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Barriers to Quality Distance Education

This article describes many of the barriers to the effective use of televised instruction and suggests ways of overcoming them. It is based on the extensive experience with programs for schools of the Arts and Sciences Teleconferencing Service (ASTS) at Oklahoma State University, but most of the issues are equally applicable to all distance learning by means of television.

Oklahoma State University is a large land-grant university located in the northern part of the state in Stillwater, Oklahoma, with an enrollment of approximately twenty thousand students. It is the first choice for many students from small and/or rural schools throughout the state—and there are many of those. Oklahoma has a land area of seventy thousand square miles, a population of approximately three million independent souls, and over six hundred school districts. These physical factors, plus a populist ethos, combine to create a climate that has historically produced students who are underprepared to face the rigors of college work.

Cognizant of this fact and fully aware that they had no control of either the high school graduation requirements or the university entrance requirements, the faculty of the OSU College of Arts and Sciences in 1983 voted to raise the college graduation requirements. This action was taken to send a clear signal to schools that better preparation was needed if a student was to make normal progress toward a degree. Among the new requirements, the one that caused the greatest consternation among public school administrators was a stipulation that all arts and science students complete one year of a single foreign language at the college level, or submit evidence of two years of a single foreign language taken at the high school level. Superintendents in the three hundred-plus high schools who had no foreign language teacher felt that such a requirement would place their graduates at a distinct disadvantage on entry to OSU. Responding to this concern and to the expressed need for course offerings in a broad range of subjects in addition to foreign languages, OSU

entered into an immediate dialogue with school superintendents around the state. Its purpose was to explore how OSU could help the public schools provide a curriculum that was adequate in preparing students to compete at the college level. The result was the creation of the College of Arts and Sciences Teleconferencing Service (ASTS), which began delivering in 1984, via satellite, enrichment programming to ten public schools in western Oklahoma.

In 1985, German I was included in the offerings and the network was expanded to fifty schools. By academic year 1992 the network has grown to include over one thousand schools, coast-to-coast, receiving some form of programming from ASTS. Offerings in fall 1991 include German I and II, Russian I and II, trigonometry, analytic geometry, advanced placement (AP) physics, AP calculus, AP chemistry, applied economics, AP American government, basic English and reading, a PSAT workshop, and a variety of staff development and enrichment programs.

Programs are delivered live via satellite, with one-way video and two-way audio communication. The satellite currently in use, Galaxy VI, has a broadcast footprint that permits transmissions to reach all of the continental United States, most of Canada and Alaska, and Mexico.

Over the seven years of work in the distance learning arena, ASTS has been confronted with many barriers to the delivery of quality distance education programs. Most of these barriers have been overcome. What follows is a description of some potential problem areas and suggestions for solutions. The issues discussed are, of course, directly related to programming for the public schools, but many of the points raised have equal validity when applied to higher education, continuing education, and most varieties of training.

Acceptance

Acceptance of television as a legitimate means of providing access to education is not automatic. Though a considerable body of data now exists that indicates the effectiveness of video in enhancing learning, much skepticism remains. Some groups of public school teachers, particularly the foreign language teachers, have seen the use of the medium for direct instruction as a threat to their continued employment. Many who wish to discredit the use of telecommunications claim that there is no student-teacher interaction, as if face-to-face contact is the only kind of interaction. Such criticism ignores the potential of available sophisticated computer hardware and software or the utility of the telephone line. It also assumes, erroneously, that significant one-on-one interaction occurs in a classroom of twenty-five students or more in a fifty-minute period.

The "ain't made here" syndrome also exists to some degree. Local control of the curriculum is highly cherished at all levels in the educational establishment. Rather than relinquish any control over either the subject matter or the teacher to outsiders, preference is often given to local staff, even if they are poor instructors or teaching outside of their field.

The Instructors

Both public school teachers and college faculty have been effectively utilized as on-camera instructors in the various programs around the country. ASTS generally uses tenured faculty members. The one exception is the Basic Reading and English course, which is directed toward seventh and eighth graders and employs a teacher who has had more than twenty years in the public schools and has experience in dealing with underachievers.

Astute selection of the on-camera teacher and assignment of the appropriate workload are important determinants for the quality of instruction. The most successful instructors with the medium are generally those who exhibit excellence in traditional classroom teaching, creativity, flexibility, showmanship, self-assurance, organization, a willingness to experiment and to learn, and, in the case of college faculty, a dedication to working with K–12 schools.

