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ABSTRACT

This monograph looks at the need for distance education technology as a result of demographic and socioeconomic changes and examines the role of the school library media program in facilitating the changes in education resulting from the utilization of distance education technology. The first section presents the mission of the school library media program as envisioned in guidelines for library media specialists published by two national professional organizations in 1988; discusses four challenges inherent in that mission; and gives examples of current responses to these challenges. Section 2 deals with changes in demographics that the educational system needs to address as the year 2000 is approached, and the third section provides a synopsis of the use of distance education technology and how it is being used to address the changing needs of students and staff. Section 4 reviews how school districts in northeastern Wisconsin are using distance education technology to enhance learning opportunities for students and the community and to expand opportunities for staff development, staff communication, and resource sharing. Sections 5 and 6 deal with the role of the library media specialist in integrating distance education programming into elementary and secondary education. A map of instructional television sites in Wisconsin and a Satellite Educational Resources Consortium fact sheet are appended. (93 references) (MES)

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I. The Need for Change in the Library Media Program

Students entering our elementary schools today will graduate in the next millennium. Will the students graduating in the year 2000 have the skills necessary to meet the challenges brought about by new technology? Socioeconomic changes brought about by our country's change from an industrial based society to an information oriented society have increased the demand for accurate and current information. A major role of K-12 education today is to develop lifelong learning skills in our children that will enable them to function productively in a democratic society. An effective school is one which will allow students to acquire and use knowledge accurately, experience the joy of discovery in learning, and develop an understanding of themselves and others.

This monograph looks at the need for distance education technology as a result of demographic and socioeconomic changes in our society, and examines the role of the elementary and secondary school library media program in facilitating the changes in kindergarten through 12th grade education resulting from the utilization of distance education technology. The first section presents the mission of the school library media program as envisioned in guidelines for library media specialists published by two national professional organizations in 1988, discusses four challenges inherent in that mission, and gives examples of some current responses to these challenges. Section two deals with those changes in the demographics of American society that the educational system needs to address as we approach the year 2000, and the third section provides a synopsis of the use of distance education technology and how it is being used to address the changing needs of our elementary and secondary students and staff. Section four reviews how school districts in northeastern Wisconsin are using distance education technology to enhance learning opportunities for students and the community, and to expand opportunities for staff development, staff communication, and resource sharing. Sections five and six deal specifically with the role of the library media specialist in integrating distance education programming into elementary and secondary education.

***Information* Power and Challenges for the School Library Media Specialist**

In their joint publication of guidelines for the school library media program, *Information Power* (AASL & AECT, 1988), the American Association of School Librarians (AASL) and the Association for Educational Communications and Technology (AECT) state that the mission of today's school library media program is to ensure that the students and staff are effective users of ideas and information. This mission is to be accomplished by providing intellectual and physical access to information and ideas in print and nonprint media for a community with diverse interests and needs. Library media specialists must provide the necessary instruction for staff and students to foster competence and stimulate interest in reading, viewing, and using information. They also need to work cooperatively with other educators to design learning strategies to meet the needs of individuals.

The guidelines promoted in *Information Power* challenge the school library media specialist to successfully integrate the library media program into the curriculum implementation process. The first challenge is to provide staff and students with physical access to information and ideas for a diverse population whose needs are rapidly changing. Today's elementary and secondary library media program must support the classroom teacher's efforts to challenge each student's ability to think critically and creatively to solve problems, to manage and retrieve information, and to communicate effectively. Library media staff must provide instruction to foster competence and stimulate interest in reading, viewing, listening, and using information and ideas in a culturally and linguistically diverse American society.

The second challenge to the school library media program is to provide equity and freedom of access to information and resources for all students regardless of sex, age, race, creed, or socioeconomic background. In order to accomplish this, school library media centers will have to change from being book depositories to being the instructional and informational hubs of the school building. As noted in *Information Power*, today's library media specialists must wear three hats: those of an information specialist, a teacher, and an instructional consultant.

The third challenge is to provide leadership and expertise in the use of information and instructional technology. Cable TV, microwave relay, satellites, fiber optics, and other broadcast technology provide school districts with a means of making formal instruction and interpersonal communications readily accessible and increasingly less expensive. To provide a leadership role in this area, the library media specialist of the 1990s will need to possess the expertise necessary to evaluate, select, manage, and use existing and emerging technologies. The proliferation of information and technological advances demands that the library media specialist engage in continuing professional development. In addition to training in traditional areas, the school library media professional will need to develop abilities related to computer and image based communication technology. Current computer and video technologies make it possible to rapidly manipulate, store, transfer, and create information in many forms, and they have enormous potential for the development of creative and critical thinking skills. As the school's information specialist, the library media specialist must work with staff to identify and select those resources and technologies that will assist staff in implementing curriculum. A great effort must be made to provide a conducive atmosphere for students to interact with literature and a wide range of reference and multimedia resources. At the elementary level, for example, library media center activities should be designed to foster critical thinking skills. The elementary library media staff must assume the responsibility for providing computer education which utilizes programs that involve students in gathering data, generating and testing hypotheses, discovering rules, creative writing, and database searching.

The secondary library media specialist, in turn, needs to accept a greater responsibility for developing these research and critical thinking skills for accessing information. Computer access to online data bases and university catalogs have provided new life and relevancy to term papers for middle and high school students For example, secondary library media centers having access to cable television and an IBM compatible computer can utilize a service called "X-Change" from X-Press, Inc. X-Change is an electronic news service that provides students with access to the latest national and international news from ten news services, as well as access to educational information, stock quotes, sports, weather, conferencing, high tech news, and electronic bulletin board services. Staff and students use key word searches to pull off information on current events as they happen.

The final challenge put forth in *Information Power* is for library media specialists to become proactive in their participation in distance education activities and networks that enhance access to resources located outside the school, community, and state. The library media specialist has a responsibility to teach students to understand the characteristics of each particular medium in which information and ideas are now presented. Students need to recognize the effect and power technology can provide in the communication of ideas and concepts. Telecommunications enhance the visibility of events in other parts of the world, giving distant events more relevancy to the role of the United States in world affairs. Hence, the library media specialist must be aware of new technological developments, recognize those appropriate for their library media programs, and provide the leadership and expertise needed for the incorporation of distance education programming into the instructional program of the school.

Meeting These Challenges with Technology

A specific example of the possibilities noted above can be found in Green Bay, Wisconsin. The secondary library media specialists for the Green Bay Area Public School District are working with the science teachers and social studies teachers in their schools to utilize satellite television programs delivered over the district's microwave television system. Once each month, advanced science students at each high school attend science, technology, and society seminars in the library media center over the Green Bay Area ITFS system. (ITFS is an acronym for Instructional Television Fixed Service.) These enrichment science programs are broadcast via satellite from the Fairfax County Public Schools in Fairfax, Virginia, as part of the Satellite Educational Resources Consortium (SERC) demonstration project. These science programs are received with a satellite dish at the ITFS studio and rebroadcast to the 17 participating school districts over this microwave system.

Social studies students take advantage of special programming via satellite from the CNN news channel. Library media staff tape CNN Newsroom at 2:45 AM CT and replay the program for social studies classes during the next school day. Social studies departments in each of the Green Bay Area Public secondary schools have also participated for the last two years in the C-Span in the Classroom Project, which brings in-depth coverage of the U.S. House of Representatives and the U.S. Senate live into their classrooms. Library media specialists working closely with classroom teachers in social studies, speech, and journalism, have made arrangements for students to participate in live C-Span coverage or to have it taped for use in the curriculum at a more appropriate time. Such real-life, practical applications of curriculum concepts add an exciting new dimension to the instruction for elementary and secondary students in the Green Bay Area Public Schools.

The distance education program in the Green Bay schools is discussed in more detail in the third section. The following section provides an overview of demographic and economic trends in the United States that must be addressed by the educational system.

II. Socioeconomic Changes in Demographics That Will Change the Structure of K-12 Educational Institutions

In his presentation on distance learning in Bangkok, Thailand, Motilal Sharma stated, "The concepts of development and the role of educational systems (both formal and informal) are determined by the socio-politico-economic features and cultural patterns of each nation." Sharma goes on to say, "The importance of the role of education in this development can be seen in terms of the opportunities for individuals to develop their abilities. Physical and technical investments should go hand in hand with investments on human resources developments" (1986, p. 4).

Guthrie, Garms, and Pierce (1988) state in their text on school finance that throughout the world, educational policy and its eventual expression in schooling are driven by two variable conditions—demography and economics.

Demographic and Economic Trends

Kelly (1986), Currence (1986), and the National School Boards Association (NSBA) (1985) have identified specific demographic and economic trends that will have a major impact on our current educational delivery system. Kelly points out that changes in school enrollments, participation of women in the work force, and the supply of and demand for teachers will greatly influence the financing of education during the next 15 years.

The Task Force on Teaching as a Profession, created as one of the Carnegie Forums (Kelly, 1986), lists five demographic trends that will affect the ability of education to attract and retain outstanding teachers:

(1) After a decade of decline, K-12 students' enrollments have stabilized and will increase during the coming decade. An increasing proportion of students will be Black and Hispanic.

(2) An aging teaching workforce will result in a sharp increase in retirements, a circumstance offering schools a once-in-a-generation opportunity to replenish the workforce.

(3) The overall number of college graduates will decrease, thus reducing the size of the pool of educated young people during a period when demand for new teachers will rise.

(4) Competition from other professions for top quality college graduates will be keen, thus exacerbating the problem of attracting large numbers of excellent young persons to teaching.

(5) Women, who have traditionally been the backbone of the teacher workforce, now enjoy new career options.

In their publication *Educational Vital Signs* (NSBA, 1989), the National School Boards Association states that the increase in total public school enrollment that began in 1985 is continuing to climb. Enrollment during the 1988-89 school year was 40.3 million, which was an increase of approximately 168,500 students nationwide. The importance of these data is that the overall enrollment increased while the secondary school enrollment decreased by approximately 358,000 students. Thus the elementary enrollment increased by an estimated 526,500 more students. Projections from the U.S. Department of Education indicate that the enrollment in grades K-8 will continue to increase into the 1990s with the secondary enrollment beginning to increase after 1990 (p. 20).

Researchers have dubbed this period of increased population growth as a "Baby-Boomlet," signifying that these are babies of the baby boomer generation. Here in Wisconsin, after more than a decade of decline, PK-8 student enrollments have increased from 501,319 in 1983-84 to 521,691 in 1987-88 for an increase of 4%. During this same time frame, secondary (grades 9-12) enrollment dropped from 273,327 to 250,672 or an 8% decrease, which is consistent with national statistics. The greatest amount of growth has been in urban and metropolitan areas among minorities who are Black, Hispanic or Hmong. Between the 1983-84 and 1987-88 school years, the number of minority students of American Indian, Asian, Black, and Hispanic heritage increased from 84,159 to 102,369 for a 22% increase (WPDI, 1988, p. iv).

The National School Boards Association (1985) has predicted that, by 1990, an estimated 50% of all children nationwide will live in single-parent homes. In addition, they point out that the increased participation of women in the labor force since the 1960s will lead to a sharp increase in the proportion of preschool children whose parents seek child care services. Warnings from the National School Boards Association (NSBA) predict that increased enrollment in a depressed educational funding cycle will put an unbearable amount of stress on local school districts' ability to meet the needs of its students.

This funding crisis in education will also be affected by the fact that only 40% of the current electorate are parents of school children and this percentage is decreasing. Projections from NSBA (1985) show that in 1982 about 60% of the work force (18-65) was under 50 years of age. By the year 2000, that percentage will decrease to 50%. The graying of America will also have an effect on our aging teacher work force and will result in a sharp increase in retirements. By the year 2000, citizens over 65 will comprise 20% of the country's population. In 1986, 50% of the public school teachers were 40 or older. The predicted enrollment increase will require 140,000 to 175,000 additional teachers per year from 1988 to 1993.

