DOCUMENT RESUME

ED 286 698 RC 016 428

AUTHOR Barker, Bruce O.
TITLE Interactive Distance Learning Technologies for Rural and Small Schools: A Resource Guide. ERIC Mini-Review.
INSTITUTION ERIC Clearinghouse on Rural Education and Small Schools, Las Cruces, N. Mex.
SPONS AGENCY Office of Educational Research and Improvement (ED), Washington, DC.
PUB DATE 87
CONTRACT NIE-400-86-0024
NOTE 6p.
AVAILABLE FROM ERIC/CRESS, New Mexico State University, Department 3AP, Box 30001, Las Cruces, NM 88003-0001 (free).
PUB TYPE Reference Materials - Directories/Catalogs (132) -- Information Analyses - ERIC Information Analysis Products (071)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Access to Education; Audiovisual Communications; Communications Satellites; Delivery Systems; *Distance Education; Educational Technology; Educational Television; Elementary Secondary Education; Financial Support; *Information Sources; Instructional Systems; Multimedia Instruction; Networks; Nontraditional Education; *Program Costs; *Rural Schools; *Small Schools; State School District Relationship; *Telecommunications; Telecourses
IDENTIFIERS Instructional Television Fixed Service; *Interactive Systems

ABSTRACT

In remote and isolated schools where a certified teacher is not always available, or in small schools where limited student enrollments make hiring teachers for low incident courses cost-prohibitive, instruction via distance may be the "next best thing to being there." Several approaches are available: (1) satellite transmissions--the TI-IN Network in Texas, Oklahoma State University's Arts and Sciences Teleconferencing Service, Eastern Washington University's Satellite Telecommunications Educational Programming Network (STEP), and the SciStar Satellite series from the Talcott Mountain Science Center in Avon, Connecticut, are cited as examples; (2) two-way interactive television; (3) Instructional Television Fixed Service (ITFS); (4) audio-graphic teleconferencing; and (5) multi-media equipped buses for in-transit studying. Interested school administrators should consider initial equipment costs, annual subscription or programming fees, and maintenance/warranty contracts, and should contact others who have had success with distance learning, as well as their own state office of education. State-sponsored educational telecommunications networks are in operation or are being developed in Alaska, Kentucky, and Missouri. While this method of instructional delivery is not a rationale for replacing teachers, it is expected to increase in terms of use and acceptance. Twenty-two program addresses--with telephone numbers--are appended. (JMM)

ERIC MINI-REVIEW

RURAL EDUCATION

Interactive Distance Learning Technologies For Rural And Small Schools: A Resource Guide

By

Bruce O. Barker
College of Education
Texas Tech University
Lubbock, Texas
1987

RURAL EDUCATION

INTERACTIVE DISTANCE LEARNING TECHNOLOGIES FOR RURAL AND SMALL SCHOOLS: A RESOURCE GUIDE

What is "distance learning?"

As administrators in rural and small schools strive to deliver quality education to their students, the obstacles of teacher availability, low student enrollments, and geographical isolation beg for solutions. In the past, our approaches to solving these problems have included pairing agreements, traveling teachers, correspondence study courses, or school district consolidation. Some of these practices still have value; however, new—and in some cases better—approaches are now available through technology.

Today's technologies have given rise to increased interest in the concept of "distance learning." With limited fanfare, many schools across the United States have been using distance learning technologies to help them meet new state mandated curriculum requirements, to offer elective or long standing required courses for which a certified teacher is not available, and to provide quality teacher inservice training which otherwise might not be available. Distance learning technologies, as used in this Review, refer to the live, simultaneous transmission of a master teacher's lessons from a host classroom or studio to multiple receiving site classrooms in distant locations. Two-way live communication, whether audio or video, between the teacher and students makes the instruction interactive.

How can distance learning technologies benefit rural and small schools?