Assigning a person to teach in a distance education program is generally unwise. Inviting and rewarding an individual for participation will more likely ensure success of the effort than will compulsion. The road to a successful program is rocky enough without involving an unenthusiastic participant.

Workload is an important consideration. Some existing programs treat distance education as an extension of the traditional classroom. The teacher enters the classroom and proceeds to lecture, in front of a camera, in the traditional fashion. As a result, administrators at the originating site often assume that a television-taught class takes the same amount of instructor time as a traditional class. Discussion with teachers in such programs suggests, however, that the additional demands imposed by the medium, such as the need for superior organization and obtaining appropriate visual materials for television, rapidly cause teacher burnout if time allowance is not made.

In programs that make fuller use of the medium—such as programs that introduce computer graphics, use the chroma key (the visual effect utilized by weather broadcasters to display their maps and themselves simultaneously), or insert pretaped segments—the on-camera teacher who is originating the course should be held responsible for no more than two class preparations per day, if quality programming is expected. The need to organize the program, collect the materials, and script the telecasts places a premium on the time between shows.

A further factor when considering workload is the number of students taught. An individual teacher may have as many as two thousand students across the country. Clearly the originating teacher alone cannot handle the grading of exams, homework, and labs or answer all of the questions of this many students. Adequate help is imperative. For example, the German instructor in ASTS, who typically will have fifteen hundred to two thousand students in German I, has a fellow faculty member working with him and employs *twelve* nonfaculty assistants.

Program Format

Most fiber-optic and some microwave-based systems are installed to permit programming originating at multiple sites, which might include several public schools and one or more universities. Each site will have both send and receive capability. This arrangement permits the school teachers to receive courses from the university, to interact with and to see and be seen by the university professors, and to see and be seen by the other classes. In turn, a teacher at one of the public schools can teach students at all the other schools, as well as his or her own. This ability to share teachers is particularly important for small schools with limited resources or in teacher-shortage areas such as science, math, and foreign languages.

The most common approach to televised instruction is to broadcast a live, fifty-minutes-a-day, five-day-a-week class. The standard camera configuration consists of two fixed cameras at the front of the classroom, one focused on the teacher and the other on the class, and one overhead camera focused on the teacher's desk. In some cases, the teacher has the capability to insert by remote control previously mounted videotapes.

In this traditional format, the on-camera person not only assumes the role of teacher, but also assumes the roles of producer, director, and floor crew. As a result, production quality, richness of imagery, and creativity of approach usually suffer, but programming is relatively inexpensive.

At the other end of the spectrum are the programs that utilize full studio production facilities and require a producer/director, a floor crew, and perhaps additional support staff. Such programs make extensive use of preproduced footage of illustrative material, music videos, pretaped demonstrations, and the like, as well as computer graphics and the chroma key.

ASTS programming is of the latter type, based on an educational philosophy to use the medium to its fullest extent. Each broadcast not only has strong educational content, but also has the visual richness that students expect of commercial television. In addition, many courses use extensive computer-aided instruction for activities such as a language drill. Because the computer is an integral part of the curriculum, ASTS courses are only broadcast two or three days a week. The other days are used for drill, laboratory, testing, etc.

Interaction

There are two principal modes of providing interaction between the instructor and students at a remote site. Satellite- based systems and most microwave systems provide one-way video only and rely upon a two-way audio link by telephone to maintain interaction during on-air hours. Fiber optic systems and some microwave systems can accommodate two-way video as well as two-way audio. Two-way video has the advantage that the teacher can see as well as hear the students. This advantage is rapidly lost, however, when there are more than six or eight remote sites. For effective interaction, a picture must be transmitted into the classroom

in each school for each and every other site in the network. At some point it is simply no longer feasible to monitor all the television screens at one time.

Interaction can be enhanced, independent of the live delivery method used, by the simple expedient of supplying an 800 telephone number for off-air hours. This permits the student to obtain answers to questions raised during the program or garner help with the homework to an extent not normally experienced by a student in a conventional classroom. ASTS typically provides this service twelve hours a day for each course.

According to data currently available, student performance is the same whether interaction is accomplished using two-way or one-way video, but is strongly affected by other factors, such as the quality of classroom management and the commitment of the on-site teachers and administrators.

