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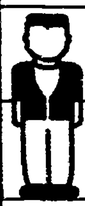
ABSTRACT

This packet of materials for a workshop on distance education for Chapter 1 programs provides a presenter's guide, which includes a script to be read with 18 overhead transparencies; masters for the transparencies; master copies for 12 handouts; and supplemental materials, i.e., copies of four articles and a glossary. Topics covered include workshop goals, one-way and two-way technologies, interactive television, major issues in distance education, sending and receiving sites, characteristics of successful projects, key components of a successful program, leading deficiencies in teleclassroom courses, directions of distance education technology, print-based and computer-based changes, audio-based and video-based changes, sample costs and funding, instructional/implementation issues, and the role of teachers. A list of resources for background information on distance education includes 11 articles, a journal, a resource guide for teleclass teaching, and a report issued by the Office of Technology Assessment, "Linking for Learning." (BBM)

TAC B-226

WORKSHOP GUIDE



Includes:

1. PRESENTER'S GUIDE
2. TRANSPARENCIES
3. HANDOUTS
4. RESOURCE MATERIALS

Region E Region 5

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WORKSHOP GUIDE

DISTANCE EDUCATION

PRESENTER'S GUIDE

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DISTANCE EDUCATION: AN ALTERNATIVE SERVICE DELIVERY MODEL FOR CHAPTER 1

Transparencies used in this workshop:

T - 1	Workshop Goals
T - 2	What is Distance Learning?
T - 3	Distance Learning Can...
T - 4	Who is Providing Distance Education?
T - 5	One-Way and Two-Way Technologies
T - 6	Summary of Distance Learning Technologies
T - 7	Interactive TV
T - 8	Major Issues in Distance Education
T - 9	Evaluation
T -10	Locations of Pilot
T -11	Sending and Receiving Sites
T -12	Characteristics of Successful Projects
T -13	Key Components of a Successful Program
T -14	Leading Deficiencies in Teleclassroom Courses
T -15	Adaptations of Distance Education Technology in the 1990s
T -16	Directions of Distance Education Technology
T -17	Print-based and Computer-based Changes
T -18	Audio-based and Video-based Changes

Handouts used in this workshop:

H - 1	Different Technologies: Advantages and Disadvantages
H - 2	Modes of Transmission for Distance Education
H - 3	Inside the Fiber-Optic Classroom
H - 4	Perceptions of Distance Education: The "Great Lies or Tough Truths?" Test
H - 5	Sample Costs of Transmission Systems
H - 6	Funding for Distance Education
H - 7	Instructional/Implementation Issues in Distance Education
H - 8	Key Issues in Decision Making
H - 9	Distance Learning: Issues
H -10	Region 5 Special Activity
H -11	The Role of Teachers in Distance Education
H -12	Directions of Distance Education Technology

Supplemental materials used in this workshop:

S - 1	Interactive Distance Learning Technologies for Rural and Small Schools
S - 2	Glossary
S - 3	Implementing Distance Education Programs: Suggestions for Potential Developers
S - 4	Distance Education: A Review of Progress and Prospects
S - 5	Separating Myth From Reality in Distance Education

Outline

Introduction		
The Distance Education Classroom		
Workshop Goals	T-1	
Definitions of Terms	T-2 thru T-5	
Technologies	T-6, T-7	H-1, H-2, H-3
Major Issues in Distance Education		
Activity:		
Separating Myth from Reality		H-4
Discussion:		
Major Issues in Distance Education	T-8, T-9	H-5 thru H-9
The Role of Distance Education in Chapter 1		
Discussion:		
R-TAC Special Activity	T-10, T-11	H-10
Key Components of Quality Programs	T-12, T-13, T-14	H-11
Current Trends and Implications	T-15 thru T-18	H-12
Debriefing		

Time:

3 hours

Materials needed:

flip chart, marker board, and/or chalk board
markers/chalk
overhead projector
blank transparency sheets
evaluation form

Resources

The following resource materials may be helpful in providing background information on distance education. The materials are referenced in appropriate places in the text of the workshop guide. Contact the Region 5 R-TAC office (1-800-922-3636) if you would like copies of any of these resources.

R - 1 Jason Ohler, "Why Distance Education?" AAPSS *Annals* 514 (March 1991): 22–34.

R - 2 Austin D. Swanson, "Role of Technology in the Education Reform of Rural Schools: Implications for District Consolidation and Governance," *Journal of Rural and Small Schools* 3, 1 (Fall 1988): 2–7.

R - 3 Francine E. Jefferson and O. K. Moore, "Distance Education: A Review of Progress and Prospects," *Educational Technology*, September 1990, 7–12.

R - 4 Scott S. Schiller and Barbara J. Noll, "Utilizing Distance Learning in a Large Urban School System," *Tech Trends* 36, 1 (1991): 23–27.

R - 5 Don E. Descy, "The KIDS Network: Two-Way Interactive Television in Minnesota," *Tech Trends* 36, 1 (1991): 44–48.

R - 6 "Interactive TV Strengthens Rural Curriculum," Beaver County Interactive TV Cooperative (c/o Beaver School, Box 580, Beaver OK 73932).

R - 7 William D. Milheim, "Implementing Distance Education Programs: Suggestions for Potential Developers," *Educational Technology*, April 1991, 51–53.

R - 8 Barry Willis, "Integrating Technology and Distance Education: Planning for Success," *Educational Technology*, April 1990, 32–33.

R - 9 Dianna Lawyer-Brook, *Region 5 R-TAC Special Activity: The Use of Distance Education To Deliver Chapter 1 Services* (Final Report). Denver: RMC Research Corporation, August 20, 1991.

R -10 Sally M. Johnstone, "Research on Telecommunicated Learning: Past, Present, and Future," AAPSS *Annals* 514 (March 1991): 49–57.

R -11 Susan M. Zvacek, "Effective Affective Design for Distance Education," *Tech Trends* 36, 1 (1991): 40–43.

In addition, the following resources provide general information on distance education:

American Journal of Distance Education (any issue)

Thomas E. Cyrs and Frank A. Smith, *Teleclass Teaching: A Resource Guide*, 2nd ed. (available from: Center for Educational Development, Box 3CED, New Mexico State University, Las Cruces NM 88003. 505-646-2204. $35 plus $3 postage & handling)

Office of Technology Assessment, *Linking for Learning: A New Course for Education* (available from: Superintendent of Documents, GPO, Washington, D.C. 20402-9325. Call 202-783-3238 to check price. GPO stock no. 052-003-01170-1)

Script to read with T-1

Approximately 15 minutes before the class begins, the overhead monitors begin to flicker. Standing in front of the room on the raised platform, the teacher glances up as the smiling faces of the facilitators appear from the remote sites. After exchanging pleasantries with them, the teacher checks her desk one more time to be sure her materials are organized and then begins to greet the children as they arrive. The Chapter 1 math class begins at exactly the same time every weekday.

The camera focuses on the teacher as she reminds the students about the lesson they covered the previous day. Yesterday they worked with the wooden blocks in sets of ones, tens, and hundreds. The teacher explained the importance of place value in everyday life and used the manipulatives to give concrete examples. The children built numbers with their own sets of blocks after she demonstrated how this could be done using the graphic board, a magic marker writing board laid on a desk with an overhead camera directed to the center. Using the graphic board, the teacher can use the zoom button of the camera to enlarge objects, showing detail even on items as small as money. The children can see the writing and objects so clearly that the teacher wishes graphic boards were available in the traditional calssroom.

Today the teacher is relating place value to the use of calculators with an activity called "The Broken Calculator." The facilitators have the calculators and activity sheets ready. The teacher's calculator is shown clearly on the graphic board. The students follow the activity demonstrated by the teacher and share their answers with the facilitator at their site. Often they raise their hands and the teacher, who may be 60 miles away, calls on them and either answers their questions or calls on students at other sites to answer the questions. The students look at a series of large monitors in front on them and see the teacher and the students at the other three sites. If the class is an hour class, halfway through the session the teacher has the students stretch and participate in show and tell for five minutes. Today is Tansy's turn, so she walks up to the front of her classroom and stands on the platform identical to the one used by the teacher at her site. She talks about her baseball team and shows her trophies. The children ask her questions and then she sits down. The teacher follows up by talking about how much math is used in the game of baseball.

Next the teacher returns to the calculator activity and gives directions to complete the work sheet that summarizes the activity. The work sheets, the week's lesson plans, and other necessary materials were faxed to the remote sites the previous week. The manipulatives were distributed at the beginning the project. When the children finish their task, they enthusiastically wave their hands to share their work. Each child has an opportunity to come forward and show his or her paper on the graphic board to the other children at the other classroom sites. Except in the classroom where the student is sharing his/her paper, all the sites have the cameras on the students so the teacher can call on them. During this activity, the TV monitor reflects the images of the children in the classrooms rather than the teacher.

When the class ends, the students return to their regular classrooms. Either before or after class, time is scheduled for the teacher to discuss lessons and student needs with the facilitators. The teacher feels that this time with the facilitators makes a difference in the quality of the program.

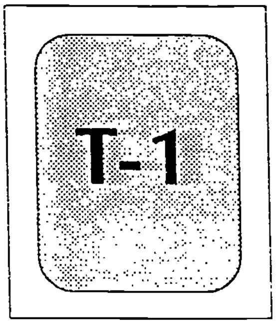
INTRODUCTION

30 minutes

The Distance Education Classroom

Read the scenario of a distance education classroom on the 2 (two) previous pages.

Workshop Goals



Display T-1:
"Workshop Goals." Introduce the workshop by stating the goals.

As a result of this workshop participants will:

- be able to define and describe terms and technology associated with distance education. When working with new technology it is especially important to form a base of knowledge.
- be familiar with main issues in the distance education field. Many issues are similar to those related to any innovative program in education, but some are unique to distance education.
- be knowledgeable about the role of distance education in Chapter 1. Working with disadvantaged elementary/secondary students in reading and math is a new use of distance education.
- understand key components associated with quality programs using distance education. Using distance education technology is not enough.
- be familiar with current trends in the techology and their implication for education. Educational technology is a dynamic and changing field.

Definitions of Terms Associated with Distance Education

NOTE TO PRESENTER

For background information on distance education, read the the following supplemental materials, included in this workshop guide:

S-1 **"Interactive Distance Learning Technologies for Rural and Small Schools"** (ERIC Clearinghouse on Rural Eduction and Small Schools)

S-2 **"Glossary"** (Office Technology Assessment)

S-3 **"Implementing Distance Education Programs: Suggestions for Potential Developers"** (William D. Milheim)

S-4 **"Distance Education: A Review of Progress and Prospects"** (Fancine E. Jefferson and O. K. Moore)

Other resources that may be helpful are R-1 and R-2. (See the list of resources at the beginning of this guide.)

T-2

Display T-2:
"What is Distance Learning?" Read the definition on the transparency and discuss examples of distance education technology in the past such as radio and television.

Explain that the Office of Technology Assessment examined distance learning in great detail in its publication *Linking for Learning: A New Course for Education*. The agency came to the conclusion that "Distance Learning is a viable, effective education delivery mechanism to address important student, teacher, and systemwide needs in this time of educational reform" (p. 21). *Linking for Learning* remains the best resource for background knowledge on distance education.

Specific needs have encouraged the growth of distance education.

T-3

Display T-3:
"Distance Learning Can..." and discuss. Mention the Oklahoma Panhandle as an ex⌞mple of a location that has the needs outlined on T-3. Distance education is a viable answer in the Panhandle, where long distances separate schools.

T-4

Display T-4:
"Who Is Providing Distance Education?" and discuss the list of providers.

Explain that interactivity is an important component of distance education. Two-way live communication, whether using audio, video, or print, between the teacher and students makes the instruction interactive. The type of interactivity depends on the system.

T-5

Display T-5:
"One-Way and Two-Way Technologies" and discuss the examples of delivery systems shown.

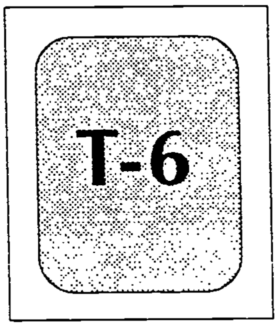
The two-way interactivity of interactive television is a big step beyond cable television. The interactivity takes a passive activity and changes it into active learning. This involvement changes the impact of distance learning and promotes new uses of the system such as speech therapy.

Technologies of Distance Learning

NOTE TO PRESENTER

Resource materials that may be helpful include R-3, R-4, and R-5. (See the list of resources at the beginning of this guide.)

Explain that technology enables distance education to exist. The various configurations are rapidly changing and improving. For example, the new compressed video has almost no residue shadow. Generally the trend is toward the use of fiber-optic cable and satellite.



Display T-6:
"Summary of Distance Learning Technologies." Explain that different combinations of the technologies exist, but the main systems are listed on T-6.

The one-way directional systems include regular television broadcasts, cable networks, ITFS, and satellite transmission.

Cable systems include educational television provided by cable networks and school districts. Examples are shows such as "Ghostwriter" and programs provided by the Denver Public Schools.

Satellite technology is used extensively throughout the United States. Transmission is made from one site, travels to the satellite, and then is beamed to receiving sites that have the appropriate equipment. Oklahoma has been using satellite technology successfully for many years. Through the Oklahoma State University Arts and Sciences Teleconferencing Service, the state provides satellite instruction to all grades. Other successful satellite programs include

- TI-IN in Texas (K-12),
- STEP in Washington State through Eastern Washington University (high school), and
- SCI STAR in Connecticut (high school).

Two-way directional systems include Public Switched Telephone Networks, audiographics, microwave transmission, and fiber optics.

Audiographics allows students to share information on their computers and ask and answer questions on the telephone. The computers are linked via modems over regular telephone lines coupled with an audio bridge on a separate set of phone lines. The main disadvantage of audiographic teleconferencing is that the students and teacher cannot see one another. Successful audiographics programs exist in Utah, Pennsylvania, and New York.

Microwave signals are high-frequency radio waves used for point-to-point and omnidirectional communcation. Microwave systems are less expensive than fiber cable and can transmit two-way audio and video. The main disadvantage is that transmission requires direct line of sight, with no barriers such as mountains or tall buildings. Microwave is frequently used with other systems to expand the broadcasting area while minimizing costs.

Explain that fiber-optic technology makes two-way interactive television possible and is one of the most promising distance learning alternatives available for small and geographically isolated rural schools. Compressed video is also used, but it has had problems with shadowed movements in the past. Interactive

TV permits two-way video and audio interaction between cooperating school districts. Explain that this technology is the closest to reality— "the next best thing to being there."

H-1

Refer participants to H-1:
"Different Technologies: Advantages and Disadvantages." Explain that different technologies fit different school districts' needs and funds. No technology is suitable for all districts.

T-7

Display T-7:
"Interactive TV." Remind participants that we've had a low-tech form of "interactive TV" for many years.

H-2

Ask participants to look at H-2:
"Modes of Transmission for Distance Education." Discuss the handout and answer any questions participants may have about analog, digital, and compressed transmission.

H-3

Ask participants to look at H-3:
"Inside the Fiber-Optic Classroom" and discuss the technology and set-up of classrooms for interactive television.

Activity:

Separating Myth from Reality

Explain that this activity is taken from an article and presentation by Ellen D. Wagner of the University of Northern Colorado.

Inform participants that the activity is meant to encourage them to think about and discuss issues concerned with distance education.

H-4

Refer to H-4:
"Perceptions of Distance Education: The 'Great Lies or Tough Truths?' Test" and ask participants to mark each statement true or false.

Discuss participants' answers. Note that many answers can be debated from several viewpoints.

NOTE TO PRESENTER

Use Ellen Wagner's article, **"Separating Myth From Reality in Distance Education"** (included in this workshop guide) for background and discussion of participants' answers to the perceptions test.

Discussion:

Major Issues in Distance Education

T-8

Display T-8:
"Major Issues In Distance Education." Make sure participants understand the three major areas of concern.

Funding

Explain that the major funding considerations in distance education are initial equipment costs and annual subscription or programming fees. Huge costs are involved in establishing a system. It is difficult to predict costs because they vary greatly from site to site.

