Chapter 6

Federal Activities in Distance Education

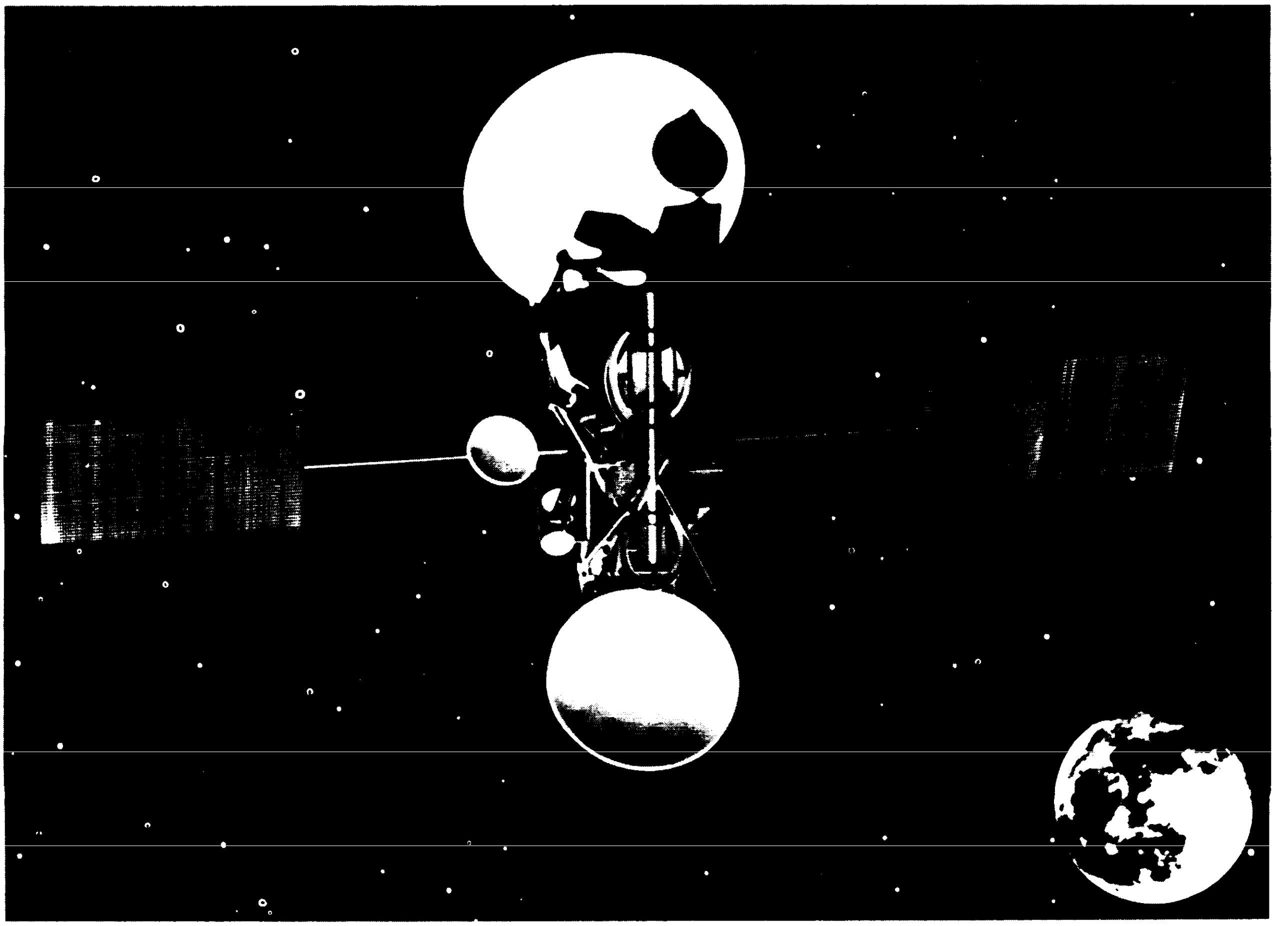

Photo credit: NASA, Washington, DC

Model of NASA's advanced communications technology satellite in orbit

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INTRODUCTION

Distance education presents a new set of concerns, challenges, and opportunities to Federal policymakers. These new issues join continuing concerns about equity, access, and quality of education. Distance education places educators in a new marketplace: the volatile and rapidly changing arena of telecommunications. Thus, the Federal Government's relationship to the public education community is expanding. In the past seen primarily as funder, infrastructure builder, guarantor of equality, and priority-setter, the Federal Government's role in K-12 education has evolved to include regulation of marketplace conditions.

This new situation brings new concerns as well as new opportunities. On the one hand, distance learning requires significant front-end expenditures, as well as large investments of time and continued support to integrate these efforts into the school. Such efforts are complicated by the need to purchase hardware and services in a marketplace in which the rules and capacities are changing rapidly.[1] On the other hand, this state of rapid change is favorable toward distance learning. An open, competitive market of suppliers gives groups involved in distance learning an increased opportunity to negotiate favorable terms and conditions for the facilities and services they require.

Growing concerns about work force quality, international competitiveness, and economic development have brought education to the attention of segments of the marketplace never before involved in education. Business and industry are showing an increasing interest in the welfare of our public school system. The Federal Government's interest in education reflect this broadening of concerns.

FINDINGS

- **Federal Government funds have accelerated the growth of distance education in this country, through direct purchasing power as well as the leveraging power of the Federal dollar.** The Star Schools Program (Department of Education) and the Public Telecommunications Facilities Program (Department of Commerce) are the primary Federal programs directly affecting distance education in elementary and secondary schools.
- Other Federal agencies have interests in distance learning through their responsibilities for technology development, training, and education. Yet, no agency-wide strategy or interagency coordination is now in place.
- Federal agencies will have increased opportunities to accomplish agency missions via distance delivery in the near future. The largest providers together can reach a great number of American schools and communities today, and that number will increase in the next few years. Agencies may find distance delivery an attractive way to reach national audiences for a variety of missions including education.
- Federal telecommunications regulations are **central to distance education, because they affect costs, availability, and types of services.** In light of the rapid growth of distance learning, it is time to review and shape Federal telecommunications policies to ensure a more effective and flexible use of technology for education.

FEDERAL ACTIVITIES IN DISTANCE EDUCATION: CURRENT STATUS

The Federal Government is not the basic provider of K-12 education in this country; this role is traditionally exercised by the States and localities. The Federal role in education has been to address particular issues, most prominently equity, access, and national priorities, through targeted funding and research, In 1988, Congress created the Star Schools Program, a comprehensive Federal effort to develop multistate, multi-institutional K-12 distance education. The other impacts of the Federal Government in the K-12 distance learning field are on components such as curriculum, hardware, regulation, research, and infrastructure, or on particular segments of the learner population. These efforts are relatively modest although Federal monies have contributed to many valuable projects.

[1] These challenges are particularly critical for school districts that would like to use the public telephone network for transmitting video. This mOSt ubiquitous telecommunications infrastructure is still adjusting to the changes brought about by the Modification of Final Judgment. Many of the Judgments are being challenged and rethought by the industry, the Federal Communications Commission, and Congress.

Interactive distance learning as described in this report has become a viable resource for American public education only within the last 5 years.[2] It is not surprising, then, that the Federal Government has not articulated any kind of comprehensive distance learning policy. Many Department of Education programs, such as Chapter 1 and Chapter 2 funds, allow use of these funds to support distance learning. However, because of the many pressing needs in the Nation's schools today, and the resistance to or ignorance of this technology on the part of some of the State and local officials, very little of these dollars have been used. Other Federal programs, such as the Rural Electrification Administration's telephone loan program, have funding missions that indirectly support interactive distance learning.