Accreditation

State borders are invisible to microwaves but accreditation and certification barriers do exist. Concern about course content is legitimate, both for K–12 and higher education, but the barriers that must be surmounted to receive permission to deliver a course, particularly in the K–12 arena, can border on the absurd. Some K–12 program providers report that to obtain certification in certain states (hence delivery of their programs to schools in those states), the teachers are required to take a physical examination, even though they will never stand in front of a class in those particular states. On the other hand, the faculty who teach for ASTS have had their courses accredited in forty-eight states, without holding certification in any state. This may be due to the fact that they are all university-based and all hold a doctorate, and hence are viewed in a somewhat different light.

The picture is somewhat less clear when delivering college-level coursework. Regional and professional accrediting bodies do not seem to be a factor at this point, but state approval is becoming somewhat more of an issue. The problem for the states is how to exercise control. If the student receives credit from the originating institution, how is the state higher education board to know? Or how is the state to exercise control if the consumers, such as major industrial corporations, recognize the validity of a program? That is the case of the National Technological University (NTU), a national consortium of universities that offers master's degrees in engineering areas. States will probably never be able to exercise control at the postsecondary level in the same manner in which they exercise it at the K–12 level.

Classroom Management

In order to keep the students on task, distribute and proctor exams, distribute and collect homework, handle incoming and outgoing mail, and provide instructional support, K–12 schools should require a classroom monitor or "teaching partner" in each receiving site classroom. The

requirements are clearly not the same for college-level courses, particularly at the graduate level, where keeping students on task is not an issue.

The qualifications of the teaching partner vary widely. In some K–12 networks, he or she may be the bus driver, in others, the superintendent. ASTS prefers someone with teaching credentials and, in science and math courses, specifies areas of competence. Whatever the qualifications required, the teaching partner plays a very important role. Appropriate training and a positive attitude toward distance learning virtually ensure success; lack of training and a negative attitude almost always ensure failure. Work load can affect that attitude. A reduced class load is not as critical for the teaching partner as for the originating teacher, since most of the preparation and paperwork is done at the originating site. But the responsibilities of being a teaching partner should not be added on top of the regular assignment of an on-site teacher.

The flow of paperwork can be a major bottleneck in certain courses and must ultimately be addressed. At present, most providers are using the U.S. Mail to ship exams and homework to and from the receive sites. This is a slow and sometimes unreliable process, which, at the very least, delays the feedback to the students. There are faster methods, such as a fax machine, but most are too expensive to be practical, given the financial situations of most public schools.

Administrative Support

Many college faculty feel that it is inappropriate for their colleagues to be involved in instructing public school students, even if the courses offered are at a college freshman level and students are held to college-level standards. This attitude can manifest itself in both overt and covert hostility toward faculty who participate in a high school program. Surprisingly, this attitude has also been reported by some providers of distance learning in programs where the instructors are dealing with college students at a distance! As a consequence, utilization of highly vulnerable nontenured faculty is to be avoided. Even when senior tenured faculty are involved, strong support from the academic administration is required if success is to be achieved. Ideally, the distance educator's colleagues should be made fully aware of the reasons for that faculty member's participation in the distance learning program, as well as of the potential benefits to the department, such as free access to the software developed for the course and some additional maintenance money.

At the receiving site, administrative support is also crucial to the success of the program. Everyone involved in the program will take their cues from that leadership. If the superintendent and school principal are not *fully* supportive of distance learning, the project is doomed. The frequent turnover of superintendents poses a major problem in this regard.

Teacher Preparation

Inadequate teacher-partner preparation can be a major barrier to quality programming. Training should focus on two primary areas: the management of instruction and operation of the equipment. While instructional management will be much the same for all courses, the use of equipment in a program depends on factors such as the level of complexity needed in a computer software package and the necessity of laboratory work. It is absolutely essential that the teaching partner have adequate training. The more complex the package used at the receiving site, the greater the likelihood of a disaster if training is insufficient.

New teaching partners should receive a minimum of one day of training if they are being asked to handle only routine matters such as classroom discipline and movement of paper. For courses with a moderately complicated software package or a routine laboratory, at least two days of training are in order. With such courses it is desirable to supply the teaching partner with detailed written instructions for the software and videotapes of the lab experiments. Longer training periods of up to a week are required for courses with complicated laboratories, such as AP chemistry. The teaching partner should also be made aware that support from the originating site is as close as the telephone and the TV set.

Training for the on-camera teacher is, of course, very different. Emphasis must be on the need to prepare a tightly organized and well-paced program. The teacher should be introduced to the appropriate technologies, such as the chroma key. The studio should be used as a focal point to allow the faculty member to gain experience working with the producer/director, to get a sense of pacing, and to see himself or herself in action. The instructor must also develop a sense of confidence in his or her ability to handle the medium—and some never do.