H-5

Refer participants to H-5:
"Sample Costs of Transmission Systems," which lists some of the costs involved in distance learning transmission systems.

There are many ways to fund distance education. Educational needs sometimes allow cost-sharing opportunities with business, government, and health-care providers.

Many districts and states have arrived at creative methods to cover costs.

H-6

Refer to H-6:
"Funding for Distance Education" lists some examples of creative funding solutions.

An example of creative funding occurs in rural districts where small cooperative telephone companies have supported school districts by laying the fiber-optic cable and leasing it to the district each year for the same amount as a starting teacher's salary. The camera room typically costs around $25,000, with community labor.

Multiutility

Another important issue is that of the multiutility of the system. Telecommunication systems that serve education also can benefit the community at large and vice versa. In rural areas, especially, telecommunication systems and services are tied increasingly to economic and community survival. Discuss the role of the school in community survival. (If a school leaves because of consolidation, sometimes a community disappears.)

Instructional/Implementation Concerns

H-7

Refer participants to H-7:
"Instructional/Implementation Issues in Distance Education". Discuss the concerns listed on the handout.

NOTE TO PRESENTER

A resources that may be helpful R-6. (See the list of resources at the beginning of this guide.)

T-9

Display T-9:
"Evaluation" to generate a discussion of evaluation issues.

H-8

For background, participants may refer to H-8:
"Key Issues in Decision Making" and

H-9

H-9:
"Distance Learning: Issues." Good data from studies are needed to continue to improve the quality of distance learning programs.

This would be a good place for a break.

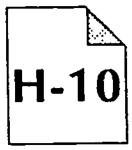
THE ROLE OF DISTANCE EDUCATION IN CHAPTER 1

45 minutes

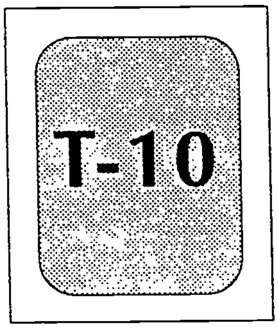
Discussion:

R-TAC Special Activity

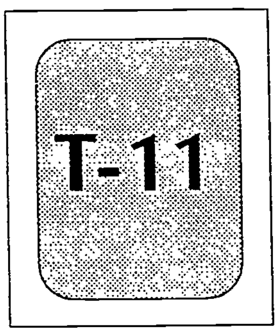
Tell participants that recently distance education has been examined as a vehicle for Chapter 1 instruction. The Rural Technical Assistance Center of Region 5 designed and implemented a pilot program using distance education technology to deliver Chapter 1 services. .



Give participants a few minutes to scan H-10: "Region 5 Special Activity." Describe the pilot project using the Summary section of the handout along with



T-10:
"Locations of Pilot"



and T-11:
"Sending and Receiving Sites." Discuss the conclusions and recommendations listed on H-10.

NOTE TO PRESENTER

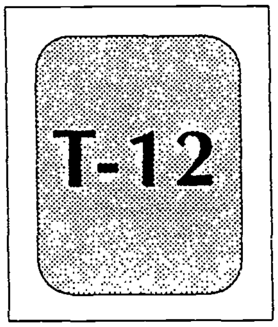
A resource that may be helpful is R-7. (See the list of resources at the beginning of this guide.)

After discussing the project and the conclusions and recommendations, brainstorm some other uses for distance education.

KEY COMPONENTS OF QUALITY PROGRAMS

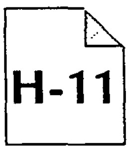
20 minutes

Explain that the same basic components that make a traditional classroom effective also make a classroom using distance education technology effective.

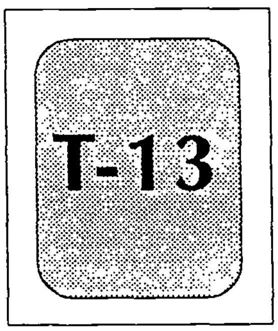


Display T-12:
"Characteristics of Successful Projects." Discuss the list on the transparency, pointing out that these characteristics are shared with traditional quality programs.

Initiate a discussion of the teacher's role in distance education.



Refer participants to H-11:
"The Role of Teachers in Distance Learning." Keep in mind the information on T-12 during the discussion.



Display T-13:
"Key Components of a Successful Program." Point out that these components need to be addressed when planning a quality program.

Preparation. Distance education takes more planning in the beginning. It is difficult to ad lib on television when one runs out of material. If a teacher is working with a technician or with paraprofessionals, the lesson plan should be shared in advance. Worksheets and tests need to be created and distributed well in advance of the appropriate class period.

Humanization. Teachers must work to project a personal image in order to be seen as people rather than television creations. Successful teachers share photographs and favorite stories.

Interaction. The trend toward active learning is even more important with distance education. Students must feel involved and motivated to participate. If they do not, the lesson becomes a presentation to passive learners.

Cooperation. Because of the necessity for networking, distance education demands close cooperation among those involved. Otherwise, the project will fail. Distance education promotes relationships between groups that normally do not interact, such as businesses and school districts.

Evaluation. Evaluation is an important part of any educational program, but it is especially important in distance learning, where data showing effectiveness are so rare. All distance education programs should include an evaluation component.

NOTE TO PRESENTER

Resource materials that may be helpful include R-8 and R-9. (See the list of resources at the beginning of this guide.)

T-14

Display T-14:
"Leading Deficiencies in Teleclassroom Courses." Inform participants that in a survey of teleclassroom courses, Cyrs and Smith found the leading deficiences, as stated by students, to be those listed on T-14. Explain that "talking heads" are presenters who talk continuously with no breaks or no switching of delivery methods.

CURRENT TRENDS AND IMPLICATIONS

20 minutes

Quote Arthur C. Clarke—"The future isn't what it used to be"—to begin a discussion of the rapid changes in education technology. Pose the question, Where are we going with distance education?

Tell participants that distance education is gaining in acceptance and popularity due to several trends:

Demand. More districts and businesses are becoming aware of the possibilities of distance education.

Advances in technology. The blurred pictures of the past have given way to video pictures that some teachers say are actually flattering! The technology has become not only more focused, but more efficient and less costly, as well.

Success stories. The greatest proponents and promoters of distance education are those who have been involved in the technology.

T-15

Display T-15:
"Adaptations of Distance Education Technology in the 1990s." Explain that the technology will be affected by several changes:

Technology integration. More pieces of technology will be networked or linked; for example, the use of fiber-optic cable for computer networking, interactive television, and the connection of fax machines to computers.

Multimedia. There is an increase in the use of computers to connect laser players, CD- ROM players, and video cameras.

Portability. Lap-top computers are becoming smaller, more powerful, and multitalented.

Satellites and fiber optics. The trend is more toward satellites and fiber-optic cable than slow scan, microwave, or audiographics. Explain that satellite and fiber-based technologies are increasing in popularity because of their flexibility.

Explain that technology is becoming more sophisticated as demand grows. For example, instead of using cassette tapes, students now meet over telephone lines at different locations. Analog technology, which all telephones used at one time, is being replaced by digital technology, formerly limited to computers. Computer-assisted instruction has been expanded by the use of the CD-ROM player and the ability to connect to electronic mail. The access to data bases throughout the nation is helping students become more active learners.

T-16

Display T-16:
"Directions of Distance Education Technology"

H-12

and hand out H-12:
"Directions of Distance Education Technology." Suggest to participants that they may use H-12 to take notes during the subsequent discussion of the different technologies.

T-17

Display T-17:
"Print-based and Computer-based Changes." Explain that print-based changes in technology include the ability to order parts of books on special request via computers or fax machines.

Computer-based changes are focused on expanding the use of the computers with CD-ROM players and video-based instruction. An example is the migrant math program created by Arizona State University, which uses a computer, a CD-ROM player, and a laser disk to create interaction. Multimedia involves integrating computers with the use of video and audio using either CD-ROM and laser disk or video cameras and recording devices. Electronic (E-Mail) can connect the student to numerous resources.

T-18

Display T-18:
"Audio-based and Video-based Changes." Audio-based changes include speaking to a computer and having the words printed, using the telephone to receive and leave messages, keying a voice pattern to initiate an action, and having computer information combined or bridged with voice interaction usually sent over phone lines.

Video-based changes focus on the use of video with computers and telephone lines and compressed video that sends video images over regular telephone lines.

DEBRIEFING

5 minutes

Discussion

Point out that technology is expanding our reach in education. Bernie Gifford of *Apple Computer* said, technology allows "teaching anywhere, anything, anyhow, anyway." Distance education is the next best thing to being there.

Suggest the following resources for information about distance education:

American Journal of Education
Linking for Learning: A New Course for Education
Teleclass Teaching: A Resource Guide
American Journal of Distance Education

Evaluation

Ask participants to fill out the evaluation form.

WORKSHOP GUIDE

DISTANCE EDUCATION

TRANSPARENCIES

prepared by:

RMC RESEARCH CORPORATION
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80202

WORKSHOP GOALS

As a result of their participation in this workshop, participants will:

- be able to define and describe terms and technology associated with distance education
- become familiar with main issues in the distance education field
- become knowledgeable about the role of distance education in Chapter 1
- understand key components associated with quality programs using distance education
- become familiar with current trends in the technology and their implications for education.

T- 1

WHAT IS DISTANCE LEARNING?

Distance learning refers to live, simultaneous transmission of a master teacher's lessons from a host classroom or studio to multiple receiving site classrooms in distant locations.

DISTANCE LEARNING CAN:

- serve isolated schools
- offer advanced and specialized courses in schools where teachers are not available or the courses are too costly to provide for a limited number of students
- offer training for teachers where experts are difficult to obtain
- link learner communities with each other
- meet state mandates for required courses.

WHO IS PROVIDING DISTANCE EDUCATION?

- school districts
- regional educational cooperatives
- state education agencies
- higher education institutions
- public television stations
- museums and science centers
- federal agencies
- private business.

T- 4

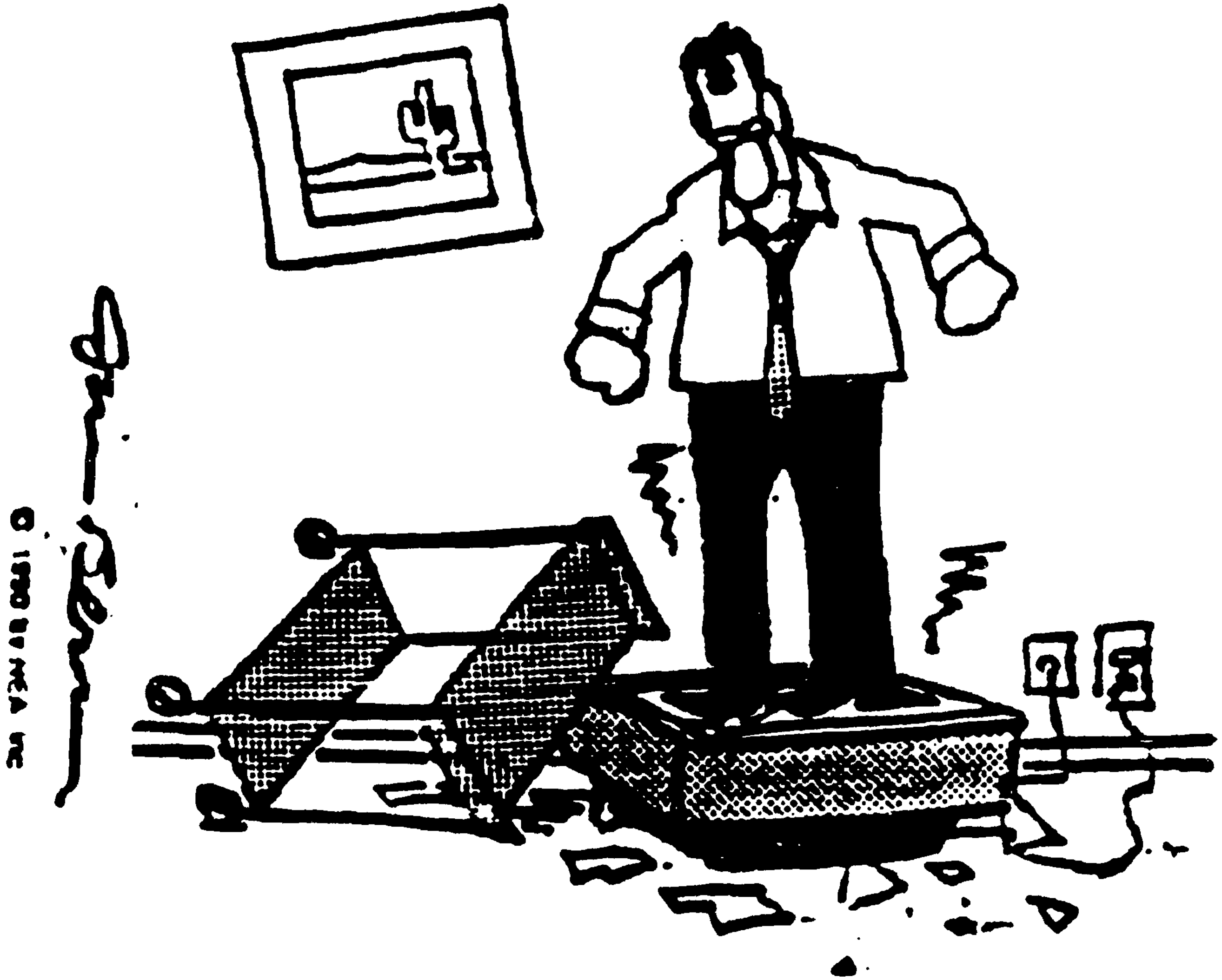
ONE-WAY AND TWO-WAY TECHNOLOGIES

	Audio	Video
One-Way	radio	public TV
Two-Way	CB telephone	interactive TV

SUMMARY OF DISTANCE LEARNING TECHNOLOGIES

- terrestrial broadcast
- cable television systems
- instructional television fixed service (ITFS)
- satellite
- public switched telephone network (PSTN)
- audiographics
- microwave
- fiber optics

BERRY'S WORLD



Interactive TV

MAJOR ISSUES IN DISTANCE EDUCATION:

- funding
- multiutility
- instructional/implementation concerns.