Direct Federal Support for Comprehensive Distance Learning Services: The Star Schools Program

The Omnibus Trade Bill and Competitiveness Act, passed by the 100th" Congress in 1988, created the Star Schools Program. It is intended to ". . . address(es) two critical needs in the rebuilding of our educational system to meet domestic and international challenges. The Nation's students must have access to basic and advanced courses in mathematics, science, and foreign languages, and these courses must be of the highest quality. ' The amount of $33.5 million was appropriated over a 2-year period.

The Star Schools Act has two major emphases: to create multistate, organizationally diverse partnerships to write and deliver both core and enrichment curriculum; and to create opportunities for disadvantaged students to receive remote instruction.

The Star Schools legislation specifies two formats for the composition of eligible partnerships. In one, membership must include at least one State education agency (SEA), State higher education agency, or local education authority responsible for a significant number of poor or underserved students. Furthermore, this type of partnership is required to have at least two other institutions from a host of types, including the three types listed above, universities, teacher training institutions, public broadcasting entities, and others. The other type of partnership must include a public agency or corporation already formed to operate or develop telecommunications networks to serve schools, teacher training centers, or other education providers. All partnerships must be statewide or multistate. These requirements were meant to create new paths to improving the education system by fostering cooperation between institutions.[4]

The legislation directs at least 50 percent of its funds to school districts eligible for Chapter 1 monies, and, within those districts, to serve poorer schools and other underserved populations.[5] The legislation also requires at least 25 percent of the granted funds be applied to instructional programming, and requires the grantees to generate at least 25 percent of the total budget from non-Federal sources.

The enabling legislation authorized the program for 5 years, setting an overall funding limit of $100 million. For the first round of 2-year grants, 4 proposals were selected from more than 70 applications: Satellite Educational Resources Consortium (SERC), TI-IN United Star Network (TI-IN USN), the Midlands Consortium, and Technical Education Research Centers (TERC). Three of the four projects are satellite-based delivery systems: TI-IN USN, SERC, and Midlands. TERC supplies science and mathematics units using computers and a telecommunications network. TI-IN USN and Midlands are building on already-established networks and/or curriculum; TERC is an existing organization whose Star Schools effort is modeled on a prior project;

[2] Experiments in interactive distance learning in American public schools dates back to 1971, when the National Aeronautics and Space Administration offered the Office of Education within the old Department of Health, Education, and Welfare free time on its satellites. Three demonstration projects were funded in Appalachia, the Rocky Mountain region, and Alaska; transmission began in 1974. The Appalachian Regionat Commission (ARC) project evolved into The Learning Channel, a cable television educational provider. The Rocky Mountain project formed the basis of the Public Service Satellite Consortium. The format for class instruction used by many of today's providers was developed during the ARC project. Kevin Arundel, U.S. Department of Education, personal communication, September 1989. See also Lawrence P. Grayson, ' 'Educational Satellites: The ATS-6 Experiments," *Journal of Educational Technology Systems,* vol. 3, No, 2, fall 1974, pp. 89-124.

[3] U.S. Congress, Senate Committee on Labor and Human Resources, Star Schools Program Assistance Act, Report 100-44, Apr. 21, 1987, p. 1.

[4] Elementary and Secondary School Improvement Amendments of 1988, Public Law 100-297, SW. 904, Apr. 28, 1988.

[5] Chapter 1-eligible districts are the districts that are adjudged to have at least 10 students living below the poverty level (as determined by the Census Bureau). These school districts are thereby eligible, under a complicated formula, for grants from the U.S. Department of Education. About 80 percent of the school districts in the country are eligible for Chapter 1 funds.

Photo credit: South Carolina Educational Television

Few students had the chance to learn Russian until the SERC Star Schools project brought teachers like Michael Primak and Sherry Beasley to their schools via satellite.

SERC is a new venture. TERC offers curriculum modules for science classes; the three satellite projects offer whole courses in science, mathematics, and foreign languages. All four projects offer teacher training and staff development activities. All will be doing evaluations of educational effectiveness, teacher training techniques, and other aspects of their respective efforts. Table 6-1 gives a broad outline of the four Star Schools projects.

The SERC Board of Directors is composed primarily of two representatives from each of the member States: the chief State school officer and the chief executive officer of the educational television network (public broadcasting) in the State. The consortium currently has 19 State members and 4 associate members (Cleveland, Detroit. Kansas City, and New York City). The member States and schools make a significant contribution to the project: State fees are $20,000 for the pilot year 1988-89, increasing to $50,000 for 1991-92. Schools contribute $150 per student per semester course; fees are also charged for teacher inservice courses and events. Schools are required to match 25 percent of the grants for equipment, and must purchase a keypad response system if participating in mathematics classes. Enrollment for the pilot year 1988-89[6] was intenmtionally limited; SERC had enrolled 4,000 students for courses in 1989-90 as of May 1989. Such demand creates confidence in the SERC management that, even in the face of equipment costs and the inevitable start-up disruptions, schools have a great need for these courses.[7]

6The pilot year was largely funded by a grant from the Corporation for Public Broadcasting; like the other Star Schools grantees, SERC's first full year of operation under Star Schools will be 1989-90,

7Gail Arnall, SERC project director, personal communication, May 1989.

Table 6-l-Basic Facts and Figures for the Star Schools Projects

Name	Organizational partners	Primary technology used	Grant amounts FY 1989/ FY 1990	Number of States involved	Number of schools	Number of students
satellite Educational Resources Consortium	19 States, each represented by the State education agency and the State educational television authority: AL, AR, FL, GA, 1A, KY, LA, MS, NE, NJ, NC, ND, OH, PA, SC, TX, VA, WV, and WI; and 4 cities (associate members): Cleveland, Detroit, Kansas City, and New York	Satellite-based transmission; one-way video, two-way audio; C/Ku-band satellite dishes, steerable; unscrambled signal	$5.6 million/ $4.10 million	23[a]	312[b]	3,300 (est.)
TI-IN United Star Network (TI-IN USN)	3 State education agencies: NC, TX, and IL; 4 universities: Western Illinois, Alabama-Tuscaloosa, Mississippi State, California State-Chico; the Region 20 Educational Service Center (Texas); andTI-IN, Inc.	Satellite-based transmission; one-way video, two-way audio; Ku-band satellite dishes, mostly fixed, some steerable; scrambled signal	$5.6 million/ $4.13 million	1O[c]	328[d]	3,200[e]
The Midlands Consortium	5 universities: Alabama-Birmingham, Kansas, Kansas State, Oklahoma, Mississippi; and the Missouri School Boards Association	Satellite-based transmission; one-way video, two-way audio; C/Ku-band satellite dishes, steerable; unscrambled signal	$5.5 million/ $4.14 million	5	278[d]	2,500[e]
Technical Education Research Centers	Boston Museum of Science; the Northwest Regional Lab; Minnesota Educational; Computing Consortium; City College of New York; Biological Sciences Curriculum Study; and 5 universities: Tufts, Virginia, Michigan, Pepperdine, and Arizona State	Computers connected viacommercial computer network	$2.4 million/ $2.04 million	18[f]	447[g]	18,000

[a] 19 States, plus school districts from the 4 cities involved as associate members.

[b] Schools participating through fiscal year 1989 funds only. An additional 121 schools are receiving teacher inservice and student seminars only.

[c] The number of States with 4 or more sites. There are 12 other States where TI-IN USN has 1-3 schools. Most of these schools are Bureau of Indian Affairs (BIA) schools whose TI-IN USN activities are being coordinated through BIA.

