summarized in the next section. The paper concludes with several suggestions for delivering an effective course by videoconferencing.

Keywords: videoconferencing, distance learning, satellite site, two-way transmission, Web-based courses, the codec system.

INTRODUCTION

Loosely speaking, distance learning can take many forms: students enrolling in correspondence courses offered online over the Internet; instructors traveling to a satellite site to teach a class; instructors conducting classes over the Web; instructors teaching in a classroom while the lecture is videotaped for delivery to a satellite site for viewing at a later date/time; instructors teaching in a classroom as a video signal is broadcast via satellite to a remote location (one-way transmission); or instructors delivering a course in real-time, interactive, full-motion video via the Internet (two-way transmission) (2, 3). Depending on the equipment and format used, distance learning allows a varying degree of interaction among instructors and students. With the declining costs of advanced technology, distance learning is becoming a cost-effective option for organizations to deliver in-house, customized employee training programs or to facilitate virtual conferencing on Web-based collaboration projects. Distance learning combined with Web-based technology also allows institutions of higher learning to provide an active and meaningful learning environment for both part-time and full-time students who are interested in obtaining bachelor's, master's, and even doctoral degrees but who cannot attend classes on the home campus.

Distance learning is beginning to be widely used not only in this country, but also in Great Britain and Asia. Closer to home, the Virginia Community College System (VCCS) will soon receive \$2.5 million from the federal government to foster and expand its distance learning programs. Armed with the vision to “provide world class distance learning programs and services that respond to the needs of the Commonwealth”, 40,000 students were enrolled in 75,000 courses supported by the Virginia Enterprise Distance Learning Delivery System at 23

community colleges last year (5). Courses offered on the distance learning channel are usually available to a large and diverse audience, spread over a wide geographic area.

Videoconferencing

More than 170 universities and colleges all over the country have updated their computer facilities to provide nontraditional degree programs or individual courses over the Internet (1). Videoconferencing refers to communication across long distances using transmission of both video and audio signals. It allows participants to collaborate on the Web in real time and in a classroom-like environment. Participating instructors and students must be present at a scheduled time and at a specified place, usually in a classroom on campus. However, besides being delivered to the students in the classroom, the lecture is also captured on camera and transmitted via satellite broadcast or the Internet to another similar system located at a remote site. Regardless of their physical proximity, students from any location can participate interactively in class discussions by speaking into strategically positioned microphones and listening to their remote peers' comments through speakers. Course materials are viewed on big screen monitors using Windows applications such as Internet Explorer and Office suites. Instructors can scribble notes on the document stand, and the information can readily be sent to the monitors at both ends. Instructors can also monitor students' attendance, feedback, and participation at both sites.

Advantages and Disadvantages of Videoconferencing

Nontraditional, working students who are eager to increase their knowledge and upgrade their technical skills by taking graduate or undergraduate courses at local colleges or universities may find distance learning to be an attractive option (4). A fixed work schedule, family responsibilities, and hectic class schedules and course requirements allow little time for travel. Because enrolling in videoconferencing courses can reduce considerably the cost and the time of traveling, students who choose this option can take courses that otherwise might be inaccessible to them.

On the other hand, there are several disadvantages associated with this innovative learning environment. The lack of physical human interaction between instructors and students at the remote site may discourage a certain kind of student from enrolling in distance learning courses. Sometimes, hardware and software incompatibility can create a technical problem; for example, participants may not be able to gain access to certain information posted on the videoconference because they are using incompatible hardware equipment or different versions of networking software.

ISSUES TO CONSIDER WHEN IMPLEMENTING A VIDEOCONFERENCING PROGRAM

The successful delivery of distance learning programs depends on several important issues, which include the hardware requirements, software applications, network/Internet connections, support services and ongoing operating costs, and instruction.