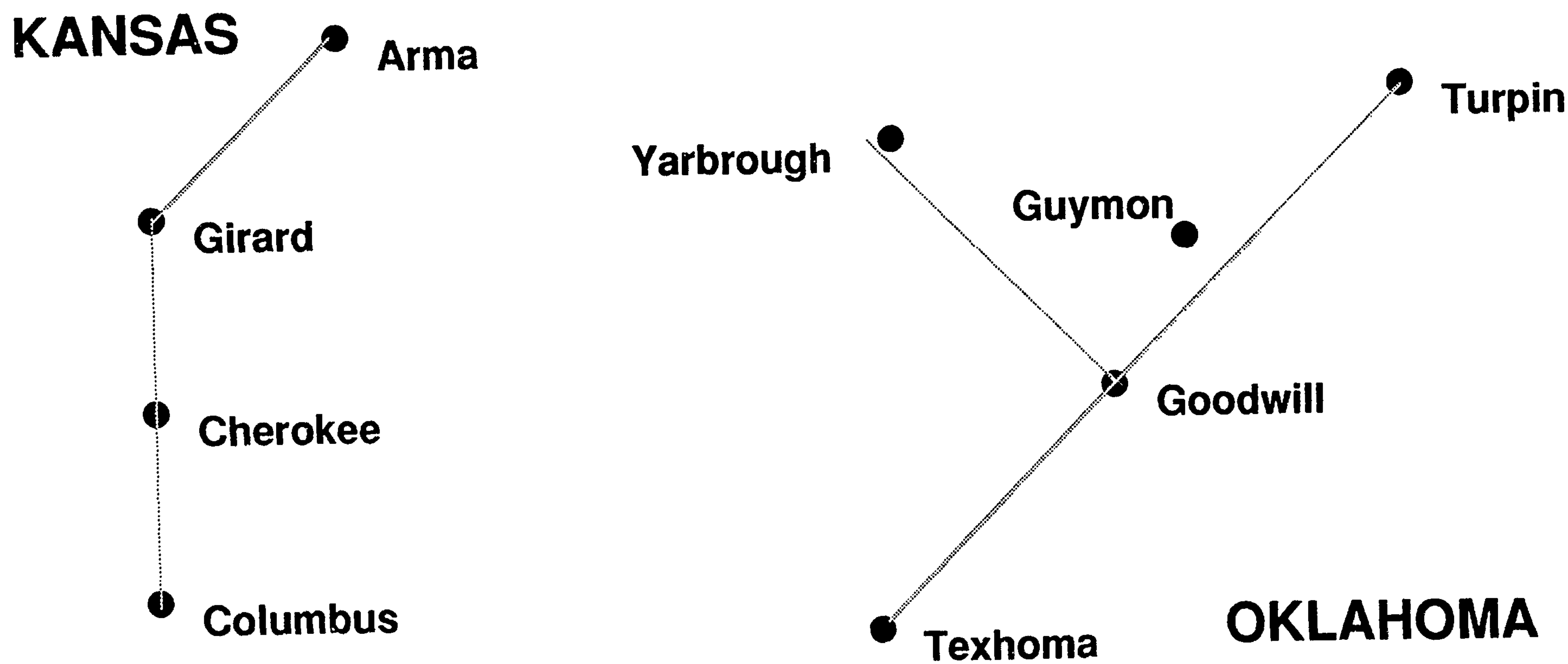
Evaluation would be most usefully concentrated on practical questions about educational quality, such as what are the learner outcomes of various teaching techniques and technology models. (page 11)

Linking for Learning

Office of Technology Assessment

R-TAC SPECIAL ACTIVITY:

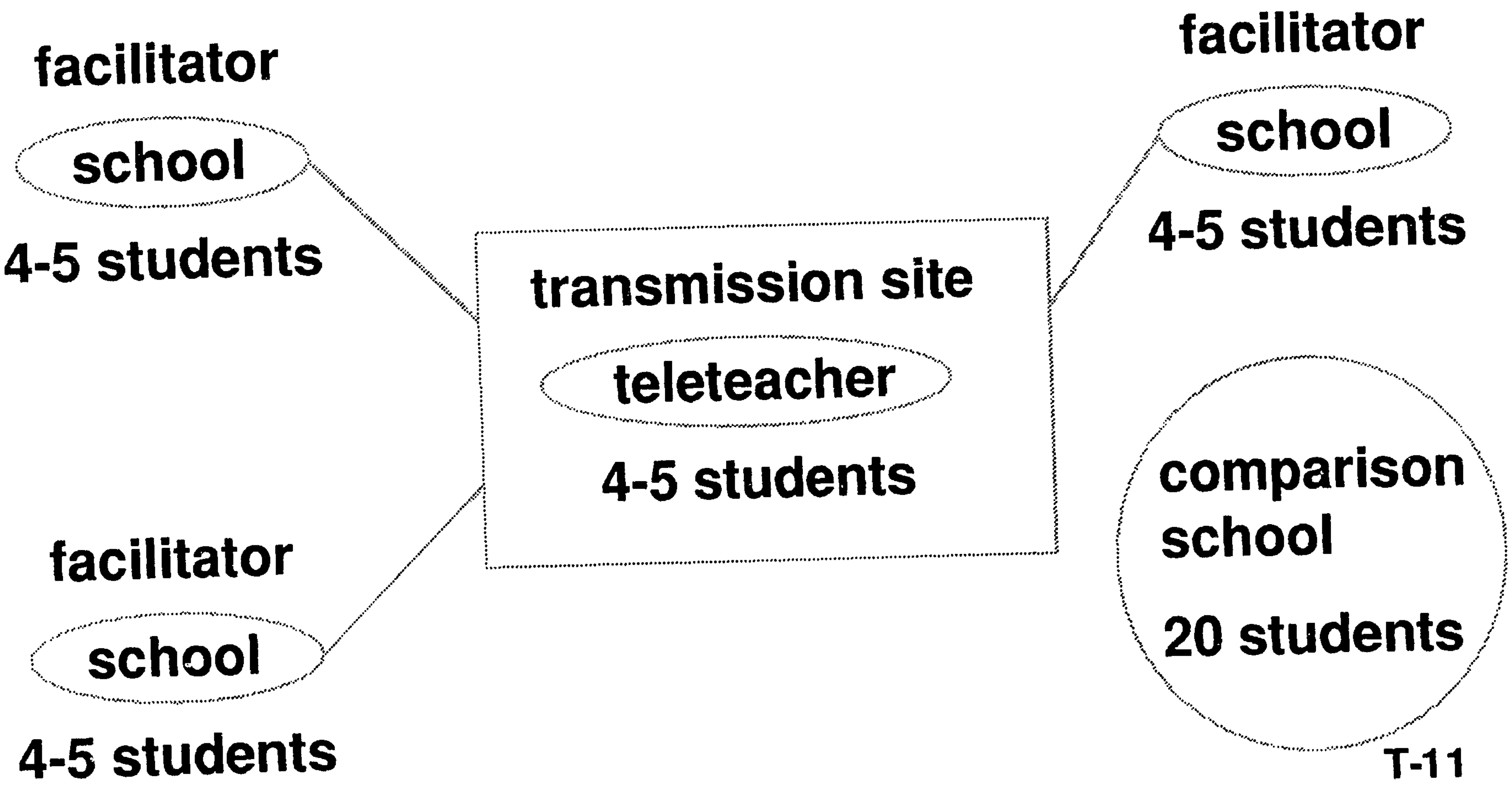
Locations of Pilot



T- 10

R-TAC SPECIAL ACTIVITY:

Sending and Receiving Sites



T-11

CHARACTERISTICS OF SUCCESSFUL PROJECTS:

- address real, pressing needs
- involve teachers, administrators, and others who affect the students' education
- have high-quality, appropriate instruction
- must be planned yet flexible.

KEY COMPONENTS OF A SUCCESSFUL PROGRAM:

- preparation
- humanization
- interaction
- cooperation
- evaluation.

LEADING DEFICIENCIES IN TELECLASSROOM COURSES:

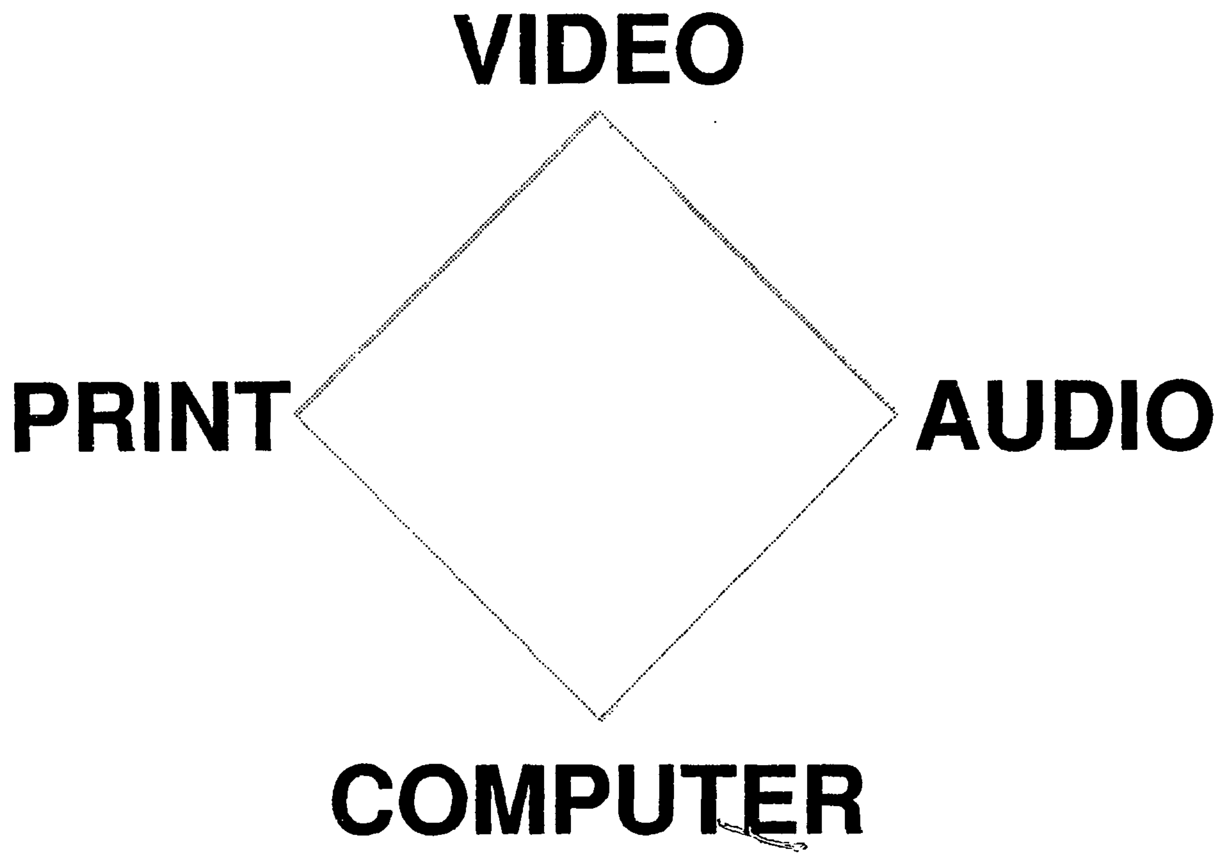
- technical difficulties
- poor course organization
- talking heads
- poor and uncorrelated handouts
- poor presentation skills
- great variations in quality (could be boring) and underutilized capabilities of the medium.

ADAPTATIONS OF DISTANCE EDUCATION TECHNOLOGY IN THE 1990's

Move toward:

- technology integration
- multimedia
- portability–lap-top computers
- dominance by satellite and fiber optics.

DIRECTIONS OF DISTANCE EDUCATION TECHNOLOGY



(Jeff Charles)

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PRINT-BASED CHANGES:

- selective binding of books
- customized distribution
- faxsimile-enhanced services
- document delivery on demand.

COMPUTER-BASED CHANGES:

- CD-ROM
- E-Mail based
- multimedia workstations.

AUDIO-BASED CHANGES:

- audiotex
- voice mail
- voice response testing
- mixed voice, data, and graphics bridging - audio conferencing.

VIDEO-BASED CHANGES:

- desktop video, videophones,multimedia (Authorware)
- multipoint compressed video
- once was analog, is becoming digitized.

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Different Technologies: Advantages and Disadvantages

Technology *	Configuration	Advantages	Disadvantages	Trends
Terrestrial broadcast	One-way broadcast of audio, video, and possibly data; possible audio return	No special receiving equipment or converters; reaches most schools and homes	Limited channels and air time; reception limited by geography; high transmission equipment and production costs	Increased use of data/text transmission
Cable television systems	One-way broadcast or two-way point-to-point audio, data, and video	Wide availability; low delivery costs	Limited capacity; can be difficult to interconnect; not usually designed for interactivity	Capacity increases using fiber; more addressability and two-way capability
Instructional Television Fixed Service (ITFS)	One-way broadcast or point-to-point audio data, and video; possiblitiy of audio return	Low-cost delivery of video	Crowded frequencies, especially in cities; FCC licensing required; limited transmission range; line of sight required	Digitalization may triple channel capacity; wider coverage areas using repeaters; rebroadcast of satellite-delivered programming
Satellite	One-way broadcast of voice, data, and video; possibility of audio and data return	Wide coverage transmission cost is distance insensitive	Expensive uplinks; high transmission costs; FCC licensing of uplinks; receive site microwave interference (C-band) or rain fade(Ku-band)	More use of Ku-band; possible transponder shortage; increased use of data; increased interactive capabilities
Public Switched Telephone Network (PSTN)	Two-way voice; limited data and video	Wide coverage; low initial cost; high quality and capacity of fiber optic links; others handle repair and upgrades	Quality is spotty; limited transmission of data and video; cost is distance-sensitive	Expanding fiber installation; digitization of network increasing; increasing intelligence in the network
Audiographics	Two-way computer conferencing with audio interaction	Lowcost; easy exchange of graphics; uses PSTN	Visual interaction limited to graphics/still video	More powerful computers; better software and peripherals increase capabilities
Microwave	Two-way point-to-point audio, data, and video	Low-cost transmission time; no rights-of-way needed	Must be FCC-licensed; tower space or location may be difficult to get; difficult and costly to expand channels; crowded frequencies; line of sight required	Use of higher frequencies is expanding
Fiber optic	Two-way audio, data, and video	High capacity/speed; channel capacity easily expandable; high-quality signal	High installation cost; rights-of-way may be required to lay new cable	Costs are declining rapidly; fiber deployment is expanding rapidly

**Technology systems do not have to operate independently; they are often combined in "hybrid" systems.*

SOURCE: Office of Technology Assessment, 1989.

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Modes of Transmission for Distance Education

Analog

The human voice is a good example of analog. It is an inconsistent wave form that is an AM or FM signal. The audio or video signal is not altered in any way. An analog pattern looks like this:

It is sent by way of fiber optics, microwave, coaxial cable, or satellite.

Digital

Using coders and decoders (codecs), audio and video signals are turned into electric pulses that establish an on/off pattern. Digital video can be full motion or compressed, depending on the end-to-end equipment used. A digital pattern look like this:

Digital can be used on fiber optics, microwave, coaxial cable, or regular telephone lines.

Compressed

When you take a digital signal and use only a part of the bandwidth available, you are compressing the signal. Because it does not require fiber-optic cable, compressed video (also called slow scan) is a less-expensive way to send audio and video signals a long distance. There is some distortion in the sound quality and picture quality, depending on how much the signal is compressed.

Inside the Fiber-Optic Classroom

What are television classrooms like?

Although they differ somewhat at different schools, they have common elements and cost the schools from $2,000 to $5,000 to remodel, usually using summer help, superintendents say.

Each classroom has the following features:

1. Two sets of four TV monitors. Four television monitors are in front of the teacher's console and face the students. They are labeled for each of the school districts. The local one may show the students or teacher, depending on the teacher's desires. Four others are attached to the ceiling and face the teacher, again labeled by school district.

2. A dais and control center--including fax machine--for the teacher. The raised dais and control center include buttons to operate the cameras and a fax machine for sending and receiving assignments.

3. Three cameras. One camera faces the teacher; another films the students. A third is over the teacher's console and can be used to picture pages of a book, charts, and drawings, like an overhead projector.

4. Microphones over the student and teacher areas. Two microphones are over the student areas and one by the teacher. They are so sensitive that a student whispering at the back of the room can be heard in the other classrooms.

5. Ample lighting. All of the classrooms have lowered ceilings and plenty of light.

6. One-way observation areas/rooms for visitors. Ideally, at the back of each classroom are either dividers with observation windows or small attached rooms with observation windows for visitors, so that the regular class work won't be disturbed.

7. Standard classroom tables for students. Instead of desks, students sit at tables, facing the teacher and four screens. If the class is taught from another district, a classroom monitor is present, but students pay attention to the teacher on the TV.

Adapted from an article in the Beaver County Interactive TV Cooperative newsletter

Perceptions of Distance Education: The "Great Lies or Tough Truths?" Test

_____ 1. Distance education is just as effective as traditional education.

_____ 2. Teaching at a distance is dramatically different from traditional teaching.

_____ 3. Teaching at a distance requires a lot of additional preparation time.

_____ 4. Distance education will replace teachers.

_____ 5. All teachers can teach effectively at a distance; all students will succeed in a distance education class.

_____ 6. Every class is a candidate for delivery at a distance.

_____ 7. Distance education will save schools money.

_____ 8. Concern for instructional quality is the single most important driving force behind technological and programmatic decision making in distance education.

_____ 9. The technologies used for distance educational program delivery promote interaction by means of their two-way, "real-time" transmission capabilities.

_____ 10. Once the decision to get involved in distance education has been made--after the needs assessments have been completed, the data analyzed, the recommendations made, the strategies developed--the hardest part of the project is over.