[d] Schools that are or will be participating through fiscal year1989 and fiscal year 1990 funds.

[e] In addition t. these students, other students at non-Star Schools sites will take classes developed with Star Schools money.

[f] The number of States with 4 or more sites.

[g] Schools participating in school year 1989-90 only.

SOURCE: Office of Technology Assessment, 19S9, based on information provided by the Star Schools projects and the U.S. Department of Education.

TI-IN USN is a consortium that includes three SEAS, four universities, a regional State education service agency, and a private for-profit company already providing satellite-delivered curriculum, TI-IN Network, Inc. (TI-IN). TI-IN has been providing whole course curriculum and staff development programming since August 1985; six of the other partners will also develop programming during the 2-year period of the grant. Participating schools will be required to pay a subscription fee of $3,650 for 1989-90, as well as a per student fee of about $240 per semester course. TI-IN sends a scrambled satellite signal to participating schools, and, for the 244 schools receiving equipment in the first year of the grant, provides a fixed-placement satellite dish. The schools receiving equipment from the second-year funding under the Star Schools Program will have steerable dishes. Although these dishes are more expensive to purchase and maintain and more troublesome in signal quality, TI-IN believes that these schools would benefit from the added programming available, both interactive and broadcast.*

The **Midlands Consortium, composed of universities in four States plus the Missouri School Boards Association, is a five-State effort to deliver satellite-transmitted secondary curriculum, inservice programming, and staff development programs. Like TI-IN, Midlands will build on an already existing core of schools, curriculum, and hardware, primarily from Oklahoma State University's Arts and Sciences Telecommunications Service (ASTS). Unlike TI-IN, Midlands is managed more like four independent networks than like one coordinated network. For example, Star Schools money will go, in full or in part, to install downlinks at 164 schools in the 5 States. The schools are required to keep a log of the use of the dish, and required to offer one high school course or 50 hours of other programming; this requirement, however, does not need to be met with Midlands-produced programming. A number of the Midlands schools have planned to use the dishes to pull in C-SPAN, The Learning Channel, and other cable programming not otherwise available to them.**

The consortium partners who will be producing programming— Kansas, Kansas State, and Oklahoma State Universities, and the Missouri School Boards Association-will independently produce, price, and market their programming. Any school in the country can tune their satellite dish to this unscrambled programming; however, if students or teachers are to receive credit toward degrees or certification, they must register with the consortium. The consortium provides assistance to its members in technical areas as well as instructional design, particularly from ASTS to the other partners.[9]

The **TERC Star** Schools Project uses a computer and a commercial teleconferencing network to connect students studying science or mathematics. The curriculum approach is to engage students in data collection and problem solving, exchanging observations and data with other classrooms around the country. The telecommunications network, basically an electronic mail network, allows students to share results, write reports, and ask questions of leading scientists who are serving on the project as models and collaborators. For example, one of the units will be on weather. Core activities will include the gathering of weather data at sites around the community, sharing this data with schools around the country, and analyzing fluctuations and unexpected differences. This data collection may be of utility to weather researchers and meteorologists, such as the National Oceanic and Atmospheric Administration. The schools are responsible for providing the computer, modem, and telephone line for the project, although some subsidies are available. Teacher preparation, software, scientific experiment supplies, and telecommunications are paid for by TERC and the teacher training center partners. The overall hardware costs (one computer per two classes) and telecommunications costs (computer network hookup at off-peak hours) are very low relative to any video-based distance education efforts. TERC estimates that 18,000 students will participate in the project in 1989-90.

In the TERC program, the classroom teacher remains the subject expert; in the other three projects the teleteacher provides most of the instruction, supplemented by the attendant classroom teacher. Therefore, inservice teacher training is considered an especially critical component to the TERC model, and is being carefully designed and evaluated. The

[8]Lloyd Otterman, chief executive officer, TI-IN Network, Inc., personal communication, May 1989.

[9]Constance Lawry, associate director, Arts & Sciences Extension, Oklahoma State University, personal communication, May 1989; and Jerry Horn, associate dean, College of Education, Kansas State University, personal communication, May 1989.

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TERC partners are acting as resource centers; teacher training and support is the primary function of these centers.[10]

With the exception of two pilot projects, the Star Schools networks did not commence their full-scale efforts until September 1989. Thus, although the first round of Star Schools grants is expected to have a significant impact on distance education, much of that impact will not be known for a number of years. Still, some impacts can be seen:

- Approximately 30 percent of rural and isolated high schools will have a satellite dish by the end of 1990;[11] of that number, approximately one-third will have been purchased and installed using Star Schools money. While different dishes will have differing capacities, it is safe to assume that these dishes will have the ability

[10]Cecilia Lenk, project director, TERC Star Schools, personal communication, September 1989.

[11] Lloyd Otterman, TI-IN Network, Inc., makes these estimates based on the following figures (all approximate): there are 5,930 rural school districts (based on Department of Education figures), and another 4,810 that are isolated (as defined by census tracking), for a total of 10,740 districts. By 1990, Otterman projects that TI-IN will have at least 900 schools with satellite receive dishes, SERC will have about 600, Midlands/ASTS will have 400, Kentucky will have close to 1,000, and STEP will have 150 for an estimated total of better than 3,000 schools. (These numbers do not include the possibility that whittle Communications' Charnel One program may install up to 8,000 high schools with satellite dishes in the next 1 to 2 years. Some of these schools will likely be rural or isolated.) Because a great majority of rural and isolated school districts have only one high school, it is Otterman's estimate that at least 30 percent of rural high schools will have dishes.

to provide these schools with course enrichment segments and some whole courses for the foreseeable future. Even if one or two of the Star Schools satellite networks were to disband in the future, the large installed base of satellite dishes creates a market that will not be ignored.

- **One of the primary goals of the Star Schools legislation—to create multistate, multi-organizational partnerships in education—has been realized.** These relationships between universities and local schools, SEAS and public broadcasting entities, and others, across and within States and regions, have the potential to provide each participant with a rich network of expertise and ideas.
- The first round of Star Schools funding has gone predominantly to support satellite-based delivery systems. None of the Star Schools projects uses fiber optic cable, digital (Tl) cable, microwave, or Instructional Television Fixed Service (ITFS) technologies as the transmitter of the video component of the programming. This narrow focus missed an opportunity to spur the development of systems and markets.
- **Star Schools money stimulated a majority of States and/or districts in States to consider distance delivered instruction. Some States have moved forward to implement or explore** such instruction, seeking funds from sources other than the first round of the Star Schools Program.[12] This groundswell of interest, enhanced by 2 subsequent years of planning and problem solving, should manifest itself in an even greater interest in the second round of Star Schools funding.
- Because of the 25 percent matching requirement built into each Star Schools grant, and the amount over and above contributed by States and others, it is estimated that Star Schools has resulted in a total capital investment in education of about $42 to $47 million.[13]

Federal Support for the Distance Delivery Infrastructure

Federal Agency Grant Programs

Some Federal funds support the distance delivery infrastructure through programs targeted for telecommunications technologies. In the following two examples, from the National Telecommunications and Information Administration (NTIA) and the Rural Electrification Administration (REA), the monies are primarily directed to support public broadcasting facilities and rural telephone facilities, respectively. Because distance education can be delivered through a variety of technologies, NTIA and REA funds are an important element in the support of the infrastructure.