Projected Needs for Teachers and School Library Media Specialists

It is also predicted that the overall number of college graduates will decrease, thus reducing the size of the pool of educated young people during a period when the demand for new teachers will rise. To meet the projected teacher need of 140,000 to 175,000 teachers, the colleges and universities would have to turn out 20% of all their graduates as teachers. In a recent article in *Educational Leadership,* Darling-Hammond states that, "Shortages of qualified teachers have become apparent in recent years in the growing number of regions of the South and West, in urban districts and in subject areas like mathematics, science, foreign language, special education and bilingual education" (1988, p. 7). She projects that the supply of newly graduated teaching candidates will satisfy only about 60% of the demand.

This teacher shortage could have a traumatic effect on the library media profession, which relies heavily on teacher candidates and continuing education programs to provide library school candidates. Turner and Coleman (1987) surveyed 210 school library media preparation programs in the United States and a stratified random sample of 456 of the 15,747 school systems to determine the current and future supply and demand for school library media specialists. Analyses of their data indicated that there were both shortages and surpluses. They found there were school systems, most frequently in the Midwest, where many library media specialists are competing for a limited number of job openings. Depending on the size of the school district where this competition occurs, between 15% and 20% of those completing library media certification programs were not being employed in the profession. At the other extreme were school districts in the Southeastern and Middle Atlantic states that had the lowest ratio of applicants per position, resulting in 22% of those openings not being filled (p. 64).

Turner and Coleman state that the primary reason for this mismatch between employment demands and surplus of library media specialists is the general lack of mobility of persons completing preparation programs. They also found that those graduates completing bachelor's level programs were the most likely not to be subsequently employed as school library media specialists.

Problems in Providing Access and Equity in Small and Rural Schools

This projected teacher shortage comes at a time when states have raised education performance standards and graduation requirements as a result of legislative pressure based on national reports. Testimony given to the Committee of Labor and Human Resources during hearings on Senator Kennedy's Star School Assistance Act reinforced the widespread problem that exists in funding fundamental educational needs as well as providing access and equity (Kitchen, 1987). Survey data from the U.S. Department of Education show that only 5,576 (or 36%) of the nation's 15,667 secondary schools offered a physics course and that most students do not have exposure to science after the 10th grade. Furthermore, national data suggest that access to math, science, and foreign language classes is worse among various sub-groups of students and communities. Students in rural schools are at a disadvantage with regard to foreign language. Surveys show that 50% of the students in rural schools are enrolled in schools not offering a third year of Spanish, 56% are in schools without a third year of French, and 83% are in schools without a third year of German (Kitchen, 1987).

The availability of teachers in rural areas will depend on several factors: college recruitment, certification standards, salaries, early retirements, and competition from other professions. School districts have become involved in distance education systems as a result of their experience and inability to offer low-enrollment advanced courses in math, science, and foreign language due to lack of funding and/or lack of staff certification. Sharing teaching staff and services through consortium arrangements and regional educational service agencies has been prevalent among the alternatives available. Some rural districts are also contracting out for services from universities and technical colleges for advanced level, low enrollment courses; other districts have restricted their foreign language offerings to a maximum of two years of one or two languages. These latter alternatives restrict the rural students' freedom of choice and result in inequity between rural and urban districts. The end resolution to this problem for many small adjacent communities has been to negotiate the consolidation of their districts in order to meet their students' needs.

The future success of these alternatives was analyzed by Hobb, who concluded that:

> Declining numbers of students, increased travel costs, and lack of public support combine to make consolidation an outmoded strategy for solving the traditional rural school problem in most parts of the country. Having nearly reached the limits of consolidation as a solution to the problem, more attention is being focused on technology and organizational innovations. (1985, p. 3)

Distance Education and Technology

In his article on restructuring the educational system, Perelman (1988) argues that technology is creating the opportunity for cost effective learning strategies and has the potential for playing an essential role in boosting educational productivity. He states, "Technology must be viewed broadly, not just as an add-on to an established and unalterable educational infrastructure" (p. 223). He goes on to say that effective strategies for transformation of education cannot rely on a change in the technical tool of instruction alone; rather, innovation must address the total school system. Perelman echoes the warnings of Goodlad (1984) and Sizer (1985), who recommend the restructuring of the total learning system as the solution to America's human resources crisis.

Hanushek (1986) did a tabulation of 147 studies on the effects of expenditures for teacher-related costs such as teacher experience, teacher education, and class size on the quality of education provided. He concluded that:

> The results are startlingly consistent in the findings, no strong evidence that teacher education or teacher experience have an expected positive effect on student achievement. According to the available evidence, one cannot be confident that hiring more educated teachers or having smaller classes will improve student performance. There appear to be no strong or systematic relationships between school expenditures and student performance. (p. 1162)

Hanushek (1986) draws the following conclusions from his study: (1) there is little educational merit for schools in pursuing lower class size; (2) teachers' experience in and of itself doesn't seem to have much value; and (3) evidence suggests that a merit pay system would make sense since there are clearly significant differences among teachers' abilities.

Hanushek's research reinforces what most educators already know: education is a labor intensive business in which labor costs are over 80% of a local school district's operating expense. Distance education technology is being viewed by educators as a key to the restructuring of the current school inputs to reduce labor costs and use the freed-up funds to design an effective telecommunications delivery system for educational programs. Distance education technology could be utilized to free master teachers for peer coaching, diagnosing learning difficulties, developing students' creative and problem solving skills, using cooperative learning techniques, and participating in school management and curriculum design. Distance learning has a sociological justification as it can help not only in extending education, but also in equalizing educational opportunities, and thereby help a varied and dispersed student population.

The Office of Technology Assessment report, *Linking for Learning*, sums up the situation:

> Over one-half of the schools in the United States can be classified as both small and rural. These districts are often geographically isolated, and suffer from a lack of funds, a shortage of qualified teachers, a minimum of resources, and limited course offerings. . . Small, rural schools face special problems that affect their ability to remain competitive in the educational marketplace. However, the numerous positive attributes of smallness argue for their preservation. In order to compete effectively, small schools must be provided with the same resources and advantages as their larger counterparts. Distance learning can provide at least a partial solution to this dilemma, by helping to keep small schools and school districts open in the face of consolidation. (U.S. Congress, OTA, 1989, pp. 118-119)

However, despite the clearly identified need to change the K-12 educational structure, movement by school districts to utilize distance education technology has been extremely slow. Unlike industry, where success and survival depend on effectiveness and efficiency, and technology is found to be beneficial, educators believe in saying, "If it's not broke, don't fix it."

III. Distance Education Technology Currently Used in K-12 Educational Systems

Distance education is not a new concept; educational institutions have relied on it in various forms for over 100 years to extend educational classes and programs beyond the traditional "brick and mortar" limitations. Correspondence courses have provided a wide range of academic and personal opportunities for part-time students. For example, in 1877 Oxford University began an open university system whereby adult learners would attend lectures by visiting the Oxford scholars in the community. A traveling library of 20-30 books per course was an essential part of the Extension Lectures Program (Scott, 1988). A pioneer in distance education in the United States was the University of Wisconsin, which established WHA, one of the first public radio stations, in 1919.

Telecommunications, as used in this paper, is defined as the electronic process that permits the passing of information over a distance from one sender to one or more receivers with the output in a usable format such as printed copy, fixed or moving pictures, audio signals, computer data, or optical signals. Telecommunications includes all services, products, media formats, and methodologies used to deliver the information electronically.

Distance education, which has become the accepted term over distance learning, focuses on more than just the learning strategies to include the hardware, software, and teaching strategies required to properly use telecommunications technology. The focus of distance education should include communication skills as well as the following thinking skills: problem solving, decision making, information searching, data retrieval, analysis, and evaluation. Distance education is defined as education conducted via communications media (i.e., teleconferencing, computers, correspondence, radio, television, and other technologies) with little face-to-face contact between students and the teachers of the course.

Essentially, distance education is a means of extending instruction beyond the boundaries of a single classroom. By means of various technologies, instruction may be stretched between school and home, between schools in a district, between districts, between secondary and postsecondary institutions, between states, and even between countries.

Distance Education Technologies

Distance education technologies can be divided into four major categories: print, audio, video, and computer. The telecommunications technologies currently used by K-12 school districts are as varied as the demographics of the communities they service and the courses they deliver. In some cases an entire course is taught over a distance, while in others, students in a classroom receive enrichment from a distance. In all cases, however, distance education is being used as a tool by administrators for bringing instruction to their students and teachers which they would otherwise not receive. In some cases, this is being done in a cost-effective and instructionally effective way.

Print technology for distance education includes textbooks, work- books, and test packets that are sent to learners in correspondence or independent study programs. Despite the sophistication of telecommunications technology and the potential for using an interactive multimedia approach, all of the distance education systems reviewed continued to rely very heavily on the printed page. Distance education presenters tend to teach these interactive television courses using a methodology similar to their normal classroom practices. Supplemental readings often play a major role in supporting these types of presentations, to the point where a course can become too restrictive to meet the varied needs of the individual learner.

Audio technologies such as audiotapes, radio, telephone, and satellites allow for transmission of voice for radio courses, audioconferences, and foreign language tapes. The cost of the installation and operation of an audio/video distribution system via microwave, cable lines, or fiber optics, is still beyond the budget capabilities of most distance education systems. Hence, for most elementary and secondary school systems, a beginning option is an educational telephone network better known as ETN. This allows schools to take advantage of what the radio and television commercials call "phone power." The use of teleconference phone units specifically designed for audio interaction can play a key role in providing staff inservice programs and courses from a presenter at a central location to each remote receive site. School administrators are finding teleconferencing via a telephone bridge system a cost effective way to save time and travel costs.

Video technologies include full-power broadcast, instructional television fixed service (ITFS), coaxial cable, microwave, fiber optics, satellite, and slow-scan television, all of which have the capability to provide two-way interactive television. In developing a distance education system, there is no single or correct video technology that will meet the physical layout or needs of a school district. A review of the distance education systems throughout the world suggests that the various delivery systems (e.g., microwave and fiber optics) are most often used in combination to distribute the audio/video programming to all participating receive sites. The Green Bay (Wisconsin) Area ITFS system, which is described later in this monograph, uses a combination of satellite technology, cable television technology, and ITFS technology to bring national and international programming via microwave to school sites as far as 60 miles away.

Computer-based technology includes the hardware and software that combine with the telephone, microwave, fiber optics, and/or satellite technology to provide staff and students with computer-aided instruction, electronic mail, computer conferencing, or audiographics technologies. The Satellite Educational Resources Consortium (SERC), which is discussed in Section IV of this monograph, uses an alpha-numeric pad tied into the network that allows the instructor to receive immediate feedback from the probability and statistics class which is taught via satellite to high schools in 23 states. This computerized response system combined with the television broadcast allows the instructor to interact with students and check for their understanding immediately. The alpha-numeric pad is a communication device which records each student's answer and transmits information to the instructor at the studio, who can then determine if sufficient learning has occurred to go on to the next concept. Within four seconds, the instructor receives a graphic display showing how many students got the problem right.

Federal Legislation and Interactive Television Systems

As a result of the educational concerns discussed in Section II of this paper, distance education has become an important issue, especially at the federal level. So important is the need for equity and quality of educational opportunities, that one of the provisions of the Omnibus Trade Bill and Competitiveness Act passed by the 100th Congress in 1988 was the creation of the "Star Schools" Program. Designed to promote the use of telecommunications technology to compensate for the shortage of mathematics, science, and foreign language teachers.

> 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 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. (U.S. Congress, OTA, 1989, p. 136)

The Star Schools Act is designed to promote cooperation among educational institutions, encourage the development and dissemination of courseware, and help state and multistate consortiums acquire satellite access and other telecommunications hardware to enable schools to offer courses to their students and teachers that they could not have offered otherwise.

There are several delivery systems that can transmit two-way interactive television alone or in combination. The most common are coaxial cable, microwave, fiber optics, and satellite. According to Kitchen and Kitchen (1988), other delivery systems that offer some potential are low-power television broadcast (LPTV), instructional television fixed service (ITFS), and slow-scan television, all of which have two-way interaction capabilities, but also some serious limitations in their FCC license requirements, and the availability of quality transmission is questionable. They point out that school districts must accept technology that is available and feasible at the time and location. In their primer on distance education, the Kitchens state that, whereas two-way interactive (ITV) systems are versatile and flexible educational systems, several factors need to be considered in looking at a potential ITV system. Such factors include curriculum benefits, teacher responses, and community acceptance.