From Ellen D. Wagner, "Separating Myth from Reality in Distance Education"

U.S. Congress. Office of Technology Assessment. *Linking for Learning: A New Course for Education*. OTA-SET-430 (Washington. DC: U.S. Government Printing Office. November 1989).

Sample Costs of Transmission Systems

Costs for distance learning transmission systems vary widely depending on system design and complexity, range and scope, capacity, large volume purchase agreements, and lease v. buy options. In general, the declining costs of electronic components have made telecommunications equipment more affordable. Continued declines in prices are expected.

Costs can be divided into two basic categories, initial costs including transmitting and receiving equipment, and continuing costs such as programming and operation. Not all schools will face all these costs. Some schools can take advantage of existing telecommunications resources to cut costs, while other schools may have to build a completely new transmission system. Schools sharing existing teaching resources and using local facilities may have low programming costs, while schools receiving programming from outside providers will face higher expenditures. Finally, costs can differ greatly between those who only receive programming and those who originate and transmit it. In a satellite system, for example, production and transmission facilities can cost millions of dollars. Costs to the local schools, however, are much lower, several thousand dollars for hardware, $5,000 to 10,000 for subscription and tuition fees, and any local personnel costs.

The costs described below are only sample costs for basic systems. These costs, therefore, should serve as only a rough guide to distance education transmission costs.

Instructional Television Fixed Service (ITFS)

ITFS is a relatively low-cost way of delivering one-way video to multiple remote sites.

Transmit Sites

200 ft. transmitting tower	$50,000
transmitter (one for each channel)	$15,000-20,000
transmitting antenna	$10,000-15,000
miscellaneous electronics	$10,000

(A rough figure for a transmit site is $60,000, not including the tower)

Receive Sites

receive antenna and tower (costs are based on the height of tower needed for reception; higher towers cost more)	$3,000-$50,000
downconverters and electronics	$350-$3,000
ITFS voice response system	$2,500-5,000

Operating costs for ITFS are minimal compared to other broadcast technologies. For example, the system run by WHRO in Norfolk, Virginia, consists of one hub location and seven repeater stations broadcasting four channels of ITFS. The annual operating cost, including salaries for personnel and technical support, is $213,000. The average cost per hour of transmission is $45.[1]

Satellite

Transmission Costs

A complete uplink facility, including studio and all electronics, can cost between $500,000 and $1 million. Some providers have their own facilities, while others lease. Added costs associated with uplink facilities include operating and personnel costs, and the cost of getting the signal from the originating site to the uplink.

Transmission time for satellite delivery is based on the time and capacity desired. The cost of satellite transmission is distance insensitive. Unlike the telephone system, which charges by the mile, satellites reach anywhere in their footprint with no higher cost to transmit 2,000 miles than for 200. Type of satellite (C- or Ku-band) and time of day (prime or nonprime time) also affect the cost of transponder time. Lower rates are frequently available for those users willing to commit to long-term contracts or minimum numbers of hours per year. C-band time ranges from under $200 per hour up to almost $500. Ku-band prices also start under $200 and range up to $600 per hour.

Pricing can be flexible, allowing users to lease only the capacity or amount of time they need. A full transponder leased 24 hours per day can cost $170,000 per month, while leasing only a portion of the transponder can cost as little as $5,200 per month. Most educational users buy time on an "occasional use" basis, meaning that they buy a full transponder, but for only a certain number of hours per day.

Receive Site Costs

Satellite downlinks cost from $800 to $18,000 depending on the type (C or Ku) and features required. Some factors affecting cost include: voice, data, and video capabilities; receive only or send/receive; and local site requirements including fencing around the dish and cabling to connect the dish to the user premises. Steerable dishes, which allow users to aim at many satellites, cost three or four times as much as fixed dishes, which remain aimed at a particular satellite.

C-band receive-only downlinks	$5,000-$10,000
Ku-band receive-only downlinks	$800-$5,000
C/Ku-band receive-only downlinks	$8,000

[1] Richard Daly, Narrowcast Services Manager, WHRO Norfolk, VA, personal communication, Apr. 25, 1989.

In some cases, schools can obtain volume discounts through a State-arranged contract or through arrangements made by programming providers.[2]

Programming Costs

Subscription rates are another (ongoing) cost associated with satellite delivery of educational services from multistate providers. For example, an annual subscription to TI-IN is $5,050, courses cost $240 per student per semester (with $50 for additional students over a set limit), and staff development costs between $2,200 to $8,000 per year depending on district size.

Cable

Basic cable television connections for schools are often provided free to schools as part of the local cable franchise agreement. A single cable drop, however, often reaches only one location in a school. Complete internal wiring for cable reception can be very expensive. The Dallas Independent School District is in the process of wiring all classrooms in 235 schools with both cable and telephone (data communication) lines at a cost of $3.8 million. When completed, the system will deliver 30 cable television channels to each classroom. The system will also make four video return channels available, and allow two-way data transmission for administration and computer networking.[3]

The initial cost for an interactive cable system depends on how much work is required to add two-way capability to the system. Additional equipment needed to bring the signal back upstream will increase costs.

Initial Costs

coaxial cable installation ... $18,000-$25,000 per mile[4]
modulators .... $500-$2,000
demodulators .... $2,000-$4,000
reverse flow amplifiers .... $3,500[5]
(for two-way capability)

Ongoing or operational costs also vary. There are no transmission costs in systems that use the public or an institutional cable system. Maintenance budgets average between 2 and 5 percent of system cost, but will likely increase as the system ages.

Microwave

Since each site in a point-to-point microwave system is both a transmit and a receive site, the cost of installing and operating a microwave system can be relatively high. Duplex microwave systems cost between $40,000 and $65,000 per channel, including transmitters, receivers, and all electronics. Adding additional channels can cost almost as much.[6]

Microwave towers vary widely in cost. One New York State study identifies costs ranging between $100,000 and $150,000 each.[7] Others report costs for short-haul towers at $5,000 to $50,000, and longer spans requiring bigger towers range from $25,000 to $75,000 each.[8] However, tower costs could be reduced or eliminated by using existing towers or placing multiple antennas on a single tower. Insurance, maintenance, and repairs can average between 3 and 5 percent of system cost per year.[9]

Public Switched Telephone Network (PSTN)

Start-up costs for using PSTN to deliver distance education can be very low. All that most users will have to pay are usage, access charges, and installation. However, line termination charges for each site can run into thousands of dollars, and installation charges can be very high if many of the school's classrooms have to be wired.[10] (See the example of the Dallas Independent School District in the Cable Cost Section.) The telephone company bears the cost for all equipment outside the school, including most upgrades, maintenance, and repair, as well as the transmission hardware.

Transmission costs on PSTN depend on the length and duration of the call and the type of line used. Local telephone transmission costs also vary from State to State, and can add a significant amount to ongoing system costs.[11] In Texas, for example, terrestrial voice/data (56 kbps) costs public institutions 52 cents per mile per month. For the higher capacity T1 lines (1.544 Mbps),

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[2]For example, a complete receive site for the Missouri Educational Satellite Network costs $8,000 which includes: dual frequency antenna, receiver, data controller, VCR, color monitor, printer, equipment rack, and speaker phone. Maintenance is offered for $300 per year.

[3]Diana Radspinner, coordinator of cable communications, Dallas Independent School District, personal communication, Aug. 16, 1989.

[4]Robert Luff, vice president for technology, Jones Intercable, personal communication, August 1989.

[5]Richard Labrie, executive director, South Berkshire Education Collaborative, personal communication, May 5, 1989.

[6]Jack Beck, WHRO, Norfolk, VA, personal communication, Apr. 10, 1989; Karen Kitchen and Will Kitchen, *Two-way Interactive Television for Distance Learning—A Primer* (Alexandria, VA: National School Boards Association, May 1988), p. 19; Linda Lloyd, "Telecommunications and Distance Learning: Trends in the U.S.," paper presented to the American Educational Research Association 1988 Annual Meeting, Apr. 5-9, 1988, New Orleans, LA.

[7]New York State Legislative Commission on Science and Technology, *Distance Learning: The Sky's the Limit* (Albany NY: August 1988), p. 11.

[8]Kitchen and Kitchen, op. cit., footnote 6, p. 19.

[9]Ibid.; New York State Legislative Commission on Science and Technology, op. cit., footnote 7, p. 11.

[10]The Telecommunication Technical Advisory Committee, "A Report to the Texas Higher Education Coordinating Board," unpublished document, November 1988, p. 5.

[11]E. Kent Ellerson, "Report on Distance Learning: A National Effectiveness Survey," prepared for the Pennsylvania Teleteaching Project, December 1987, p. 9.

which can carry limited (compressed) motion video, the cost is $12.49 per mile per month. Long distance charges will increase costs significantly.

Distance learning systems requiring simultaneous communication among multiple sites may need an audio or data bridge. These bridges can either be purchased ($1,000 to $2,000 per port—each port represents one line per user that can access the bridge), or rented through services such as AT&T's Alliance Teleconferencing Service, which charges 25 cents per port per minute. On this system, for example, a three-way 1-hour call would cost $45.

Fiber Optics

The cost of constructing a fiber optic system is relatively high, but is expected to decrease rapidly as electronics and cable costs decline. The cost of fiber cabling is widely expected to fall below that of coaxial or copper cabling by the early 1990s.[12] The cost to connect an individual household or school to the public network is approximately $1,200 for copper and $1,500 for fiber for new construction.[13] In general, the price of electronics is steadily declining,[14] and the cost of fiber optic technology should continue to drop as economies of scale are realized.[15]

analog transmitters and receivers	$12,000
repeaters (spacing varies)	$24,000
laser modulators	$2,000-3000
coders/decoders (codecs)	$8,000-60,000 (depending on capability)

Additional termination equipment at each site can cost up to $45,000.[16]

Sample Fiber Optic Contract Agreements[17]

Northwest Education Technology Cooperative

- 10-year lease with a national telephone company
- 10-year renewal period option
- 70-mile network
- $28/mile/month lease rate includes all maintenance
- 2 dark (unused) fibers
- Schools own terminal equipment
- Prohibited from T-1 and bypass use

Pottowattomie County, Oklahoma

- 5-year lease with the local telephone company and renewal periods of 5 years thereafter based on maintenance expense and rate of return regulation
- 18-mile network
- $70/mile/month including most maintenance
- 2 dark fibers
- Schools own terminal equipment
- Prohibited from T-1 and bypass use

Girard, Kansas

- 15-year lease with local telephone company with 15-year renewal
- 60-mile network
- $38/mile/month includes maintenance
- 2 dark fibers
- Schools own terminal equipment
- Prohibited from T-1 and bypass use

Dodge Center, Minnesota

- 7-year lease with a national telephone company and annual renewal period
- 60+ mile network (not complete)
- $53/mile/month including all maintenance
- 2 dark fibers
- Schools own terminal equipment
- Prohibited from T-1 and bypass use

Big Fork, Minnesota

- Direct ownership with four local telephone companies and one long distance carrier
- 134-mile network
- $8,955 per mile including some maintenance
- 2 dark fibers
- Schools own terminal equipment
- Prohibited from bypass use

Computer-Based Applications

Compared to other technologies used for distance learning, computer-based systems can have relatively low start-up costs.

personal computers	$1,200-$5,000
modems	$300
graphics tablets	$400
scanners	$1,500
printers	$300-2000
software for communication/audiographics	$0-3,500

Total costs per site are under $10,000.

[12] U.S. Department of Commerce, National Telecommunications and Information Administration, *NTIA Telecom 2000* (Washington, DC: U.S. Government Printing Office, October 1988), p. 76.

[13] Robert M. Pepper, *Through the Looking Glass: Integrated Broadband Networks, Regulatory Policy and Institutional Change* (Washington DC: Federal Communications Commission, November 1988), p. 8.

[14] National Telecommunications and Information Administration, op. cit., footnote 12, p. 220.

[15] "In a report on fiber deployment released in January of 1988, the Federal Communications Commission noted that a 50 percent decrease in the cost of electronics is typical, and that fiber itself has declined in price by approximately 50 percent over the past six or seven years." Andrew C. Barrett, "The Potential of Fiber Optics to the Home: A Regulator's Perspective," *Public Utilities Fortnightly*, Jan. 19, 1989, p. 15.

[16] Kitchen and Kitchen, op. cit., footnote 6, pp. 20-21.

[17] The following examples were provided by Dennis Pellant, executive vice president, Tele-Systems Associates, Inc., Bloomington, MN.

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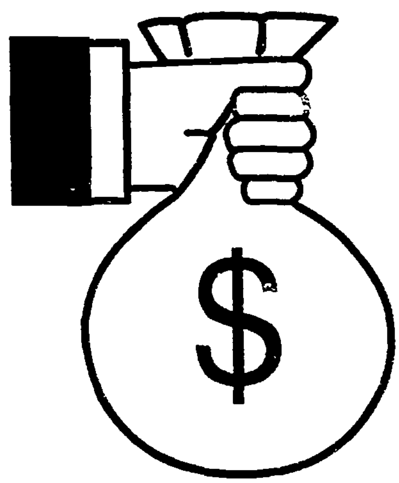
Transmission costs associated with computer conferencing and audiographic systems are the costs of using the public telephone system. (See the cost section on PSTN). The costs of wiring all classrooms with data connections (telephone jacks) can be high, especially for schools having to wire existing classrooms. Packet radio modems may help schools avoid some of this cost.[18] Wiring done at the time the building is constructed is less expensive. Installation charges will depend on the arrangements made with the service provider (the telephone company, cable, or other independent contractor).

[18] A device has been developed using packet radio technology, which essentially functions as a wireless/radio modem allowing computers in any part of the school building to access outside phone lines with out being physically connected to them. The modem at each computer wirelessly communicates with another radio modem that is connected physically to one of the school's telephone jacks, thus allowing communication anywhere in the school building without the necessity of expensive wiring. Each unit (two are required, just as with traditional modems) may cost $600.

Funding for Distance Education

Funding solutions are as varied as technical solutions. Examples:

1. Arizona issued bonds to cover construction costs.
2. Kentucky voted $11.3M to install satellite dishes on every school in the state.
3. Iowa authorized $50M for construction of the state's educational telecommunication system.
4. Connecticut has a grant program for local projects.
5. Missouri has imposed a tax on videotape rentals and is expected to raise $5M.
6. Oklahoma used grant money and rural telephone company partnerships.



Instructional/Implementation Issues in Distance Education

- Curriculum alignment/coordination with the regular classroom
- Staff training: master teachers and paraprofessionals
- Teacher and community support
- Parent involvement and parent conferences and visitation
- Troubleshooting: equipment failure, transportation, scheduling, classroom discipline, school closure, field trips, PA announcements, fire drills
- Evaluation: process and outcome

Key Issues in Decision Making

Scope of the system
How many sites will the system serve? More sites will increase the cost of the system, but costs per student or site may decrease as economies of size are realized.

Existing infrastructure
What telecommunications resources are available? Schools with access to local resources, such as cable television systems or university ITFS networks, may be able to use those resources at minimal cost. Other schools may have to build or lease facilities.

Partnerships
With whom can schools share costs? Cooperative arrangements to share facilities and resources with business or higher education can substantially reduce costs.

Engineering requirements of the system
What are the technical requirements of the system? Longer distance or rough terrain may increase costs.

Financial arrangements
Will it be cheaper to buy or to lease capacity? Many combinations are also possible, such as owning the hardware and leasing the transmission channels.

Programming
What types of programming are desired? Broadcast-quality video production is very expensive. Other forms of audio, video, or computer materials may be far less expensive.

Training
Who must be trained and what expertise is already available? Experienced teleteachers and support staff will need less training and support. Inservice and staff development costs will vary depending on the types of technology used and the way the course is designed.

Distance Learning: Issues

from Linking for Learning, U.S. Congress Office of Technology Assessment

Distance learning affects the educational process in a number of ways:

- Students report having to take greater responsibility for their own learning and that their experience helps them make the transition to higher education.
- Students report that they benefit from exposure to a greater range of ideas, peers, and teachers made possible by the expanded educational community.
- Students report that distance learning is harder. When the group is large, students complain about difficulties in raising questions and obtaining help during class time.

