Motion Curricula and Non-Motion Curricula in Distance Education: Technology Selection Reconsidered

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Resume: Distance education programs are delivered through a variety of media, from print to full-motion video. However, the current trend appears to be leading toward the use of video-based systems for most courses, irrespective of the course content and its educatronal delivery requirements. In other words, more attention should be paid to what a course requires in its delivery to be effective. This article looks closely at why a delivery technology is selected and proposes a method for selecting the medium based on course curricula. A listing of delivery methods is included to assist the reader in determining an appropriate technology.

Résumé: Les programmes d'éducation à distance sont offerts à travers une variété de médias, de l'écrit au vidéo. Toutefois, les présents courants semblent pencher vers l'utilisation d'un système basé sur les vidéos dans la plupart des cours sans tenir compte du contenu des cours et de ses besoins particuliers de livraison. En d'autre mots, plus d'attention devrait être portée sur les exigences particulières d'un cours afin que sa livraison soit efficace. Cette article se penche sur les raisons pour lesquelles on choisit la livraison de la technologie en éducation, et propose une méthode de sélection de médium d'enseignement basée sur le contenu du cours. Une liste de méthodes de livraison est incluse afin d'aider le lecteur à déterminer une technologie d'enseignement appropriée.

This paper is the result of several discussions related to appropriate use of technology for the delivery of distance education. It is the authors' hope that readers will benefit from this somewhat different viewpoint of where we are and where we should be in technology selection today. The current chronology for selecting delivery systems is discussed, as well as a proposed method to identify appropriate technologies for distance delivery based on the need for motion in the curriculum.

Present Chronology for Selecting Technology to Deliver Distance Education

The current trend to invest in compressed video is an example of the need for the development and application of a sound planning sequence that ties curriculum and technology together, based upon actual need and realistic budgets (Guilder 1993; State of Louisiana 1993; Williams et. al. 1990).

Enchanted by the possibilities of distance education delivery systems, the immediate reactions of educators often center more on the technology being used to deliver instruction than on the instruction itself. The interest in distance education, especially in its "newness" and "magic," centers on the technology. The vendors show top-of-the-line wares at conferences and on-site demonstrations, where educators see the possibilities and consequently desire to provide the best for their students and to be on the forefront. The first introduction to distance education is seeing action shown through the hardware of the delivery system.

Some distance education providers feel that the ideal distance learning classroom is one where instruction is delivered to a small number of students via live two-way video and audio using fiber optic technology. Certainly, compressed digital systems are becoming more the technology of choice as the services improve and the costs decline. However, many educators and administrators are inappropriately disappointed if they cannot afford the compression technology at this moment. Many times large expenditures are rationalized; using the "if you build it they will come" mindset. In fact, enrollments do increase in some cases as a result of adding a high-end system (Schriftgliesser 1994; Weiss 1994).

However, distance learning classrooms that are two-way video and audio are not easily obtainable and are often out of reach financially. Unfortunately, many of the discussions today involving distance education focus only upon video-based delivery. In comparison to print, audio or computer-based delivery systems, a video-based delivery program demands the highest initial investment, upkeep, and on-going cost; the most time in preparation and coordination for delivery; and the greatest number of skilled persons for course delivery. Due to these cost barriers, providers strive to develop systems that come as close as possible to the ideal without actually establishing this type of classroom. Granted, the fully interactive classroom may become more available for most aspects of distance education, but it is not now affordable for most institutions. And *now* is what many distance education providers must be concerned with at this point.

As long as the National Science Foundation, the National Telecommunications and Information Administration, and the National Information Infrastructure Initiative serve as major funding sources, high-end technology will flourish. The recent investments in education by telephone companies like Bell Atlantic in New Jersey or U.S. West in Colorado and Wyoming will

ther the cooperative buildout that will eventually result in the true digital Information Highway. What about the educators who have a demonstrated need to deliver courses, but do not have the clout, politically or otherwise, to obtain compression technology on a grand (or even a small) scale? (Office of Technology Assessment 1989; State of Louisiana 1993).

The answer is to decide which technology is actually appropriate to deliver a course or courses based upon proven requirements for the curriculum. Excellent examples of such reality-based decision making can be found at all levels of the academic continuum (Office of Technology Assessment 1989). One very useful tool in a search for such examples is the United States Department of Education. Office of Educational Research and Improvement (OERI) Distance Learning Database (Garnette 1994). In addition, the absolute explosion of interest in distance education has prompted such mainstays as the *Chronicle of Higher Education* to deal regularly with the innovations that abound.