Schools with the most to gain from distance learning technologies are those with low student enrollments and/or those faced with teacher shortages. Distance learning technologies make it possible for these schools to offer a full and varied curriculum, as well as quality teacher inservice training, without the need to consolidate schools and without physically transporting teachers from one location to another.

The purpose of this Review is to (1) provide a brief description of some of the more popular distance learning technologies currently being used and (2) present a list of successful programs/projects interested readers can contact for further information.

What specific technologies are used for distance learning?

Several approaches are available. The most common seem to be some form of audio teleconferencing linked with microcomputers, or interactive television which integrates satellite, fiber optics, microwave, cable, slow scan TV, or ITFS (Instructional Television Fixed Service) technologies.

Satellite Transmissions

Four instructional television satellite systems are presently broadcasting instruction to high school students scattered throughout the continental United States. One-way, full-motion video is transmitted from an uplink studio to downlink or receiver dishes at subscribing schools. Audio talk-back by participants is over regular telephone lines, thereby making the system interactive.

The TI-IN Network operates out of Texas. At the close of the 1986-87 school year, TI-IN was beaming lessons for 23 different high school credit courses 5 days each week to over 200 subscribing high schools in 14 different states. In addition, the network beams extensive inservice training for teachers and enrichment programs for students across the K-12 curriculum.

Oklahoma State University's Arts and Sciences Teleconferencing Service began broadcasting a single semester of German language instruction in January 1985. Since then the network has grown significantly. During the 1986-87 school year, broadcasts were received by 101 districts in 6 states, and offerings had been expanded to 2 full years of German and a full year of high school physics. At the beginning of the 1987-88 school year, OSU commenced the offering of trigonometry and advanced placement calculus. Future course production plans include the broadcast of accredited high school courses in Russian language and chemistry. Unlike the TI-IN Network, OSU's satellite courses are broadcast either 2 or 3 days each week (depending on the course) rather than 5. On the non-broadcast days, students work individually at their schools on computer assisted lessons and written assignments which have been specifically designed by OSU educators. Extensive inservice training and K-12 student enrichment programming is also provided by the network.

Beginning in the Fall of 1986, Eastern Washington University—in conjunction with Education Service District #101 in Spokane, Washington—began the broadcast of the Satellite Telecommunications Educational Programming Network (STEP). STEP began with the broadcast of 4 high school courses to 15 schools in Washington state. The operation of STEP most closely parallels the TI-IN Network, except that live instruction is beamed to subscribing high schools 4 days each week rather than 5. This gives school officials the time to handle more local concerns each Friday with those students who would normally be studying by satellite. At the beginning of the 1987-88 school year, the STEP Network had expanded beyond Washington to other states in the Northwest. In addition, the original four courses have now increased to seven. Inservice programs for teachers are also provided.

The SciStar Satellite series originates from the Talcott Mountain Science Center in Avon, Connecticut to nearly 100 sites in 25 states. SciStar has produced several school enrichment programs, chiefly in the sciences, for high school students. Numerous teacher inservice programs, discussing such topics as brain hemisphericity, chronobiology, gifted education, and creative teaching strategies, are also available. Student programming includes science news, reading proficiency, high school computer science, amateur radio, physical science, etc. Most student programs are presented in five, 50-minute broadcasts. By far the most popular SciStar program has been the "Shoulders of Giants" series. Ten sessions, each lasting an hour and a half, are presented during the school year. Each session features a world leader in science with whom students at downlink site locations can dialogue during the broadcast.

The application of satellite technology for interactive television instruction in public schools is still in its infancy. As existing networks grow and new networks begin beaming instruction, interest across the country—especially in small and geographically isolated school districts—is expected to mushroom.