Most distance learning applications to date have been with academically advanced high school students and independent adult learners. These populations generally already possess strong study skills, high motivation and discipline. Whether the medium of distance learning works well with young or academically weak students, and under what conditions, needs further study.

Distance learning has been found to be an effective teaching media for learners in business, industry and the military, and for adult learners in education. Evidence is incomplete for K-12. Studies point to the need for competent teachers, valid instructional models, and appropriate institutional support.

The research on distance learning has shown that there is no single best model. The quality and effectiveness of distance learning are determined by instructional design and technique, the selection of appropriate technologies, and the quality of interaction afforded to learners.

The research has shown that effective "tele-teachers" used student names; set out clear statements of purpose; made use of printed materials; encouraged discussion; and did not speak in a monotone.

Effective "tele-techniques" include: humanizing the teaching experience by creating rapport with the students; to encourage participation by ensuring teacher-student and student-student interaction; to attend to message style by varying tone of voice and volume, using video and other visual aids; and to provide regular feedback to all participants by monitoring student interest.

Due to the physical separation between the teacher and the students, tele-teachers need to establish ways for students in the remote classrooms to feel comfortable contacting them. These arrangements vary with type of distance learning project, the technology used, distances and the number of students involved. These include:

- meeting in person with students in each of the distant classes early in the course;
- arranging for all the students to meet together at least once, ideally at the beginning of a class;
- asking students to send in pictures of themselves to personalize their responses to questions on the air;
- having telephone office hours when students can call and discuss the lessons with them, or with teaching assistants;
- setting up assignments for students to handle as members of learning groups;
- using electronic keypads to gauge students understanding during the lesson, allowing the teacher to assess if the material is understood before moving ahead in the lesson; and
- assigning computer activities that give students the opportunity to move along at their own pace, with feedback enabling the teacher to assess each student's strengths or trouble spots.

Specific educational issues to be considered are instructional design, teaching techniques and various kinds of interaction that affect learner outcomes.

The technology removes barriers due to geography, and expands opportunities for learning, but the teacher teaches. Teachers of distant learners find that they are often required to change their method of teaching. Specific teaching issues to be considered are: advanced preparation; student interaction; visual materials; activities for independent study; and follow-up activities.

Staff have also identified needs for differences in teaching methods for distant learners. The primary differences leading to these needs stem from the facts that:

- information technologies are primarily a visual medium rather than the textual and auditory environment of the conventional classroom;
- the affective content of technology-mediated messages is muted compared to face-to-face interaction;

- complex cognitive content can be conveyed more readily in electronic form because multiple representations of material (e.g., animations, text, verbal descriptions, and visual images) can be presented to give learners many ways of understanding the fundamental concept.

Based on these differences, teachers have identified certain staff development needs if they are to become effective tele-teachers. These include:

- determination of the time needed to prepare and teach distance delivered courses;
- methods to establish and maintain effective communication with distant students;
- learning from experiences of other faculty members;
- strategies for adding visual components to audio courses;
- strategies for increasing interaction both among students and between students and faculty;
- planning and management of organizational details involved in distance delivery; and
- strategies to encourage group cohesion and student motivation.

Classroom facilitators are usually responsible for operating the receiving equipment, monitoring student behavior, evaluating or distributing homework and materials, supervising testing, and assisting with educational activities as assigned by the teachers. Under ideal circumstances, the distant teacher and facilitator work as a team. Before classes start, they meet in person or electronically to discuss the teacher's goals for the class, instructional techniques, and most importantly, how the facilitator can contribute to the students' learning experience. Often classroom facilitators also have training needs.

Another area of concern is the evaluation of distance education courses. Evaluation would be most usefully concentrated on practical questions about educational quality, such as what are the learner outcomes of various teaching techniques and technology models.

The next five years...present a critical window of opportunity, while investment decisions are being made, for evaluation of and experimentation on distance education in K-12 settings. Research on design and innovative approaches, and applications of cognitive theory represent good investments of the Federal Government in order to meet the long term needs of the field.

The Use of Distance Education to Deliver Chapter 1 Services

Summary

The Region 5 R-TAC received approval to conduct a pilot study to explore the use of distance education as a means of delivering Chapter 1 services to rural schools. This innovative project was unique in its use of interactive television to provide Chapter 1 math instruction to third and fourth graders. Services were offered to eligible students who would otherwise not receive supplementary instruction.

The pilot sites were located in Oklahoma and Kansas. The R-TAC offered training to selected teachers and facilitators in effective strategies for teaching mathematics and teleteaching techniques, and provided consultations on curriculum development, enhancing support for the project from the Board of Education, the community, and parents. R-TAC staff also designed and conducted the evaluation of the pilot.

Formative evaluations were conducted through the use of classroom observations and student, teacher, and parent surveys. Summative evaluations were conducted through the use of criterion-referenced tests and student attitude measures.

Conclusions

Overall, evaluations of this special pilot project were positive. Distance education is a viable Chapter 1 instructional delivery system. This conclusion is supported by the following data:

- Student achievement was measured by criterion-referenced tests indicate that students in the ITV classes learn as much or more as their peers in traditional classrooms. Statements from interviews, classroom observations, and surveys support this finding.

- Interactive television was successful in actively engaging the students over the course of the semester or summer program. Interaction was promoted through the use of manipulatives and hands-on activities, cooperative learning groups, questioning strategies, and special activities designed to build rapport.

- No relationship was found between learning styles and any academic outcomes or attitude measures.

- When the technology is already in place, the cost for Chapter 1 delivery via distance education is comparable to or slightly less than the cost of a traditional Chapter 1 program.

- Advantages of using the distance education delivery system include visual clarity of objects, staff development through modeling, the sharing of human and material resources, and increased teacher support through networking. Issues that need attention by districts considering distance education include the necessary commitment of time and money, the need for specific teleteaching training, the difficulty of establishing a schedule, the limitations of the classroom environment, and the differences in classroom management.

- Teleteachers, facilitators, superintendents, and parents responded positively to the ITV project in surveys and interviews.

Recommendations

This pilot has shown distance education to be an effective service delivery model for Chapter 1 elementary students. Future use of distance education for Chapter 1 elementary students should include consideration of the following:

- Considerable community preparation should precede any distance education project to establish coordination and support.

- All groups affected by the choice of service delivery model, including teachers; should be involved in planning.

- Parents and community members should be actively involved.

- If possible, a coordinator or cooperative should assist in coordination and support efforts.

- School districts using distance education should have staff observe a master teacher presenting a lesson, engage in brainstorming sessions, and participate in staff development activities to enable them to be effective teleteachers.

- Teleteaching training should be provided for teachers and facilitators using the system. No previous experience using technology is necessary.

- Facilitators need not be certified teachers, but do need training in classroom management and instructional strategies.

- Teleteaching training should include strategies for establishing rapport, increasing interaction, using the new media, preparing lessons that take advantage of the media, and practicing on the system.

- Summer appears to be the optimal time for Chapter 1 program delivery via interactive television since there are fewer scheduling conflicts. Transportation, however, may be difficult to arrange.

- Elementary programs benefit from the use of hands-on activities and cooperative learning strategies.
- Distance education may be a good alternative for Chapter 1 program delivery to isolated rural areas, migrant programs, private schools, and/or any district that shares resources with surrounding districts.
- State and federal government should take a more active role in promoting the use of distance education to deliver services otherwise unavailable to educationally disadvantaged students.

The Role of Teachers in Distance Learning

1. Teachers play a critical part in distance learning.

2. To be successful, teachers must have
   - training
   - preparation
   - school/district support

3. To date, few teachers have had preparation for teleteaching.

4. Teacher input in distance learning is critical for
   - assuring long-term suuport
   - shaping the development of distance education

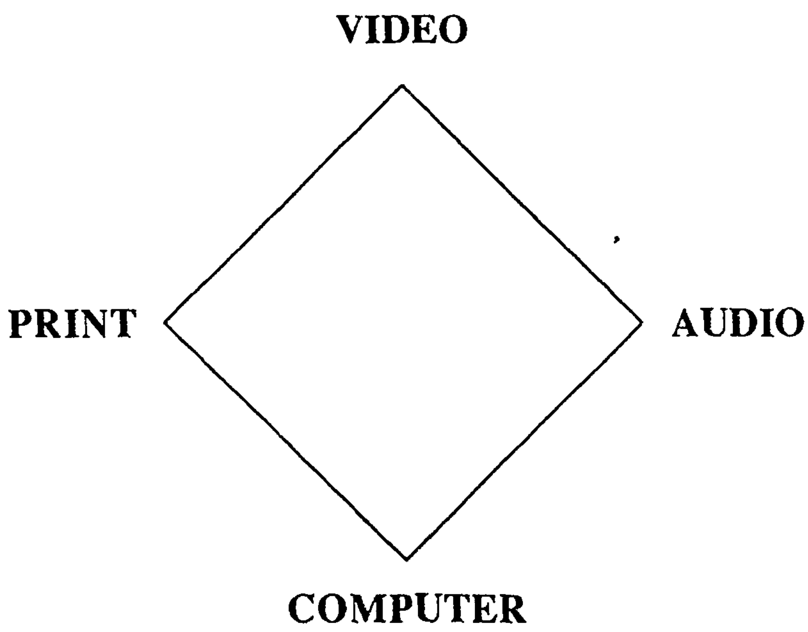
5. Teachers using distance learning have had to find new ways to structure student-teacher interaction.

6. Teachers are concerned about being displaced by technology.

7. Distance learning has implications for student teaching.

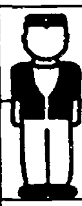
8. Distance teaching is not for everyone.

DIRECTIONS OF DISTANCE EDUCATION TECHNOLOGY



WORKSHOP GUIDE

DISTANCE EDUCATION



RESOURCE MATERIALS

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ERIC MINI-REVIEW

RURAL EDUCATION

CRESS

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 512K 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 1988 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 September/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.
11985 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) 396-3874

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
Panguitch, 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) 575-8043

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

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Glossary

ACTS (Advanced Communications Technology Satellite): A National Aeronautics and Space Administration Ka-band satellite that is scheduled for deployment in the early 1990s.

Addressable converter: A device connected to a television set that allows cable television operators to turn on or block individual subscriber access to pay-per-view services.

Amplifiers: Electronic devices, spaced at intervals (cascaded) throughout a cable television system, used to boost the strength of the cable signal as it passes from the headend to the subscriber. In coaxial cable systems, amplifiers are needed approximately every 1,500 feet.

Analog communication: A communication format in which information is transmitted by modulating a continuous signal, such as a radio wave. *See also* Digital communication.

Asynchronous communication: Two-way communication in which there is a time delay between when a message is sent and when it is received. Examples include electronic mail and voice mail systems.

Audio bridges: Electronic devices that connect and control multiple telephone lines for audio and data applications, allowing many callers to be connected as a group simultaneously. Used for audioconferencing.

Audioconferencing: An electronic meeting in which participants in different locations use telephones to communicate simultaneously with each other.

Audiographics: An advanced computer application in which computer interaction is augmented by two-way, real-time audio communication. Audio, data, and graphics are shared over regular telephone lines, allowing users in different locations to work on the same application simultaneously.

Bandwidth: The width of frequencies required to transmit a communications signal without undue distortion. The more information a signal contains, the more bandwidth it will need to be transmitted. Television signals, for example, require a bandwidth of 3 million hertz (cycles per second), while telephone conversation needs only 3,000 hertz.

Bit (BInary digiT): the smallest unit of information a computer can use. A bit is represented as a "0" or a "1" (also "on" or "off"). A group of 8 bits is called a byte. Bits are often used to measure the speed of digital transmission systems.

Bell Operating Companies (BOCs): As a result of the divestiture of AT&T in 1984, the original Bell telephone system was divided into 22 local Bell Operating Companies that now provide local telephone service across most of the country. These companies are controlled by the seven "Baby Bells," the Regional Bell Operating Companies (RBOCs).

Bulletin board service (BBS): A computer service that allows remote users to access a central "host" computer to read and post electronic messages. Communication is usually asynchronous.

C-band: The designation for satellite communications operating at 6 GHz (billion cycles per second) uplink and 4 GHz downlink. These frequencies are also used for terrestrial microwave transmission.

Coaxial cable: Shielded wire cable that connects communications components together. It is commonly used in cable television systems because of its ability to carry multiple video (or other broadband) signals.

Codecs: The abbreviated form of "coder-decoder." Electronic devices that convert and compress analog video signals into digital form for transmission, and convert them back again on reaching their destination.

Compact disc-read only memory (CD-ROM): An optical storage system for computers that only allows data to be read off the disc. New data cannot be stored and the disc cannot be erased for reuse.

Compressed video: A video signal requiring less information to transmit than broadcast quality or full-motion video. Digital technology is used to encode and compress the signal. Picture quality is generally not as good as full-motion; quick movements often appear blurred. Compressed video requires transmission speeds between 56 kbps and 2.0 Mbps.

Computer conferencing: Allows individuals at different locations to communicate directly with each other through computers. Communication may be in real time or delayed.

Digital communications: A communications format used with both electronic and light-based systems that transmits audio, video, and data as bits ("1s" and "0s") of information (*see* Bit). Codecs are used to convert traditional analog signals to digital format and back again. Digital technology also allows communications signals to be compressed for more efficient transmission.

Digital video interactive (DV-I): A system that combines audio, data, and limited-motion video on an optical disc. DV-I will run on a personal computer, allowing the user to control interactive programs.

Direct broadcast satellites (DBS): Satellites that operate in the 12.2 to 12.7 GHz frequency band. These satellites are designed to broadcast programming directly to small (1 meter) home receiving dishes. No such services are currently operating in the United States.

Downlink: An antenna shaped like a dish that receives signals from a satellite. Often referred to as a dish, terminal, Earth station, TVRO (television receive only).

Downstream: The direction a signal travels as it moves from the transmitting (origination) site to the receiving sites.

Electronic blackboard: A computer application that allows graphics to be shared among many computers simultaneously. Each user can see and annotate the graphics as needed. The results will be visible to all users.

Facsimile machine (fax): A telecopying device that electronically transmits written or graphic material over telephone lines to produce a "hard copy" at a remote location.

FCC: Federal Communications Commission.

Fiber optics: Hair thin, flexible glass rods that use light signals to transmit audio, video, and data signals. Signals can be sent in either analog or digital format. Fiber optic cable has much higher capacity than traditional copper or coaxial cable, and is not as subject to interference and noise.

Footprint: The area on the Earth's surface to which a satellite can transmit. Different satellites cover different areas and have different footprints. Satellite footprints generally cover all the continental United States (full conus) or only half of it (half conus coverage).

Freeze frame: One method of transmitting still images over standard telephone lines. A single image is transmitted every 8 to 30 seconds. Also referred to as slow scan.

Frequency: The number of times per second an electromagnetic wave completes a complete cycle. A single hertz (Hz) is equivalent to one cycle per second.

Full-motion video: A standard video signal that can be transmitted by a variety of means including television broadcast, microwave, fiber optics, and satellite. Full-motion video traditionally requires 6 MHz in analog format and 45 Mbps when encoded digitally.

Gbps: Giga (billion) bits per second. *See* Bit.

GHz: One billion hertz (cycles per second). *See* Frequency.

Graphics tablet: A computer device resembling a normal pad of paper that users draw or write on. The graphics tablet converts hand-drawn images into digital information that can be used and displayed by a computer.

Headend: In a cable television system, the headend is the central transmission office from which programming is distributed to subscribers.

High definition television (HDTV): An advanced television system that produces video images as clear as high-quality photography. HDTV is still experimental in the United States.

Instructional Television Fixed Service (ITFS): A band of microwave frequencies set aside by FCC exclusively for the transmission of educational programming. Allows broadcast of audio, video, and data to receive sites located within 20 miles. Receive sites require a converter that changes signals to those used by a standard television set.

