To the Graduate Council:

I am submitting herewith a thesis written by Timothy J. Hogan entitled "Two-Way Interactive Television in Education: A Historical Overview and Case Study of Project TIDSS." I have examined the final copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the requirements for the degree of Master of Science, with a major in Communications.

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TWO-WAY INTERACTIVE TELEVISION IN EDUCATION: A HISTORICAL OVERVIEW AND CASE STUDY OF PROJECT TIDSS

A Thesis
Presented for the
Master of Science
Degree
The University of Tennessee, Knoxville

Timothy J. Hogan

December 1990

DEDICATION

This thesis is dedicated to Dhyana, my family,

and a new age in education.

ACKNOWLEDGMENTS

In the course of my graduate studies, a number of scholars have assisted me with their academic expertise. In particular, I'm indebted to the members of my committee, Dr. Dhyana Ziegler, Dr. Barbara Moore, and Dr. Carmen Manning-Miller, who served as my chairperson and committee respectively. Their consultation and encouragement made this endeavor possible, although any errors that remain are solely my responsibility. Special acknowledgement to Dr. Dhyana Ziegler, my mentor, for never losing faith and making this dream a reality.

In addition, I would like to recognize Camille Hazeur for seeing me through the 'darkest hours'. Also, I would like to acknowledge Michael Hogan for his encouragement and criticism.

Finally, I would like to thank the Jackson County Intermediate school District and Gerald Lang. Their cooperation made this endeavor possible.

ABSTRACT

The purpose of this study is to acquire an understanding into how, historically, the twelve constituent school districts that comprise the Jackson County Intermediate School District (JCISD), implemented a two-way interactive interconnect system into their curriculum. The project called Two-way Interactive Delivery system for Schools (TIDSS), was implemented to solve an identified problem, shared academic programming. It has been in operation since the 1987-88 school year.

This research is an amalgamation of information gathered from personal interviews, on-site class inspection, and archive research. The study first establishes why the JCISD decided to use two-way interactive technology to alleviate their identified problem, shared academic programming. The study then presents a chronological framework of how the project was implemented. This includes how the system is being used and the implications that have arisen as a result of its implementation. Finally, an attempt is made to establish a list of criteria for the implementation of a two-way interactive interconnect system.

This research indicates that the criteria for successfully implementing a two-way interactive delivery system includes but is not limited to: a long term commitment made by all participating principles; cooperation from all participants; realistically establish

funding mechanisms not only for actual construction cost but for ongoing operational cost as well; complete the planning process prior to actual construction, including a final engineering study; involve staff, teachers, students, and anyone else who may be potentially involved in the planning and implementation process; use consultants in the planning and implementation process; bring a few sites online for trial programming prior to bringing the entire system online, to work out any bugs in the system; establish inservice programs to help teachers make maximum use of two-way interactive technology; go slow during the implementation process; and, above all, be flexible.

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CHAPTER I

INTRODUCTION

Technology is clearly changing the structure of our lives and the society in which we live. In order to keep pace in the world economy, the U.S. has shifted from an industrial-based society to an information-based one (Kitchen, 1987). "Information sector businesses are expected to create a majority of the new jobs in the future and all businesses are becoming more reliant on telecommunications technologies to handle their communications and information distribution needs" (p.5).

Telecommunications is a term that encompasses the entire spectrum of electronic media. Specifically, telecommunications can be defined as: "systems, many involving high levels of technology, which enable conversation, data exchange, sound and visual material to be transmitted between individuals or among groups over great distances with possibility of immediate response" (Distance Learning Systems, 1987). Educational telecommunications can be defined as: "noncommercial television and audio (and related electronic media) transmissions of purposeful, broadly educational, communications-whether for specific classroom objectives or for general public enlightenment" (Wood, 1977 p.5). There are telecommunication technologies available that could assist in restructuring are educational system. According to Pinsel (1988), "We should identify the range of unmet educational needs with which we have had to live and, within the range of technological tools, examine the new possibilities that current technologies might offer in meeting those needs."

Historically, educational institutions have lagged behind the business sector in relation to implementing new technology. Ziegler (1985) states, "As telecommunications technology introduces diversification to society, it is revolutionizing the delivery of education as well" (p.8). Her research emphasizes the "importance of institutions updating their systems to keep up with a fast and changing society through the use of telecommunications technology" (p.8). According to Lang and Kitchen (1989), the pace at which the Information Age is moving is "staggering." "The impact of the Information Age, the rapid rate of change in today's society, and the explosion of new knowledge is having and will continue to have a dramatic effect on public education in our country, especially in light of the well publicized and documented decline of learning opportunities and quality curricula for students" (p.24). Benson (1988), discussing the current telecommunication situation in relation to socioeconomic influences, says that educators are facing overwhelming odds. However, "educators have maintained a creative commitment to seeking ways that learning technologies and telecommunications can address their goals" (p.10). Bramble (1986) offers this summation. Technology "has certainly changed the nature of knowledge and what it means to be knowledgeable. As a result it may ultimately change the nature of education and the educational process."

This research suggest that our society as a whole cannot afford for our educational institutions to fall behind in regard to implementing new telecommunication technologies, technologies which could be an impetus for a new age in education.

A New Age In Education

One telecommunication technology that is finding its way into the classroom is interactive television (ITV). According to Johnson and Tully (1989) ITV is a communication system that when used in education allows teachers and students to interact through audio and video channels. Some systems have degrees of interaction. For example, a system may allow all participating classrooms to receive video transmission, but is not capable of two-way audio transmission. Some systems may allow two-way audio, but only one way video transmission. Some systems are fully interactive, allowing teachers to see and hear all students on a television monitor (regardless of the distance that separates them). In turn, students are able to see and hear the teacher, as well as other students at other remote sites. In other words, everyone participating is capable of interacting with one another instantaneously. This type of system is referred to as two-way interactive television and will be the focus of this paper. The terms two-way interactive television and interactive television, for the purpose of this paper, are synonymous.