The Minnesota Technology Demonstration Project

A major impetus into distance education technology began in Minnesota in 1983 with the passage of the Omnibus Education Bill. The bill provided funding to school districts to create model plans which focused on the cooperative use of technology between school districts. As of 1987, the state of Minnesota had provided nearly $6 million for this Technology Demonstration Program. Fifteen sites were chosen for funding, each offering a variety of technological uses. Below are four samples of interactive technology systems chosen as technological demonstration grants, each of which received $125,000 to implement an interactive system in its respective school district cooperative. Although relative newcomers to distance education, these Minnesota projects have been analyzed and evaluated more than any other K-12 distance education system in the literature. The evaluation results and recommendations coming out of the Minnesota projects have been very beneficial to such school districts as Green Bay who are just entering the realm of distance education technology.

In their primer on interactive television, Kitchen and Kitchen (1988) observed that the impact of distance education on public school districts has been to provide solutions to problems related to declining enrollments, geographical distance between districts, and increasing state graduation requirements.They point out that school systems participating in the interactive systems for the most part offer first or second year foreign language classes and advanced placement classes in English and math, and that there are significant differences between systems in the preparation and organization of lesson plans. Several districts are using multi-district electronic mail systems or hard copy data transfer via facsimile units to provide a more flexible, timely method for the distribution of resources.

Kitchen and Kitchen's (1988) descriptions of four of the systems designed for the Minnesota project provide the reader with an idea of the types of interactive technologies that are used in K-12 distance education systems; i.e., coaxial cable, microwave, fiber optics, and hybrid systems. The Sibley County Cooperative is located in south-central Minnesota and connects the cities of Arlington and Green Isle. Other communities involved in the cooperative are Gaylord, Gibbon, and Winthrop. The goal of this cooperative is to enrich and enhance educational opportunities for students, for teaching staff, and for the community through the use of a cable system. The school systems are using two-way interactive equipment such as microphones, cameras, and monitors interconnected by cable to offer junior high and high school classes, particularly advanced placement courses in math and English. This interactive system is also used to transfer data from one school district to another, e.g., curricular material, library information, and district news.

The East Central Minnesota Educational Cable Cooperative (ECMECC) employs both cable and microwave technologies for two-way visual and audio communications. ECMECC involves seven area school districts—Cambridge-Isantic, Braham, Milaca, Mora, Ogilivie, Pine City, and Princeton—and a private cable television company, East Central Minnesota Cablevision One of the main objectives is to expand and enrich the curriculum in each of the participating districts through the use of interactive television courses. High school courses for the 1985-86 school year included advanced accounting, advanced shorthand, and advanced placement English; astronomy/meteorology; calculus; college algebra; probability;

French; German; Latin; Spanish I, II, and III; speed reading; and study skills (Kitchen & Kitchen, 1988, p. 82).

The more sophisticated distance education systems for K-12 districts very often have had substantial funding support from private industry. For example, the Mid-State Educational Telecommunications Cooperative (MSET) is working jointly with such companies as Upoala Cooperative Telephone, Minnesota Power, Northwestern Bell, and the Pirelle Corporation to demonstrate the potential of fiber optics and to provide telecommunications and technological services to schools (Kitchen & Kitchen, 1988, p. 86).

The Sherburna-Wright Education Cooperative (SW-ETC) in Minnesota is another hybrid system which emphasizes the critical need for increased cooperation and coordination among school districts, postsecondary institutions, and the business sector. The primary focus of SW-ETC is the implementation of a two-way interactive television system that will interconnect eight school districts and the Wright Vocational Center Cooperative through microwave and coaxial cable technology. The six communities and school districts will be connected via a supertrunk coaxial cable system and a microwave network connected to four communities and school districts.

In her evaluation of the Minnesota Technology Demonstration project, Diane L. Morehouse (1987) briefly alludes to the importance of supplemental support for distance education. Morehouse, as well as Robinson and West (1986), found no significant difference in the scores of students in traditional classes and those of students in the identical interactive classes (p. 124). The advantages of distance education programming, she states, were that it increased the sharing of resources and staff expertise between districts, expanded curricular offerings, and enhanced community education programs. In her final observations, Morehouse reminds us that distance education, like all other technology, is a teaching tool. Like all tools when skillfully used, interactive television can be effective in the hands of those prepared to use it. Morehouse's evaluation emphasizes that preparation, involvement, and teacher support are critical to the success of interactive television.

ITFS Networks in Texas and Virginia

Throughout the United States, school districts have begun to look seriously at distance education technology as a means of providing equity in educational offerings to school districts where enrollment or lack of certified teachers prevent courses from being offered. The Region IV Education Service Center in Houston, Texas, for example, operates an Instructional Television Fixed Service (ITFS) network covering seven counties. The one-way video and two-way audio closed circuit network broadcasts on four channels, with courses originating from instructional sites at the service center and on participating university and college campuses. A talkback system enables students to talk with the instructor and with students at other locations, and a courier service is used to deliver course materials and examinations. The system allows for the 55 school districts within the service area to participate in staff development and inservice training workshops being held at the service center, as well as certification and degree coursework originating from universities in Houston, without leaving their buildings (Barker, 1987).

Dr. Ida Hill (1988) describes a comprehensive four-year high school in Henrico County Public Schools in Virginia which distributes classes for students through ITFS microwave signal broadcast and dedicated telephone lines. The Varina High School "electronic classroom" uses one-way video and two-way audio connections. The electronic classroom is broadcast as a regular television signal to the 50 central Virginia counties that make up the station's reception area. For $245 per course, students in participating schools can take advanced placement courses in calculus, English, Latin I, and Latin II. In addition, videoconferencing is available for staff and students via satellite from the state network with one-way video and two-way audio capabilities.

Other Technologies: Electronic Mail, Electronic Blackboards, and Teleconferencing

Not all systems, however, use interactive video. Batey and Cowell (1986) describe a joint project among four rural schools in Oregon's Willamette Valley which offer the same language arts course in fiction using an electronic mail system. The schools formed a cross district consortium and received a grant from the Apple Corporation which provided six computers, two printers, and a modem for each school. The electronic mail system is used to send lessons and assignments to the students. The students write their assignments off line and then send their work back to the master teacher. The master teacher corrects the work and makes comments on it before returning the work to the students electronically. The students and staff have found this electronic mail system lends itself very well to the writing process, allowing students to "publish" their work for others to read.

In her problem solver's guide to distance education, Levison (1984) describes how trigonometry and calculus are offered at three sites via a Gemini Electronic Blackboard and Quorum teleconferencing equipment. South Oak Cliff High School in Dallas, Texas, offers the course, which allows the teacher to talk and write questions or diagrams to the other locations, which can respond orally or in writing. Paraprofessionals at the two receive sites maintain discipline and distribute materials.

Effectiveness of Courses Presented via Interactive Television

Robinson and West (1987) provide an excellent model for distance education consortiums and school systems to evaluate the effectiveness of the courses and programming broadcast over interactive television systems. The purpose of their evaluation report was to determine whether or not the goals of the Carroll Instructional Television Consortium were being met. The first cooperative educational program of its kind in Illinois, the Carroll Instructional Television System was born of the common need of four rural schools to provide quality and equity of educational opportunities to their students. The consortium utilizes a cable television system which connects the four school districts to provide two-way audio and video interaction between sites. The evaluation found that there was no significant difference between live and interactive televised instruction in cognitive growth. Their findings confirm what other distance education projects have found, that interactive television technology is an acceptable, viable method for increasing the number of course offerings for students, sharing instructional resources, better utilizing faculty expertise, and more fully servicing the academic needs of the students.

Satellite Networks for the Delivery of Instruction

The key to renewed interest in instructional television in the classroom is the new potential of live, two-way communication made possible from anywhere in the world by linking satellite technology with regular telephone service. Satellite technology permits one-way transmission of voice, data, and full-motion video. Audio talk back by participants at the receive sites uses regular telephone lines with conference phone systems. Satellite instruction now makes it possible to offer low incidence courses and those for which a locally certified teacher is not available. This can be achieved via satellite without regard to location and cost of transportation for staff.

Educators across the country—especially high school administrators in sparsely populated rural areas—are showing great interest in courses which are transmitted live via satellite. The largest producer of satellite teaching to schools is the TI-IN network, which broadcasts over 100 hours of live interactive programming each week from its Texas studios to some 23 states. Offerings include 23 different high school courses, including Spanish, German, Latin, computer science, business management, honors English, honors calculus, and algebra. The total class size for all schools receiving courses has been limited to 200 students. TI-IN also provides over 400 hours of inservice training and staff development, selected college credit courses, student enrichment programming, student remediation courses, test reviews for both teachers and students, and community interest programs (Barker, 1987).

The second largest satellite network identified by Barker (1987) is the satellite network that comprises schools subscribing to Oklahoma State University's Arts and Science Teleconferencing Services. The ASTS Network began broadcasting a single semester German class in January 1985, and has expanded to 101 districts in six states. Offerings have expanded to two full years of German and a full year of high school physics. ASTS's satellite courses are broadcast either two or three days each week, and on non-broadcast days, students work individually at their schools on computer assisted lessons and written assignments that have been specifically designed by O.S.U. educators.

The move toward satellite networks is growing rapidly. In Kentucky, the 1986 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 down link dishes. K-12 school districts throughout the country, specifically those in isolated rural areas, are finding numerous benefits of live, interactive TV instruction via satellite for educational purposes. The following list compiled by the Northwest Regional Education Laboratory indicates that distance education has the potential to provide:

(1) Equity and increased quality of educational opportunity.

(2) Access to subject matter or career role models not available in the local community.

(3) Interaction and joint ventures with students at other schools.

(4) Increased access to information and instructional resources.

(5) Opportunities for staff development and inservice training.

(6) Increased school/community linkages. (Batey, 1986)

The Star Schools Program

The most recent cooperative ventures in the utilization of satellites have come about as a result of the Star Schools initiative. The amount of $33.5 million was appropriated by the U.S. Congress for the first two years, i.e., 1989-1990 and 1990-1991, and four organizations were granted funding in the first round of 2-year grants. The Star Schools legislation specifies that two types of partnerships are eligible for grants. One must include at least one state education agency, state higher education agency, or local education agency responsible for a significant number of poor or underserved students, together with two other institutions, which may include one of the above, universities, schools of education, public broadcasting agencies, and others. The second type must include a public agency or already existing corporation that is involved in the development or operation of a telecommunications network designed to serve schools and other education providers. At least 50% of the funds must go to school districts eligible for Chapter 1 funding and be designated for the poorer schools or other underserved populations, and a minimum of 25% of the grant monies must be applied to instructional programing. Agencies receiving the grants are also required to generate at least 25% of the total budget from non-federal sources (U.S. Congress, OTA, 1989, p. 136).

The Midlands Consortium is the recipient of a $5.5 million grant for the Star School demonstration projects. The primary purpose of the newly formed multi-site Midlands Consortium Star Schools Project is to demonstrate the effectiveness of providing live, interactive satellite-based instructional programs.

The Midlands consortium will provide direct instruction and teacher training in the critical subject areas of mathematics, foreign languages, and sciences. The purpose is to equalize academic resources in schools by overcoming barriers of geography, wealth, race, and culture. The consortium consists of technical programming expertise of eight partners: the University of Alabama-Birmingham, the University of Kansas, Kansas State University, the Missouri School Boards Association, the Missouri State Department of Education, the University of Mississippi, Oklahoma State University, and the Oklahoma Department of Education.

The other three organizations receiving Star Schools funding are: (1) The Satellite Educational Resources Consortium (SERC); (2) The TI-IN United Star Network; and (3) the Technical Education Resource Centers, Inc. (TERC). The SERC project will be discussed in the case study described in the next section. The TI-IN system, which was described earlier, will use the Star School funds to expand its broadcasting to serve students and teachers in 244 Indian and Chapter I schools in 16 states. These receive sites will be equipped to receive instructional programming, including two-way satellite broadcasting that uses electronic writing tablets and allows students to respond to the teacher's questions.