Integrated Services Digital Network (ISDN): An end-to-end digital network that will allow users to send voice, data, and video signals over the same line simultaneously. Narrowband services now in operation give users up to 24 channels to send voice and data information, with a combined capacity of up to 1.544 Mbps. In the future, broadband services available over a public ISDN are expected to offer full-motion video services as well.

Ka-band: Satellite communications frequencies operating at 30 GHz uplink and 20 GHz downlink.

Kbps: Kilo (thousand) bits per second. *See* Bit.

KHz: Kilohertz; thousand cycles per second. *See* Frequency.

Ku-band: Satellite communications frequencies operating at 14 GHz uplink and 12 GHz downlink.

Light emitting diodes (LEDs): Used as transmitters in some fiber optic systems. They transmit digital bits as pulses of light along a fiber optic strand.

Limited-motion video: *See* Compressed video.

Mbps: Mega (million) bits per second. *See* Bit.

MHz: Megahertz; million cycles per second. See Frequency.

Microwave: High-frequency radio waves used for point-to-point and omnidirectional communication of audio, data, and video signals. Microwave frequencies require direct line-of-sight to operate; obstructions such as trees or buildings distort the signal.

Modem (modulator/demodulator): A device that converts digital computer signals into analog format for transmission.

Modification of Final Judgment (MFJ): The 1984 agreement that brought about the divestiture of AT&T, and limited the Bell Operating Companies' involvement in manufacturing and designing equipment, as well as their ability to provide long distance and information services.

Modulation: The process of encoding audio or video signals onto a radio wave (carrier frequency) for transmission.

Multiplexer: A device that combines multiple signals for simultaneous transmission over a single channel.

Multipoint distribution services (MDS): Also MMDS; Multichannel Multipoint Distribution Service. Also known as "wireless" cable. A telecommunications service that uses microwave signals to transmit video entertainment and data.

Public Switched Telephone Network (PSTN): The public telephone network.

Real-time communication: Two-way simultaneous communication, as opposed to asynchronous.

Repeater: A device used to extend the range of a communication signal.

Reverse flow amplifier: In two-way cable television systems, these devices move video and audio signals from the receive sites back to the cable headend.

Signaling System 7 (SS7): A recent development in control systems for the public telephone network. It allows telephone company computers to communicate with each other, making telephone call processing faster and more efficient and enabling more services to be made available to consumers.

Slow scan: *See* freeze frame.

Steerable dish: A satellite receive dish that uses motors to rotate the dish to receive signals from many satellites. "Fixed" dishes are stationary, always pointed at the same satellite, unless reaimed by hand.

Switched network: A type of system where each user has a unique address (such as a phone number), which allows the network to connect any two points directly.

T1 rate: A digital transmission speed of 1.544 Mbps.

Teleconferencing: A general term for any conferencing system using telecommunications links to connect remote sites. There are many types of teleconferencing including: videoconferencing, computer conferencing, and audioconferencing.

Television receive only (TVRO): Satellite dishes only capable of reception.

Touch screen: A computer screen that allows data to be entered by using a specialized pen to write on the screen, or by making direct physical contact with the computer screen.

Transponder: The electronic equipment on a satellite that receives signals from an uplink, converts the signals to a new frequency, amplifies the signal, and sends it back to Earth. Satellites are usually equipped with 12 to 24 transponders.

Uplink: A satellite dish that transmits signals up to a satellite.

Upstream: The direction a signal travels as it moves from a receive site back to the site of original transmission. Used especially in two-way cable television systems.

Vertical blanking interval (VBI): The unused lines in a standard television signal. The VBI appears as a black band at the top or bottom of a television picture. Often used for closed captioning.

Very small aperture terminals (VSATs): Satellite receive dishes, approximately 1.8 to 2.4 meters in diameter, that are capable of sending and receiving voice, data, and/or video signals.

Videophone: A telephone combined with a video screen, allowing callers to see each other as they speak.

Implementing Distance Education Programs:

Suggestions for Potential Developers

William D. Milheim

Distance education has been used in one form or another for decades to deliver instruction to students who choose to learn at some distance from the institution providing their education. While it has been used quite successfully by some organizations (e.g., the Open University in Great Britain), other educational institutions have not been very successful in implementing this type of instruction.

Many established institutions, however, are now considering implementing this form of instruction to increase their course offerings as well as the number and types of students enrolled in current courses. The purpose of this article is to provide these institutions as well as potential course developers with basic information to help them design and develop distance education programs and instructional materials for the distance learner.

Technology Components of Distance Education Programs

Distance education has traditionally consisted of courses taught to distance learners through a variety of media formats. While there has been some emphasis on the use of electronic media for this delivery of material, most programs have traditionally been implemented with text-based materials, often academic texts or workbooks of some type. These text-oriented systems also typically include some type of adjunct support from radio/television broadcasts, student tutors, or other types of instructional assistance.

Many of these programs have been in use for many years, typically in locations where on-campus education was not a viable option, including less-populated areas and in developing countries where traditional education may be too expensive to utilize. While many of these programs have been quite successful at delivering instructional materials, they tend to lack significant interactivity between instructor and student.

Based on this lack of interactivity and the development of a number of new technologies during the last five to ten years, distance education has been undergoing radical changes in the methods that are employed in the design and delivery of instruction. Technologies such as microwave transmission and satellite delivery are a part of this change and are beginning to be utilized in a number of settings where interactivity is important to the learning process. This "high tech" delivery, however, while effective, can be quite expensive and may not be warranted in many situations where cost is a significant factor.

The present state of distance education programs, therefore, includes a variety of media types, ranging from texts delivered by mail to instruction delivered through satellite and/or computer systems. Regardless of the media choice, however, certain guidelines should be observed to minimize costs as well as many of the potential problems that can result from the implementation of a distance education program.

Economic Decisions

One of the most significant factors to be considered when developing a distance education program (or its associated materials) is the cost required for providing instruction to learners dispersed over a large geographic area. While such costs can vary significantly from one program to another due to the choice of technology or the distance between students and their educational institution, a potential developer must still plan for a number of costs associated with every distance project.

A large part of these expenses is based on the start-up costs required by many distance-based programs. While some projects require a relatively small initial investment (e.g., the use of text-based materials), many programs will necessitate spending significant capital resources to merely get the program started.

Projects that do require significant initial expense may include the large-scale use of electronic media such as broadcast or prerecorded video, telecommunications in a variety of forms, or computer-mediated training. While these media types may prove to be cost-effective in the long run, with large student populations, their initial costs (equipment, personnel, etc.) can be quite high.

Costs associated with the design and production

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of instructional materials must also be taken into account for all distance education projects regardless of media type. This expense is significant with most distance education projects, since this type of education traditionally relies heavily on the use of instructional materials that are delivered to students learning at some distance from their educational institution.

Monetary support must also be allocated for the continuing costs required by many distance education programs. While a variety of expenses may be included in this category, these costs typically include: (1) continual design and development of new courses; (2) duplicating expenses for instructional materials for students located in diverse regions away from campus; (3) equipment maintenance and repair for both on and off-campus sites; and (4) the use of professional and non-professional staff at a number of different locations. Each of these areas should be carefully considered for budget allocation, both for short- and long-term planning.

Personal Needs

Staffing needs must also be considered when developing a new or revised distance program, both in terms of budgeting as well as obtaining appropriate personnel for each task in the development process. While support staff can be quite expensive compared to other instructional costs, they are absolutely essential to designing an appropriate course for distance students.

As with other courseware, an instructional designer should play a key role in the development of the educational materials, and should be involved in the entire process from needs assessment through the pilot testing and installation of the materials. Other necessary personnel typically include subject matter experts, scriptwriters, experts in specific media development (videographers for video development, etc.), and evaluators. While several of these abilities can sometimes be obtained from a single individual, all are essential for the development of effective teaching materials for the distance learner.

Significant costs may also be associated with the hiring and training (or retraining) of instructors, who must become competent in teaching distance education courses. which often involve significantly less interactivity as well as the use of high-technology equipment. This type of lesson delivery may be particularly difficult for instructors who have experience primarily in a traditional classroom.

Finally, staffing may include the use of student or nonprofessional tutors who assist distance learners with the learning process. While these tutors may not always be required, they can increase both the effectiveness of the instructional materials as well as improve the attitudes of learners toward the distance learning process. If such tutors are utilized, further discussion will help determine whether these staff members should be paid and the hours when they will be available to students.

Choosing an Appropriate Delivery System

A related decision that must also be made during the early stages of developing a distance education project concerns the choice of a delivery system for transmitting the instructional materials to the learners enrolled in a particular course. While this decision is somewhat dependent on available economic resources, it must also be based on a number of other significant factors, including the proposed audience (i.e., learners) and the amount of interactivity between students and the instructional materials required for a particular course.

The type of learner enrolled in a program is relevant to this media decision process and is based on a number of factors including the student's: (1) previous academic experience, (2) experience with various media, and (3) distance from the educational institution. A mismatch between the learner and the media chosen for a particular course (e.g., using computer-based materials with students who have limited academic backgrounds) can significantly reduce the effectiveness of the instruction for that course.

Another issue important to the final choice for a delivery system is the amount of student interactivity desired for a particular course. In terms of specific media, this spectrum ranges from highly interactive systems, such as two-way teleconferencing (using television and/or computers) to instruction with low interactivity (including, for example, textbooks or broadcast radio). While interaction can be built into nearly any type of instruction at some level, this aspect of the media decision process is often reduced to the amount of available economic support, with greater expense usually required for systems that offer more interactivity.

As in a traditional classroom, the final choice for a media delivery system may actually involve a combination of different media types, with each system chosen for its unique characteristics. In this sense, one medium (e.g., videotape) may be used for the delivery of new material while another (e.g., text-based workbooks) could be used for student review or testing.

Designing Instructional Materials

After a preliminary budget has been allocated and a delivery system has been chosen, the materials for a specific course must be designed and produced. While this process is similar to the design of other types of instructional materials, certain aspects of this process deserve specific attention within a distance education system. The overall design process is particularly important given the importance of instructional materials within distance education, where human instructors may not be physically present during the actual instructional presentation.

Audience (or student) analysis is extremely valuable since it assists the instructional designer in developing a course that matches the needs of the students. This type of analysis is somewhat difficult within distance education, however, due to: (1) a lack of generalized data about distance students, (2) the non-traditional nature of the learners enrolled in these courses, (3) the high student drop-out rate in many distance education programs, and (4) the difficulty obtaining data from students residing at some distance from their educational institution.

While such analysis is difficult, it is also quite helpful since these learners may have special instructional needs due to their geographic location or lack of previous academic experience. In general, important information to be gathered from these students should include at least: (1) highest completed grade level, (2) previous experience with distance learning, (3) reason(s) for taking a course, and (4) the amount of previous knowledge in the subject matter to be taught. An analysis of this information will allow the course designer to develop a more effective course that better matches the needs and previous knowledge of the intended learners.

During this same time, an analysis of the course content must also be accomplished and should include at a minimum: (1) a description of course objectives, (2) an outline of course content, including the scope of material to be taught, and (3) decisions concerning the sequencing of course material. Each of these choices will help establish guidelines for the presentation of material to students throughout the course.

Based on course content and an appropriate audience analysis, course designers should also develop instructional strategies for each topic within the overall course. These strategies are again particularly important in a distance education environment where the instructional materials themselves are required to support a large proportion of the educational experiences for each student.

Finally, appropriate evaluation strategies must be decided upon, especially as they relate to the type of distance instruction used in a particular course or curriculum. Specific decisions to be made during this stage should include: (1) the overall evaluation strategy, (2) specific methods for evaluating learning (types of questions, time limits, etc.), and (3) uses of the evaluation data. A special issue within distance education is whether evaluation in a distance course should be identical to the evaluation given during the same course on campus.

Delivery of Materials to the Student

After the materials have been designed and produced, the instruction must be delivered through the chosen medium over some distance to the intended learners. The time delay between message transmission by the educational institution and its actual reception by students varies from nearly immediate (e.g., when using live teleconferencing) to much longer time periods (e.g., when using printed materials or prerecorded media).

Regardless of the chosen medium, the delivery of these materials is associated with significant continuing costs for equipment maintenance, personnel costs (technicians, off-site personnel, tutors, etc.), and duplication of materials. While many of these costs are also required by traditional instructional methods, the proportion of the total required by each may be much higher in a distance learning environment.

One of the areas where such costs are significantly higher is the revision or updating of materials over time. While the revision of on-campus materials is often accomplished with the purchase of new textbooks and the updating of an instructor's notes, these same changes within a distance course require time-consuming and expensive alterations in the educational materials which must carry the majority of the instruction to the distant student. These changes are particularly expensive with "high technology" delivery systems (video and/or computer systems) where implementing such alterations can be very complex.

Conclusion

Courses offered through distance education have the potential for reaching a great number of individuals who are not able (or willing) to take traditional, on-campus courses. However, this potential must be tempered by the careful consideration of factors that can affect the overall effectiveness of distance courses including: (1) budgeting for short and long term needs, (2) planning for teaching and support staff, (3) choosing an appropriate delivery system, (4) using instructional design principles for the development of the instructional materials, and (5) delivering the materials to students in an accurate, timely manner. Following the above guidelines will help assure an effective distance education program. □

Distance Education: A Review of Progress and Prospects

Francine E. Jefferson and O.K. Moore

This article has three interrelated objectives. First, we want to convey a sense of what presently is going on in the United States with respect to distance education; we believe that the promise of distance learning likely will be fulfilled in the decade of the 1990s. Second, we attempt to make clear that distance education comes in kinds; we maintain that it is important to understand the strengths and limitations of the various distance systems so that appropriate choices can be made from among them with regard to satisfying diverse needs. Third, we focus attention on one kind of distance-learning technology, specifically "slow-scan" systems, that has special relevance for bringing quality control to educational practice. We emphasize the importance of quality control for the education of the socially disadvantaged.

Distance Education in the United States

Turning now to our first objective, we begin by considering what the United States Congress did, and is doing, about distance education. Among other things, it passed Public Law 100-297 that created the Star Schools Program. The U.S. Department of Education was instructed to fund distance-learning demonstration projects under this program. (1) In September, 1988 a total of $19.1 million was awarded to four demonstration projects, each of which was designed to expand educational opportunities for elementary and secondary students in isolated or otherwise disadvantaged schools in the United States.

We served as members of the evaluation team that selected the four winning proposals from some 67 applicants. The top-ranked applicants were given two-year grants which began October 1, 1988 and run through September 30, 1990. Congress now has appropriated $30 million for the second phase of the Star Schools Program. One of us (Moore) served on the evaluation team which completed its work in June of this year. The winners, from among 43 applicants, have not been announced as yet, but they will receive their awards beginning next month (October 1990).

The law stipulates that any winning proposal must involve at least three partners and that the communication network to be established must serve either an entire state or be a multi-state project. Each partnership must have as one of its partners either a local-education agency, a state-education agency, or a state higher-education agency. (2) A Star Schools grant can provide school districts with a variety of kinds of equipment, e.g., satellite dishes, television monitors, computers, printers. It is specified that 25 percent of the award must be used for creating programs.

It is estimated that some 12,000 to 15,000 students will have taken part in the Star Schools Program during the school year 1989-1990. Of the four systems that won the first round of the competition, three make use of television via satellites with telephone and computer feedback loops. The current grants entail the installation of approximately 2,500 downlinks in 40 states. One of the first-phase winning proposals makes use of an electronic-mail service system to instruct students and teachers to use relatively sophisticated science modules at remote sites. In effect, a cadre of competent mentors is made available to students and teachers.

Perhaps we have said enough about the federal interest in distance education to give the flavor of it. We now consider initiatives being undertaken at the state level. Many states are in the process of building educational telecommunication networks for distance learning. For present purposes we select, somewhat arbitrarily, the state of Iowa to illustrate what is "in the works," so to speak.