The fact that school districts, colleges, and universities are spending literally hundreds of thousands of dollars on high-end technology is reason enough to address these issues. Why are distance education providers spending such large amounts of money when it may not be necessary? This is not to say that if they have the money they shouldn't use it. After all, as stated previously, in the ideal distance education classroom, the teacher and students can see and hear each other simultaneously. When facing the reality of having less than two-way video and audio. however, this is a question that educators should ask regularly: Are we, as distance education providers, promoting delivery technologies based on our own desires to be on the current edge, or on the instruction to be delivered? The choice does not have to be all or nothing; but the answer is not a compromise with parts of a video system. This partial response is often the worst alternative.

Distance education does solve many problems, but any provider must possess the resource base to minimize the barriers associated with distance learning: distance, time, and money. The barrier of cost in itself associated with video-based delivery often limits access to distance learning programs. If the resources are found and video system installed, the same excitement demands to see immediate results for the large investment. There is expectation that a course will be delivered soon, and in the experimental stage (which is also the first impression that persons have of distance education) *insufficient time and expertise is spent on formulating the instructional design of the course.* When instruction is delivered over distance education, time must be spent in preparation -the site must be prepared, the teacher must be trained, and the content must be converted from a traditional format to a distance learning format.

Evaluation of the effectiveness of the system, for which the school paid so much and expected even more, is often difficult and inconclusive because

the needs for the distance education delivery system were not clearly set forth at the beginning. The system might work perfectly, the instructor might teach brilliantly, but the course selected might not meet the needs of the students or of the school, so the experience becomes a very expensive "extra." Attempting to force all instruction into a single delivery mode will end up in an information "dead end" for a large portion of our learner population. We are currently in the exponential period of the instructional telecommunications growth curve. There are numerous technology camps, each touting a particular methodology or system of delivery. Many times an inappropriate technology is chosen to deliver a particular course, and a great deal of disappointment ensues. The fact remains that the technology did not fail; rather, the decision process used to determine the technology was flawed.

The concept of distance learning occupies a unique position in the continuum of delivery options in distance education. Schools and universities do not need full-motion video in every teaching/learning environment. On the contrary, providers must maximize the available bandwidth for video in order to assure that the appropriate system has been utilized to reach the desired learning outcome. The overall goal must be to improve student performance.

Recommended Chronology for Selecting Technology for Delivery of Distance Education

Successful distance education programs can be built, even within budget restraints, when the planning process begins with thoughtful attention to these three steps:

1. determining the need for a program or course, with consideration of program level and the institution's distance learning infrastructure;
2. formulating the instructional design of that course; and
3. selecting the appropriate technology to deliver the course based on the instructional content and design.

Currently, some school districts and universities are placing the third step before the second, inevitably increasing the barriers to the successful delivery of a course or program. Institutions have also been guilty of selecting a technology for delivery without consideration of the course content (i.e., without determining if a particular technology is required to send the instructional message). This paper acknowledges each of these issues, and offers a new approach to selecting an appropriate delivery system. Another way to categorize curricula is provided.

DETERMINING THE NEED FOR A PROGRAM OR COURSE

The first step in any distance education program is to determine the need for the course or courses. Surveys, questionnaires, and interviews can assist a school or organization with this effort. Once an organization determines that — in order to meet the needs of its students — distance education technology must be used, the emphasis must then be placed on the instruction itself, beginning with the design of the course. In addition, a decision must be made regarding the appropriateness of distance delivery for the program level (i.e., undergraduate or graduate). This decision and many that follow in the design and delivery of a course may depend heavily on the distance learning infrastructure that exists at the sponsoring institution.

FORMULATING THE INSTRUCTIONAL DESIGN OF THE COURSE

When designing a distance learning course, there are many questions that must be answered by the those involved in the program. What is to be taught? Is teaching students to build a home the primary objective? Is it how to successfully complete complex algebra problems? Or is teaching a second language the goal of the program? Whatever the goal is, questions like these must be asked in order to systematically design the curriculum for the course. Although this paper will not address ways to design a course, this process should be completed prior to selecting the appropriate delivery system.

SELECTING THE TECHNOLOGY TO DELIVER THE COURSE

How does one determine which technology is most appropriate for the content being delivered? A general analysis of the instruction will give the provided valuable information, such as desired learning outcomes and ideas on how to achieve these goals instructionally. But the type of delivery itself can often be determined by placing the curriculum in one of two categories: *motion* or *non-motion.* This is a dramatic departure from the traditional way of selecting the technology which was to choose between video-based, audio-based, traditional, or "other."

Here the terms *motion* and *non-motion* refer to the curriculum, or the type of instruction, not to the delivery. This analysis of the curriculum should be done before the delivery technology is selected. A course contains *motion* curriculum if the instruction requires motion in its presentation to students. In other words, if motion is a mandatory part of the delivery in order for the student to understand the concept(s) being presented, then that is a motion curriculum. If a course is designed to teach students how to complete a scientific experiment that involves measuring and pouring activities sensitive to error, that would probably require motion sequences to teach the course suc-

cessfully. Thinking in these terms, providers may gain insight as to the types of curriculum that require motion and those that do not require motion.