Technical Education Resources Centers, Inc. (TERC) is an interactive, computer-based instructional system for math and science. This programming is designed to be supplementary to ongoing instruction. Because of the computer-based technology of this programming, TERC programming could be delivered by satellite and/or telephone technology. TERC will work with 11 cooperative centers across the United States to provide teacher training and teaching strategies for math and science. The purpose is to build an environment where students experience science first hand and undertake experiments first hand. The TERC project will bring together students working on the same research project in different locations and scientists from university research facilities across the country.

Satellite Technology and Educational Equity for Rural and Small Schools

The sudden interest in satellite technology has been generated by its potential as a viable approach for bringing educational opportunities to students, staff, and faculty in rural and small schools that are hampered by low student enrollments, increased per pupil cost, and lack of facilities and certified personnel. K-12 educators throughout the United States are finding satellite technology, combined with local audio/video delivery systems, can transmit courses for students and inservice programs directly to each school on an ongoing basis.

IV. Wisconsin: A Case Study in Distance Education

Introduction to Distance Education in Wisconsin

Compared to other states such as Alaska, Arizona, California, Colorado, Illinois, North Carolina, South Carolina, and Texas (to name a few), Wisconsin is a relative newcomer in the use of satellite technology. The advantage in being the "new kid on the block" is, of course, that Wisconsin has had the opportunity to draw on the experiences and technical frustrations of these other states. Wisconsin christened its satellite uplink facilities prior to the start of the 1989-90 school year. The advantage of using Wisconsin as a case study in distance education is that the organizational structure for overseeing distance education activities in the state have been carefully coordinated by the Wisconsin Department of Public Instruction. Two state agencies, the Educational Communications Board and the Bureau for Instructional Media and Technology, provide technical and organizational planning and coordination of the state's instructional television system.

In 1984, the State Superintendent, Herbert Grover, established the Advisory Committee on Broadcast Instruction to advise the Department of Public Instruction on matters relating to broadcast instruction for K-12 public school districts. The Advisory Committee was replaced by the Council on Instructional Telecommunications (CIT) by state statute during the preparation of the 1985-87 budget. The chair person of the Council of

Instructional Telecommunications also serves as a voting member of the Wisconsin Educational Communications Board (ECB), which governs the Wisconsin Educational Television and Radio Networks. The ECB's responsibility for instructional programming includes the use of telecommunications at all levels of instruction in Wisconsin.

In recent years there has been a great deal of interest in Wisconsin in distance education as an alternative method of providing direct instruction to students and staff development opportunities to educators. The increase in state standards for elementary and secondary education programs has focused attention on the need to provide equal access to educational opportunity to students throughout the state and the need to provide a variety of opportunities for Wisconsin educators to upgrade their skills to better meet the needs of today's students. Distance education technology is being studied by the Wisconsin Department of Education as a means by which small, rural districts can maintain their tradition of quality education and retain their "comprehensive high schools."

An Overview of Distance Education in Wisconsin

Similar to the other state projects described earlier, distance education projects in Wisconsin offer instructional opportunities to students that would not be available in their own school setting due to limited enrollment. By sharing teachers and instructional resources, districts can offer a course to enough students to make instruction cost effective and eliminate the need for students to commute from one school district to another to share classes.

The utilization of distance education technology in K-12 education in Wisconsin had its beginning in west central Wisconsin. Most of the communities participating in the Western Wisconsin Communications Cooperative (WWCC), which is based in west central Wisconsin, are located in Trempealeau County, south and east of Eau Claire. In 1976, the Kellogg Foundation was impressed with the potential of a two-way interactive cable TV system that would interconnect participating schools. The Kellogg Foundation provided a substantial amount of funding to help provide the audio and video equipment the schools needed and helped finance the inservice programs for teachers. A combination of funding sources were used to construct the cable and microwave system needed to interconnect the communities.

The Trempealeau County Kellogg Project, together with the WWCC system, was the first two-way interactive television system in Wisconsin and serves as a model for other states. The basic emphasis of this project was to "enhance the quality of rural life." Five areas of programming were identified for developmental consideration and implementation: staff development, programs for students with special needs (i.e., at-risk and gifted and talented students), improvement of student services and access to community resources, community education, and information and resource sharing among participating districts (Lienau, 1987).

In his evaluation of the interactive cable television courses provided by Trempealeau County project, Lienau (1987) reports that this distance education project provided students in eight rural school districts with learning opportunities they would normally not have received. Courses made available over the system included Spanish 1, 2 and 3; German 1 and 2; French 1 and 2; shorthand; digital electronics; advanced mathematics; and advanced computer science.

Another distance learning project that has demonstrated the potential of this technology is the Wisconsin Rural Reading Improvement project. This project began in the summer of 1987 as a joint venture of the Wisconsin Department of Public Instruction (DPI) and the Wisconsin Public Radio and

Television Networks. During its first year, 18 small, rural K-12 school districts located in seven west central counties participated in this project, which was designed to integrate the use of telecommunications technologies for the efficient, cost-effective delivery of staff development to remote sites. Funding from the North Central Regional Education Laboratory (NCREL) in Elmhurst, Illinois, was intended to help educators learn and use a new concept in reading instruction, and the teaching of reading as a thinking skill (Wilsman, 1988-89).

These new roles and responsibilities in reading instruction were delegated to district leadership teams consisting of the elementary school principal, K-12 reading specialist, and the library media specialist. The 17 districts participating in year two of the project will use five telecommunications technologies to access information for staff development. Computer modems are used to access "Learning Link," an electronic bulletin board operated by the Wisconsin Public Television Network. While SCA (sub channel audio) radio is used to deliver staff development information, telephone conferencing equipment and the ITFS television system are used to deliver both locally and nationally produced live teleconferences. The public television network is used to distribute *Teaching Reading Comprehension*, a video inservice course, and *Storylords*, a video/computer series which was produced to help districts and teachers improve reading programs and write district curriculum. During the summer of 1989, the Wisconsin Educational Communications Board (ECB) began operating a Ku-band uplink in partnership with a consortium of educational institutions, including the Department of Public Instruction, the University of Wisconsin (UW)-Extension Division of Telecommunications, Cooperative Extension, UW-Madison Outreach Development, and the Schools of Agriculture, Business, and Engineering (ECB, 1988).

The ECB's satellite report (1988) to Governor Tommy Thompson indicates that the last mile delivery system, such as broadcast, cable, or ITFS, is the most critical element in the distance education process. These last mile systems allow users to supplement the programming received via satellite with material produced locally and/or purchased from other sources. The ECB began by moving up its time line for the completion of 13 ITFS (Instructional Television Fixed Service) towers in Wisconsin (see Appendix A). School districts within the 30-mile broadcast range of these ITFS towers will have the opportunity to explore and share instruction via distance education technology. By combining the microwave technology with a telephone teleconferencing system, students are able to participate in interactive instructional programs from such distance education providers as the Satellite Educational Resources Consortium (SERC).

In September 1988, when the U.S. Department of Education announced the first four recipients of demonstration grants from the Star School funds, one of the recipients was the Satellite Educational Resources Consortium (SERC), of which Wisconsin is a key member. The consortium received $5.6 million to provide 1,920 hours of live, interactive instruction via satellite during the 1989-90 school year. Administered by the Southern Educational Communications Association (SECA), the SERC organization was initially composed of 18 state broadcasting and educational agencies and four individual stations and their local school district partners. During the 1989-90 school year, participation expanded to 19 states and five cities to include 330 SERC high schools. SERC represents a new initiative on the part of its participants to deal directly with a major problem facing the United States, i.e., how to make quality education in math, science, and foreign language equally and cost-effectively available to all students across the country, regardless of their geographic location or socioeconomic status (WDPI, 1988). (See Appendix B for a fact sheet on school district participation in SERC and course enrollment during the 1989-90 demonstration year.)

The Wisconsin Department of Public Instruction and the Educational Communications Board (ECB), which operates the Wisconsin Public Radio and Television Network, are members of the SERC consortium. Wisconsin has received $500,000 of the SERC grant money to produce a series of satellite teleconferences for teacher inservice. The Wisconsin-produced inservice teleconferences for the 1989-90 school year consisted of 13 one-hour forums and four six-hour workshops. The workshops address such topics as developing critical thinking skills, strategic learning in the content areas, school/business partnerships, and children at risk. In addition to inservice programs, the Star Schools money will be used for the production of courses for students, satellite uplink equipment, satellite time, downlinking equipment, and program evaluation.

The pilot semester for SERC programming began in January 1989, and was funded by the participating states for that trial semester. Four high schools in Wisconsin (Merrill, Peshtigo, Platteville, and Spencer) participated in the interactive satellite programs during the second semester of the 1988-89 school year. Programming for this pilot project included Japanese, produced by Nebraska; probability and statistics, produced by Kentucky; and a series of eight seminars for high school students in science, society, and technology produced by Virginia. Courses taken by high school students in Wisconsin require a Wisconsin certified teacher to monitor classes and to serve as the teacher of record. This classroom facilitator, however, does not have to be certified in the subject area.

SERC courses are designed to include a high degree of student/instructor interaction. In addition to seeing the instructor on a video screen and having two-way audio communications, each student participating in the course on probability and statistics will have an alpha-numeric pad tied into the network that allows the instructor to receive nearly immediate feedback.

Great Plains National (GPN) at the University of Nebraska plays a major role in the facilitation of the SERC project. GPN provides schools participating in the SERC project with a "one step" source for the distribution of auxiliary resources for the courses. Schools have access to an 800 number for requesting materials. Backup video tapes are made by a central facility in Nebraska at the time of broadcast and are available on a cost basis. SERC has placed special emphasis in the project on making education equally and cost-effectively available to students, regardless of their geographic location or socio-economic status.

During the second semester of the 1988-89 school year, 58 schools participated in the SERC pilot project. Of those schools, 57% were small schools with enrollments of less than 1,000 students. In a follow-up survey of receive sites, 97% of the principals indicated that they would enroll in SERC programs again, and 87% planned on expanding the number of SERC courses offered.

Wisconsin participation in SERC programs for the 1989-90 demonstration year includes high school students from 15 school districts, of which the Green Bay Area Public Schools is one. Wisconsin students are enrolled in credit courses in Japanese (60), Russian (40), probability and statistics (9), and advanced placement economics (13). In addition, nine of the 15 participating SERC sites are participating in a monthly science, technology, and society seminar. Inservice teleconferences, which are available to all school districts in the state, have had 24 districts participating in the forums and nine enrolled in the four- to six-hour workshops.

Distance Education in Northeast Wisconsin: The Green Bay Model

Northeastern Wisconsin has maintained a leadership role in educational television production since the early days of "Slim Goodbody." During the 1987-88 school year, the Green Bay Area Public School District took steps to maintain that leadership role in Wisconsin. The Green Bay Area School Board approved the funding and staff for the development of a distance education delivery system using microwave technology. Local and state funding for Project B.E.S.T.: Better Educational Systems through Telecommunications helped the school district to expand opportunities for staff development programs, enhance staff communication and resource sharing, and increase learning opportunities for all students through the effective utilization of telecommunications technology.

The Green Bay Area Public School District, in cooperation with the Wisconsin Educational Communications Board, operates and broadcasts instructional programs over an interactive instructional television fixed service (ITFS) system to 17 school districts in northeastern Wisconsin. ITFS is a combination of broadcast television and point-to-point microwave commonly used to carry telephone and television signals. This ITFS system is designed to handle all four modes of instructional delivery: print, audio, video, and computer.

The ITFS studio/classroom and broadcast control room are housed at Southwest High School in Green Bay. Microwave signals are broadcast from Southwest High School to Scray's Hill, south of the city, where a broadcast tower picks up signals and rebroadcasts them in a 30-mile radius. There is a similar ITFS repeater tower located in Chilton, Wisconsin, which broadcasts the signal to school districts within another 30-mile radius. Schools participating in the Green Bay Area ITFS system must use a microwave antenna and down converter to capture the microwave signal and convert it to a VHF signal that can be viewed over a cable ready television. Special conference phone units have been purchased for each receive site to allow for interaction between receive sites and the studio. Currently, the U.S. mail services provide a slow, but reliable, delivery system for print and supplemental resources.