To begin with, officials at the state agency setting up the general telecommunications network for Iowa estimate that the total cost will come to somewhere between $60-$120 million. The Iowa legislature has appropriated $10 million a year, for five years, starting in 1990. The first $600,000 of the 1990 appropriation will go to the funding of a pilot project; the remainder of the first $10 million will be expended in the construction of a backbone of fiber-optic links. Iowa aims to construct a two-way television system that will connect teachers and students around the state. The overall network, in addition to its educational uses, will accommodate public video teleconferencing, statewide public meetings, and state government administrative communication. An existing statewide video-teleconferencing site network will become part of the

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educational network. The state's 15 regional community colleges are to be the building blocks of the system; these colleges will serve as regional hubs permitting two-way television between 100 schools statewide—these schools, in turn, will provide televised instruction to about 1,000 schools in the surrounding areas. (3)

As was mentioned above, Iowa is only one of many states now in the initial stages of building distance-education systems. We could, for example, have used Kansas for illustrative purposes. The state of Utah probably has gone further in constructing a wide variety of distance-education systems than any other state—it is also becoming very sophisticated in its employment of these technologies. It is plain that distance education fills a need for states with great distances between their villages, towns, and cities. As is well known, American agriculture is becoming capital-intensive as opposed to labor-intensive; farmers need a strong background in science, biological and physical, if they are to exploit the potential of modern farming technologies. Yet, it has become increasingly difficult to get well-trained teachers to go into rural areas; the bright and well-educated "school marm" is seldom seen. Once women were trapped into being school teachers because social and legal barriers prevented their entry into the full range of professional occupations; this is no longer true. Some rural districts in farm states report that they do not have even one properly trained science teacher, or mathematics teacher, or foreign language teacher. This is one reason that farm states now are willing to put up hard money to build distance-education systems.

It is our guess-estimate that by 1995 all rural areas in the United States will have distance-education service. Unfortunately, physical isolation is not the only form of isolation; there is the social isolation of our growing underclass in large metropolitan areas. It probably will be in the latter half of this decade that the socially isolated will start receiving much assistance in the form of interactive distance education, although some steps in this direction are being taken.

Kinds of Distance Education

We turn now to the second of our objectives. We promised to make it evident that what is loosely referred to as "distance education" or "distance learning" comes in kinds. To the best of our knowledge, no one has created a satisfactory classification of such systems. We have devised a typology that has helped to clarify our own thinking about this topic. It has three major dimensions and in its simplest form there are 18 distinct types. The classification is of information systems, in general, and only some of the 18 types are what we term communication systems, and of these only some are distance-education systems. It goes beyond the scope of this article to explain this typology in detail. However, Figure 1 provides an introduction to it and we discuss some of the current distance technologies using the dimensions of this classification.

The first dimension to be considered is labeled "Sociality." It admits of three levels: the patient level, the agent-patient level, and the agent-patient-significant other level. The three levels referred to here are based on distinctions due in part both to Georg Simmel and George Herbert Mead. (4)

An information system, and more specifically here a communication distance-learning system that operates at the "patient level," places the learner(s) in the position of being patient to, or subjected to, whatever is being presented. There is no response on the part of the learner that can alter what is being provided. An example of a distance-learning system that operates at the patient level is ordinary radio or television educational broad-casting—these are one-way systems. One reason commercial radio and television are so sensitive to ratings is that the only way they can tell whether their messages are getting across is to estimate the size and composition of the "audience." Educational radio and television have been around for a long time and they are not what currently is meant by distance-educational systems.

We have to move up to the agent-patient level in order to get into the domain of what presently is being referred to as "distance education." For most of those who are concerned with this form of education, there must be some acts of *agency* that the learner(s) can perform which are fed back to the "head end" of the system and that make a difference in terms of what is being presented—without this feedback loop a system is not of the distance-learning variety. The loop may be as simple and impersonal as providing the learner(s) a key to press in order to give some indication as to what he or she thinks or feels. If, say, 90 percent of an audience respond correctly to some question that is being asked, then the presenter may go on as planned. If 90 percent get the answer wrong, then this may lead to a planned change in the program. In short, there is a feedback loop that is operative. This feedback loop may itself be of a restricted or relatively nonrestricted variety—but we will get into this matter when we turn to the Productivity Dimension of the classification. Another aspect of the agent-patient level of Sociality is whether responses to what is being presented can take place in real time (or near-real time) or only with long time delays. The classic case of a feedback loop with long time delays is the correspondence course. There is a feedback loop alright, but one might not get an answer for weeks. The present-day electronic bulletin board when used in conjunction with a science curriculum, for example, might be thought of as an up-dated version of a correspondence course.

The third level of the Sociality Dimension is labeled "agent-patient-significant other." Roughly speaking, this is the level of two people interacting on a face-to-face basis; each can take account of the other. Of course, this level need not be confined to dyads—triads and "larger" small groups can engage in such mutual taking-into-account. One interesting point about this level, from a technological standpoint, is that there is no "head end." The equipment and access to the equipment is symmetrical. It is obvious, we think, that most of the planned distance-education systems are not designed to operate at this level. If one teacher is presenting something via television to a set of classes of 20 students each, and even if there is a telephone or video feedback loop, it is virtually impossible for each student to interact with the teacher. As in the ordinary classroom situation, some students tend to monopolize the teacher's attention. Nonetheless, if the audience is kept relatively small and the number of teachers is relatively large, one can reach this third level with currently available technology.

Another dimension of the classification is labeled "Sense Modality"—the levels are one, two and three-plus. Distance-education systems differ in terms of whether they are restricted to one sense modality, for example hearing, or two, as in the case of television. Very few systems have more than two sense modes. There are ways of engineering tactile modes of a limited kind in addition to sight and hearing, but none is generally available. Also, with respect to vision, sooner or later we will be incorporating holographic features into our visual presentations, but that, too, currently is not economically feasible. One of us (Moore) now is attempting to push the state of the art with respect to educational applications of holography, but it will take several years before we have a better idea of how that will work out. One other aspect of the Sense Modality has to do with color. Most of us have become accustomed to color television and are disappointed if we do not find it. However, some distance-education systems, which are very practical from an economic standpoint, can operate very nicely in black and white.

The third dimension of the classification is labeled "Productivity." Only two subcategories are recognized here, specifically, restricted and unrestricted. This dimension has to do with the symbolic resources offered by the system. If one is confined, as is the case in many computer programs, to a preset and fixed set of response options, namely to a menu, then the Productivity Dimension is regarded as restricted. Part of the frustration that many of us feel from time to time in "communicating" with a computer is that we cannot get the question asked we want to ask. Beyond this, we cannot modify the program easily so that the computer will be responsive to our information needs. This also happens with teachers who sometimes declare that certain questions are out of bounds. This business of the restrictiveness of the Productivity Dimension is obviously one of degree, whereas the classification gives it as a dichotomy. In this sense the classification is too simplistic, but it at least has the virtue of bringing to one's attention the question as to whether any given distance-education system permits relatively free and open discussion and analysis or whether the learning environment is made very restrictive. In general, distance-learning systems that attempt to accommodate large numbers of learners simultaneously have to place fairly severe restrictions on the symbolic resources that are to be made available.

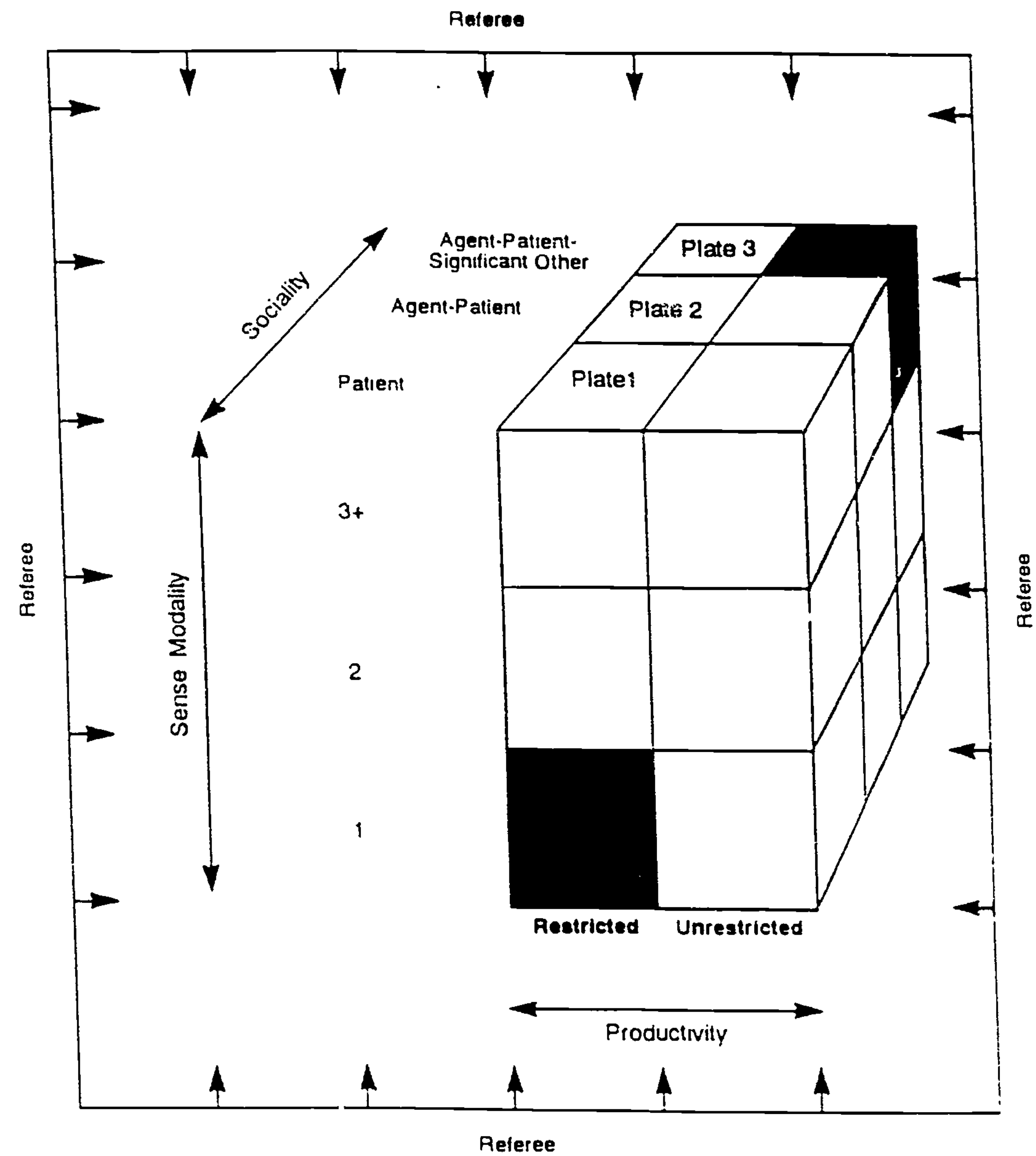
There are two other aspects of Figure 1 that we should note in passing. On the outside of the square, the word "referee" is written and there are arrows pointing inward. This aspect of the classification pertains to the deontic or normative rules that govern the use of information systems. We cannot go into this matter here, but it should not be forgotten that information and communication systems are used within normative systems that may place arbitrary, or not so arbitrary, restrictions on how the technologies are to be used—this is included in the classification as a reminder of this important aspect of all systems. Also, two cubes are shaded; they represent polar opposite types. The one in the lower left-hand corner is an information system with a restricted symbolic system involving only one sense dimension at the patient level. A good example of such an information system is a lighthouse or a burglar alarm. The shaded cube in the upper right-hand corner represents a communication system with an unrestricted coding system and full, symmetric, symbolic interaction, plus three or more sense modalities. There are no systems of this kind currently available although the system to be described shortly comes close.

Quality Control

We go now to the third of our objectives. In this last section of the article we concentrate on one particular kind of distance-learning technology that does have relevance for bringing quality control to educational practice. We believe it is of special importance for those who are subject to social isolation, especially in large urban settings. We begin by

Figure 1

Classification of Technologically Based Information Systems*



*Shaded blocks represent ideal-typical extremes.

making a few summary judgments about distance education, in general, as it is being put into practice both at the federal and the state level.

It is clear, we think, that those who are in charge of spending millions upon millions of dollars on various forms of distance education should have decent evaluation data available so they can make sensible judgments about what kinds of systems to field. It is true that a number of the major programs have launched demonstration projects and pilot studies, but there is not currently available a body of valid data concerning the fruitfulness of the various systems being planned or put into partial operation. One reason no such bodies of data exist is that they are very difficult to collect. Just consider the problems that would arise in collecting data on thousands of students in dozens of states.

It seemed to us that there is a pressing need for comprehensive, formative, process-oriented evaluations of the implementation of these many diverse systems. In order for a research team, or a set of research teams, to function "nonlocally" the evaluators need a distance-bridging system themselves, one that is rich enough to enable investigators to engage in full-bodied, flexible, symbolic interaction with students, teachers, administrators and others who are part and parcel of the new educational systems. We looked for such a system and required of it that it be relatively modest in cost and able to go most anywhere without an elaborate technological backup. The system wanted should come close to meeting the requirements of the ideal-typical system in the upper right-hand corner of our classificatory scheme. In terms of the Sociality Dimension it should be unrestrictive; and in terms of the Sense Modality it should be an audio-visual system. The question arises naturally, "Does any such system exist?" The answer is, "Yes," although there is a small departure from real-time interaction at the visual level. Systems of the kind that we think can help bring quality control to distance education are of the "slow-scan" variety—sometimes they are called "freeze-frame" systems. (5)

Perhaps a good way to give a vivid sense of what a freeze-frame system is like is to compare it with the other major video technologies. These technologies come in three kinds. They are:

- Full-motion video systems. Such systems use a wide-band channel to instantly transmit continuous motion. These systems are expensive and require special cables or dishes.
- Compressed video systems. Such systems present "near motion" but rapid movements appear to be blurred. A data circuit is required for transmission.
- Freeze-frame systems. These systems presently are the only kind of video conferencing technology that uses ordinary voice-grade telephone lines. The penalty one pays for the practicality of using the telephone is that it takes about 35 seconds to transmit a black-and-white image (color is also available). The image appears on a TV monitor as a still picture which is either scrolled from side to side or from top to bottom. Of course the audio component of freeze-frame video is transmitted in real time. From what has been said it is plain that one can hold a video conference wherever there are telephone lines, and that is almost anywhere in the United States.

But what about the sending and receiving equipment for freeze-frame systems? Must one have what is in effect a little TV studio at each end of a telephone line? The answer is no. The leading manufacturer of freeze-frame equipment, Colorado Video Inc. of Boulder, Colorado, sells the Video Briefcase that weighs only 20 pounds and measures 18 X 14 X 5 inches. The Video Briefcase is designed with either single or dual resolution capability. The standard resolution is 512 times 240 visible picture elements. The high resolution is 512 times 480. The unit has a 64-shade grayscale, with an option of 256-shade grayscale. Any video camera, monitor or hard-copy printer may be used with the Video Briefcase. With a pair of Video Briefcases one has, in effect, mobile TV-like studios. Almost anyone, male or female, can carry the "studio" easily from place to place. All that is required is the Video Briefcase, a six-inch monitor, and lightweight video camera. Any ordinary telephone will fit into the modem.

Our opinions about slow-scan systems are based on direct personal experience. We have carried out multi-party teleconferences as well as data-collection interviews. Systems of this kind are well suited to social science research wherever face-to-face interaction is important. A symmetrical pair of "Video-Briefcase" stations can be purchased for between $6,000 and $10,000. If the research is to be done in a local area, the channel cost is that of a local call. Since the briefcases are portable, one can have the informant's station carried directly to him or her—all that is needed is a telephone. Any moderately intelligent person can manage the system from a technical standpoint; one does not need a resident technician, to say nothing of an engineer. We ran our first teleconference on the basis of the instructions that came with the equipment—the equipment is not nearly as crucial as is having something to say and/or to show.

We trust we have made it evident that slow-scan systems presently are affordable, flexible, and symbolically mature. We are of the opinion that such systems should play an important role in bringing quality control to distance education and to many other facets of social science research. What we want to address now is the special contribution that such systems can make to distance-education systems for the underclass, especially the minority underclass in metropolitan centers.