The Public Telecommunications Facilities **Program (PTFP)** at NTIA (U.S. Department of Commerce) funds equipment purchases and some planning grants for broadcast (public television and public radio) as well as nonbroadcast (noncommercial providers using ITFS and cable, for example) telecommunications facilities. *4 The annual appropriation was $18 million in fiscal year 1988. Priority is given to applications that equip new public television and radio facilities, both broadcast and nonbroadcast, or to extend service to new areas. The next priority is given for replacement of outdated and outmoded equipment. While no rules are set on the amount to be spent in each area, these priority applications tend to account for about three-quarters of the ITFP granting budget. The remaining funds are used to support innovative projects and minority access. It is from this part of the pool that NTIA has provided funding for equipment used in interactive distance learning efforts. In 1988, this program funded nine special nonbroadcast projects at a level

[12] See, for example, Th. Iowa Educational Telecommunications Plan. The Iowa legislature appropriated $50 million over the next 5 years to install a statewide fiber backbone that links the State universities, community colleges. and public schools. Linda Schatz, Iowa Public Television, personal communication, May 1989. Other efforts include the Vermont/New Hampshire/Maine Northern 'her Network, which came out of Star Schools proposal planning.

[13] The 2 years of Star Schools funding totals about $33.5 million in Federal funds. The matching requirements leveraged more than 25 percent from some of the projects. Cheryl Garnette, Star Schools Program, Educational Networks Division, Office of Educational Research and Improvement, U.S. Department of Education, personal communication, September 1989.

[14] The predecessor of this program, called the Educational Broadcast Facilities Program, was originated in 1962 and was administered by the Office of Education, at the Department of Health, Education, and Welfare. In 1978 the program was expanded to include nonbroadcast components and to fund planning efforts; in 1979 the program was moved to the Department of Commerce. Originally the program allowed some funding for programming, although now the funds are reserved for equipment and planning. Frank Withrow, Star Schools Program, Educational Networks Division, Office of Educational Research and Improvement, U.S. Department of Education, personal communication, July 1989.

of $2.25 million (12.5 percent of the PTFP budget). These grants include funding for the purchase of equipment for two satellite uplinks, three new ITFS systems, expanding service for two established ITFS systems, a microwave system, and captioning systems to increase access to telecommunications programming for the hearing-impaired. The grantees include community colleges, universities, a county office of education, and community telecommunications networks (i.e., organizations formed specifically to provide these services) .15

The Rural Electrification Administration (REA) (U.S. Department of Agriculture) offers direct loans, federally established bank loans, and guaranteed loans to both rural electric and rural telephone companies. In fiscal year 1988, the REA telephone division made loans or loan guarantees of $273 million, of which $193 million were in the form of 5-percent interest direct loans. The direct loan fund and the Rural Telephone Bank loans are both revolving funds; i.e., all payments received by the fund are available to be reloaned. The REA loans to rural telephone companies are authorized to finance telecommunications equipment that extend telephone services. This mandate does not exclude educational television applications, but the limitation of traditional copper cable (i.e., not enough bandwidth to transmit video) has greatly limited the number of loan applications REA received in the past with educational components. However, with the advent of fiber optic cable and its significant capacity for video, voice, and data, REA has seen an increase in applications for such loans. When a telephone company is laying fiber cable, dedicating lines for the school system and connecting from the trunk to the school itself is relatively inexpensive. One REA official estimates that the cost of laying the additional cable to the school is $1,500 per mile during initial trunk line installation, but $10,000 if such cable is laid at some future date.[16]

There are no separate funds for educational efforts per se, but projects in rural Minnesota, the Oklahoma Panhandle, and the Papagos Indian reservation, among others, have been supported by loans to the rural telephone companies in these areas. REA encourages telephone companies to work with school districts as away of cost sharing, but does not solicit specific projects for education.

Through NTIA and REA, significant government resources are being invested in the national telecommunications infrastructure; in some projects, this investment serves the educational needs of the community. These funds represent a significant resource for the education community. These resources offer the interactive distance learning community limited (NTIA) or indirect (REA) support. Changes in the scope or direction of these programs could expand the resources available,

Department of Education Programs

There are other examples of Federal monies that support the distance education infrastructure. The Department of Education has many programs that address concerns of equity, access, advancement, and special populations. Many of these programs allow use of funds for distance delivered education efforts, although to date few of these funds have been tapped for this purpose.

Chapter 1 funds, $4.5 billion in fiscal year 1989, are provided to assist "educationally deprived children "[17] in elementary and secondary schools. The eligibility and allocation formulas essentially limit Chapter 1 funds to only this population—poor and disadvantaged children. Ninety-nine percent of these funds go to local education agencies for the targeted population. A high percentage of Chapter 1 funds go to elementary schools.

Because most distance delivered whole courses are targeted to higher-level classes in high schools, and because many disadvantaged children are not high academic achievers, Chapter 1 funds have not played a significant role in distance learning in this country to date. However, the mandate in the Star Schools legislation that at least 50 percent of its funds benefit Chapter l-eligible schools may serve to leverage more Chapter 1 funds for distance education. Ongoing costs such as per-student fees and supplies will be increasingly paid for out of Chapter 1 funds. Enrichment classes, course mod-

[15] Dennis Connors, National Telecommunications and Information Administration, personal communication, Apr. 3, 1989.

[16] Robert peters, Rural Electrification Administration, personal communication, March 1989. An industry expert believes these estimates may be closer to $2,500 per mile now versus $8,000 later, although such numbers contain considerable variables. Joe Arri, Bellcore, personal communication, August 1989.

[17] Elementary and Secondary School Improvement Amendments of 1988, Public Law 100-297, Sec. 1001, paragraphs (a)(2)(A) (Declaration of Policy) and (b) (Statement of Purpose), Apr. 28, 1988.

ules, teacher training activities, and staff development activities may become accessible and relatively inexpensive in light of a school's existing system capacity.

Certain Department of Education programs have limited activities in support of distance education. The Federal, State, and Local Partnership for Educational Improvement, commonly known as Chapter 2, is the consolidated funding mechanism for dozens of previously separate directed pools of money. Chapter 2 funds are rarely used for any telecommunications technology or training. Eighty percent of these funds, $463 million in fiscal year 1989, are distributed to the local education agencies through the States. States and local education agencies are allowed to spend the funds in any of six broadly sketched areas, which gives the agencies a great deal of flexibility. The Department of Education and the State education authorities are prohibited by statute from influencing the decisionmaking of the local education agencies on how to spend the money; this provision protects the local autonomy of the program.[18]

Money distributed under Title III of the Higher Education Act, dedicated to maintain the self-sufficiency of higher education institutions, funds universities and colleges in many areas, including facilities and technology. In fiscal year 1989, the Title 111 program budget was $140 million, which included $23 million in new starts.[19] These funds affect the K-12 education community through the connection between institutional outreach and advanced high school coursework, one of the primary uses of distance education. For example, the University of Maine system received a 5-year, $4.4 million grant under Title III to fund the statewide Community College of Maine/Telecommunications System. Central to expanding access to advanced educational programming in the State is connecting every high school to the system.[20]

The Secretary's Fund for Innovation in Education ($14.7 million in fiscal year 1989) is a new fund offering grants in four areas-innovation in education, technology, health education, and computer-based instruction. The technology funds, limited in 1989 to $1 million in continuing projects, are currently being used to support television and radio broadcasting efforts. The computer-based instruction category awarded between $3 to $4 million in fiscal year 1989.[21]

Department of Education Technical Assistance: The Regional Education Laboratories

The Department of Education charters and supports nine regional educational laboratories. Each laboratory is governed by representatives of SEA and local education agencies, business, school board members, and other affected parties. These laboratories attempt to bridge between research and practice, bringing into the field important findings, techniques, evaluations, software, and other services to support the practitioners in their region. The Department of Education provided $17.2 million for the laboratories in 1989, plus an additional $5.2 million for an initiative on rural small schools. The laboratories draw additional funds from the States, foundations, and contracts and grants, including other Department of Education funds. The laboratories can be an important resource for distance learning projects. In North Dakota, State planning activities and technical assistance for three model projects have been supported by the Mid-Continent Regional Educational Laboratory (MCREL). In fall 1990, MCREL will launch a model "magnet school without walls" for advanced mathematics and science high school students in South Dakota. Videotapes produced by the Annenberg/Corporation for Public Broadcasting project and audiographics instruction provided by the University of South Dakota make up the school's curriculum.[22]

Mission-Related Federal Activities

Many Federal agencies have educational components in their missions. These efforts allow agencies to raise awareness among the Nation's schoolchildren about aeronautics and space (National Aero-

18Robert Kastner, Division of Formula Grants, Office of Elementary and Secondary Education, U.S. Department of Education, personal communication, July 1989.