Non-motion curricula are those that can be taught without motion in the delivery. Most high school and college level courses easily fall into this category. Courses such as English, mathematics, history, and other social sciences are taught on a regular basis by lecture and via traditional correspondence study. The reader who is not familiar with correspondence study may be surprised to see mathematics in this list; however, one must remember that, according to the above definition, mathematics is not a motion-based curriculum. Therefore, it should not require a motion-based delivery system to meet its distance education goal (Schmidt, Sullivan, & Hardy 1994).

VIDEO IS NOT THE ONLY WAY TO DELIVER DISTANCE EDUCATION

Audiographics systems allow teaching to be done from any site in the system. As a matter of fact, any site with the basic equipment and standard phone line automatically becomes a virtual classroom. Faculty do not have to be on the campus of the academic institution to teach a class.

One such innovative approach to delivery at a distance not requiring full-motion video is the simple analog phone-based system deployed in 1990 by the University of Wisconsin (Weiss 1994). Weiss describes an audiographic system used by the College of Engineering to teach a variety of technical courses to students spread over the state of Wisconsin. Classes are small (32 in this semester's Technical Japanese course), as are expenditures. All that is required is a 386 class PC, a VGA monitor, Vis-a-Vis software, a graphics tablet, and a microphone. Standard analog telephone lines are linked to 9600 baud modems to create a virtual whiteboard environment. James Davis, Professor of Technical Japanese, has fully interactive audio and shared graphics communications with his students. Davis prepares graphics ahead of time and transmits them to the students as needed. This type of modified document conferencing has many virtues when applied to the appropriate classes. Davis does not require full-motion video.

A second example, this time in the pre-college environment, is the nationally recognized telelearning program known as Project Outreach (Loftin 1990). This very effective application of non-motion graphics is located in the small town of Natchitoches, Louisiana, on the campus of the Louisiana School for Math, Science and the Arts. The facility is a boarding school for gifted and talented students. Project Outreach was initiated in 1986 as a means of providing courses necessary to attend in-state colleges and universities to rural high school students in Louisiana. The program started with delivery of courses to over 1200 students in 116 high schools across the state of

Louisiana during academic year 1992-93. Costs are significantly lower than any technology involving full-motion video. Once again, Project Outreach uses an audiographic system closely related to the University of Wisconsin program. Formal evaluations reveal that students learn as well as in a conventional classroom, grades are as high (higher in some cases), and faculty members are revitalized as they learn new teaching techniques (McElveen 1992).

A third program to mention is one offered through the UT TeleLearning Center at The University of Texas at Austin. Although the majority of distance education programs serving schools are delivered by satellite, TeleLearning courses at the high school, college, and continuing education level are more cost-effective because they are delivered by telephone and supplemented with print materials, videotapes, and computer-assisted instruction. During live audioconference lectures, the teacher and students talk with each other using telephone equipment that allows multiple-source input and reception, bridging all participants together in a manner similar to a typical conference call.

The response to the UT program continues to be overwhelmingly favorable. The TeleLearning Center's distance education programs offer a cost-effective method for providing students with course options that would not otherwise be available. In addition, because the Center utilizes economical low-end technology, class size at the high school level is capped at 30 students per section, while the college level classes do not exceed 50 students per section. In addition to the vocational program in Health Science Technology and Spanish I and II for high school students, the Center offers a special program, *Algebra Across the Wire,* for Texas migrant students. Algebra I and II is offered each summer to students as they move around the country, and class averages for the past three years have not dipped below 90% (Schmidt, Sullivan, & Hardy 1994). Obviously, video has not been required for the successful completion of these courses.

The allure and functionality of non-motion graphics in the delivery of distance education came about quite unexpectedly. While directing one of the largest public school distance education programs in Texas, one of the authors taught seven teachers to use the popular Persuasion presentation software as a tool to enhance the fifteen hours per day of full-motion video (ITFS-based) classes taught by the faculty. As time progressed, the classes became more graphically oriented and less dependent upon the full-motion video. Student progress was not adversely effected; teachers were enjoying the activity.