Two-Way Interactive Television

Many model two-way video and two-way audio interactive television systems are operative in small schools. Successful projects include systems in Illinois, Iowa, Wisconsin, New York, Minnesota, and other states. In most systems, each school on the network has a fully equipped television classroom which allows a teacher in one location and students at one or more locations to both see and hear each other during the instructional broadcast. Transmission may be over cable, fiber optics, or microwave. The typical model is a cooperative arrangement between five to eight districts to form a telecommunications network. The network co-ops human, financial, and equipment resources to provide interactive television programming over several channels between member schools. Programming usually includes elementary/secondary courses and inservice training for teachers. A variety of other courses may also be offered such as vocational instruction, library programs, community education classes, story hours, or general interest topics. Instructional television permitting two-way video and two-way audio interaction between cooperating school districts is one of the fastest growing—and most promising—distant learning alternatives available for small and geographically isolated rural schools. The fact that participating schools maintain local control of their programming is also an appealing aspect of this technology.

Instructional Television Fixed Service (ITFS)

ITFS systems are FCC licensed, low power, line-of-sight TV broadcast stations that transmit omnidirectional signals a maximum distance of about 40 miles. In most cases, ITFS stations are located in large metropolitan areas, benefiting large schools in urban and suburban settings. Small rural schools near or adjacent to the respective metro area may also benefit by receiving the signal. Most ITFS systems are one-way video with the possibility of two-way audio interaction. The audio interaction is typically over regular telephone lines.

ITFS has inherent advantages and disadvantages over other instructional television systems. Advantages are that four channels are usually licensed to one operator. Only one antenna is needed by receiver site schools to pick up signals for all four channels. Hence, the host site is able to broadcast on four different channels simultaneously, enabling distant schools to receive a variety of programs. Disadvantages center on the limited broadcast range due to the low power broadcast and on the expense of the technology.

ITFS systems operate in many of our large cities. Examples of two large systems are the InterAct system in Houston and the Regional Instructional Television Consortium (RITC) in Richardson, Texas. Both systems are characteristic of others like them across the country.

The Region IV Education Service Center in Houston operates the InterAct Instructional Television Network. Using closed circuit microwave technology, video and audio signals originate from the InterAct studios. From there, they are dispersed via omnidirectional microwave to subscribing receiver sites in the seven county Gulf-coast area. Receiver sites are equipped with a tower, antenna, down converter and an audio talk-back converter. The receiver classrooms are equipped with modified television sets and talk-back instruments. Over 30 school districts subscribe to the network, including several small schools in the area. Program offerings include selected high school courses, K-12 student enrichment viewing, staff development, and college credit courses.

The Regional Instructional Television Consortium (RITC) is a cooperative effort of almost 50 public and private schools. The purpose is to provide high quality instructional television to schools and communities in North Texas. Broadcast recipients are chiefly large schools located in the Dallas-Fort Worth metroplex, yet numerous small schools in outlying areas are also members. RITC broadcasts 8 hours of instructional programming each school day across the K-12 curriculum. The evening hours are devoted to college courses and continuing education. Most RITC programs are one-way video and one-way audio only.

Audio-Graphic Teleconferencing

Microcomputer networks and electronic mail systems are commonplace in many schools. Yet, a relatively new approach to microcomputer networking is to integrate PC's with live, telephone interaction. Microcomputers are linked via modems over regular telephone lines coupled with an audio bridge over a separate set of phone lines.

Audio-graphic teleconferencing is a PC-based system that incorporates a graphics tablet which functions much like an electronic chalkboard. The system requires specially designed software. Once on-line with other compatible PC's, the system operates on a "common screen" basis—that is, whatever graphic or print material is executed from any one screen (location) shows up on all the other screens (locations) at the same time. The technology is capable of operating in either a "present" mode or an "interact" mode. The teacher (or students) can prepare pages prior to "class" and store them on disk. During instruction, disk content can be distributed electronically to each user simultaneously. Audio-graphic teleconferencing also permits real time interactive writing and/or annotation on blank or existing screens. Along with graphics/print interaction, an audio bridge permits immediate voice interaction between all users.