To implement the goal of Project B.E.S.T., Green Bay ITFS staff in the spring of 1988 began working with the regional Cooperative Educational Service Agency, better known as CESA #7, to form a consortium of innovation-minded school districts. The Green Bay Area ITFS Consortium, which began in the spring of 1988 with seven superintendents, today consists of 17 school districts in northeastern Wisconsin, with approximately 32 receive sites servicing approximately 2,500 teachers and 36,000+ students. The ITFS consortium, which adopted the title Northeast Wisconsin Telecommunications Education Consortium (better known as NEWTEC), is governed by a board of seven superintendents or their designees. An advisory committee consisting of a representative from each member district makes recommendations for programming and fiscal management to the seven member Board of Control.

In January of 1989, after more than one year of research, design, and development, NEWTEC began broadcasting instructional television programs over the Green Bay Area ITFS system. Programming during that pilot semester consisted of live programming from the studio at Southwest, the rebroadcast of prerecorded programs, and live satellite teleconferences and programs. Live programming began in the morning at Southwest with an early bird advanced placement calculus class at 7:00 AM, and usually concluded at 6:15 PM at the end of a staff development program.

A major undertaking for the consortium during the pilot period, i.e., the second semester of the 1988-89 school year, was the advanced placement calculus course broadcast live from the ITFS studio at Southwest High School each morning between 7:00 and 7:50 AM to 22 high school students in six districts outside of Green Bay. Students in these rural districts in northeastern Wisconsin appreciated the opportunity to take calculus for credit without leaving their schools and missing other course offerings. Evaluations from students at the end of the calculus course indicated that there were plenty of opportunities for them to ask questions of the instructor during class or office hours. Students also appreciated the receive site facilitator at each school who helped with their concerns and problems. These site facilitators set up equipment, notified staff and students of programming, kept attendance records, supervised testing, and provided the communication link between the studio teacher and the students. The responsibilities of this vital communication link with the ITFS staff and studio have fallen on the library media specialist in NEWTEC member schools.

Staff development programs were offered live over the ITFS system two or three nights each week throughout the semester. These programs were offered immediately after the school day and allowed staff to remain in their buildings to participate in the interactive television programs. (This was greatly appreciated on those cold and snowy Wisconsin winter days.) Included were such topics as: *Emergent Literacy Development, Programming for the Gifted and Talented, Cooperative Learning, Teaching Skillful Thinking, Skills for Effective Teaching,* and a series of programs for special education teachers sponsored by CESA #7.

The second source of programming was prerecorded video programs for which the Green Bay Area Public Schools or NEWTEC owned the broadcast rights. National Geographic videos, Public Broadcasting Service (PBS) programs, National Aeronautics and Space Administration (NASA) teleconferences, and C-Span programs provided a wide variety of enrichment opportunities for elementary and secondary students in participating districts.

The third source of programs for student enrichment, and for the staff development programs that provided the greatest stimulus for teacher participation, was satellite teleconferences. Live interactive staff development programs were received via satellite dish at Southwest and rebroadcast to receive sites over the ITFS system. This resource freed the consortium members of the geographical constraints and time restrictions that frequently prevent educators from participating in professional development opportunities. The NEWTEC board believes the real potential for staff development opportunities lies in the consortium's ability to access satellite programming from ASTS at Oklahoma State University, SERC, NASA, NUTN (National University Teleconference Network) and other satellite transmission networks. These satellite networks, which NEWTEC has just begun to utilize, provide a wealth of national teleconferences from professional associations and universities throughout the United States and Canada.

During the 1989-90 school year, NEWTEC expanded its student enrichment programs and added a second channel to the system. The second channel was needed because five of the NEWTEC consortium school districts, along with ten other school districts from throughout Wisconsin, were selected to participate in the SERC demonstration project. NEWTEC schools participating in this national distance education project have students participating in Russian I, Japanese I, economics, science, and technology and society seminars, as well as 37 hours of staff inservice programming.

In addition, the consortium has added a series entitled *Assignment Discovery* (from the Discovery cable channel) to its daily broadcasts along with the taped replay of the *CNN Newsroom Program*, which is broadcast at 2:45 AM Central Time.

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Teachers and students from the 15 NEWTEC consortium schools who participated in live interactive programming during the pilot semester of Project B.E.S.T. stated that interactive distance education has excellent potential for meeting staff and student learning needs Findings from surveys and interviews conducted by the ITFS staff at the end of the 1988-89 school year support the conclusions of research by Simonson, Johnson, and Neuberger (1989). Their research on the use of satellite technology to deliver high school courses for credit to Iowa high schools, which was completed in 1988, provides an overview of the attitudes of students, teachers, and administrators toward this technology. They found that superintendents in general favored using satellite technology to deliver courses for credit. Students participating in the courses via satellite were generally positive about the experience, but would have liked more of a variety of teaching resources to make the courses interesting. A survey of the leaders of state teacher and administrator associations indicated that they were positive about the use of satellite instruction and the effect it would have on the teaching profession (Simonson, Johnson, & Neuberger, 1989).

Similar results were found in an evaluation of the pilot semester of the Green Bay area ITFS system:

(1) Superintendents and principals directly involved in the NEWTEC ITFS consortium strongly supported the use of microwave and satellite technology to deliver high school courses for credit and staff inservice programs. The greater the principal's support, the more staff participated in the programs.

(2) Students expressed their concerns about recurring audio and video problems and found the use of the U.S. mail to exchange tests and quizzes very slow. However, they were very comfortable with, and adapted very easily to, the interactive technology. They were positive about the potential of

ITFS technology to bring courses into their schools. Students who are participating in the Russian and Japanese classes over satellite truly appreciate the opportunity this technology is providing.

(3) Teachers appreciated the opportunity to participate in staff development programs at their home school, and they were very supportive of the use of ITFS and satellite technology for staff development. However, their attitude toward the use of telecommunications in the school for student courses for credit fell into three categories: (a) those anxious to use this potential source of programming; (b) those who don't really care one way or the other; and (c) those who support the position of the state's teacher association that distance education should be used by teachers only for enrichment purposes. (Burke, 1989)

Another recurring problem faced by the students and teachers participating in the distance education programs over the Green Bay Area ITFS system was access to supplementary resources. Handouts and supplemental resources, which were developed by the presenter, were often sent out two days prior to broadcast. This frequently resulted in half of the viewing audience with resources and half without during the courses. This provides an example of a major flaw in distance education, i.e., the attempt by distance education instructors to make the distance education courses over television self-contained. That is to say that all the resources for these interactive television courses are either broadcast over the air or come to the participants in the form of a packet of photocopies.

Two factors contribute to the success currently being enjoyed by the Green Bay Area ITFS system. The first is the coordination and communication provided by the ITFS staff and the receive site facilitator. The second is the quality of program development and production by participating institutions and presenters.

Future of Distance Education in Wisconsin

The future of distance education in northeastern Wisconsin will depend on the financial, technical, and program support provided to regional ITFS systems by the state and federal governments. Telecommunications innovations of the magnitude of SERC will require a substantial amount of coordination and financial support after the Star Schools funds dry up.

The 13 initial ITFS transmission facilities being constructed in Wisconsin are the result of a contractual agreement between the Educational Communications Board (ECB) and Wisconsin Bell, Inc. (see Appendix A, ITFS Sites in Wisconsin). The contractual arrangement was agreed to by the governor and the legislature in order to demonstrate the need for, and feasibility of, the ITFS technology. The Green Bay ITFS consortium, NEW-TEC, and other ITFS systems in Wisconsin located in Wausau, Madison, Eau Claire, and LaCrosse have conclusively demonstrated the feasibility of this microwave technology to deliver interactive instructional programming. The successful results and expanded educational opportunities recorded by existing ITFS systems have resulted in numerous requests by school districts around the state for the construction of ITFS transmission facilities.

In November 1987, the State Superintendent of Instruction requested that the Council of Instructional Telecommunications (CIT) study the concept of distance education as it pertains to elementary and secondary education in Wisconsin. After more than two years of development and hearings, *Distance Education for Elementary and Secondary Schools in Wisconsin* was submitted to the State Superintendent. The CIT recommended that the Educational Communications Board develop a plan for a comprehensive, statewide, interactive telecommunications delivery system to assure equal access to distance education f all Wisconsin students and educational institutions (ECB, 1989).

The report went on to recommend that a master plan be developed to link all existing telecommunications delivery systems into a statewide distance education network that is transparent to the school districts regardless of the particular technology they are currently using. The delivery system must reach all school districts of the state.

During the 1989-91 biennium, the Wisconsin Governor and state legislature approved a budget bill which included $1 million specifically for the expansion, development, and evaluation of ITFS systems to provide distance education to students. The legislature put two stipulations on the funding: (1) that a statewide evaluation of the distance education systems be conducted to determine their effectiveness for delivering instruction; and (2) that the ECB prepare a long-range plan for video delivery systems that will serve the needs of the educational institutions of the state. Distance education providers such as NEWTEC were asked to submit their short- and long-range plans for system improvement and expansion.

The Green Bay area ITFS system will continue to play a prominent role in the ECB plans for expansion of ITFS programming into northeastern Wisconsin. Short-range plans include adding a microwave repeating tower in Oconto Falls, thus expanding ITFS programming to 10 school districts in the CESA #8 region. While short-range plans will look at expansion of the school districts participating in the Green Bay area ITFS consortium, long-range plans involve designing plans to connect the ITFS control room at Southwest High School to the three transmitting towers using fiber optics or ISDN (Integrated Systems Digital Networks) telephone technology. Using fiber optics or ISDN as opposed to microwave will avoid technical problems during transmission of the microwave signal between the studio and transmitter that result from weather conditions or interference from other microwave signals. Use of fiber optics or ISDN is also being evaluated as a means of connecting the various universities and technical colleges who currently provide staff and student programs from the control room at Southwest High School. The resulting two-way audio/video interconnect would allow instructors as far as 60 miles away to teach classes to high school students or teaching staff at more than 50 receive sites in northeastern Wisconsin.

The Green Bay ITFS consortium is especially interested in the University of Wisconsin (UW) System's five-year plan for a university network that would be designed to provide access to library and off-campus databases, computing resources, and compressed two-way interactive media, and still frame graphics teleconferencing and teaching facilities. The plan calls for all UW-System and Cooperative Extension service locations to have satellite reception facilities. These satellite receive sites on state campuses would be linked via video connections to communities such as Green Bay for ITFS and cable distribution. Still another element of the proposed network would establish connections from the four major UW-System television production sites to network carriers or uplink locations including the satellite uplink in Madison.

While the University of Wisconsin system looks to telecommunications to meet the needs of a changing society, their plan has helped to focus on the state's need for a statewide telecommunications network. The plan calls for providing support for research through greater access to libraries and other information sources via telephone, video, and computers. This access to information resources and video programming via satellite has already greatly affected elementary and secondary education in northeastern Wisconsin and the role of the library media specialist.

The Role of the Library Media Specialist in Facilitating the Green Bay Area ITFS Distance Education Programs

Implementation of the Green Bay ITFS system has not come about without some concerns and resistance. The Green Bay ITFS system has been designed to take advantage of the teaching expertise of master teachers from participating school districts, as well as instructors from area colleges and universities. The system is inherently structured to utilize team teaching and cooperative learning strategies. Student courses will be taught via the system by a master teacher in the studio classroom at Southwest, but who will be responsible at the receive sites? Whereas teachers appreciate the opportunity to participate in staff development programs without leaving their buildings, the library media specialists within the 17 school districts who have been asked to facilitate the distance education programming have not been as enthusiastic. The questions below, which are related to facilitating ITFS programs, have dominated several NEWTEC Board meetings:

(1) Who is responsible for disseminating the information to appropriate staff within the building?