In our view the presently planned distance-education systems with their satellite downlinks and paucity of uplinks are not sufficiently and sensitively interactive to meet the needs of underclass students who ofttimes lag three to four years behind their age-peers in basic academic skills. It is not only the students themselves that are inadequately prepared to handle standard academic fare, but this is often true of their teachers as well. A few years ago we were doing an evaluation study for the National Science Foundation. (6), (7) A set of learning modules in physical science had been introduced, on an experimental basis, to two of the top schools in the District of Columbia Public Schools (DCPS) system and to two of the academically poorest schools. The hands-on learning modules were for sixth graders and they should have been easily understood by any science teacher. In carrying out one of our testing sequences we passed out protractors to the stude ts. In one of the underclass schools it was patent that the students were perplexed by the protractors. We asked the teacher what was going on. The teacher said that whenever it came time to show the students how to use a protractor she skipped this section of the curriculum—she did not know how to use a protractor. We privately showed her how to use a protractor and she was quick to learn and delighted to know how. Teachers of this degree of unpreparedness are common in underclass schools. Marvelous educational television programs can come into underclass schools via satellite or cable, but there has to be a meaningful "interpretive link" between the programs and the students. The teachers in underclass schools need an audio-visual instructional link of their own with a sympathetic, competent mentor. Further, supervisors need nearly continuous process-oriented evaluations of just where underclass students are so that remedial steps can be taken just as soon as difficulties have arisen.

We think, too, that the schools and various community organizations should be tied into the communication network so that after-school activities can be made more academically meaningful to students. It should be possible, for instance, to initiate a wide variety of academic competitions in school and in community centers—these can be dramatized for the students themselves via slow-scan systems. Presently, the only way to "star" in underclass settings is through athletics, music—or crime.

Conclusion

In this article we have presented material that indicates distance learning is likely to become a major force in the American educational system. In the 1990s such systems likely will spread from rural to urban areas. We also have underscored the point that distance education comes in kinds, and there is not a valid body of data to guide the selection of systems in order best to satisfy a diversity of needs. Finally, we have explained how one particular kind of system, specifically the slow-scan variety, can be used by social scientists and others to bring quality control to education, particularly to the education of the growing underclass in the United States. □

Notes

1. Dr. Frank B. Withrow, Team Leader-Technology Applications Group, U.S. Department of Education, took the administrative lead in organizing the Star Schools Program.
2. The other partners may be either profit or nonprofit organizations, e.g., some proposals were made by a partnership of a state university, a for-profit company and a public-service telecommunications organization.
3. For more about Iowa's adventure in distance education see an article by Steve Davis, a technology writer in New York City, entitled, "The Iowa Educational Telecommunications Network" which was published in *Educational Technology*, Volume XXX, Number 6, June 1990, p. 48.
4. For an exposition of Simmel's contribution see a piece by one of us (Moore) entitled, "Simmel on the Ratio of Subjective Values to Objective Cultural Possibilities" in *Georg Simmel and Contemporary Sociology*, Volume 119 of the Boston Studies in the Philosophy of Science, eds. Michael Kaern, Bernard S. Phillips and Robert S. Cohen. Dordrecht, Boston, London: Kluwer Academic Publishers. 1990, pp. 199-224.
5. The description below of freeze-frame systems is adapted freely from a prior paper by one of us (Moore) entitled, "Distance Education: Building a 'Video Briefcase' Network." It was presented at the plenary session on Applied Sociology in Educational Contexts for the Sixth Annual Conference of the Society for Applied Sociology. Pittsburgh, PA: The Responsive Environments Foundation, Inc., 1988. 7 pages.
6. *Preliminary Evaluation (Carried out under the University of Pittsburgh's UCSUR Subcontract) of Selected Phases of the National Learning Center's NSF Learning Laboratory Project.* Omar K. Moore and Francine E. Jefferson. Pittsburgh: The Clarifying Environments Program. July 15, 1986. 13 pages.
7. *Impact Analysis Tables for the National Learning Center's NSF Learning Laboratory Project*, Omar K. Moore and Francine E. Jefferson. Pittsburgh: The Responsive Environments Foundation, Inc., June 1989. 102 pages.

Separating Myth From Reality in Distance Education

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The pressures upon public education to improve services have been well publicized: economic conditions have decreased the availability of revenues needed to support educational programming at a time when the public outcry for school improvement is pervasive. Educational reform has become a national agenda. The demands for instruction to "tool and re-tool" learners of all ages have stretched existing resources beyond their limits (Wagner, 1990). The theme which unites these pressures is change — relentless, multifaceted, unforgiving, blindingly rapid change. (Rummler and Brache, 1990). Hall and Hord (1987) have suggested that, to improve the probability of successfully bringing about change in education, *it is critical to understand the point of view of participants in the change process*. Since the single most common variable associated with the implementation of distance education programs is change -- regardless of the technologies being used, the programs being offered or the level of instruction being provided -- it may useful to review commonly held perceptions about distance education in order to better understand the concerns of those involved.

While the commonly held perceptions of distance learning are as varied as are the projects in which distance learning methods are used, there seems to be three general categories in which these perceptions fall:

- the "we've seen this before, and we know how it's going to end" category;
- the "great lies" category
- the " tough truths" category.

Some perceptions reflect historical biases and concerns which had evolved while implementing technology projects in previous decades or phases of technology integration. For example, educators have spent two decades speculating about the strengths and weakenesses of computer based instruction (Hannafin, Dalton & Hooper, 1987), while instructional television's impact and effect upon teaching and learning has generated lively debates since the 1950s. The concerns expressed about these and other instructional media may (or may not) have been relevant for their specific technology application; nevertheless, some of these same concerns have resurfaced in discussions about distance education's impact upon educational practice.

Other perceptions may be "great lies" — inaccurate assumptions which have been repeated so often that they have come to represent current thinking regarding distance education — or technology integration — as we know it today. The "great lie" is an example of a logical fallacy. Other examples of logical fallacies include:

- resorting to blind belief in an authoritative source (*ad vercundium*);
- assuming that the majority is right, that the criterion for an idea's acceptance is its popularity *(ad populum)*
- an appeal to pity -- "think of the kids, think of their future . . ." *(ad misericordium)*;

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- assuming that becose something sounds right that it is right (" self-evident truth")

- succumbing to force or pressure (*ad baculum)*

- assuming that the absence of information is sufficient reason to proceed - "there's no evidence which suggests that this won't work". *(ad ignorantiam)*

Finally, some perceptions may be "tough truths", and do indeed describe potential stumbling blocks for your project's success. However, it is far more effective to systematically determine what those tough truths might be before getting a distance education project underway and to anticipate ways to deal with them than to pretend as if potential barriers to success simply don't exist.

Whether "great lies" or "tough truths", it is useful to acknowledge that various perceptions of distance education exist. True or not, any single perception can easily become a "self-evident truth" if it is repeated often enough. It ultimately becomes the folklore which, when used as a basis for further program development can, over time, serve as psychological barriers to program success. The greatest value of examining "ten great lies" or "ten tough truths" about distance education does not come so much from dismissing these perceptions outright or overstating their potential impact. Rather, by taking a look at a number of these perceptions we acknowledge and validate the variety of concerns about how distance education may or may not affect our professional lives. As we consider their relevance to our own circumstances, it becomes easier to develop interventions to improve the likelihood of our individual and collective success.

Perceptions of Distance Education: The "Great Lies" or "Tough Truths"? Test

This test has been designed to encourage discussion about a variety of perceptions that people have regarding the impact that distance education has upon teachers, students, instruction and organizations. Read each numbered statement carefully. Then indicate whether you believe each statement is true (T) or false (F) by circling the correct response in the space provided. Answers to these questions appear on the following pages.

T F 1. Distance education is just as effective as is traditional education.

T F 2. Teaching at a distance is dramatically different than traditional teaching.

T F 3. Teaching at a distance requires a lot of additional preparation time.

T F 4. Distance education will replace teachers.

T F 5. All teachers can teach effectively at a distance; all students will succeed in a distance education class.

T F 6. Every class is a candidate for delivery at a distance.

T F 7. Distance education will save schools money.

T F 8. Concern for instructional quality is the single most important driving force behind technological decision-making in distance education.

T F 9. The technologies used for distance educational program delivery promote interaction by means of their two-way, "real time" transmission capabilities.

T F 10. Once the decision to get involved in distance education has been made—after the needs assessments have been completed, the data analyzed, the recommendations made, the strategies developed—the hardest part of the project is over.

SOME THINGS TO CONSIDER WHEN SCORING THE "GREAT LIES OR TOUGH TRUTHS" TEST:

This "test" has been designed to examine the perceptions which have surrounded distance education as teachers, students and administrators look for ways to determine if distance education is right for their organization and circumstances. As you review your answers, it is important to remember that every situation in which distance education is going to be employed is unique. This means that, to be totally accurate, the correct response to *each* of these questions is going to vary from case to case. On first glance, there may seem to be some clear-cut true or false answers – yet even in these apparently true or false situations one should be aware that the circumstances surrounding each set of circumstances under which a distance education project is implemented require that one not make "leaps of faith" based upon someone else's data, experiences or sterotypes. From this point of view, there really *are* no right or wrong answers to the test. The power and potential for distance education to solve difficult problems of equity and access should not be minimized by the folklore which has come to surround its implementation. Even so, it is pointless to ask questions such as these without providing *some* direction for discussion. Answers have been provided and point values assigned to score your responses. A "tongue in cheek" scale has also been provided to help gauge where you fit along the "Distance Education Perceptions Continuum."

1) **TRUE, but...** It is very likely that distance education is going to be just as effective as is traditional education. In many cases it may actually be more effective, since more time and care may be taken to develop materials for delivery over interactive television systems. In cases where care is *not* taken to reformat traditional instructional materials, or to provide instructionally sound "wrap-around" sessions to support broadcasted programming, it is possible that distance education may not be as effective as is traditional education. However, this is due more to faulty instructional practice than it is to distance education, per se. (Give yourself the following points for your answer: T= 0, F = 5).

2) **FALSE, but...** Teaching at a distance is likely to be comparable to teaching in face-to-face situations. Some teachers and students may have difficulty adapting to the tools and techniques of distance education if they do not acknowledge the differences to be encountered in distant learning situations by virtue of geographic separation. In these cases, distance education may not be as effective as traditional education, but the difference in effectiveness is due more to the users' ability to adapt than it is to the methods of instructional delivery. (Give yourself the following points for your answer: T = 5, F = 0.

3) **FALSE, but...** Teaching and learning at a distance will require adaptation of traditional classroom materials, familiarity with the technology being employed in the classroom and will require some practice to become comfortable with the cameras, the microphones and the techiques for getting students to interact. These changes will require some additional preparation time, but this does not necessarily mean that teachers and students will find that it takes a lot of extra time to be effective. Depending upon the teacher, the students, the subject being taught, the technologies and the circumstances under which distance learning is to be used, the time to adjust will vary. Some may need only a little extra time to prepare, where others may need substantially more time and preparation. (Give yourself the following points for your answer: T = 5, F = 0)

4) **FALSE, but...** It is highly unlikely that distance education will replace teachers, although it is very likely that it will alter the

role and the function of teachers in the classroom. Depending upon the specific situations, some teacher roles may be changed dramatically, and this may result in some reassignments of duties and responsibilities. Teacher replacement, if it does occur, is more likely to arise from district staffing, personnel or policy decision than directly from distance learning methods. (Give yourself the following points for your answer: T = 5, F = 0)

5) **FALSE, but**. . . It is not likely that all teachers, or all students, will be successful in distance learning situations — the fact is that not all teachers or all students are successful in traditional instructional situations. However, this is going to be largely dependent upon how one defines "success" — and depending upon how distance education success is defined in any single organization, one may see all students and all teachers being successful in distance education. (Give yourself the following points for your answer: T = 0, F= 5)

6) **FALSE, but**. . .It is not likely that every conceivable class is a good candidate for delivery at a distance, although it is possible to design each and every learning experience to account for any number of instructional variables, of which distance is simply one variable. Depending upon the context, the need and the circumstances, any class can be re-designed for delivery at a distance. The relative success of its delivery will depend in large part upon the outcomes expected at the end o f each class being delivered at a distance and how those outcomes are going to be measured. (Give yourself the following points for your answer: T = 0, F = 5)

7) **FALSE, but**. . . Distance education very well may save schools money by sharing resources, sharing teacher expertise and reducing travel. It will also cost schools money to buy necessary new technologies, to pay for the reformatting of courses, to provide teacher and student in-service training and to provide for site facilitation. Whether on not a district realizes an overall savings due to distance education will depend upon how dollar values are assigned to both tangible and intangible variables associated with educating students in that particular district. It is more important to remember that the *cost benefit* of distance education may enable schools to serve the needs of its students, teachers and administrators more effectively by providing better access to information, more equitable access to instructional opportunities and a catalyst for encouraging the development of technological proficiencies which will be necessary to succeed in contemporary society. (Give yourself the following points for your answer: T = 0, F = 5)

8) **TRUE, but**. . . While concern for instructional quality may very well be the motivating factor supporting the decision to employ distance education in a district, other variables, such as competition for resources among regional districts, interests in providing technologically based learning experiences, return on investment and other non-instructional considerations may very well encapsulate the overall reasons for actually deciding to implement a distance learning program in a district or within an organization. (Give yourself the following points for your answer: T = 0, F = 5)

9) **FALSE, but**. . . Interactive technologies provide opportunities for improving the interaction between teachers and students as well as among students with others students, but the technologies do not guarantee that instructional interaction will occur. Interaction is an attribute of well planned and well implemented instruction, whereas interactivity is more likely to be an attribute of a specific variety of technology being employed. Nevertheless, the ability to encourage interaction as a consequence of interactive instructional systems may prove to be catalytic in improving the interpersonal communications between teachers and students, both in the classroom and at a distance. (Give yourself the following points

for your answer: T = 0, F = 5)

10) **FALSE, but...** The hardest part of getting a new innovative project underway is not likely to be the decision to get involved. Generally speaking, it is easier to plan for change than it is to actually implement change in an organization. However, depending upon the organization, it may require more energy to get people to start changing their expectations than it is to do things differently. In these cases, once the decision has been made, the implementation falls in place with fewer headaches. Depending upon your organization, you may find that the anticipation of change is more difficult to confront than is change itself. (Give yourself the following points for your answer: T = 0, F = 5)

IF YOU SCORED BETWEEN 0 AND 15 POINTS:

You are an idealist! Your enthusiasm for distance education will serve you well, especially during the implementation phase of your project. However, you need to guard against being disappointed if -- and when -- those "real life" variables that accompany every innovative technology application project begin to appear. You may end up running into a some surprises -- but your faith in your project will pull you through.

IF YOU SCORED BETWEEN 16 - 35:

You are a pragmatist -- with an eye toward the future but with your feet firmly planted on the road to getting your project underway. It is very likely that you will be able to anticipate many of the issues which may potentially affect your distance education project, so that you will have your solutions

IF YOU SCORED BETWEEN 36 - 50:

You may need to do something about your attitude before proceeding much further with your distance education project! You may have a tendency to see problems where they may be none -- and in anticipating potential difficulties in implementing your project you may inadvertently bring these anticipated problems to your project in spite of your good intentions. While it is always a good idea to go into a technology application with your eyes open, a little bit of faith will go a long way in seeing you through otherwise tough times.

References

NOTE: The Perceptions Test and related materials were featured in the Pacific Mountain Network's videoteleconference, **FarView**, which was held on January 18th, 1991.

Abraham, J. (1990). private communication, December 13, 1990.

Hall, G. E. & Hord, S. M. (1987). Change in the Schools: Facilitating the Change. Albany: State University of New York.

Hannafin, M. H., Dalton, D. W., and Hooper, S. (1987). Computers in education: Ten myths and ten needs. Educational Technology, October, 1987 pp 8 - 14.

Rummler, G. A & Brache, A. P (1990). Improving Performance: How to Manage the White Space on the Organizational Chart. San Francisco: Jossey Bass.

Wagner, E. D. (1990). Looking at distance education through an educational technologist's eyes. American Journal of Distance Education. 4(1)