Hardware Requirements

The quality of instructional delivery depends not only on the instructor's technique and style of instruction but also on the computer technology used to deliver the lectures. The basic computer requirements aside, hardware equipment can be very costly if universities want to incorporate the latest technology into their distance learning programs. The delivery of videoconferencing classes requires two (or more) working classrooms at two separate locations, installed with the necessary hardware equipment, software applications, and network connections. Two-way live video and audio connections must link the classrooms at the primary and satellite locations.

Signals can be transmitted in two ways – namely, via the ATM or the Internet using the codec system. Working almost like a modem, a codec encodes an incoming analog signal into a digital signal for transmission to another codec, and the digital signal is later decoded into the analog format again. The ATM (Asynchronous Transfer Mode) is the traditional approach for transmitting voice, video and other data simultaneously over low speed (T1 - 1.5 Mbps) or very high speed (622 Mbps) networks. But this method can be very unstable and often results in many unpredictable transmission problems. For instance, the audio signal might be fine, but the video signal often locks up, freezes, or cuts out in the middle of a class presentation; or the video signal can drop at any time with no apparent reason; or the whole system can fail completely. Reestablishing the connection takes valuable class time. The codec system is stored inside the PC unit and the system software must be installed on the computer, which often leads to incompatibility with other software applications. Compatibility becomes an issue if instructors need specific software packages to be installed on the computer. A basic ATM installation setup can cost at least \$40,000 and, depending on the additional equipment needed, as much as \$125,000. The basic setup includes equipment such as the PC, a big-screen monitor, camera, document stand, VCR, speakers, a switching device to control microphones, switches between video sources, peripheral cables, etc. An overhead projector is optional. Obviously, bigger classrooms call for additional expenditure, since amplifiers and additional speakers are needed for a better sound system.

The second method of transmission is via the Internet using the codec system. This approach is more stable, since only hardware equipment, but no additional system software, is needed. The signal is transmitted from the camera and microphone across the Internet off the network protocol to the other end of the codec system. The minimum cost for a complete bottom-line group system that can be connected to two monitors and can dial in to two other additional remote sites simultaneously is \$10,000. This barebones system includes the codec system, a big-screen monitor, a camera, peripheral cables, and several microphones and pods placed strategically around the room. The codec system is an external unit that comes with one IP address; therefore, instructors can install any kind of software onto the PC. A personal, PC-based, codec system consists of a codec board, camera, microphone, and picture-in-picture format, and costs as little as \$500. A more expensive (\$17,000) brand new installation would include two cameras, an amplifier, twelve microphones, and enough switches for a 24-seat classroom. The instructor's omni-directional microphone is always on and is voice-activated within a 15-foot radius. Student microphones, by contrast, need to be manipulated for speaking, and students must speak directly into them.

Software Applications

Depending on the transmission approach, different types of software systems may be needed to deliver distance learning courses. For instance, the ATM-based, VTEL Enterprise Series Architecture (ESA) 2.2 videoconferencing system requires a proprietary VTEL board set and the ESA 2.2 system software to be installed on the PC. In contrast, the Internet transmission approach does not require any additional software, except a Web browser such as Netscape Navigator or Internet Explorer to connect the computers. Any course-specific software packages such as SPSS can be installed onto the PC.

Network Connectivity

Traditionally, LAN or WAN connections are used to facilitate distance learning. Intensive competition and decreasing costs result in the availability of advanced technologies and telecommunication services such as digital subscriber line (DSL) and high-speed Internet access, which can quickly and effectively transmit massive amounts of information over the net. The major concern regarding distance learning is the ability of the network to handle unpredictable traffic. Video conferencing, audio conferencing, and application sharing require lots of dependable and predictable bandwidth. This is a bigger problem for the Internet than the Intranet. Also, there is usually a limit to the number of participants permitted at any one time. Hence, IP multicasting, a relatively new bandwidth-saving technology, is implemented in some organizations to provide better network connections. But IP multicasting requires that network routers be set up in a certain way, which may not be feasible in some organizations (1). In certain situations, telephone or ISDN (Integrated Service Digital Networks) conferencing is used to improve the quality of video or audio conferencing and to save bandwidth. As digital and wireless technology becomes more popular and eventually more affordable, connectivity setup in distance learning will be upgraded to a more advanced level. Nevertheless, the most important concern is that the network server be able to sustain its full capacity during peak network time.

