Journal of Research in Rural Education, Fall, 1994, Vol. 10, No. 2, 126-128

Distance Education in Rural Schools: Technologies and Practice

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In recent years, the use of telecommunicated distance learning has become increasingly popular in rural schools for providing curriculum equity to students and staff development for teachers. Here, we report findings from a national survey of the nation's smallest rural school districts: single campus, K-12 public school districts enrolling fewer than 300 students. We report the extent of distance education use among these schools and the types of technologies used for distance learning (or available *for use). Investment dollars in distance education technologies and programming costs are reported, as are programming priorities for students and staff.*

Precise data on the use and availability of educational technologies in rural schools is lacking. The myriad definitions surrounding "ruralness," the diversity between rural schools in different regions of the country, and the fact that most federal data for schools are not broken down by school district size or community population make it difficult to ascertain what technologies exist in rural schools and how they are being used. Yet, depending on the data cited and definitions used, America's rural schools enroll between 17% and 33% of all school-aged children and comprise between 28% and 67% of all schools (Geiger, 1992; Lewis, 1991; Matthes & Carlson, 1987; U.S. Department of Education, 1992).

Most studies that do report equipment resources for rural schools have been completed by independent researchers and are limited to individual state, district, or school reports. Many of these reports have been produced for local needs and typically remain unpublished. Nevertheless, anecdotal information from educational conferences and printed proceedings indicate that many rural schools are indeed making extensive use of distance learning and telecommunications technologies. The proper use of these technologies seems to broaden student learning opportunities and, at the same time, connect teachers with new resource materials and experts across the country. Developments in satellites, fiber optics, digital compression, and other forms of distance telecommunications hold considerable promise for helping rural schools overcome the disadvantages associated with remoteness and geographical isolation.

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Method

We sought information on the extent to which specific technologies are used to deliver distance education programs in rural schools. We also wanted to gather general information on distance education practices in rural schools. For the purpose of this study, we defined distance education as any form of instruction in which the learner is physically separated from the teacher but is linked by some form of advanced technology that permits live, real-time interactive audio and/or video exchanges.

We were interested in K-12 single-campus public school districts across the United States enrolling fewer than 300 students. Due to their small size, these schools are located in predominately rural areas. In spring 1993, we purchased a mailing list of 1,862 such schools from Market Data Retrieval Incorporated. We eliminated alternative schools (e.g., detention centers, schools for unwed mothers, vocational centers, adult learning centers), leaving a universe of 967 schools. We selected a random sample of 311, which assured a 95% confidence level that the sample was representative of the population (Krejcie & Morgan, 1982). In early 1993, a 16-item self-administered questionnaire and pre-paid return envelope was mailed to the building principal in each of the 311 schools; 130 questionnaires were returned, a return rate of 42%.

Results

Questionnaires were returned from schools in 32 states. The greatest response came from Nebraska (18), followed by Texas (17), North Dakota (11), Missouri (7), South Dakota (6), Colorado and Montana (5 each), and Idaho, Illinois, Michigan, New York, Oklahoma, Washington, and Wyoming (4 each). The remaining states with three or fewer participating schools each were Arizona, Arkansas,

California, Florida, Georgia, Indiana, Iowa, Kansas, Maine, Minnesota, New Hampshire, New Mexico, North Carolina, Oregon, Pennsylvania, Tennessee, Utah, and Vermont.

The mean K-12 enrollment of participating schools was roughly 198 students: 104 for elementary (K-6) and 96 for secondary (7-12). The mean instructional faculty was 23, resulting in an average teacher-student ratio of 1 to 9. Findings in response to specific areas of interest follow.

1. To what extent are rural schools receiving/participating in distance learning programs? Half (50%) of the school principals reported that their schools used some form of distance learning. Of these, two thirds (66.2%) indicated that they used more than one technology as part of their distance learning program.

2. What kinds of technology are being used in rural schools for distance learning (e.g., satellite, cable, ITFS, compression, fiber optics, computer networks)? The most popular technology reported was satellites. In fact, almost three quarters of all schools using distance learning (73.8%) used televised satellite programs. Just over half of these schools (52.1%) had dual feed-horn Ku/C band dishes, which are steerable and can receive signals from a number of transponders. Almost one in three schools (29.2%) had a Ku-band dish and about one fifth (18.7%) used a C-band dish.

Next to satellite technology, cable television use was reported by 41.5% of districts with distance learning programs. Only 18.5% made use of CODEC (coder-decoder) units transmitting digital video/audio signals on either T1, DS3, or fiber optic lines. Similarly, only 18.5% reported use of audiographic systems or computer networks for distance learning. And only 13.8% of schools participating in distance learning used either microwave or Instructional Television Fixed Service (ITFS) technologies.

3. How pervasive are telecommunication devices in rural schools (e.g., speaker telephones, fax machines, video telephones, modems, computers, satellite dishes, television monitors, and cameras) which could be used for distance learning? Of the 130 districts, fewer than half had television monitors (44.6%), computers (41.5%), or computer modems (40.0%) for audiographic networks. Roughly one in three schools had video cameras (31.5%) and facsimile machines (30.0%). About one quarter (23.8%) had speaker telephones, while only 3.8% had a video telephone.