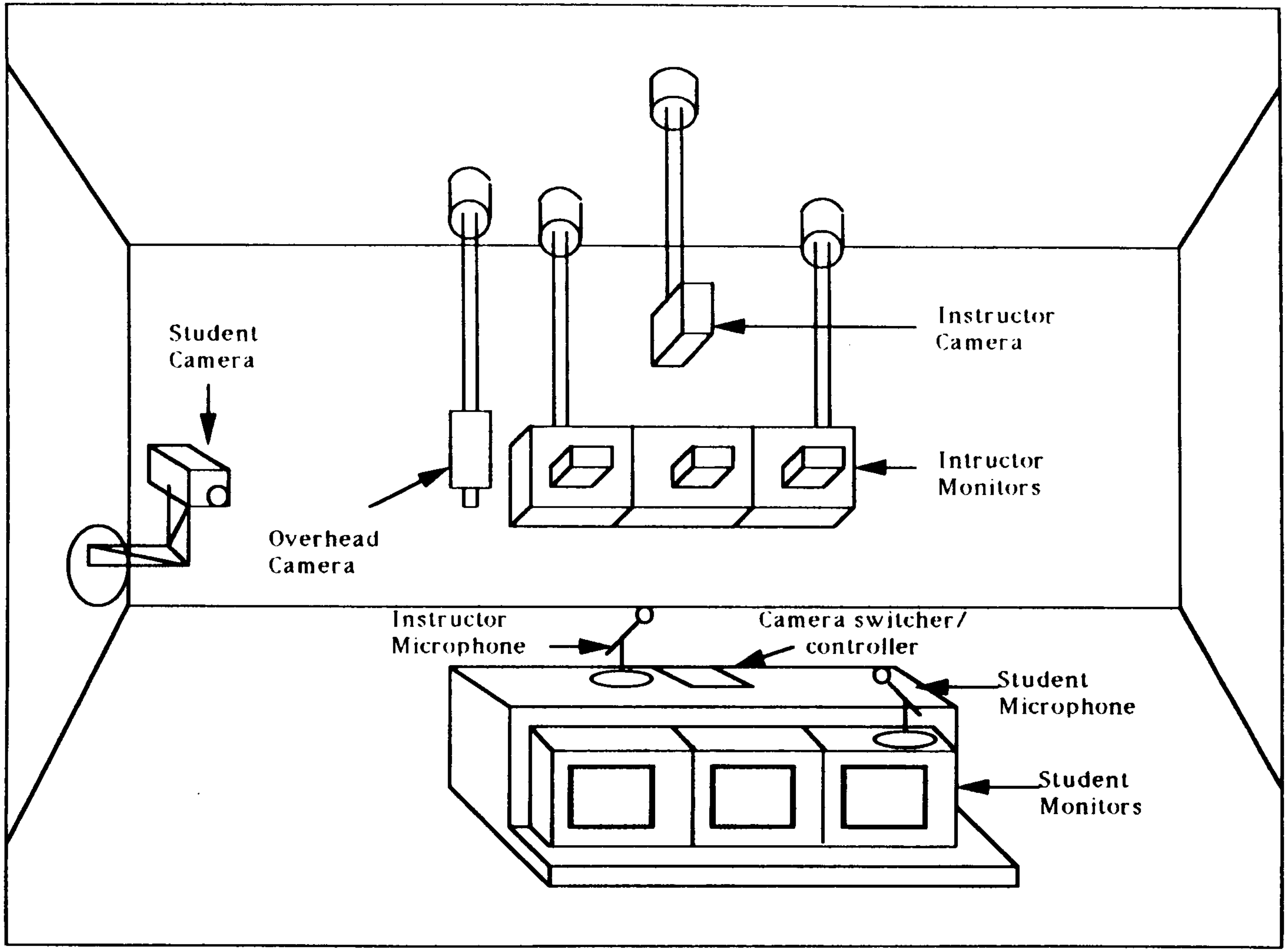
Morehouse, et al., (1987) offer a more complete description of ITV:

> Interactive television can employ a number of technologies - cable, broadcast options of various kinds, fiber optics, etc. Moreover, systems can and do use these options in combination. Regardless of the technology used, each system basically allows a teacher in one location, with or without students present, to be simultaneously seen and heard by students in one or more remote locations. Students in each site can similarly respond to the teacher and to one another. The allowable distance between sites is dependent on the type of technology. The classroom in which the teacher is located is known as the live or host site; students are in receiving or remote sites. Classes are typically limited to 18 students or fewer in up to three districts (p.1).

Regardless of the degree of interaction and of the system used to transmit the signal, such as fiber optics, coaxial cable, satellite, or terrestrial microwave, the purpose of interactive television is communication (Johnson, Tully, 1989 p.9). An example of interactive television can be seen on the network nightly newscast. Through satellite transmission, network anchors are able to see and converse with correspondents around the globe. Correspondents, in turn, are able to see and converse with the anchor. Using split screen or several monitors, more correspondents can participate, and all are capable of total interaction with the anchor as well as other correspondents.