19Stanley Andrews, Division of Institutional Development, Office of Postsecondary Education, U.S. Department of Education, personal communication, June 1989.

20Pamela MacBraWe, executive director of distance education, University of Maine at Augusta, personal communication, May 1989.

21Shirley Steele, Fund for the Improvement and Reform of Schools and Training, Office of Educational Research and Improvement, U.S. Department of Education, personal communication, June 1989.

22Paul Nachtigal, Mid-continent Regional Educational Laboratory, personal communication, September 1989.

nautics and Space Administration-NASA), agriculture and agribusiness (U.S. Department of Agriculture--USDA), and law and the police (the Department of Justice), to name just a few. For these agencies, the very missions they pursue are the curriculum they propagate. Most often, these programs are developed to be modules or units within traditional K-12 curriculum. Some of these agencies use distance delivery of their materials; others, such as the Department of Justice, have not, or have deemed it inappropriate to their mission.

Distance education can bean effective system for accomplishing a mission. For NASA, the technology inherent in distance education, primarily satellites, has been part of its research and development effort for more than 30 years. For NASA, both the medium *and* its mission are the message. NASA launched the first communications satellites used for education in 1974; the first satellite-delivered NASA educational effort was images from the Voyager mission to Jupiter in 1979 and Saturn in 1981. Universities, science centers, and planetaria received these images as they were returned from the spacecraft, accompanied by presentations from NASA scientists. In April 1985, NASA ran a pilot project entitled "Mission Watch," in which scientists aboard the Space Shuttle discussed their experiments and answered questions from students and teachers. This highly successful pilot was to be the model for daily classes from the Teacher-in-Space Program during the Challenger flight that ended in a tragic explosion. The two overview videoconferences that were held one day prior to the accident had an estimated viewing audience of 2 million students and teachers.

For the last 2 years, NASA has produced an educational videoconference series, "Update for Teachers," in conjunction with Oklahoma State University. These four, l-hour programs provide elementary and secondary teachers with space science activities, experiments, and strategies for the classroom. An extensive question-and-answer period is part of each videoconference. Prior to each broadcast, NASA distributes written material to participating teachers describing classroom activities, related publications, and broadcast information. In addition, videotape segments have been uplinked to schools for taping immediately after the videoconference. NASA estimates that 20,000 teachers from all 50 States viewed the November 1988 conference on "Living In Space. " NASA's future plans include conducting a live lesson from space sometime in the next 1 to 2 years, and at some point reviving the "Mission Watch" concept for the Teacher-in-Space program. In the more distant future, NASA sees the space station as the base for a variety of exciting educational opportunities.[23]

Distance delivery methods are being used or contemplated for special projects in USDA. The National Agriscience Ambassador, funded through the Special programs Office of the Cooperative State Research Service, organized a February 1989 teleconference on careers in agriscience which was viewed by an estimated 2 million students.[24] The Extension Service is using interactive video to convey information about land issues and the Department's services.[25]

USDA has a mature administrative audio- and videoconferencing system, used to connect headquarters with the vast network of regional administrators and Extension Service agents. USDA uses distance delivery methods for their elementary and secondary educational efforts only in isolated cases, as described above. USDA, primarily through the Extension Service, has developed a highly decentralized, inexpensive partnership with States, counties, and local organizations that is reaching millions of students very effectively, without technology.

Federally Funded Curriculum Development

The Department of Education and the National Science Foundation (NSF) have missions targeted to improving quality and access of education for K-12 students. NSF has the lead role in the Federal Government's efforts in science and mathematics education, while the Department of Education's mandate is based on providing access to educational opportunities for the entire spectrum of students, a.. well as curriculum improvement efforts across all subject areas. Both agencies have funded curriculum development projects for distance education.

[23] William D. Nixon, National Aeronautics and Space Administration, Educational Affairs Division, "NASA Distance Learning—Satellite Videoconferencing for Education," unpublished document, May 17, 1989.

[24] Deborah Harris, Louisiana Educational Satellite Network, Southern University-Shreveport, personal communication, February 1989.

[25] Tom Tate, Extension Service, U.S. Department of Agriculture, personal communication, February 1989.

The Star Schools Program, described previously in this chapter, gave grants totaling $33.5 million, of which at least 25 percent is to be applied to instructional programming, as required by the enabling legislation. The legislation specifies instruction in mathematics, science, and foreign languages; whole courses, modules, inservice training workshops, and staff development seminars are being developed by the Star Schools grantees.

NSF's efforts in distance education have so far been the funding of a limited number of projects that extend the technology in unique ways. NSF, through its Materials Development, Research, and Informal Science Education Division, Directorate of Science and Engineering Education, has funded applications using telecommunications to deliver instruction. Grants are available for curriculum development, hardware purchases, and development of advanced technologies. Examples of recent projects include the Jason Project, a seafloor exploration project headed by Titanic discoverer Robert Ballard (see chapter 1, box 1-E). NSF spent a total of about $1 million on the Jason Project, both for hardware purchases for the 12 science centers and museums that served as downlink sites, and for the science curriculum developed by the National Science Teachers Association. NSF also provided funding to TERC for the Kids Network project, science enrichment curricula using computer networks that is the precursor to the TERC Star Schools project. Currently, NSF is funding curriculum development for an Advanced Placement chemistry class being developed by Oklahoma State University.[26]

Federally Run or Managed Schools

In a few circumstances, the Federal Government is responsible for actually running K-12 schools. The Department of Defense Dependent Schools (DoDDS), for example, has the responsibility for basic education for 155,000 schoolchildren living in military installations in 32 countries. At that size, DoDDS ranks as the ninth largest school district in the country. The Bureau of Indian Affairs (BIA) directly operates 182 schools in 27 States; tribes and tribal organizations operate 71 of the schools through a contract with BIA.

Photo credit: Craig D. Lewis

The Eastern Navajo Agency Network links students from Native American schools around the country.

Both of these government-run school systems are beginning to use electronic networks for education; use of video-based distance delivery systems is rare at the present time. DoDDS is installing a management information system in its schools and administrative offices around the world. Until that fiber-based system is in place, no comprehensive efforts using the telecommunications infrastructure for education will likely occur.[27] However, grassroots initiatives have already emerged in the DoDDS system. DoDDS students in West Germany have participated in Interactive Communications Simulations developed by the University of Michigan.[28] The Pascal computer language is taught to DoDDS students in Germany, Okinawa, Korea, and Italy via computer network. The teachers communicate with

26 Michael Templeton, Andrew Molnar, and Mary Kohlerman, Materials Development, Research and Informal Science Education Division, Science and Engineering Education Directorate, National Science Foundation, personal communications, March-May, 1989.