Successful audio-graphic distance learning programs have been piloted in Utah, Pennsylvania, and New York. One disadvantage of this approach is that the teacher cannot see the students, nor can students see the teacher. Oral communication over the audio bridge and visual communication in the form of computer graphics or print must be well designed in order to maximize instruction. Proponents of audio-graphic teleconferencing claim that this feature gives this approach to distance learning its most positive aspect—the necessity for teacher/student interaction. In order for audio-graphic teleconferencing to work well, students must be actively involved in the learning process. They must be more than recipients of instruction. They must also be participants.

What monetary costs are associated with distance learning technologies?

School administrators interested in investigating interactive distance learning technologies for adoption in their schools should consider two cost factors: (1) initial equipment costs and (2) annual subscription or programming fees.

Required equipment for each of the satellite systems includes a downlink or satellite receiving dish, a TV monitor, and assorted telecommunications devices. Initial equipment costs vary among vendors, with ranges between $4,500 to $15,000. In addition, schools joining the Oklahoma State University network will need to acquire—unless they already have them—one microcomputer for every two students enrolling in coursework. The microcomputers must be compatible with software produced by the respective network. OSU's software is Apple, IBM, and Radio Shack compatible. Interested readers should contact the individual networks directly for information on current prices and for help in identifying precise equipment needs. Annual subscription fees also vary. Typically, fees for high school programming are separate from fees for teacher inservice training and other special programming. Depending on the extent of programming desired, annual subscription fees may be as low as $300 or as high as $10,000.

Costs for two-way video/two-way audio instructional television systems are very expensive. Among the cooperatives which have been organized, total equipment investment has ranged anywhere from $400,000 to 2 million dollars. Costs are shared among cooperative members. In most cases, they have been offset with sizeable federal, state, or private grants. Partnership arrangements between schools, cable companies, and rural telephone companies have also resulted in a significant reduction of direct equipment costs to some schools.

Initial equipment costs for an ITFS broadcast site can range from $100,000 on up. Schools at each receiver site location will need to purchase an antenna, down converter, and possibly repeaters if they are a long distance from the station. Equipment costs for receiver sites can range anywhere from $1,000 to $4,000—more if a repeater is added.

Costs for audio-graphic teleconferencing include equipment charges as well as long-distance phone service for the audio bridge. Hardware, speaker phones, and associated communications software can be expected to run between $6,000 to $13,000 per site. Schools which already have the necessary hardware equipment (typically a PC microcomputer with a minimum of 612K memory) can purchase required software for anywhere between $700 to $4,000 per site Long distance phone charges will vary between geographical regions, but are likely to range between $.15 per minute (for WATS line) to $.45 per minute for prime time commercial use.

Could distance learning technologies be utilized while students are traveling long distances on a school bus?

As part of its Area Vocational Program, Pikes Peak Community College in Colorado Springs, Colorado has initiated a Distant/Mobile Learning Project which involves the use of a multi-media equipped school bus for the transportation of students. While the students are in transit, they can participate in learning rather than wasting time. The 18 passenger bus is equipped with a 13 inch TV monitor, a VHS video cassette recorder, head phones, an OMNI multidirectional antenna, power inverter, laptop microcomputers, and a mobile telephone. Instructional content can be delivered in the form of (1) "canned" (commercially prepared) video programs; (2) delayed video—programs taped one day then viewed the next, coupled with instructor interaction the following day in school; (3) live ITFS video transmission from Colorado Springs to the bus, with student audio interaction via a mobile telephone located on the bus; or (4) laptop microcomputers used by the students for note taking, homework, or telecommunications while in transit.

Are state sponsored educational telecommunications networks in operation or in the process of being developed?