The concept of using two-way interactive television in education is basically the same as that described above. Schools can be electronically linked through microwave transmission, coaxial cable, satellite or fiber optics, allowing teachers and students to see and hear one another simultaneously. Special classrooms are equipped with cameras, microphones and monitors which allow total interaction to take place. (See Figure 1.) The number of classrooms that can participate at a given time is limited by the channel capacity of the delivery system in use.

"Two-way interactive television resulted from the desire during the 1950s to provide educational and instructional programming to people in remote areas. One of the first successful attempts at this process was when an airplane circled a specified area while transmitting educational programs" (Lundgren,1985 p.16). The Public Broadcasting System (PBS) expanded this method with the goal of providing quality instruction at a national level. With cooperation from universities, these courses came to be known as telelectures. These courses were one-way interactive, either being received through line or tape presentations. These telecourses relied primarily on movement and motion to reduce boredom and thus were produced and scripted to create excitement (p.16). Lundgren further adds that "as the one-way TV communication created boredom and frustration among many students, two-way TV communication creates interest and stimulates challenging responses because: it is live; it is unrehearsed; it is changeable; it is dependent upon those who are being addressed for their response; it does not have time restraints; and it depends upon the instructor rather than directors, producers, and technicians" (p.16).



Two-way Interactive Instructional Classroom
Figure 1

According to Robinson and West (1986), since 1940, educators have viewed technology as a means of revolutionalizing the educational process. As they point out, however, even though millions of dollars have been spent, education has been slow in adopting technology into the curriculum. Technology simply has not brought about the universal changes once anticipated (p.7). The reason, to many critics, is that "education is the only major American industry which does not yet make intensive use of modern technologies to reduce its cost and to increase the scope of its services" (p.3). Interactive television has changed the perception of instructional television. ITV . . . "has proved to be an effective and popular medium of instruction, more so than the ITV programs first introduced in the 1950's" (p.3).

Project TIDSS

The Jackson County Intermediate School District (JCISD), in Jackson, Michigan, is located in the lower south central area of Michigan. This area is approximately 100 miles west of Detroit and 35 miles south of Lansing, the State capital. The Jackson area is comprised of small towns and villages with the exception being the City of Jackson.

The JCISD project, called Two-way Interactive Delivery System for Schools (TIDSS), involves twelve constituent school districts: Columbia, Concord, East Jackson, Grass Lake, Hanover-Horton, Jackson, Michigan Center, Napoleon, Northwest, Springport, Vandercook Lake, and Western School District. The total enrollment for these schools as of March, 1989, was 24,259 (Inventory of Instructional Telecommunications, 1989).

A description of the project is provided by the Michigan State Board of Education:

> This is a two-way interactive telecommunications network. Specially designed and equipped classrooms are tied together electronically to share the same instructional resources. It is a combination of cable overlash, microwave, and fiber optic links. Each of the 13 sites can be interlinked into a three pod active classroom. This system is composed of partnerships with cable companies, especially Summit-Leoni cable, and existing or proposed microwave towers. Plans call for the use of a Michigan Bell Telephone Co. fiber link to Lansing in order to experiment with a distance carrier and involve the Ingham County schools and Michigan State University partners" (Inventory of Instructional Telecommunications, 1989).

This paper will examine the Jackson County project TIDSS to see why and how rural school districts are turning toward technology to help alleviate their educational problems. This is an excellent system to examine for two reasons: (1) it is the largest system in operation in the U.S. in terms of number of sites that are on line (14) and; (2) TIDSS is a pilot project, whereby future systems may benefit from their experiences in implementing an ITV system.

Rural Education

The fact that the technologies used in two-way interactive television are now becoming affordable can be of particular importance to rural school districts throughout the United States. According to Ohler, "The two major reasons to use distance learning as an educational tool are to provide equity of educational opportunity and to make up for the lack of conventional resources" (Bruder, 1989 p.31).

The Office of Technology Assessment (OTA) states:

> One benefit of distance learning technology is its potential for allowing small, underserved schools and school districts to remain active despite waning student populations and a shortage of critical resources. According to the U.S. Department of Education, approximately 75 percent of the 15,579 school districts in the United States can be classified as small (less than 2,500 students). These districts enroll slightly over 20 percent of the Nation's student population. Additionally, over one-half of the school districts in the United States can be classified as both small and rural (Linking for Learning, 1989 p.118).

Distance learning technologies appear to meet the needs and challenges that rural school districts face. "Geographic distances, isolation, shrinking population bases, and even inadequate telecommunication infrastructures and related services are all obstacles that rural communities must overcome to attain economic and educational parity with urban areas" (Kitchen, 1987 p.2). In the past, rural schools' only alternative for dealing with limited financial resources and staffing was consolidation. This meant combining several schools in a central location in order to combine resources and expand educational offerings. Consolidation is unpopular because K-12 schools are an integral part of rural communities. One could go so far as to say that a rural community's identity is lost when its school is shut down. Lundgren (1985) points out the drawbacks of this approach in relation to the cost of implementing a ITV system. "Although cost may be considered a drawback, we must consider costs associated with alternative strategies, such as busing students to a central location". Further, he adds that, "The rural areas of our country must either consolidate their small school districts to compete effectively with the larger metropolitan school districts or they must adapt technology to provide equal access to the information that larger school districts provide through larger course offerings" (p.19).

This research suggest that America's rural communities and rural school districts are facing increased challenges to provide equitable services and economic stability. Declining enrollments, low funding, and teacher shortages have created an educational disparity between rural school districts and their urban cousins.

Pinsel (1988) states that there are opposing forces which are directly impacting ITV's development across the U.S. One problem deals with the driving forces behind each project. According to Pinsel, some projects are being driven by a top-down approach, whereby the state directs all planning, training, and implementation efforts. "Statewide one-way educational television and the introduction of microcomputers into the curriculum were both handled in the 'top-down' tradition" (p. 8).