(2) Who is responsible for setting up and checking ITFS equipment operation prior to broadcast?

(3) Who is responsible for making sure the support materials for the program are available for staff and students prior to and after the broadcast of the distance education programs?

Prior to the start of the 1989-90 school year, the ITFS consortium board asked each participating school site to identify a contact person in its school who would be responsible for setting up receive equipment, dissemination of program information, and monitoring program broadcast quality. These ITFS receive site facilitators were brought into Green Bay for a one-half day inservice on how the system functions and how to set up and troubleshoot the VCR/conference phone/TV unit for viewing. Also explained at that meeting were the process used to disseminate information to students and staff on programming and how the registration process would work for staff development programs.

The experience of the ITFS staff in troubleshooting problems at the various receive sites during the fall semester of the 1989-90 school year demonstrated that there were relatively few problems at receive sites where facilitation of ITFS programming was the responsibility of the library media specialist. In many cases problems could be handled with assistance provided over the phone. At the non-library media specialist operated receive sites, ITFS staff have had to drive out to the schools on numerous occasions to troubleshoot the problems.

The school superintendents from the school districts participating in NEWTEC have come to realize that the library media specialists' role and skills in information access make them key staff members to lead the school's planning and use of educational technology. Hence, the library media specialists in the majority of the consortium school districts have had to reprioritize some of their responsibilities to include the accessing and dissemination of information on distance education programming for staff and students.

If the library media specialists are going to truly accept the challenge of the AECT and the AASL and strive to become effective instructional consultants for staff and students, what responsibilities must they accept for accessing and promoting effective use of instructional technologies? It is this administrator's opinion that library media specialists need to have a broad knowledge of resources and teaching methodologies that includes an understanding of the instructional design process and the application of telecommunications in elementary and secondary education.

V. What Is the Role of the K-12 Library Media Specialist in Distance Education?

Mary Diebler (1984) begins her article entitled "Marion in the Satellite Age" with a brief scenario of how Marion the Librarian starts her day in a futuristic public library. This futuristic library uses computers and satellite technology to access information and video databases to meet all the curricular needs of staff and students.

As noted earlier, the library media specialist's role as distance education facilitator in the Green Bay Area Public Schools did not come without concern, reluctance, and several training sessions. More importantly, this role should not be limited to disseminating information, setting up the ITFS receive equipment, and reluctantly letting staff and students use the library media center during and after school for viewing ITFS programming. If the K-12 library media specialists are willing to accept the challenge of *Information Power*, and strive to become effective instructional consultants for staff and students, they must be responsible in their school(s) for accessing and promoting effective use of instructional technologies. A thorough review of the literature on distance education provided limited information on the role "Marion the Librarian" must play to facilitate telecommunication technology for elementary and secondary schools.

Evaluation reports of distance education programs for K-12 education by both Robinson and West (1986) and Morehouse (1987) reflect what earlier researchers on the effectiveness of distance education have found:

- Students learn as much through distance education programs as they do through conventional programs, and
- Students like distance education programs as much as they like conventional programs.

However, no mention is made of the role, if any, that the library media specialist can play in facilitating and implementing distance education in the participating elementary and secondary schools.

Involvement of the Library Media Specialist in Distance Education

How can library media specialists support teachers and students in their attempt to use distance education technology as a viable teaching/learning tool? The Rural Reading Project in Wausau, Wisconsin, as described by Wilsman (1989), promotes the role of the library media specialist as a leadership position in implementing the "reading is thinking" model. Wilsman goes on to point out that the library media specialists involved in the project have become proficient in the use of the five telecommunication technologies utilized. She sees the library media specialists as being responsible for improving the district's capacity to obtain maximum learning benefits from distance education programs for staff development in reading.

In their research on K-12 education programs, Batey and Cowell (1986) hint at the potential involvement of library media specialists. They found that, although interactivity in distance education is critical, it is not the only ingredient in a successful system. Features beyond the technology such as good curriculum, good teaching, and good program organization are also critical to success. Batey and Cowell go on to say that the curricular ingredients for an effective distance education program are essentially the same as those used in a standard classroom situation. Distance education curriculum, they say, should be developed collaboratively by experienced teachers, content specialists, and technical personnel.

Self-Contained Telecourses May Stifle Student Initiative

Both Meakin (1985) and Smith (1986) observed in their studies that distance education designers of telecourses usually opt for a massive compilation of readings, allowing the distance learner to be self-sufficient. Smith points out that the lack of library media center involvement has been the result of the tendency of designers of distance education courses to structure and package the course so meticulously that learners have no choice in what they learn vs. how they learn it, thus inhibiting creative thinking and critical analysis.

In his presentation to the Fifth Annual Distance Learning Conference in Madison, Wisconsin, Borje Holmberg (1989) warned that student motivation is being stifled by a depersonalized distance education system. He argues that:

> Both distance educators and students are often fond of entirely self-contained courses, i.e., courses that contain everything students need so that they can avoid time consuming consultation of books, articles, and databases. . . . There is a great risk involved. A self-contained course can easily become autocratic, telling students not only what to do but what conclusions are the proper ones, thus depriving them of the exercise of their own criticism and judgement. (1989, p. 1)

Holmberg suggests that one of the ways to avoid this difficulty and provide classes that are more academic is to assign more individualized project work in distance education. This type of work, he points out, will require a well-equipped library with excellent resources and services.

Meakin (1985) says it very distinctly: "We are doing the distance learner a tremendous disservice since a major role of postsecondary education is to teach students and get them to learn how to access knowledge for themselves" (p. 55). Meakin's paper on library services to distance education for postsecondary students provides information relevant to the development of library media centers in K-12 school districts utilizing this technology.

Library Media Centers Can Provide Support for Distance Learners

The distance learner, says Meakin, needs to access all forms of print and non-print material, thus making cooperation and resource sharing the most important ingredients. In addition to the resources and equipment, the institution should provide full information on how remote students can access library services. Services should be prompt and performed preferably by staff whose responsibility and commitment is to the distance learner. Meakin briefly mentions some of the services that should be provided, including computer database searching, electronic mail, facsimile transmission services, online access to the institution's library catalog, and interactive videodisc storage.

The two examples of postsecondary distance education systems that follow illustrate how college and university library media centers can support distance education students.

At California State University in Chico, faculty and student awareness of what the library consists of and what it can do plays a key role in distance education programs. Staff members contracted to teach distance education courses meet with library media staff to discuss course needs. The library staff also works with the public library network to help distance education students obtain resources by either print, microforms, computer software, or online access. Online database services include DIALOG and BRS. A computerized catalog and circulation system provides off-campus students with dial-up keyboard access to the complete campus collection. Delivery vans and U.S. mail are used to deliver books, photocopies, microfiche, audiovisual kits, and computer texts to centers (Cookingham, 1982).

The second example occurs at Simon Fraser University (SFU), British Columbia, where librarians have been given the responsibility for providing distance learning students with equal access to all of the university collections and necessary resources. Students use a toll free telephone network to contact the SFU library for books and articles needed for distance education courses. They are able to call 24 hours per day and telephone answering machines are used to accept calls and record information. Calls are transcribed to support staff each day and resources are mailed to the student's home address. When appropriate, library staff will initiate interlibrary loan requests on behalf of the SFU distance education students. Librarians also use online computer services on a selective basis to facilitate subject searches for students at a modest fee (Slade, 1986).

In her report on the open university system in Australia, Crocher (1985) maintains that library media specialists can play an active role in course preparation through involvement, cooperation, and working with course writers. Library media specialists, she believes, need to become more involved in the course development process, helping to adapt library resources to the teaching strategies for the distance learner. The result will be improved access to resources and a greater awareness of staff and students to a variety of information resources and teaching strategies.

Librarians, according to Crocher, can advise course designers on the strengths and weaknesses of the library collection, thus ensuring that recommended readings and resources will be purchased and available when needed. The production of annotated bibliographies for courses is another valuable service provided to distance education instructors.

The role of the library media specialist in providing curriculum design assistance to distance education instructors is described by Jackson (1983), who identified six considerations for library media specialists when designing support services for distance education programs:

(1) Identify where the closest information resources for a course can be found.

(2) Provide a central library collection of multiple copies of resources for interlibrary loan to receive sites.

(3) Repackage information resources that are to be dispatched to students

(4) Develop flexible lending policies for interlibrary loan and the distribution of resources to receive sites.

(5) Acquire the additional playback equipment for audio and videocassettes utilized by the courses.

(6) Provide continuing education courses for library media staff members on non-traditional teaching strategies, with emphasis on motivations and problems connected with distance education.

In their book on the administration of instructional telecommunications, Hudspeth and Brey (1986) also stress that the role of the library media specialist is to work cooperatively with content area specialists to design curriculum for education courses. The library media specialist, in addition to serving as a curriculum consultant, must fulfill the other two roles identified in *Information Power*, those of collection manager and teacher. They suggest that the library media specialist should negotiate specifications for learning and teaching strategies and plan how each instructional objective will be met with appropriate library media resources.

Hudspeth and Brey expand on Jackson's (1983) recommendations for library media support of distance education programs. They suggest that library media programs provide a learning environment for distance education courses if they:

(1) Provide students with a bibliography of new books with notes on specific concepts to explore in the course.

(2) Provide bookstores and book distributors with a list of suggested books and the name of the telecourse.

(3) Purchase a small teleconference bridge to allow four to six students to participate in small group discussions.

(4) Coordinate "self-help" groups that can meet at the library to discuss issues and prepare for exams.

(5) Enlist the aid of local libraries, museums, banks, and other public buildings to locate a meeting space where supplemental print and non-print resources can be used by the distance learner.

(6) Facilitate and encourage field trips. (1986, p. 86)

They also offer the following hints to the library media specialist for providing appropriate resources for distance education courses:

(1) Assign one person the responsibility to review content and prepare auxiliary support materials and activities.

(2) Distribute materials and create networks (field trips, conference calls) based on a sound database.

(3) Maintain good relationships between the college and other private and public entities.

(4) Provide a carefully designed information dissemination system that efficiently promotes communication. (1986, p. 87)

Study Environment and Resources

The authors go on to stress the importance of creating a desirable study environment for the distance education student. Most important for this environment to exist is a separate space to be designated for telecourse study. This area should have files with all information pertinent to the course, as well as an array of reference books, videotapes, trial exams, and other learning resources.

The types of print and non-print resources utilized by the distance education student depend on the telecourse since each medium holds some potential for supplementing a particular course. If nationally produced programs are used, faculty may request library media staff to produce additional resources dealing with the state and/or local scope of the issues. The library media center will also need to have appropriate video equipment to allow for the review of videocassette copies of the distance education classes for lessons missed or review of exams.

Hudspeth and Brey (1986) state that videotapes, video players, monitors, other AV equipment, space, and staff constitute a major start-up cost for a library media center to support distance education courses. They go so far as to suggest that the responsibility does not stop with the production of distance education support resources, but should include the management of the distance education system as a logical outgrowth of providing a broad range of instructional resources for students and staff. The rationale is based on the existing organization and budget of the library media center, which is responsible for the evaluation and selection of video programs, the acquisition of instructional resources to support courses, and, in some cases, housing the media production and cable casting services.

However, it is the attitude of the library media specialist toward this new role, according to Hudspeth and Brey (1986), that is a key factor in determining the quality of these support services. They recommend that the library media specialist be involved early in the planning process and continue to receive planning and management information. More important than the role of providing facilities, resources, and support of student inquiry, however, is the nonverbal attitude library media staff communicate to the distance education students.

VI. Designing a K-12 Library Media Program To Facilitate Distance Education Programming

Hudspeth and Brey's (1986) position that the management of distance education is an outgrowth of the library media specialist's role of technology and instructional resource consultant for his or her school fits very nicely into the philosophy of the American Association of School Librarians (AASL) and the Association for Educational Communications and Technology (AECT). As stated in *Information Power* (AASL & AECT, 1988), if K-12 library media specialists accept the mission of the library media program as equal access to education and the assurance that students and staff are effective users of ideas and information, then they must also accept the challenge to provide leadership and expertise in the use of information and instructional technologies. This leadership role for library media specialists includes the effective use of distance education technologies and the integration of the library media resources into the distance learning curriculum.