4. What level of funding have rural schools committed to distance learning? In those schools with distance learning programs, the mean dollars expended during the 1992-93 academic year to participate in distance learning was $6,838. The mean dollar investment in distance learning equipment was $19,335.

5. Who are the major providers of distance learning programs to rural schools? As noted, satellite delivered courses were the dominant medium for receiving distance learning programming in rural schools. In this study, 25.9% of the schools with distance learning programs subscribed to courses from TI-IN Westcott Telecommunications (Dallas, TX); 18.9% subscribed to Satellite Telecommunications Educational Programming (STEP; Spokane, WA); 10.4% subscribed to the Arts and Sciences Teleconferencing Service (ASTS; Stillwater, OK); and 10.4% were part of the Satellite Education Resources Consortium (SERC; Columbia, SC). Approximately one third of the schools (34.4%) reported linkage to local cooperatives (e.g., cable TV, education service units, or audiographic networks) as their program provider.

6. What kind of distance learning programming is received by rural schools and what are the major programming needs? Extent of distance learning programs received by participating schools were directed primarily to secondary students. Principals reporting use of distance learning at their school noted that almost two thirds of all programs received (64.0%) were geared to secondary students. In fact, fewer than 10% of program offerings were directed to elementary students. Regarding staff development programs, a mean total of 14 hours were received during the 1992-93 academic year. According to principals, the greatest curricular need for distance learning programs for secondary students was foreign language courses, followed by advanced mathematics and science courses, then vocational education courses. And the greatest reported need for elementary students was foreign language courses, followed by science and English. The greatest needs for staff development programs were in the areas of technology and instructional design, with emphasis also being given to student motivation, student assessment, outcome based teaching, multicultural education, special education, and school effectiveness.

7. How supportive are teachers and administrators about distance learning courses at their school? The vast majority of school principals (78.8%) felt that distance learning was a viable means of providing curriculum equity for students at their school. Roughly half (52.1%) felt that parents and teachers were supportive of distance learning efforts. And just under half (46.3%) reported that teachers in their school would be interested in earning a Master's degree via distance learning if such a program could be accessed at their school.

Discussion

This study gathered data from 130 rural school districts in 32 states in an effort to ascertain the extent of distance education use in these schools and the types of technologies being used. We found that half of responding K-12 single campus school districts with fewer than 300 students had some form of distance learning program in place. In our opinion, however, the actual number is probably somewhat lower inasmuch as 181 schools receiving the questionnaire

did not respond. We suspect that many of the non-respondents did not want to admit that they are not on the "cutting edge" of advanced technology or that they have failed to invest in advanced technologies at their school.

Nevertheless, our data suggest that many of the nation's smallest school districts do participate in distance learning. Satellite-based programs are by far the technology of choice used by most schools; commercial vendors such as TI-IN, STEP, ASTS, and SERC are the major program providers. Satellite-based programs offer "turn-key" services (e.g., scheduling, daily instruction, and grading) that minimize personnel demands at local school sites. Furthermore, initial equipments costs for schools to receive satellite courses range between $5,000 to $10,000 with annual subscription fees between $3,000 to $10,000, depending on programming needs.

Not surprisingly, few schools report use of compressed video systems requiring CODEC units. Although this approach to distance learning is receiving the bulk of attention in higher education and business teleconferencing, the cost for these two-way, interactive TV systems is still exorbitant for most rural schools. Video teleconferencing units typically range between $50,000 to $70,000 per site. In addition, on-site connections may easily exceed $15,000 to $20,000, and it is not unusual for monthly line changes to be $2,000 or more. Operation and maintenance of compressed, two-way TV systems require personnel and technical expertise that is simply beyond the capability of most rural schools. Hence, it is unlikely that compressed TV technologies delivered via T1, DS3, or fiber optic lines will have significant impact in rural schools until costs drop sharply.

It is also interesting to note that few schools reported use of audiographic-based systems. While this approach is perhaps the least expensive of distance learning technologies, it is also the least desirable. Although the teacher and students share a common image on their computer screens and are able to speak freely with each other via speaker telephones, neither can see the other nor can they respond to the many nuances which are possible only through visual communication.

Most rural school administrators view distance learning as a realistic means to expand curriculum offerings in their school. Secondary students are clearly the target audience for most programs. In fact, the demand for distance learning in rural schools has been driven in large part by state mandated curriculum reforms and upgraded college entrance requirements. The only way that many small rural schools have been able to provide some course requirements for students has been through distance learning. While program offerings for elementary students and staff development have been somewhat low, administrators indicate definite programming needs in both areas.

Improvements in telecommunications have made it increasingly easy to transmit instruction, access information, and share electronic messages over geographically forbidding distances. New and advancing technologies are reaching out to diverse audiences providing increased opportunities for education and communication. The benefit to rural schools is obvious. The traditional barriers of remoteness and geographical isolation are bridged by today's telecommunication technologies. It remains for educators and community leaders in rural areas not yet participating in distance learning to find ways to make these resources a part of their school's educational program.

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