A major drawback of the top-down approach is that it assumes there are people with experience at the local level who are capable of training and assisting in the implementation of ITV systems. "In rural and remote areas where such a pool of training and experience does not exist -- those staff members at the local level may feel they are caught up in the middle of a technological revolution complete with those staff members who quietly wish it would go away" (p. 8).

On the other hand, the grassroots, bottom-up approach involves local leaders from the conception. These leaders have defined educational problems they want to solve, and they know what resources they have available to successfully accomplish these goals (Pinsel, p. 8). The apparent advantage of the bottom-up approach is "that local leadership and shared success in resolving a shared problem generates feelings of ownership and mutual support" (p.9). Pinsel points out that those involved in a bottom-up approach may feel they are simply experiencing a technological evolution, rather than a revolution.

Business/Education Partnerships

By taking a bottom-up approach, rural communities place a great deal of significance on cooperation (Kitchen, 1987). "Cooperatives grew out of rural America and now cooperative ventures may provide rural America with a vehicle to again be competitive with urban communities and yet keep their distinctive identities" (p. 5). Kitchen elaborates further on this cooperative effort. "Today, a unique cooperative concept is emerging between two important rural resources - public school systems and local telecommunications providers (telephone companies, utility companies, cable television companies). By forming unique, mutually advantageous, business-education partnerships, both parties share the cost and the use of the system" (p.2).

Paramount to success in education, according to Lang and Kitchen, (1989) are cooperation and sharing (p.24). They state that the success of these business-education partnerships is contingent upon the level of commitment made by all parties. In addition, they point out that these partnerships must be mutually beneficial (p.24).

Television In Education

What brought television back into the educational limelight? One of the major drawbacks concerning the use of television as a primary source for instruction has always been the inability for students to interact (Johnson, Tully, p.9). Many educators felt that since television could not provide interaction between teacher and student it could only be useful as a supplement to traditional classroom instruction. "Putting a television set in every classroom was unsuccessful not because the TV did not work, or because we overestimated its ability to accomplish what we hoped it would do, but rather because we did not put forth the effort necessary to fully utilize it" (Nytes and Musegades, 1985 p.33).

Educators are now realizing that by using existing technologies they can "resolve persistent instructional problems, and that these applications are affordable" (Pinsel, p.9). The bottom line, according to Connett (1985) is that "television can no longer be thought of as solely a vehicle for entertainment. It must be viewed as a delivery system" (p.30).

A brief discussion of technology in education and the concept of distance learning will aid in a more comprehensive understanding of this relatively new technology.

Technology In Distance Learning

"Each generation of learning technology has tended to reflect a different pedagogical theory. Early learning machines derived from a behavioristic approach to education, which could be implemented on the simple drum devices then available" (Seal-Wanner,1988 p.374). While these tools were useful in certain areas of learning (i.e., memorization of multiplication tables, vocabulary learning), they failed to stimulate a more active learning process. An active learning process is essential, according to educators, to "attaining higher competencies" (p.74).

"Technology *in* education' embraces every possible means by which information can be presented" (Percival, Ellington, 1984 p.12). For the purpose of this study, technology in education can be essentially defined as audiovisual aids. Audiovisual aids would include television, radio, VCRs videodisc players, tape recorders, various projected media, and computers. The aforementioned are called hardware, a term concerned with the actual equipment. Software are items that are used in conjunction with the hardware, such as video tapes, audio tapes, slides, and computer programs.

According to Percival and Ellington, during the early stages in the evolution of educational technology there was an intense 'hardware phases' in which a great deal of time and effort was spent developing equipment that was effective and affordable to schools and colleges. Eventually this equipment became generally available. However, there was insufficient software to support it. Subsequently, this initiated a 'software phase' in which emphasis was placed on developing effective learning materials that were "often based on the contemporary theories of learning and perception" (p.12). Educators soon realized that to effectively adopt technology into education there would have to be a merging of ideas, whereby hardware and software were developed in conjunction with one another.

The concept behind using technology in education was to "help improve the overall efficiency of the teaching/learning process" (p. 13). This was manifested in many ways:

(a) increasing the quality of learning, or the degree of mastery;
(b) decreasing the time taken for learners to attain desired goals;
(c) increasing the capacity of teachers in terms of the numbers of learners taught, without reducing the quality of learning;
(d) reducing costs, without affecting quality (p.13).

The advent of telecommunication technology in education has given educators a chance to explore exciting new ways of instruction. Technology has, in effect, expanded the parameters of the traditional classroom walls and is redefining the term distance learning.

Distance learning has existed for over a hundred years and has proven its pedagogical value in relation to more familiar forms of classroom instruction (Beaudoin, 1986). Distance learning or distance education "refers to formal study in which teacher and learner are separate throughout the main mode of educational delivery" (Clark, Verduin, 1989). Correspondence by mail was the original system used in distance learning. Correspondence education can be defined as: "a form of distance education which relies on postal materials mainly written materials i.e. print text distributed from system, written assignments from learner, written comments and assessment from tutor" (Unesco, p.95).

When telecommunications was adapted to distance learning the need for a more qualitative definition arose. Keegan (1980), offers a more descriptive definition:

1. separation of teacher and learner during the main mode of instructional delivery, which distinguishes it from face-to-face teaching;
2. the influence of an educational organization, which distinguishes it from private study [and other nonformal education];
3. the use of technical media, usually print, to unite teacher and learner and carry the educational content of the course;
4. the use of two-way communication . . . which distinguishes it from other uses of educational technology [such as self-initiated learning using formal educational materials];
5. the teaching of students as individuals and [sometimes] in groups, with the possibility of occasional meetings of teachers and learners for social and didactic purposes;

6. the participation in an industrialized form of education [characterized by division of labor, automation, mass production, etc.-usually used by large-scale but not small-scale distance education systems] (pp.13-14).