Obstacles to the Success of Distance Education

If distance education is going to become an effective teaching/learning tool in elementary and secondary education, two major obstacles need to be overcome. First and foremost is the attitude of library media specialists towards distance education technology and their willingness to go from a "no involvement" level of participation to what Turner (1985) calls the "Action Education" level of instructional design. At the Action Education level of instructional design, the library media specialist and teacher form a design team to select resources appropriate for the instructional objectives and the students' learning styles.

The second obstacle, as described by Meakin (1985), Smith (1986), and Holmberg (1989), is the highly structured packing of course content by distance education course designers which inhibits the students' creative thinking and critical analysis. This obstacle, however, is contingent upon our success in overcoming the first obstacle. If the library media specialists accept their role in the instructional design process as a curriculum resource consultant, than they will assist distance education instructors in the design, production, and selection of instructional materials based upon the course objectives and learner characteristics.

Unlike the slow meticulous process used by K-12 library media specialists to computerize their library management functions, library media staff will not be able to postpone their distance education involvement. Socioeconomic and demographic changes in our country have provided the impetus needed to abandon an educational structure that no longer meets the needs of all its students. According to Barnshaw:

> The main effect between the present period of technological change and earlier periods is that our society now has a greater opportunity to direct the development of the technology to meet positive social goals, instead of becoming the beneficiary of uncontrolled technological change. (1987, p. 77)

One of those goals is the ability to provide quality and equity of educational opportunities for all students. The role of the library media center in K-12 education is dependent on the educational philosophy and goals of the school system. If educators are truly serious about developing life-long learning skills in students before they graduate, the K-12 library media program has to play a major role in the development of problem solving and critical thinking skills. As the Commonwealth of Australia Advisory Committee of Advanced Education stated:

> Ultimately, the library is primarily concerned with providing means for individual study by the student in his own time, at his own pace, in such a way that his interest is stimulated and he becomes self-disciplined. . . .If this is to happen, the lecture and laboratory programs should allow time for this extremely important activity by the students. (1969, p. 63)

A similar perspective on the role of the library media program in developing thinking skills is provided by Allen, who argues that:

> The highest aim of the library in its contacts with students, whether in class groups for specific instruction throughout their studies or as individuals with unique problems, will be to stimulate them to make independent searches for knowledge, and to guide them to a competence in the use of the available aids to learning. (1982, p. 531)

Training in Technological Skills for Library Media Specialists

Where then can the K-12 library media specialist go to gain this wisdom and obtain those skills that they will need to creatively integrate library media resources and services with telecommunications technology? Robinson (1983) stated that one of the prime reasons people fear technology is that they do not understand it. Intensive training is often necessary before a person can talk to a machine intelligently. Hence, future library media specialists will need to receive training in distance education technology and the elements of good instructional television. What better way to discover the potential of a technology than to interact with it under learning conditions?

The University of South Carolina, which has been a leader in distance education via satellite, provides one solution. Since 1982, the University of South Carolina College of Library and Information Science has offered more than 20 for-credit courses which have involved more than 400 individual students. Librarians enrolled in these courses learned first hand of the major problems encountered by distance education students.

Barron (1987) surveyed library media students who had taken distance education courses from the library school since 1982. These distance learning library school students quickly found they had limited access to resources on the main campus, and thus had to rely on local resources, interlibrary loan, or, in the case of the children's literature course, traveling to different libraries to complete assignments. The second problem confronted by these future librarians was limited access to instructors once the television was turned off and questions needed to be answered. Participants felt a lack of the social and emotional support that is normally provided by the conventional teacher-class interaction. However, despite some of the disadvantages, distance education did allow 55% of these future library media specialists to continue their course work, which they would not have been able to do without distance education technology.

Unfortunately, few school districts have the benefit of a library media training program similar to that of the University of South Carolina. The ability of library media specialists to receive training via a hands-on experience in distance education would be invaluable to their understanding of this educational delivery system. Library media specialists must obtain training not only in the operation of the distance education equipment, but in the strengths and limitations of this technology to deliver curriculum to students. As the library media students in South Carolina quickly learned, once the TV is turned off, distance learners are on their own to access information that will further help them understand the topic being studied. Hence, library media staff need to understand their roles in distance education as information providers and curriculum consultants, and actively seek the training necessary to facilitate distance education technology in their schools. They must learn how to select and access resources that meet the specific goals and objectives of the curriculum delivered over the distance education system.

The Green Bay Area ITFS system provides an example of how one consortium of school districts trained their library media staff to facilitate the use of distance education opportunities for participating staff and students. During the pilot semester, the training of the library media specialists on the operation and use of ITFS receive site equipment could best be described as "hit or miss." ITFS staff offered an inservice over the ITFS system on how the system worked. Even though several days were devoted to putting together instructional packets of information, and several more going out to sites to set up equipment and check operations, the system was malfunctioning the day of the inservice. Unfortunately, only those sites where the library media staff took the initiative during the pilot semester was programming provided on a regular basis.

At the start of the 1989-90 school year, the Green Bay ITFS staff worked with administrators in each participating school district to identify a receive site facilitator for each of their schools, and required them to attend one of the two-hour training sessions at the ITFS studio and control room. The majority of NEWTEC schools have identified the library media specialist as their receive site facilitator. This inservice was designed to describe how the system functions, its limitations and potentials, and the library media specialists' role as receive site facilitator for their schools. This was followed by an on-site visit by ITFS staff to check each facilitator's ability to set up the receive units for programming.

One indicator of the success of this training and the comfort level of library media staff with distance education is the substantial reduction in the number of panic phone calls two to five minutes before air time. Success can also be judged by the increased number of requests for satellite programs from library media staff, who only a year ago didn't know that ITFS technology existed in Wisconsin. In addition, two staff meetings were conducted to watch national teleconferences on the utilization of distance education in the United States and the role of the library media specialist in instructional design. Evaluation results of the pilot semester of operation of the Green Bay ITFS program by Burke (1989) support the need for a continuous inservice for library media specialists on the instructional design process and their involvement at each stage.

Information Skills for Students

Library media specialists can reinforce this newly acquired knowledge by providing formal and informal instruction in information accessing skills to staff and students involved in distance education. This proactive approach to supporting the delivery of courses via telecommunications technology by using good fundamental teaching strategies will assist in overcoming the second obstacle. This obstacle, as Smith (1986) pointed out, is that students can be conditioned by the practice of supplying the total resource package for the distance education course. The result is that students then tend to accept whatever is prepared for them as the last and final word on the topic, without using critical thinking skills such as analysis and synthesis. Secondly, he believes that this spoon feeding ignores the diverse experiences and backgrounds students bring to the class situation, and it also limits their freedom of choice of information and sources and learning strategies.

Designing distance education courses to be totally self-contained is contrary to the principle of distance education. As Faibisoff comments:

> By definition, distance education relies on students to accept responsibility for the success for their program and not depend on the presence of an authoritarian professional educator. It is assumed that students will. (1) plan their own programs, (2) take responsibility for their own learning, and (3) evaluate their own learning. (1987, p. 255).

The Library Media Specialist and Instructional Development

Both Turner (1985) and *Information Power* (AASL & AECT, 1988) emphasize that one of the roles of the library media specialist is to help teachers in the design, implementation, and evaluation of instruction. Turner identifies four levels of intervention or involvement by the library media specialist in the instructional design process that are applicable to the distance education process. The four levels of intervention are: (1) no involvement, (2) passive participation, (3) reaction, and (4) action/education (p. 15).

The library media specialist should work with distance educators in the distance education design process at the level of action/education. The K-12 library media specialist must assume an integral role at both ends of the distance education system, i.e., receive site facilitator and course designer. Hudspeth and Brey (1986) point out that the K-12 library media specialist should provide formal and informal instruction in information accessing skills to staff and students involved in distance education. They further support the need for the library media specialist to work cooperatively with distance education course designers and facilitators in the instructional design process to ensure that the resources selected meet the specific goals and objectives of the curriculum and the needs of the students and staff.

Provision of Resources Appropriate to Students' Learning Styles

Unless the K-12 school district originates distance education programs for broadcast over an interactive television system, the library media specialist's production responsibilities center around identifying the learning styles of the participating students and providing the resources appropriate for these styles. Just as the library media specialist needs to meet with building staff to make them aware of the center's resources and services, similarly the library media specialist must contact the distance education instructor in the course. In working with the distance education instructor, the library media specialist must:

- Ensure that distance education students have equal access to library media resources.
- Ensure that two-way interaction exists between instructor and students to assure proper feedback; this could be done via teleconferences, electronic mail, facsimile or on-site visits.
- Ensure that emotional support is provided for distance learners as well as resource support.
- Select or design aesthetically pleasing resources to motivate the distance learners.
- Develop a bibliography of available resources that are matched to specific concepts of the course for students to explore.
- Provide an appropriate space for telecommunications equipment and computerized instruction tools; space

requirements will depend on the need to accommodate computer labs, online terminals, CD-ROM readers, teleconferencing equipment, and a satellite receive station and viewing room.

- Establish a network of public and postsecondary resources for use by distance education students.
- Prepare a resource list for distance education courses that describes the available library resources which support courses.
- Maintain a collection of videocassettes of telecourses in the library media center for students who missed classes or need to review information prior to an exam.
- Assist in the coordination of "self-help" groups or cooperative learning activities at the receive site.

An appropriately staffed library media center provides the ideal location for the K-12 use of interactive telecommunications systems. Many K-12 library media centers today contain the equipment needed to facilitate distance education, i.e., a television monitor, videocassettes, videodisc players, microcomputer terminals with modems, a cable distribution system, and a satellite dish. The distance learner will need access to all forms of print and non-print resources, including, when available, electronic mail services, facsimile transmission services, computerized database searching, online catalog access, and interactive multimedia resources such as videodisc and CD-ROM storage systems.

Like computers during the 1980s, advances in video technology during the 1990s, combined with the changing socioeconomic demographics of our society, will greatly accelerate the adoption of distance education into K-12 education. The library media specialist will need to become familiar with the existing and rapidly expanding telecommunications technology, so that he or she will be able to determine the strengths and weaknesses of each as an information access tool. Recent advances in all four categories of media for distance education—print, audio, video, and computer—require careful evaluation for use in K-12 education. For example, the recent surge in use of the facsimile machines has already gained strong support from library media centers. The "FAX" machine combines two telecommunications technologies, print and audio. The primary use of FAX machines by library media centers is to receive requests. Illinet, a network of 150 FAX sites in Illinois, has grown in three years from 420 requests per month to an average of 2,220 per month. FAX machines are being used to answer communications previously answered with formal letters or phone calls. Libraries will use FAX machines to send interlibrary loan requests, library searches, and other research related transactions (Max, 1988). The utilization of FAX machines at each distance education receive site would enhance resource sharing and utilization between course participants and a central library media collection by allowing for the immediate transfer of information and avoiding the delays caused by using the U.S. mail system.

The K-12 library media specialist involved in the distance education design process should carefully examine the access to online databases. Electronic databases offer the distance learner access to traditional sources of information faster and in a more precise and comprehensive manner. Information that could not be obtained by high school staff and students before can now be accessed electronically. Distance educators and students have access to basically three types of databases—full text, bibliographic, and numeric. Access to online database services such as DIALOG, BRS, NEWSNET, WILSONLINE, EINSTEIN, and X-Change Express can provide invaluable resources for distance learners doing research.

Berger (1989) suggests that library media specialists look at CD-ROM technology as an alternative to online databases, which can be costly. Online searching requires a computer, a modem, communications software, and access to one or more database services with hourly connect charges and telephone costs, whereas a CD-ROM disc can be purchased or leased for one year. CD-ROM is more cost effective when a database is in high demand and searched often, while online is more comprehensive, very current, and expensive. While online and CD-ROM databases currently provide excellent support for distance education curriculum, the real potential of distance education will not be realized until interactive multimedia combines with distance education technology to provide students with the ultimate hands-on learning experience. The use of interactive multimedia will provide a nonsequential learning environment in which information is linked by association. The information linked will be accessed from texts, sound graphics, animations, and videos, and controlled by a computer.