Support Services and Ongoing Operating Costs

A capable support staff must be on call at the primary campus while distance learning classes are in session to attend to any emergencies immediately in order to ensure minimal disruption to the class. An administrator must also be present at the remote site to prepare and set up the classroom.

Compared to the heavy initial capital investment, the ongoing operating costs of running the distance learning program are minimal. However, periodic upgrades are needed and should be budgeted for and scheduled at regular intervals. Although interactivity and collaboration among instructors and students are desirable, such features demand more computer power and at times may create a security problem. Therefore, organizations and academic institutions must be aware of the high costs of maintaining and constantly upgrading the technology facility.

CHALLENGES ENCOUNTERED AND EXPERIENCES SHARED BY INSTRUCTORS AND ADMINISTRATOR

This section summarizes several years' experiences of five instructors and an IT support administrator in delivering videoconferencing classes via distance learning. These participants worked at a mid-size university in rural central Virginia. The university has a satellite site, located about 50 miles from the main campus, which was set up to serve as an information and enrollment center, addressing the basic needs of nontraditional commuting students. The satellite has a small library, a small computer lab, and several classrooms, and is staffed by two administrators. Initially, instructors traveled to the remote location weekly to teach several distance learning classes. Then, several Web-based courses were offered over the Internet. However, in addition to the university's need to establish its presence in the rural areas, there was an increasing demand for more courses to be offered at the satellite site so that local residents could enroll in classes without having to travel to the main campus. In the fall of 1999, the university started offering several videoconferencing courses in the evenings, so that nontraditional working students could take classes on a part-time basis. Over the years, several undergraduate and graduate classes were offered by the Education Department, the Social and Criminal Justice Department, and the Business College via videoconferencing. Such course offerings worked in the students' time schedule and allowed students to take the classes who otherwise couldn't have. Basically, videoconferencing provided services to students who could not come to the main campus. The class size varied from as small as two to as many as ten students at the main campus, and from as small as three to as many as 20 students at the remote campus. The instructors taught from one to six videoconferencing classes.

Technology Glitches

Initially, the university installed the ATM-based, VTEL Enterprise Series Architecture (ESA) 2.2 videoconferencing system in three classrooms on the main campus and two classrooms at the remote campus. All the main hardware components are stored inside the cabinet of the ESA system. The proprietary VTEL board set, located inside the PC, consists of a video board and a codec board that incorporates a video codec, an audio subsystem, a communications protocol, and a framing processor. Other main components include the table (with optional PenPal), microphone, camera, mouse, keyboard, and peripheral cables. Not surprisingly, after offering numerous courses, instructors began to encounter varying degrees of hardware problems. Specifically, the classrooms were installed with different versions of equipment, thus creating hardware incompatibility between the two locations. The extent of the hardware problem depended on which classroom the instructors used for the lectures. On the other hand, instructors experienced little or no problem with the network connections and software applications. Soon, instructors became frustrated by the constant technical problems and lost interest in offering more distance learning courses. Consequently, two years later, the university upgraded the VTEL system to the more advanced Internet transmission. The university's main campus has a DS3 connected to the Internet, while the remote campus utilizes a T-1 line. The new approach to transmission received rave reviews from instructors.

Instructors' Teaching Styles

In considering the effectiveness of their own teaching styles, instructors concluded that videoconferencing works best for instructors who are always 100% prepared, can teach lecture-driven classes, and offer courses that do not require much spontaneity. Such an instructional

approach would also be effective with computer-based classes; for example, the extensive use of Blackboard or PowerPoint slides to deliver course materials would permit the camera to focus on the lecture materials rather than on the instructors.