This research suggest that, because of advancements in technology, there needs to be a more qualitative definition of ITV. ITV, to this day, still stands for instructional television. However, due to advancements in technology, it can also stand for interactive television. In order to avoid any subsequent confusion, the definition this paper will use is one offered by the U.S. Department of Education's Office of Educational Research and Improvement: "the application of telecommunications and electronic devices which enable students and learners to receive instruction that originates from some distant location. Typically, the learner is given the capacity to interact with the instructor or program directly, and given the opportunity to meet with the instructor on a periodic basis" (Bruder, 1989 p.30). (See Appendix B For Further Technology Definitions Related To This Study.)

A variation of distance education is open education. 'Open' can be defined in several senses; (1) a person is not limited by age, and there are no formal entry requirements; (2) delivery is via public broadcasting media; (3) the design is to provide a curriculum independent of formal school curriculum to a boundless group of learners; (4) the availability is limitless, and is not bound to a given campus; and (5) there is no restriction on enrollment. Open education institutions may display some or all of these characteristics (Unesco, p.96). The difference between distance learning, as described above, and the open university telecourse is that distance learning involves two-way interactive technology.

During the past two decades distance learning has beckoned innovative educational programs, which have proliferated, and gained wide acceptance. Despite the success of these programs, distance education is still viewed with skepticism in many circles (Beaudoin, 1986). These programs have been criticized on the grounds that "students need the stimulus of group learning, that instructors take too much time in responding, that students aren't motivated, and that too few of them complete a course of study" (p.56). According to Beaudoin, a considerable amount of prejudice still exists for alternative methods of education which do not conform to conventional classroom-based instruction (p.57). The root of this prejudice lies in faculty members "who have vested interests in the established educational system in its more familiar form of classroom instruction" (p.57).

Another problem, according to Jason Ohler, director of the Educational Technology Program at the University of Alaska, Juneau, is getting people to understand the concept of the future. "Most people think of the future in terms of their own lifespans, unconsciously. It's like this gate comes down shut and they can't get beyond that 70 or 80 years."

Ohler further compares the current status of distance education in the U.S. with that of the introduction of steam engines in factories. "Now, 200 years later, we see that it has totally revolutionized our roles, how people relate to each other." (Bruder, 1989 p.30)

According to Bruder, "Distance education is characterized by nonconventional modes of delivery" (p.24). Delivery systems in distance learning have evolved considerably from the original system used, correspondence by mail. Broadcasting, both television and radio, have greatly contributed "to the democratization of education by enabling socially and educationally disadvantaged groups to achieve and express social and economic, as well as educational aspirations" (Unesco,1987). There is a great deal of public interest in the employment of technology in distance learning and "its ability to assist the universalization and democratization of education" (p.9).

In studies comparing distance education and conventional classroom-based instruction Childs (1986) and Macken (1976), have found the performance of students to be academically the same. A survey conducted by Clark supports these previous findings and "lends strong support to the contention that distance education is not academically inferior to conventional classroom education" (Clark, Verduin, 1989).

According to Bates (1983), an underlying point to all the excitement telecommunication technology in education has generated is that "technology has a fascination, an attraction, which is independent of the messages it transmits." He points out that the main concern in using technology in education is that all to often emphasis is on the technology, whereas the concern should be on effectively teaching human beings. "Technology does not necessarily mean that teaching becomes mechanical, isolated and inhuman;

indeed it can help increase personal interaction. But technology means that the role of the teacher becomes even more important, since it must be the teacher that controls the technology, not the reverse" (p.4).

Statement of the Problem

Ziegler (1985) states that, "If one of the purposes of education is to prepare students to serve society, then education will not be able to fulfill this goal unless they adapt teaching techniques and training to new technological innovations developing in society" (P.13). Through the use of telecommunication technologies, educators are now presented with an affordable opportunity to achieve this goal. In addition, unique business/education partnerships between local telecommunication companies and public education systems, two integral rural resources, can help cut cost further and be mutually advantageous. By pooling their resources rural school districts, as well as many urban school districts can alleviate low funding levels and limited staffing. Hopefully, they will also provide more equitable educational opportunities to the areas they serve.

By forming cooperatives and sharing telecommunications networks, educators are presented with an alternative delivery system, two-way interactive television, to interconnect multiple school locations. These systems are fully interactive in that a teacher can teach from any school by transmitting at least one channel of audio and video to other classrooms in any number of other schools. Each of these classrooms is capable of receiving audio and video signals from other classrooms simultaneously. In other words, the teacher is able to see and hear all of the students, all the students are able to see and hear the teacher, and all the students are able to see and hear each other (Kitchen, p.2).

While there has been considerable literature written on interactive television in education, very few case studies have been conducted. None were found that focused solely on the implementation process. In addition, little research has focused on the partnerships that have developed between local telecommunication companies and public education systems. Since this is a relatively new concept, the existing problem is that there are educators who are not even aware of it's availability. A better understanding of how these cooperatives work will be one of the focal points of this paper.

"Like free computers given to schools that remained unboxed and unused, distance learning could become a time-filler for rainy days. On the other hand, distance learning could become part of the answer for which small, isolated, and rural schools have been searching" (Pinsel, p.25).