27 Dennis Bybee, Department of Defense Dependent Schools, personal communication, December 1988.

28 See ch. 2, footnote 26.

students solely through the network, feeding messages, homework and tests through a University of Michigan computer. DoDDS schools in England, Japan, and Bermuda have expressed interest in participating in the future.[29]

Currently, 19 BIA schools are part of the TI-IN Star Schools effort.[30] In this project, the schools will be outfitted with a satellite dish and connections for $75, and will then pay TI-IN $240 per student per course that they purchase from the TI-IN menu of courses. BIA is committed to funding these schools' continued access to distance learning courses.

The other key BIA effort is the Eastern Navajo Agency Network (ENAN), a computer network that will be hooked into most of BIA's 182 schools by October 1989.[31] This network includes a student "pen pals" section, an administrators network, an effort to share culturally relevant teaching strategies (developed at Northern Arizona University), a beginning teachers network (starting in fall 1989), and a mathematics/science master teachers network (involving 70 teachers and professors from the University of Kansas and the University of New Mexico). Teachers in these isolated settings are able to share instructional strategies, particularly in mathematics, science, language arts, and foreign languages. Also, teachers who participate in BIA's summer inservice institutes are encouraged to keep in touch via the network. BIA is particularly concerned about the isolation of teachers in Native American schools. The summer institutes and ENAN are considered critical elements to improving the quality of teaching. Also, some BIA schools recently began experimenting with the Pennsylvania Teleteaching Network, an audiographics teaching system headquartered at Mansfield University .32

The Bureau is encouraging tribes and tribal organizations to more directly control the education of Native American children; the management of 39 percent of the BIA schools has already been contracted out.[33] Distance education delivery systems can be key resources for retaining and reinforcing the cultural context of Native American schools. Distance education can overcome cultural as well as geographic barriers, by grouping students with cultural peers around the country. This expansion of the base of students offers the advantages discussed previously in relation to geographic isolation: a broader array of information, Curricular, and human resources necessary to improve educational quality.[34]

Federal Training Efforts and Their Relevance to Distance Learning

The Federal Government is one of the largest trainers in the world, spending an estimated $18 to $20 billion a year to train both its civilian and military personnel,[35] and distance delivery for training has been used extensively for a number of years. Such efforts, both in the Federal Government and private industry, shed light on technical and classroom management models that could be effective in the K-12 classroom, and in the professional development and training of educators.

Federal networks for training and management communications are important because they are national or regional. As such they have the potential to serve secondary users, such as the elementary and secondary education communities, with facilities and expertise that are already in the public domain. Also, Federal and State policymakers participate in many audio and video teleconferences; this involve-

[29] It is estimated that one-third of the 270 Department of Defense Dependent Schools have started some telecommunications activity for instruction. Sam Calvin, Department of Defense Dependent Schools, personal communication, August 1989. See also Kent Appelgate et al., "Pascal Via Telecommunications: Using Low Tech for High Tech Results, ' presented at the International Symposium on Telecommunications in Education, August 21-24, 1989, Jerusalem, Israel.

[30] Sixteen of these schools are working directly through the Bureau of Indian Affairs; the other three are contracted through the other TI-IN partners, or were identified and included through involvement with the State education agency.

[31] Paul Resta, Center for Technology and Education, University of New Mexico, personal communication, Aug. 31.1989.

[32] For a full description of the Pennsylvania Teleteaching Network, see Bruce Barker, Texas Tech University, ' 'Distance Learning Case Studies, ' OTA contractor report, April 1989.

[33] Bill Mehojah, chief, Elementary and Secondary Education Branch, Bureau of Indian Affairs, U.S. Department of the Interior, personal communcation, July 1989.

[34] Jason Ohler, University of Alaska Southeast, ''Distance Education and the Transformation of Schooling: Living and Learning in the Information Age, " OTA contractor report, May 1989.

[35] Tony Carnevale, Vice President of National Affairs, American Society for Training and Development, personal communication, July 1989.

ment tends to demystify such technologies for the very officials whose attitudes can have significant influence on distance learning efforts.

In addition to training and telecommunications networks, interactive curricular materials and research relevant to distance-mediated instructional design are produced extensively for and by the Federal Government, and thus are public property. These materials are primarily for training, although some of it is relevant to education, as are many authoring systems for curriculum development. For the educational community to make use of these materials, however, evaluation, modification, and distribution of materials needs to be performed.

Federal Training Networks: Models of Distance Learning Technologies

Existing Federal training networks using distance delivery of course materials can serve the K-12 education community in two ways. One, they can serve as a model of distance delivery used in the public sector. Secondly, Federal networks provide an existing hardware base that could be used by the education community to extend their service to more learners.

The Department of Defense (DoD) has a vast and diverse learning audience, and thus employs numerous distance learning networks. One example is the Army Logistics Management College (ALMC), which has been offering one-way video, two-way audio courses over its Satellite Education Network for over 4 years. The college offers nonclassified, American Council on Education-accredited courses to both civilian and military defense personnel; courses are offered for other branches and subdivisions of DoD. Of the 57,000 students who have taken courses from ALMC in this 4-year period, 13,000 have been remote learners. Evaluation data show no