Classroom Management Skills

In videoconferencing, usually the camera is stationary and does not follow the instructor around. Therefore, the instructors in this study had to be constantly aware of where they were standing, since they had to stay within the camera's range in order to be broadcast to the remote site. When instructors wrote on the blackboard or document stand, students at the remote site could not see the writing. Therefore, minimum spontaneity was allowed, stifling the instructors' creativity and spontaneity. Further, given the two- to three-second transmission delay between the two destinations, instructors needed to slow down and wait for the remote students to receive the signals. Instructors also encountered difficulties in getting discussions going on simultaneously at both locations. For instance, only students who have access to the microphones are allowed to talk. Therefore, a sufficient number of microphones must be distributed across the room so that students who would like to participate do not have to wait too long for their turns. Because students must push on the microphones in order to be heard, instructors were not aware of students talking at the satellite site.

As reported by the instructors, some students expressed stronger feelings than the instructors regarding enrolling in videoconferencing courses. Although there was relatively little difference in the retention rates at both locations, students at the remote campus seemed to be less satisfied with their education and learning. In fact, many remote students reported that, given the choice, they would prefer not to take any distance learning classes but would rather drive to the main campus for classes. Interestingly, some students at the main campus felt that the remote students were cheated of the opportunity to participate in class activities and discussions.

SUGGESTIONS FOR DELIVERING AN EFFECTIVE COURSE BY VIDEOCONFERENCING

Delivering distance learning classes to a constantly changing world is a new way of doing things for college administrators, a new way of teaching for instructors, and a new way of learning for students. The demand for distance learning courses has been increasing steadily and will continue to increase. Hence, college administrators and instructors must continue to learn to deal with not only the problems encountered in traditional classroom settings (e.g., attendance, knowledge retention, loss of focus, disruptive behavior) but also the problems associated with distance learning. The nature and presentation format of distance learning require that students take charge of their own learning. Consequently, administrators and instructors need to find ways to conduct lively presentations, initiate interesting and enlightening interactions among students at both locations, and create a more learning-centered environment for distance learning students.

The traditional in-class and distance learning approaches require totally different teaching styles since distance learning instructors have to address the needs of two different groups of students (traditional vs. nontraditional) and to attend to students sitting in two separate locations. Since

teaching videoconferencing courses is not for everyone, it is extremely important for college administrators to involve instructors whose teaching styles are suitable for distance learning. For instance, distance learning courses are better taught by instructors who have a dynamic and interesting personality. Further, the success rate with distance learning increases with courses that are based on a case study approach.

CONCLUSION

Institutions of higher learning look on videoconferencing as a revolutionary way of providing inexpensive, yet effective, instructional learning to a large group of students. The positive feedback received from corporations, employees, universities, and students indicates that distance learning can be an appropriate and effective learning and instructional medium. With the continuous improvements in interactivity, animation, and collaboration technology, there is no doubt that distance learning has the potential to become an engaging, interactive learning environment for students and employees.

REFERENCES

1. Auerbach, S. (1998). Classroom in a Box, Inside Technology Training, 2 (1), 38-42.
2. Gagne, M., and Shepherd, M. (2001). Distance Learning in Accounting, T H E Journal (Technological Horizons In Education), 28 (9), 58.
3. Schrum, L. (2000). Online Teaching and Learning: Essential Conditions for Success! In Linda K. Lau (ed), Distance Learning Technologies: Issues, Trends, and Opportunities, 91-106. Hershey, PA: Idea Group Publishing.
4. Shih, T. K., et al. (2003). A Survey of Distance Education Challenges and Technologies, Journal of Distance Education Technologies, 1 (1), 1-21.
5. Virginia Community College System Online, <http://www.so.cc.va.us/vccsonline/about.html>.