Purpose of the Study

The purpose of this study will be to examine two-way interactive television (ITV) in education. This task will by no means be all encompassing because this relatively new concept is in its infancy in terms of the number of systems in use. Each school district that chooses to use ITV will have their own unique set of problems. The outcome according to Lang and Kitchen (1989), "will be determined by the quality of the persons involved, their total commitment, and the adherence to an appropriate plan and process for implementation of the plan" (p.24). This research will attempt to identify the problems rural school districts face that warrant the use of ITV. In addition, it will investigate the unique business/education partnerships that are forming to support the implementation of an ITV system.

The primary purpose of this research is to narrow the knowledge gap that exists concerning the implementation of a two-way interactive television system into a K-12 setting. While there is documentation on ITV activities that are going on across the U.S., much of this literature is in the form of general overviews, and does not discuss the entire implementation process. This obviously leaves many questions concerning ITV unanswered.

Further, little information has been written about the unique cooperatives being formed between telecommunication companies and local school districts. Further research needs to be conducted regarding two-way interactive technology in education in order to alleviate certain fears educators have with technology in education in general and two-way interactive television in particular.

Research Questions

For the purpose of this paper the following research questions will be addressed:

1). What were the needs and goals that led the Jackson County Intermediate School District to develop a two-way interactive television system?

2). How was the system implemented?

3). What are the criteria for successful implementation of a two-way interactive television system here or everywhere?

Organization of the Chapters

Chapter I of this thesis is an introduction to the study and contains the following information: the background of project TIDSS and other information that is relevant to distance learning technology; a statement of the problem; the research questions; and the purpose of the study. Chapter I also includes the organization of the chapters.

Chapter II is a review of literature on two-way interactive television in eduction. This review includes the various technologies that are applicable to two-way interactive television, how it's being used, and cost.

Chapter III is a description and defense of the methodology used for this research study.

Chapter IV includes a historical overview of the Jackson County Intermediate School District (JCISD). This history includes the problems the JCISD faced in the 1970s and early '80s that led them to look for alternative means to share academic programming. This will lead up to, and include, the reasons why they turned to technology to solve their problems. A history of how the TIDSS project was implemented will follow. A case study of how the project is currently being operated will conclude this chapter.

Chapter V will include a summary and implications of the study. It will review the general findings and discuss their implications for educators who may want to replicate this project. The limitations of the study will also be included. In addition, recommendations for further research in the area of two-way interactive television will be made.

CHAPTER II

REVIEW OF LITERATURE

The purpose of this review is to present an overview of the literature on current technologies that are applicable to two-way interactive television in education. The intent is to discuss what technologies are available for two-way interconnect systems and the approximate cost, as well as the advantages and disadvantages of each system. This review will also cover two-way interactive systems that have been constructed and are in use.

Distance Learning: A New Alternative

According to a report by the Office of Technology Assessment (OTA), (Linking for Learning, 1989), distance learning efforts over the past five years have increased dramatically. The study showed that in 1987, fewer than 10 states were involved in distance learning; in 1988, two-thirds of the states reported some involvement (p.27). Pinsel (1988) reports that virtually all states are involved in some distance learning activity.

A summary of OTA's report (1989) indicates that there are two reason for the increase. First, distance learning technologies are now allowing specific educational needs to be met. These needs include a means for providing instruction in mandated courses or advanced, specialized courses in schools where teachers are not available or are too costly to provide for a limited number of students. Further, the study reports that many efforts are the result of increased requirements for high school graduation, or college admission.

The second reason for increased activity is due to the relatively rapid development of distance learning technology. With the technology available today, systems can be designed that are effective, flexible, and affordable. Advancements in technology have increased the options for districts in designing distance learning systems.

Another reason distance learning activities have increased is because the more traditional methods of sharing academic programming proved to be unpopular. Jordahl (1989) states that consolidation and resource sharing, two of the more common means of alleviating restraints on rural education, "often entail social and economic trade-offs that hamper their potential long-range effectiveness" (p.34). Due to events that have taken place in the telecommunications industry, more and more educators are turning to technological options as a means for distributing instruction to remote and isolated sites (p.34).

Distance Learning Technologies

Transmission technologies play an important role in the delivery of distance education. Basically, there are four ways to transmit a signal between two points: by copper wire (cable), fiber optics, microwave, or satellite. "Each technology has capabilities and limitations that constrain the distance learning system, shaping the educational product" (Linking for Learning,1989 p.60). For example, satellite systems and other broadcast technologies generally allow only one-way video transmission, which is a critical concern for many educators (p.60). Other concerns educators must consider when deciding on a delivery system include regulatory requirements, availability of local infrastructure resources, and possible technical and economic trends that may affect transmission technologies (p.60).

The distance learning technologies that will be examined in this review are Instructional Television Fixed Service (ITFS), terrestrial microwave, coaxial cable, and satellite. The reason these technologies will be examined is because they are the ones most commonly used in todays interconnect systems. Research (Kitchen 1987), indicates that fiber optics, due to its high channel capacity and clarity, will ultimately become the technology of choice for two-way interactive interconnect systems. However, at present, this technology is too expensive for most K-12 districts to consider when planning an interconnect system.

Instructional Television Fixed Service (ITFS)

Instructional Television Fixed Service (ITFS) "refers to a band of microwave frequencies originally set aside by the Federal Communications Commission (FCC) in 1963 exclusively for the transmission of educational and cultural programming" (Linking for

Learning, p.62). Further, "ITFS uses omnidirectional microwave signals in the 2.5 GHz band to transmit standard 6 MHz video signals to remote locations" (p.62). Today there are 20 channels assigned to ITFS, down from the 31 originally allocated in 1963. These channels are generally grouped in blocks of four per licensee. "In 1983, there were 88 ITFS systems operating 644 channels; in 1989, that figure rose to 745 licenses to operate 2,358 channels" (p.62). This dramatic increase is linked to the increased number of applications coming from rural areas (p.62).