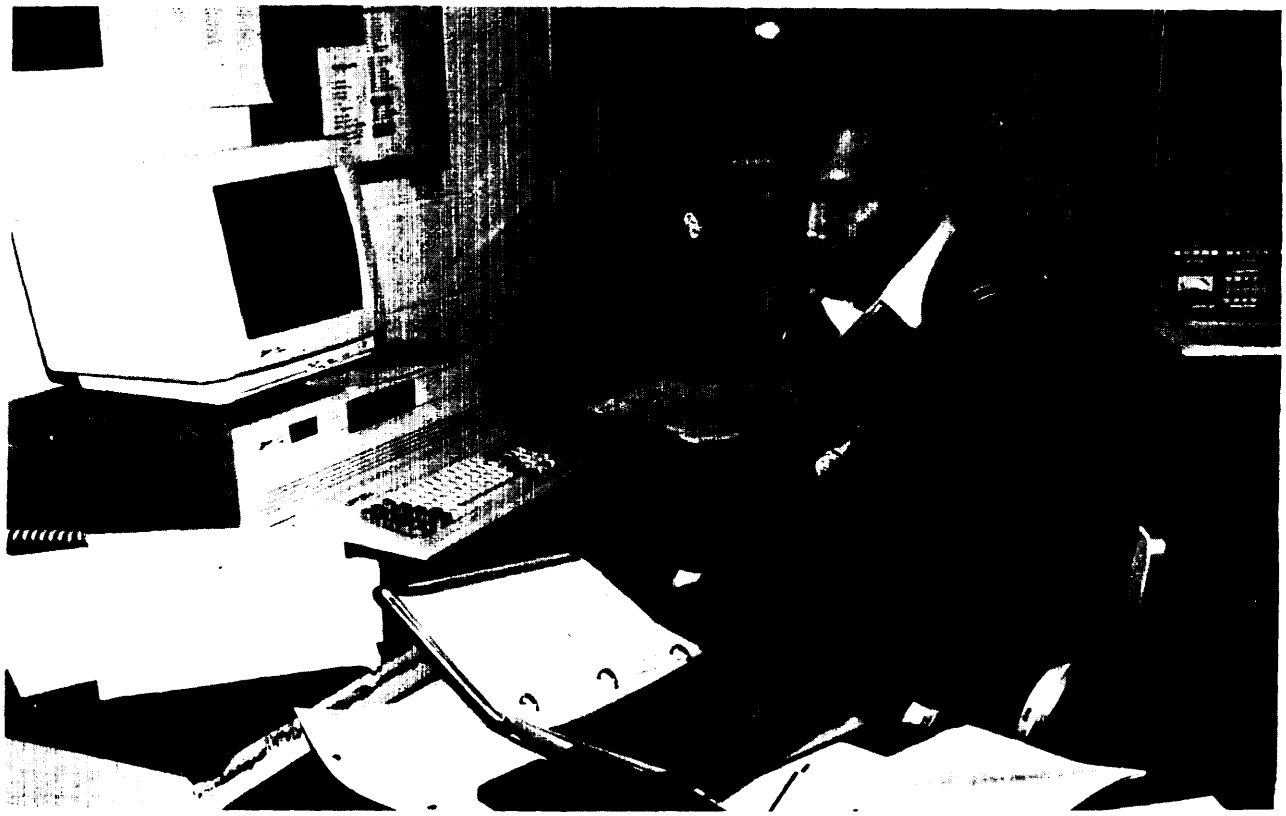

Photo credit: U.S. Army, Ft. Lee, VA

The military has used distance learning to train personnel for many years. Transferring this experience and investment in technologies to the Nation's classrooms could be a tremendous boon to schools.

significant difference between remote and on-site instruction.[36] The college estimates that it saves $1,500 per remote student versus an on-site student; most of the savings comes in the form of travel costs. These findings are similar to findings in private sector training applications of distance learning systems. In spite of severe budget cuts at ALMC in the last year, the college hopes to expand its efforts to include more uplink and downlink sites.

ALMC provides a useful example of the opportunities and barriers to distance learning efforts in the Federal Government and in the public school system. The college is able to share its expertise and facilities with others in DoD, and is exploring the possibility of providing at-cost services to local education users as well. Such interconnections provide for cost-efficient use of hardware and facilities, and may provide an increased basis for justification of budgets.

Because of the present budget climate, Federal program managers report that it is difficult to convince superiors and Congress that avoiding program budget increases is as valuable as reducing program budgets. Many distance delivery systems, such as the ALMC Satellite Education Network, can increase range and quality of programs for little or no extra money. However, many budget-setters are concerned about cutting costs, not improving or increasing services for the same dollars, and this is hampering the ability of successful systems to increase savings from economies of scale and efficiency of management.

Also of note within DoD is an effort in the Department of the Army to plan a comprehensive training strategy. The Army has a massive training mission, a mission that has become even more acute in the past decade as more and more responsibilities have been transferred from the active Army to the Army Reserves. Reserve forces are difficult to adequately train because they are dispersed throughout the country (4,600 reserve unit sites) and are available for only 39 days per year.[37] Added to this is the training of the National Guard, another large force dispersed in location and short on time.

The Army has embarked on the development of a comprehensive training strategy to serve these and other missions; the stated goal is to reduce the amount of local training by 50 percent by the year 2020. The Army is focusing on models that allow for a selection of media, depending on the particular course or material that needs to be conveyed.[38] One of these models is the TRAINS system (the Training Reserves Active component Integrated Network System), which uses off-the-shelf technology to provide the capability for video, audio, and computer teleconferencing, and allows the instruction to reach into private homes as well as remote instruction sites. This system will be pilot-tested in the coming year.[39]

The Army Reserves and National Guard represent a large, dispersed and varied segment of the population. The geographic spread of the reserve component of the Army mimics the spread of schools and communities throughout the country. Resource- and facility-sharing could occur between schools and the Armed Forces Reserves, especially because reserves would tend to use such services during nonschool hours. In fact, the Army Reserve training managers have discussed the feasibility of putting a TRAINS system in every high school in the country. The high schools could use these systems to receive satellite-transmitted courses and services from national or local providers. The Army and National Guard could use the school facilities and TRAINS system on evenings and weekends.[40]

This kind of resource sharing is suggested by the cost of the equipment, as well as the cost of facilities to serve as downlink sites. Potential benefits to the schools include cost savings and increased community involvement in and commitment to the schools; potential risks include the inevitable conflicts between organizations that share resources.

Federal Teleconferencing Networks: Policy makers Learning via Technologies

Many Federal agencies, like their private-sector counterparts, use teleconferencing to improve communications between multiple regional offices and headquarters, and realize significant savings on

36John Brockwell, Army Logistics Management College, personal communication, September 1989.

37James S. Cary, U.S. Army Training Support Center, ''RIMS System Description,' unpublished report, January 1989.

38Millie Abell, U.S. Army Training and Doctrine Command, personal communication, August 1989.

39James S. Cary, U.S. Army Training Support Center, personal communication, January 1989.

40Ibid.

travel. For example, USDA has an audio and video teleconferencing network in place which produces approximately 1,500 audio conferences and 12 video conferences a year, all from one studio at USDA headquarters in Washington.[41] The USDA system is exemplary for its growth pattern (gradual, user-driven) and its service characteristics (high-quality service, allowing technology to become transparent to the users).

In another example, the Nuclear Regulatory Commission (NRC) has recently established a teleconferencing network between its Washington headquarters and its seven regional offices around the country. It took only 8 months to implement the system from the first demonstration of the possibilities to an NRC senior administrator,[42]

As teleconferencing becomes a more ubiquitous communications tool, Federal managers may be affected by and thus affect the distance learning environment in this country. Particularly, the installed base of satellite dishes may provide both the government and education communities with sharable resources and expertise.

Technology Transfer: Dissemination of Distance Learning Technologies and Curriculum

The Federal Government is one of the largest creators and users of training materials in the world. Much of this material is software used in training and basic skills education, often deployed in interactive settings. There is also a large body of research on learning and teaching effectiveness sponsored by the Federal Government, largely funded by DoD.[43] These resources-computer-based instruction, cognitive retention research, authoring systems for instruction, and many others-are a potential resource for K-1 2 education.

Technology transfer for training in the Federal Government received a boost with the signing of the Omnibus Trade Act of 1988, a section of which mandated the Department of Education to establish a Training Technology Transfer Office, and to contract with the National Technical Information Service (NTIS) to collect and disseminate such information. NTIS, part of the Department of Commerce, is the agency charged with making available at cost any technical material a Federal agency deems valuable to the public. NTIS works on an entirely cost-reimbursable basis; thus, no Federal funds are appropriated to support this effort. The Training Technology Transfer Act requires each agency to designate an officer of the agency to act as liaison and disseminator to the public of that agency's education and training software. Funds were authorized for development and conversion of exemplary software to the public sector, but no funds have yet been appropriated for this effort.[44]

There are numerous barriers to overcome if the Federal Government is to be an effective technology transfer agent for training. One is creating agency incentives to participate in such activities. The agencies missions do not include seeking out secondary users for agency products. The Trade Bill legislation, requiring cooperation on this effort from the agencies, may help to create a tradition of transfer, although 'forced transfer' has been unsuccessful in the past. Another barrier is the cost of disseminating information on such materials. Writing software descriptions, assembling demonstration discs, and coordinating extensive efforts by agency instructional experts all represent significant time and money commitments, and are not likely to be within the capabilities of an agency public information office. A third barrier is the cost of actually converting training texts and software for another use; such costs are significant, although much less than creating such materials from scratch.

There are potentially significant educational resources produced by the Federal Government that might apply to distance learning curricula and instructional effectiveness. It is difficult to gauge how much of this material would be applicable to K-12 education because so little evaluation or transfer is being done.