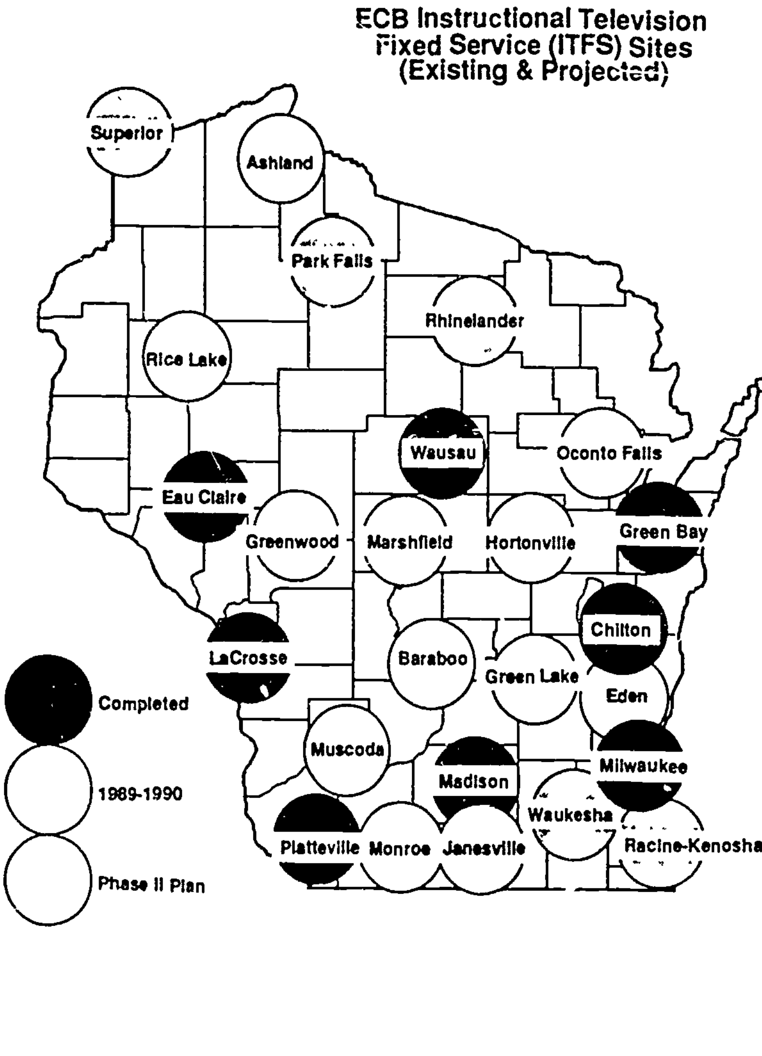
The increased utilization of distance education technology in elementary and secondary schools will provide staff and students with a much more global view of events and the need to access world-wide information. The need for rapid information access and its availability in electronic form will enhance the library media specialist's role of curriculum consultant and information provider. The success of this transition will depend very heavily on the inservice training of the library media staff and their participation in the long-range planning process to determine the utilization of new technologies.

The joint AASL and AECT publication, *Information Power*, says it best:

> New opportunities for access to information challenge school library media specialists to be aware of new developments, recognize those appropriate for their library media programs and provide leadership and expertise for their incorporation into the instructional program of the school. They must evaluate, select

and manage the technologies that make information and ideas available in a wide variety of formats. (AASL, 1988, p. 27)

Appendix A: Instructional Television Fixed Sites in Wisconsin



Appendix B: SERC Participants

SATELLITE EDUCATIONAL RESOURCES CONSORTIUM

PO BOX 50,008
COLUMBIA,
SOUTH CAROLINA 29250

803 799 5517

SERC FACT SHEET

SERC is a unique consortium of 19 states and five cities It is the best example of state departments of education, local school districts, state and local educational television entities, instructional program producers, university educators, and private industry focusing their considerable resources to collectively improve education. The board of directors of SERC includes the chief state school officer and the chief executive of the educational television entity of every participating state Membership is open to all State members include

Alabama	Kentucky	North Carolina	Texas
Arkansas	Louisiana	North Dakota	Virginia
Florida	Mississippi	Ohio	West Virginia
Georgia	Nebraska	Pennsylvania	Wisconsin
Iowa	New Jersey	South Carolina	

Associate members are a partnership of local educational television stations and local education agencies Associate members include

Boston, Massachusetts	Kansas City, Missouri
Cleveland, Ohio	New York City, New York
Detroit, Michigan	

Participation Figures for the 1989-90 Demonstration Year

Number of states reached by SERC		23
Number of SERC high schools		330
(as of 9/30/89)		
High school students enrolled in credit courses		3,500
Japanese (3 sections)	1,123	
Russian (3 sections)	941	
Probability & Statistics and Discrete Math (2 sections)	726	
Advanced Placement Economics Micro & Macro (3 sections)	710	
Schools participating in Science, Technology and Society Seminars.		85*
Schools participating in afternoon teacher in service and graduate level courses		108*

* Figures in these categories may change due to continuing registration

Number of satellite uplinks funded in part with Star School match	4
Number of satellite downlinks funded in part with Star Schools match	249

Success of 1989 Spring Pilot Semester

Of the 58 schools participating in the SERC pilot semester in the spring of 1989

- 57% were small schools with enrollments of less than one thousand students.
- 53% of the schools were in rural areas 22% were in urban areas.
- Those students taking high school courses for credit received the following grades
  A - 36% B - 27% C - 19% D - 10% F - 8%
- 97% of the principals of participating schools said they would enroll in SERC programs again. 87% said they planned to expand the number of SERC courses offered in their schools.

Funding Leveraged with Star Schools Grant (First Year)

Star Schools first year grant to SERC	$5,600,000
State and associate membership dues	382,500
State and local match for equipment (budgeted)	2 243 000*
State match for productions (budgeted)	1,667 000*
Student course school fees (estimate)	900 000
Teacher in-service, graduate courses fees (estimate)	30 000
Total leveraged from first year grant	$5,222,500

*Based on a 50-50 match of Star Schools funds

Filling the Gap

Qualified teachers in math, science and language instruction are in short supply. Even worse, over 40% of the present mathematics and science teaching force will retire by 1992. Many rural and urban schools simply cannot find qualified teachers to run critically important classes, and they do not have the funds necessary to attract new instructors into the system. SERC is the only way they can offer courses in math, science and foreign languages.

Wisconsin SERC Fact Sheet
Participation Figures for the 1989-90 Demonstration Year

High schools taking student credit courses located in:

DeForest	Mineral Point	Plymouth
Green Bay	North Fond du Lac	Rice Lake
Luxemburg-Casco	Oakfield	Seymour
Menomonie	Peshtigo	Spencer
Merrill	Platteville	Waunakee

Students enrolled in credit courses:
- Japanese - 60
- Russian - 40
- Probability and Statistics - 9
- Advanced Placement Economics - 13

School districts enrolled in Wisconsin-produced in-service teleconferences.
- Thirteen one-hour forums - 24
- Four six-hour workshops - 9

High schools enrolled in Science, Technology and Society seminars - 9

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SERC Participants

and Board Representatives

ALABAMA

Dr. Wayne Teague Superintendent Department of Education	Judy Stone Executive Director Alabama Public Television

ARKANSAS

Dr. Ruth S. Steele Director General Education Division Department of Education	Susan Howarth Executive Director Arkansas Educational Television

FLORIDA

Betty Castor Commissioner Department of Education	Don MacCullough General Manager, WLRN Florida Public Broadcasting

GEORGIA

Werner Rogers Superintendent Department of Education	Dr. Richard E. Ottinger Executive Director Georgia Public Television

IOWA

Dr. William L. Lepley Director Department of Education	George C. Carpenter Executive Director Iowa Public Television

KENTUCKY

Dr. John H. Brock Superintendent of Public Instruction Department of Education	O. Leonard Press Executive Director Kentucky Educational Television

LOUISIANA

Wilmer S. Cody Superintendent Department of Education	Beth Courtney Executive Director Louisiana Public Broadcasting

MISSISSIPPI

Dr. Richard A. Boyd Superintendent Department of Education	A.J. (Jody) Jaeger Executive Director Mississippi ETV

NEBRASKA

Dr. Joe E. Lutjeharms
Commissioner
Department of Education

Jack McBride
General Manager
Nebraska ETV

NEW JERSEY

Saul Cooperman
Commissioner
Department of Education

Robert G. Ottenhoff
Executive Director/
General Manager
New Jersey Network

NORTH CAROLINA

Bob R. Etheredge
Superintendent
Department of Public
Instruction

John W. Dunlop
Executive Director
UNC Center for Public
Television

NORTH DAKOTA

Dr. Wayne Sanstead
Superintendent
Department of Public
Instruction

Dennis L. Falk
Executive Director
Prairie Public
Broadcasting, Inc.

PENNSYLVANIA

Thomas K. Gilhool
Secretary of Education
Department of Education

H. Sheldon Parker, Jr.
General Manager
Pennsylvania Public Television

SOUTH CAROLINA

Dr. Charlie G. Williams
Superintendent
Department of Education

Henry Cauthen
President/General Manager
South Carolina Educational
Television Network

TEXAS

William N. Kirby
Commissioner
Department of Education

Noel Smith
General Manager, KNCT
Texas Public Broadcasting

VIRGINIA

Dr. S. Jolly Davis
Superintendent of Public
Instruction
Department of Education

Suzanne Piland
Director
Department of Information
Technology

WEST VIRGINIA

John Pisapia
Superintendent
Department of Education

Ken Jarvis
Executive Director
West Virginia Public Television

WISCONSIN

Herbert J. Grover
Superintendent
Department of Public Instruction

Paul M. Norton
Executive Director
Wisconsin Public Television

ASSOCIATE MEMBERS (Not represented on Board of Directors)

BOSTON, MA

Barry Cronin
WGBH Educational Foundation

CLEVELAND, OH

Gary Vance
WVIZ-TV

DETROIT, MI

Douglas Halladay
WTVS-Channel 56

KANSAS CITY, MO

Lee Allen
KCPT-TV

NEW YORK, NY

Esther Ready
WNET-TV

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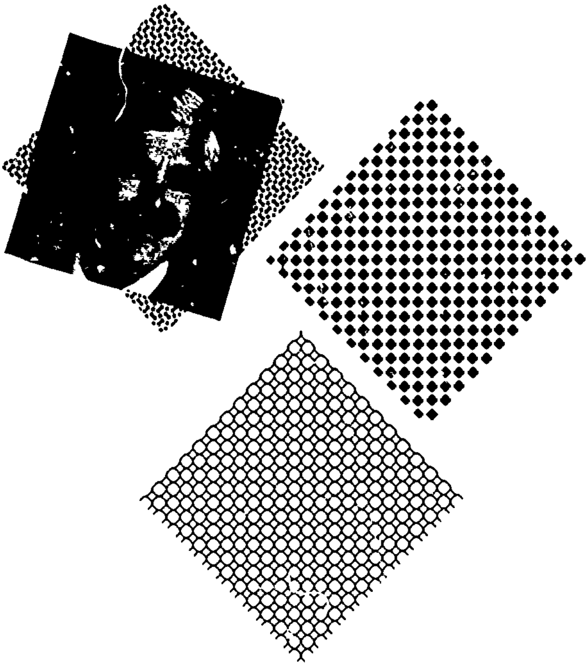

As the Director of Instructional Resources for the Green Bay Area Public Schools in Green Bay, Wisconsin, Michael A. Burke is responsible for the coordination and supervision of the library media resources and services, the elementary library book processing center, textbook processing, and printing and duplication services for the school district. He is also involved in the long range planning, development, and implementation of the Green Bay Area Instructional Television Fixed Service (ITFS) system. He holds a B.S. degree in mathematics and an M.A. degree in library and information science. He is currently completing requirements for a Ph.D. degree in urban education with a specialty in administrative leadership at the University of Wisconsin-Milwaukee.