ITFS uses omnidirectional microwave signals to transmit video signals to remote locations. ITFS generally functions as a broadcast system (point-to-multipoint), with the use of a special downconverter, which is needed to convert the microwave signal back to a standard television signal. ITFS requires direct line-of-sight to operate, whereby antennas must be exactly aligned to receive the signal. "The normal range of ITFS transmissions is approximately 20 miles, although range can be increased by using signal repeaters, by increasing the height of transmitting and/or receiving antennas, by increasing receiver sensitivity, or by increasing transmitter power" (p.62).

An ITFS system can either function as a stand alone delivery system, where programming is distributed directly to local schools or cable companies for redistribution, or as an intermediate link where, for example, it can take a satellite feed and rebroadcast the signal through the ITFS network (p.62). "Most commonly, ITFS is used to deliver one-way video to schools with telephone hookups for two-way audio" (p.62). Two-way video is possible but more expensive since it requires transmission back from remote schools.

ITFS networks require FCC licensing, which can take up to two years for approval. Often, Federal Aviation Administration (FAA) approval is required to assure that tower placement doesn't interfere with aviation traffic. "FCC review of how the system will actually be used has become more stringent as competition for ITFS frequencies has increased" (p.64). Further, the "FCC does not monitor how many channels are leased, but has established safeguards to ensure that channels are used for education (at least 20 hours per channel per week) and that time can be recaptured from commercial operators if educational needs increase" (p.64).

According to Johnson and Tully (1989), an ITFS network using point-to-point microwave transmission is one of the least expensive forms of interactive linking. "With an installation serving four to five locations in relatively flat terrain where tall towers would not be necessary, the cost would be in the $200,000 to $300,000 range" (p.13).

The basic advantage of ITFS is that it provides low-cost delivery of video. The disadvantages are that the frequencies are sometimes crowded (especially in cities); FCC licensing is required; there is limited transmission range; and direct line-of-site is required (Linking for Learning, p.61).

Terrestrial Microwave Systems

Point-to-point microwave systems differ from ITFS systems, in that they operate in various frequency bands. Specifically they operate in the 900 MHz, 1.9 GHz, 2.1 GHz, 6.0 GHz, 12.0 GHz, 18.0 GHz, and 23.0 GHz bands (OTA, p.71). Microwave systems "can transmit audio, data, or video in either a one-way (simplex) or two-way (duplex) format" (p.71). The signal requires a direct line-of-sight between the sender and receiver, which makes microwave transmission sensitive to buildings and terrain.

Point-to-point microwave systems are classified either short-haul (with a range of 5 to 15 miles) or long-haul (with a range of up to 30 miles between towers) (Linking for Learning, p.72). Short-haul systems are more simple to construct and operate and are less expensive than long-haul systems. In addition, short-haul systems require no state regulatory approval or right-of-way (p.72).

"Microwave frequencies are regulated by FCC, and licensing is required for all transmitter sites because of interference concerns, and is necessary for receive sites desiring protection from possible new sources of interference" (p.72). In some cases, local zoning ordinances prohibit the construction of towers close to the school. In these instances, the tower is connected to the school either by coaxial or fiber optic cable.

"Since each site in a point-to point microwave system is both a transmit and a receive site, the cost of installing and operating a microwave system can be relatively high" (Linking for Learning, p.173). Cost for a duplex system ranges from $40,000 to $65,000 per channel, with additional channels costing almost as much (p.173). The cost for microwave towers vary widely, ranging from $5,000 to $150,000 each. Local utility companies can help reduce or eliminate this cost by allowing school districts to use existing tower space.

The advantages of microwave transmission are its low-cost transmission time; and no right-of-ways are needed. The disadvantages are that it must be FCC licensed; tower space or location may be difficult to get; it is expensive to expand channel capacity; crowded frequencies; and direct line-of-site is required (Linking for Learning, p.61).

Cable

Cable television systems, which use coaxial and fiber optic cable to distribute signals, have penetrated into 50 percent of America's households. It is estimated that 55 to 60 percent of schools have cable hookups, and 80 percent of the Nation's schools are in cable franchise areas (Linking for Learning, p.71). "Programming is received from local broadcast stations and national programming services, such as HBO, at the cable "headend" and is sent out over the cable in a tree configuration" (p.68). A cable headend is capable of receiving various kinds of signals, such as microwave or satellite transmissions, that are retransmitted to schools over the normal cable system (p.68). Most cable systems are designed in a one-way configuration where a signal is sent downstream, boosted by amplifiers, to receiving locations. For a system to be two-way interactive a reverse channel is needed to allow information to be sent back upstream to the cable headend (p.68). "Most cable systems make only limited use of this two-way capability, because additional (reverse flow) amplifiers are needed to move signals upstream, as well as special filters to keep upstream and downstream signals separate" (p.68).

One of the most significant aspects about using cable television for distance learning efforts is that, with the proliferation of the cable industry, educators are able to take advantage of an existing resource to help alleviate cost. According to Benson and Hirschen (1987), the key is establishing effective partnerships between the cable company and the participating schools (p.19). Cable company interest in providing this type of service appears to be increasing (Linking for Learning, p.71). "In Michigan, for example, of the 27 projects identified in the State's inventory of educational telecommunications, all involved local cable companies as participants, even if the system was not cable-based" (p.71).