GOVERNMENT REGULATION OF TELECOMMUNICATIONS

The regulations guiding telecommunications infrastructure and services have a significant impact on the ways and means by which distance education

[41] Larry Quinn, Video and Teleconferencing Division, U.S. Department of Agriculture, personal communication, Mar. 1, 1989.

[42] Isaac Kirk, Office of Information Resources Management, Nuclear Regulatory Commission, personal communication, February 1989.

[43] U.S. Congress, Office of Technology Assessment, *Power On! New Tools for Teaching and Learning*, OTA-SET-379 (Washington, DC: U.S. Government Printing Office, September 1988), ch. 7.

[44] Darcia Bracken, National Technical Information Service, U.S. Department of Commerce, personal communication, Mar. 1, 1989.

is made available to the Nation's schools. Many of these policies and regulations are currently being reexamined. The education community will compete with many other stakeholders for influence. The overlapping regulatory authorities and competing interests of well organized groups threaten to submerge the interests of the education community in this debate. At the same time, the opportunity exists for education to influence important policy decisions in telecommunications.

The Regulatory Environment for Telecommunications

Telecommunications regulatory authority and policymaking is shared by many in the public sector, including an independent Federal agency, an executive branch agency, Congress, the Federal courts, and State and local authorities. Federal regulation of telecommunications is administered primarily by the Federal Communications Commission (FCC), which coordinates use of the airwaves and provides general oversight of the broadcasting, cable, and telephone industries. In the Department of Commerce, **NTIA coordinates executive branch telecommunications policy. The telephone industry is influenced by the decisions of U.S. District Court Judge Harold Greene, who is administering the agreement-the Modification of Final Judgment (MFJ)-that resulted in the breakup of the Bell System. State public utility commissions regulate intrastate and local telephone service, and State and municipal governments oversee local cable franchises.**

The fragmentation of telecommunications regulation and policymaking may inhibit development of a coherent plan for educational telecommunications. Furthermore, since the education community is diverse and speaks with many voices, it may be difficult to have its concerns articulated over the din of other stakeholders more fluent in these issues. On the other hand, the volatility of the telecommunications policymaking environment may work to the advantage of education interests. Because the Nation's schools represent a major market for new technology applications, the education community could create a powerful position from which to influence telecommunications policy.

Telecommunications Issues for Education[45]

Government regulation of telecommunications infrastructure and services affects the availability, cost, and types of services schools can use. Availability of telecommunications services to education is controlled in a number of instances by the Federal Government. FCC determines the allocation of the public spectrum, including the number of ITFS channels. In 1983, the FCC removed underused spectrum from ITFS and also allowed licensees to lease ITFS channels to other users, resulting in fewer channels being available for education. FCC also controls the licensing of satellites.

Another critical issue affecting the availability of telecommunications services is the restrictions placed on the Bell Operating Companies (BOCs) as a result of the MFJ. BOCs are currently prohibited from providing inter-exchange (long distance) services, and are greatly restricted in the information services they can provide.[46] Currently, these policies are being revisited by telecommunications policymakers. BOCs claim that these restrictions slow the development of advanced telecommunications services and that educational customers are not able to get the full service applications they want, such as videoconferencing.[47] Opponents argue that there is no guarantee BOCs will provide this service any less expensively or with higher quality than other providers. Opponents also fear the telephone companies may monopolize the content provision market. Educators and State and local education policymakers are divided on these issues, which are currently under review by FCC and Congress.

Federal and State regulations that govern the public telephone network affect distance education costs. State regulators control local telephone rates and telephone company construction; FCC controls

[45] This section of the report draws heavily on a workshop and subsequent paper produced on behalf of this study. The colloquium, ''Changing Telecommunications Technology and Policy Implications for Distance Learning," was held on Feb. 16, 1989, under the auspices of The Annenberg Washington Program of Northwestern University. The resultant paper explores the range of telecommunications policy issues that may affect the provision of successful distance learning. Lynne Gallagher and Dale Hatfield, *Distance Learning: Opportunities in Telecommunications Policy and Technology* (Washington, DC: The Annenberg Washington Program of Northwestern University, May 1989).

[46] The Modification of Final Judgment restrictions on information services, along with the Cable Communications Act of 1984 (concerning video programming), essentially limits the BOCs to providing the pipeline to carry content created by others. The content restrictions were implemented to ensure that the owner of the public information highway, the BOCs, would not also control what content was carried over that highway.

[47] Cathy Slesinger, NYNEX Government Affairs, personal communication, July 24, 1989.

long distance rates for dominant carriers (i.e., AT&T) and interstate access charges to local telephone companies. New forms of rate regulation, based on a set price for services rather than a guaranteed rate of return to providers, are being implemented in many jurisdictions. Some expect these changes to lead to lower costs for users, while others worry that locking in prices as technology gets cheaper will actually disadvantage users.

The types of services that could become available to serve education are critical to the future development of distance learning, and will be strongly influenced by Federal telecommunications policies being set today. Narrowband Integrated Services Digital Networks (ISDN) and advanced switching technologies, for example, give users greater capabilities for exchanging voice, data, and some video services. An alternative technology on the horizon is integrated broadband networks, whether telephone or cable. Broadband networks would be capable of carrying full-motion video and would go a significant step beyond narrowband ISDN.

The pace and location of ISDN or broadband deployment will depend on many factors, including pricing and depreciation rates. Faster depreciation could encourage the deployment of new networks at the expense of higher prices for existing services.[48] Some States have allowed local telephone companies to charge slightly higher rates to generate funds to upgrade rural service. Some BOCs have promised to upgrade their systems in rural areas to accommodate the eventual deployment of ISDN in exchange for regulatory flexibilities. Opponents argue that, even in the short term, ordinary ratepayers should not disproportionally bear the costs for upgrading the network. Rural customers, especially, are vulnerable to bearing development costs for services that would not benefit them immediately.

It has been argued that modifying the current restrictions on telephone company provision of video and information services would also speed development of a broadband network. Proponents of the regulations now in place argue that the threat of monopoly posed by the telephone companies controlling content and delivery of video services are great, In the long run, they argue, this may drive cable television companies and other providers out of business, and reduce the choice and diversity available to local communities.[49]

Universal access to information services, perhaps defined as narrowband ISDN capacity, may be an important objective for the distance education community. On the other hand, the education interests may want to advocate jumping directly to a broadband network, capable of carrying full-motion high-quality video in conjunction with other services. Such choices are tied to the broad range of regulatory issues, including the content restrictions on BOCs and what sectors will pay for such a massive infrastructure investment.

Besides determining the conditions under which communications services can be offered and what these services may cost, regulatory agencies are also active in setting standards and protocols that ensure the interoperability necessary for successful communications systems. To date, interoperability has been accomplished with the various transmission technologies used in distance learning systems, Government action can range from ratifying industry-determined or de facto standards to involvement in standards research and decisionmaking.

The philosophies underlying the role of communications in a democratic society inform telecommunications policy debates. If communication is defined as a market commodity, education has enormous economic clout because of the size of the education endeavor. If communication is seen as a springboard for economic growth, education is increasingly perceived as the critical ingredient needed in a global economy. If communication is seen as a basic component of the social infrastructure, education may flourish in its traditional role as the primary tool for creating social and economic equality.[50]

All three of these philosophies, and the subsequent view of Federal involvement in telecommunications policy implied, require thoughtful explication in the education community. The experiences accumulated from the recent surge of distance education efforts can inform this critical discussion.

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[48] Gallagher and Hatfield, op. cit., footnote 45, p. 15.

[49] Ibid., pp. 14-17.

[50] U.S. Congress, Office of Technology Assessment, *Critical Connections Communication for the Future* (Washington, DC: U.S. Government Printing Office, in press),