Due to its immense geographical expanse and scattered population, the state of Alaska several years ago developed the LearnAlaska network as a statewide system of audio-conferencing and satellite instructional television for classroom use, inservice training, staff development, college credit coursework, and educational outreach. Plummeting oil prices in 1986 resulted in severe budget cuts to the LearnAlaska system, dramatically limiting its outreach capability. The audio-conferencing component is still in place, but the instructional television system has been significantly cut back. In spite of its reduced level of operation, the LearnAlaska system is still an excellent model for interested educational leaders in other states to consider in developing a statewide telecommunications system.

The rapid growth of the satellite instructional television networks, discussed earlier in this Review, has spawned great interest by many state school officials in the feasibility of such statewide networks. In particular, the 1986 Kentucky Legislature, with strong endorsement from the Governor's office, approved plans for a multi-million dollar statewide network that will include an uplink and 1,650 downlink dishes. A receiver dish will be located at each of the state's 1,320 elementary and secondary schools, as well as at state sponsored vocational schools, libraries, community colleges, and universities. The primary thrust for educational programming will be to elementary and secondary schools. Programming during evening hours will include staff development, college credit instruction, adult education, continuing education, and community education. Programming will originate from Lexington. Educational leaders in Kentucky anticipate that the network will be operational by the Spring of 1989.

In 1987, the Board of Directors of the Missouri State School Boards Association (MSSBA) approved establishment of the Educational Satellite Network. At the time of this writing, 200 downlink dishes have been installed in public secondary and elementary districts across the state. By the end of 1989, the MSSBA plans to have installed downlinks at most of the state's 545 elementary/secondary districts. The network will operate on a non-profit basis and will broadcast a full range of programming, including high school courses, student enrichment, staff development, and college credit classes. Uplinking will be from a KU-band mobile unit, thereby allowing programming to originate from virtually any desired location within the state. The base price for districts to participate on the network is about $3,500.

School officials in many other states are expressing keen interest in the possiblity of a statewide network for their respective state. It is expected that others will follow the examples set by Alaska, Kentucky, and Missouri.

How do interested administrators bring their schools "on-line" to distance learning technologies?

The best approach is to contact others who have experienced success. Addresses of the programs mentioned in this Review are listed at the conclusion.

Interested school officials should carefully assess their needs and resources—specifically student curriculum and inservice training requirements and budget capability. Once a decision on a system is made, support should be sought from other school leaders, the community, and key groups before investing in expensive technologies. It would be wise to contact the state office of education and seek advice from state education leaders. Some states have restrictions on telecommunicated instruction, especially when it originates from out-of-state. It is also important to remember the diverse nature of rural America and of rural and small schools. No one distance learning model or practice necessarily "fits all sizes." Modification of existing practices or models may be needed in order to determine the best approach to meet local needs.

Another consideration is the matter of maintenance and warranty. Anyone who drives a car knows that technology occasionally breaks down. The more technology that is hooked together to form a system, the greater the possibility that things can go wrong. Who is going to fix things when they break? Maintenance agreements and equipment warranties are important considerations when setting up a system or subscribing to a program producer.

Will the attention presently given distance learning technologies continue in our schools?

There seems to be a great deal of interest in applying distance learning technologies to rural and small schools. This is not to suggest that the use of distance learning technologies is an educational panacea. Most educators would agree that quality instruction by a certified teacher in the classroom is still the ideal way to educate students. Yet in remote and isolated schools where a certified teacher is not always available or in small schools where limited student enrollments make hiring teachers for low incident courses cost prohibitive, instruction via distance learning technologies may be the "next best thing to being there." Although it is highly unlikely that distance learning technologies will be a rationale for replacing teachers—nor should they be—we can anticipate that this approach to instructional delivery will not only remain with us for many years but will likely continue to increase in terms of use and acceptance.