THE INTERNET PROVIDES OTHER OPTIONS FOR DELIVERY

A final fact to support the case for stopping to think through the decision to invest in full-motion video is the tremendous growth in the Internet (Rheingold 1993). Accurate figures on exactly how many people are on the Internet and associated on-line services are very hard to obtain. It is safe to say, however, that the number of students on-line is growing daily. Classes at the elementary, middle school, high school, undergraduate, and graduate levels are easily documented. For example, the phenomenal success of the America OnLine (AOL) service as a teaching tool is worth mentioning. AOL has classes and workshops offered in at least 30 different interest areas on-line. Students receive everything from homework help to college degrees without the involvement of full-motion video (AOL 1995). A member of the AOL faculty has had some excellent experiences as both a teacher and student on-line.

Certainly the ease of building multimedia presentations into classes on-line is a definite plus for computer-based delivery of distance education. In addition, students are not tied to a particular location in order to access the classes. The evolution of Mosaic and other World Wide Web tools will put the power of all types of presentation styles and technologies at the fingertips of anyone with access to the Internet (Rheingold 1993). In fact, some of the "virtual faculty" will choose full-motion video — some will not. *The key will be the question of appropriateness of the technology to the task at hand.*

Table 1
Hierarchy of Technology

Compressed voice, video, data (fiber, T-l) (di;al-up)
Compressed voice, video, data (analog phone)
Full-motion analog video, voice, data (uplink, ITFS, cable)
Audiographics + fax
Audiographics
Phone/Fax/Downlink
Phone/Fax/Videotape
Phone/Fax/Digitizer (scanning "videophone")
Phone/Slides (telelecture)
Phone/Fax
Standard videotape/on-line computer
On-line computer (Tenet, Internet, BBS)
Standard videotape/off-line computer/CD ROM
Off-line computer (CAD/CD ROM
Standard videotape + "datatrack"
Standard

If it is determined that the curriculum is a motion curriculum, then the selection of a delivery system is made. Costly mistakes in selecting a technology can be avoided through the use of a well-constructed and constantly updated hierarchy of technology (Table 1) which functions as a decision-making tool along with a carefully thought out distance learning plan.

**Please note that the hierarchy is built upon technologies that are currently available. Each organization should begin with a "basic capability package," consisting of image transfer, video delivery, and on-line communications capabilities. The evolution of a full-fiber backbone will merely require consolidation of categories and the creation of more fully interactive delivery options.

In order to determine which type of delivery is best for a particular course, organizations can use the hierarchy in Table 1 as a flexible menu of options. In doing so, responsibility for the teaching/learning environment is at the building/department level. By applying the hierarchical concept, instructors tailor a system in an effective and economically sound manner. Providers can choose the level of technology actually needed to reach the levels of learning desired. Theoretically, an organization can choose multiple inputs as required.

School districts and universities just venturing into distance education have frequently fallen victim to organizing new programs without giving enough consideration to the type of curriculum being offered. In many cases, the typing teacher or the business teacher inherited the computer classes and is in line for the distance education course, or the data processing department has inherited the distance delivery lines. In other instances, the curriculum is chosen according to which teacher is willing to participate. In other cases the choice correlates with the class where the members of the school board have children. Similarly, many colleges began by putting the technology in the president's conference room, only to find that they had lost access to the equipment.

Given the variety of delivery systems available today, there should never be a situation where a school cannot receive distance education services based upon a lack of means to deliver the services to the school's location. Not every school can afford a satellite hook-up or compressed video technologies, but almost every school has a cassette player, a VCR, and/or a telephone. The suggestion here is not necessarily to avoid video-based or electronic instruction, but to *consider what the curriculum absolutely requires before selecting a delivery system.*

Instructional designers take great care to determine learning outcomes of instruction in order to design a course. Should distance providers not do at least the same to determine how courses should be delivered? The bottom line is this: if a course requires motion within the instruction in order to effectively present the curriculum to the learner, then that course should be

fered either in person or via a video-based delivery system. If, on the other hand, the course to be delivered does not require motion in order to present the necessary information to the learner, then our organizations may be spending a great deal of money just to be on the high-end technology bandwagon.

In summary, there is no doubt that educators want to provide quality education programs for our students at a distance. Neither time, distance, nor funding should prevent a student from receiving the educational opportunities that he/she deserves. If educators cannot reach students via wireless technologies, they can certainly do so by using the ubiquitous telephone or mail networks that literally circle the globe. The time has come to spend more time on the instruction itself, not the delivery system.

Providers must consider what is absolutely necessary to deliver a course or program *before* acquiring expensive studio equipment and large grants to cover expenses. With instructional telecommunications, no student will be denied an opportunity to learn because of technical limitations. The only reason for lack of delivery is the lack of willingness or persistence on the part of the human elements found within the system. Distance education providers cannot afford to be "trapped in the future," and believe that all distance instruction requires full-motion video. Educators should give strong consideration to all forms of distance delivery in order to overcome the barriers of distance, time, and money, and to create high-quality distance learning programs that can be adapted to an ever-changing technological world.

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