Costs

The costs of delivery can be a very real barrier. The development of a high-quality two-semester course alone requires $250,000 to $600,000, depending on whether a package of computer-aided instruction must be created and on the extent of using preproduced videotape and computer graphics. Very important also is the general ease with which the subject adapts itself to the medium.

Costs for the satellite transmission of a fully produced program depend on the choice between the two regions of the microwave spectrum currently in use: the C-band and the Ku-band. Time on the former is less expensive than on the latter because of the simpler technology needed to transmit the signal, the lower power requirements, and the large number of transponders available. The C-band range of the spectrum suffers, however, from its use by the telephone companies and others, making it particularly subject to interference in urban areas.

C-band transmission will run, at a minimum, $200 per broadcast-hour between 6 A.M. and 4 P.M., Eastern Time. Ku-band costs nearly $300

per-hour more. Time on the transponder, the receiving and transmitting device on the satellite, is approximately 20 percent of the total cost of program delivery when using C-band.

Added to the hourly transmission charge are the costs of the faculty, a "manager" for each course who takes care of the paper flow, graders, and computer programmers and technicians who constantly update the software and the preprepared videotape. These costs will vary somewhat depending on the size of the student body being taught. In aggregate, they will average between $250,000 and $500,000 per year. With continuing costs of this magnitude, it is a common and disastrous mistake for a course to be developed using grant money with little thought given to how that course will be sustained.

Production costs for the low-end, "plain-Jane" format, in which fixed cameras record live instruction in an actual classroom, such as is used by NTU, will typically be about $100 per hour in addition to the transponder costs. Other expenses will vary but will usually be much lower. One could conceivably reduce the cost for everything but salaries to below $50,000 per year for a two-semester course that is offered twice weekly.

A receiving site can purchase the necessary hardware—dish, monitor, etc.—for less than $5,000 or can spend tens of thousands of dollars. The cost of acquiring the programs also varies widely, from as little as $2,000 to as much as $11,200, depending on the provider. In the college market, pricing is handled just as it is on campus: by the student credit hour. Costs to students will generally include the university tuition plus a surcharge for delivery. Currently NTU charges $454 per credit hour. The NTU fee is usually paid by the student's employer.

Access

A rich array of thousands of hours of both credit- and noncredit-bearing courses, as well as enrichment and staff development programs, is already available. However, gaining access to all of these offerings is a problem. Currently, program providers use several different satellites and transmit on two microwave frequency bands, C and Ku. Purchase of a dual capability downlink can remedy the C/Ku band problem, but it cannot prevent the need to reorient receiving dishes with each change of satellite. The obvious solution to this problem is the aggregation of all appropriate programming on one satellite. Such discussions are currently underway. Progress is, however, inhibited by the issue of turf. Most program providers are very protective of their "market." A critical mass of students is necessary to ensure the continued existence of a course. The bills must be paid. If all programming is located on a single satellite, where it is easily accessible to all, the concern is that "customers" may be lost. Realistically, if a decision is not made to share resources, then serious long-term damage will likely be sustained by the distance education industry.

Higher Education Courses

The predominant current use of satellite-delivered programming in higher education is for graduate-level courses and teacher in-service training, although the Mind Extension University, headquartered in Colorado Springs, has announced the creation of a bachelor's level curriculum in business. Graduate courses are of the traditional format, with little integration of technologies and no attention to production values. To the present, this has not been a barrier to acceptance of satellite-based programming as an important educational delivery system. Providers such as the National Technological University find a high demand for their courses in the workplace. In this market, the student is motivated and completion of a master's degree often has ramifications for promotion.

In-service teacher training, conducted over a distance, also generally uses a traditional format, usually in the form of a seminar. Other technologies, such as the computer, are rarely incorporated. Programs tend to be dry, consisting of talking heads, restricted movement, few graphics, and generally low production values. Comments from teachers tend to be very negative about the quality of the current offerings. This is a wasteland that badly needs cultivation.

Conclusion

There are many barriers to providing and receiving quality distance education. Some are mechanical (How do you move the paper?); some are financial (How do you pay for the programming?); some are informational (How do you let people know what you have?); but the toughest of these barriers involves people. Convincing people of the efficacy of the medium, working with accrediting agencies, cajoling good faculty into participating as teachers, convincing site coordinators that their role is crucial—all these and more are crucial if a program is to be a success. It takes tact, determination, commitment, and good humor; but given these, no barrier is too high to overcome.