For more information

Information about the programs and information presented in this Review was obtained by the author over an 8 month period via personal correspondence and telephone contact with each of the programs discussed. It should be understood that the specific programs mentioned in this Review are not inclusive. Still other exciting applications of technology are occuring in small and rural schools around the country. Interested readers are encouraged to contact the programs listed below for updated and more detailed information. In addition, the Septembe October 1986 issue of *Teleconference: The Business Communication Magazine*, Volume 5, Number 5 provided an address listing of 57 different telecommunications vendors in the United States. The same list is reprinted as part of an ERIC microfiche document entitled "Using Interactive Technologies to Increase Course Offerings in Small and Rural High Schools," ERIC Document ED 279 465.

Satellite Transmissions

The TI-IN Network
100 East Nasa Road, Suite 201
Webster, Texas 77598
(713) 554-5545

Arts and Sciences Teleconferencing Service
Arts and Sciences Extension
206 Life Sciences East
Oklahoma State University
Stillwater, Oklahoma 74078-0276
(405) 624-5647

Satellite Telecommunications Educational Programming
Education Service District #101
West 1025 Indiana
Spokane, Washington 99025
(509) 456-7660

SciStar Satellite Series
Talcott Mountain Science Center
for Student Involvement, Inc.
Avon, Connecticut 06001
(203) 677 8571

Two-Way Interactive Television

Tele-Systems Associates, Inc.
11995 Singletree Lane, Suite 230
Minneapolis, Minnesota 55344
(612) 829-5881

Knowledge Interactive Distribution System
St. Peter High School
Lincoln Drive, Room 120
St. Peter, Minnesota 56082
(507) 931-4210

East Central Minnesota Educational Cable Cooperative
Westview High School
Braham, Minnesota 55006
(612) 396-3674

Carrol Instructional Television Consortium
200 South School Street
Lanark, Illinois 61046
(815) 493-6301

Trempealeau County Kellog Project
205 Offeo Road
P.O. Box 326
Independence, Wisconsin 54747
(715) 985-3004

Communicasting Project
Woodland Cooperative Center
N.E. 5th Street
Staples, Minnesota 56479
(218) 894-2438

Morning Sun Community School District
P.O. Box 129
Morning Sun, Iowa 52640
(319) 868-7702

Instructional Television Fixed Service (ITFS)

Regional Instructional Television
8221 Towns Street
Dallas, Texas 75243
(214) 235-7770

InterAct Instructional Television Network
Region IV Education Service Center
P.O. Box 863
Houston, Texas 77001
(713) 462-7708

Audio-Graphic Teleconferencing

Tele-Learning Network
Garfield County School District
Box 398
Panquitch, Utah 84759
(801) 676-8821

Tele-Teaching Project
Mansfield University
Mansfield, Pennsylvania 16933
(717) 662-4578

Wasatch Blackboard System
P.O. Box 626
Salt Lake City, Utah 84110
(801) 575-8C43

Interactive Tele-Learning Network
Delaware-Chenango B.O.C.E.S.
RD 3, East River Road
Norwich, New York 13815
(607) 336-6514

Optel Communications Inc.
322 8th Avenue
New York, New York 10001
(212) 741-9000

Statewide Telecommunication Systems

LearnAlaska
Instructional Center
Alaska Department of Education
Box F
Juneau, Alaska 99811-0500
(907) 465-2884

Satellite Project
Kentucky Educational Television
600 Cooper Drive
Lexington, Kentucky 40402
(606) 233-3000

Educational Satellite Network
Missouri School Boards Association
1809 Vandiver Drive, Suite 100
Columbia, Missouri 65202-1983
(314) 474-8591

Interactive Video on a School Bus

Distant/Mobile Learning Project
Area Vocational Program
Pikes Peak Community College
5675 S. Academy Blvd.
Colorado Springs, Colorado 80906
(303) 576-7711, Ext. 404

Prepared by:

Bruce O. Barker
College of Education
Texas Tech University
Lubbock, Texas

1987

This publication is based on work sponsored wholly or in part by the Office of Educational Research and Improvement (OERI), U.S. Department of Education, under contract number 400-86-0024. Its contents do not necessarily reflect the views of OERI, the Department, or any other agency of the U.S. government.