The advantages of cable are its wide availability; and relatively low delivery cost. The disadvantages are its limited channel capacity; it can be sometimes difficult to interconnect; and its not usually designed for interactivity (Linking for Learning, p.61).

Satellites

Jordahl (1989), points out that educators are now beginning to see that "satellites with their ability to broadcast voice, video, and data anywhere within a broad geographical area, might be an ideal way to beam cost-effective instructional and staff development programming from one central site to literally any school in the country, regardless of its size or location" (p.34).

The technology involved in satellite transmission is relatively simple. Live broadcasts are beamed from a host site by a transmitter, known as an uplink, to a communications satellite that is in geosynchronous orbit 23,000 miles above the equator. The signal is received by the satellite and instantaneously beamed back to earth to receiving dishes called downlinks (Connett, 1985 p.29). "Satellite technology, in this configuration, permits one-way transmission of voice, data, and full-motion video" (Barker, Patrick, 1988 p.3). In other words, students can see and hear the instructor, but are not able to see other students located at different sites. Teachers are unable to see students, but by the use of telephone lines are capable of hearing their questions and comments (p.4). "The same technology that transmits the instructor's voice and image to the student can also be used to simultaneously transmit the student's voice and image back to the instructor. This type of full-motion, two-way interaction is rarely utilized at present, however, due to the expense" (p.4).

Cost for using satellite transmission has become affordable due to dramatic advances in technology. Downlink receivers which cost about $70,000 ten years ago can now be purchased today for $2000 to $3000 (Connett, p.30).

The use of satellite technology in education is more advantageous in mountainous areas and wide open spaces because it is more cost effective than laying coaxial or fiber optic cable or constructing a microwave communication system. Hawaii was one of the first states to use satellite technology for instruction (Jordahl, 1989 p.34). In 1972, the University of Hawaii used NASA's ATS-1 satellite to connect three of their island campuses for an audio-assisted library science course. Further experiments were conducted in remote areas in the Rocky Mountains, Appalachia, and Alaska around the mid-1970's. The success of these efforts resulted in the development of satellite educational networks (p.34).

1985 saw the inauguration of three satellite networks; Oklahoma's Arts and Science Teleconferencing Network (ASTN), the Texas Interactive Instructional Network (TI-IN), and a joint venture in Utah sponsored by the Utah State Department of Education, IBM, and Bonneville Corporation known as the Accelerated Learning of Spanish by Satellite Project (Jordahl, 1987 p.39).

ASTN was initiated to help Oklahoma's small schools meet state-mandated foreign language requirements (p.39). The success of their pilot project, a German language course, lead to over 200 schools in many different states going on-line in 1988-89. Courses are designed and taught by professors from the faculty of Oklahoma

State in Stillwater. This network allows interaction to take place between the instructor and student by telephone and electronic mail. Interaction after classes is conducted via a toll-free telephone line. Classes are taught twice weekly via live satellite transmission. During the non-broadcast days computer assisted instruction is used to provide vocabulary practice and reinforcement. Subscribing districts are required to purchase their own receiving dish, classroom video equipment, and microcomputer equipment. Costs range from $5000-$10,000. Classes that were offered for the 1987-88 school year included German I and II, physics, advanced placement trigonometry and calculus. The subscription fee for 1987-88 was $1750 for each lesson and includes all written materials, software, and the right to copy each broadcast (p.39).

During the 1987-88 school year the Texas based TI-IN Network, which is a privately owned, for-profit project, broadcast to approximately 450 schools in 25 states. Some of the courses offered included Computer Science I, German, Latin, Art History and Appreciation, and Business and Computer Law. In addition, the TI-IN Network specializes in inservice training for teachers (p.40). "The methodology employed in TI-IN's delivery system simulates the traditional teacher-led presentation and discussion model of instruction" (Jordahl, 1989 p.35). Classrooms are supervised by adult assistants. Students can respond to the instructor by using a cordless telephone during class time and after class. In addition, electronic writing tablets are used, as well as Dot-matrix printers to distribute handouts, test, and other supplementary material (p.35).

Unlike the ASTS project, TI-IN includes as part of each subscriber's start-up cost the hardware necessary for satellite reception. The approximate price is around $19,500 with a subsequent annual fee of $5,250 (p.35).

The Utah Spanish-by-Satellite is different from ASTS and TI-IN in that it doesn't employ a interactive component. Rather, it uses a combination of video and computer technologies in order to alleviate the shortage of qualified Spanish instructors (Jordahl, 1987 p.40). "To compensate for the absence of interaction, the project uses voice-recognition and speech-synthesis technologies to provide computer-assisted lessons that are designed specifically to compliment the satellite broadcast, which occur every other day" (p.40). The cost for a five year period, which includes satellite reception hardware, the PC network and various other printed materials is around $18,500 (p.40).

The federal government showed its support of the use of telecommunication technology in education when, in 1987, they established the Federal Star Schools Assistance Act. This program, with a five year budget of around $100 million, was initiated "to promote the use of telecommunication technology in providing instruction in foreign language, math, and science to traditionally underserved populations" (Jordahl, 1989, p.36). The program requires matching contributions of 25 percent and calls for 50 percent of the funding to be used for economically disadvantaged schools (p.36).

The overall effectiveness of satellite networks at this point is difficult to measure. If judged in relation to the number of schools who are subscribing, the overall effectiveness would appear to be quite high. However, basing effectiveness on the number of subscribers in no way measures the quality of the courses that are being taught via satellite networks. To date, only preliminary findings (Morehouse,1987) (Barker and Patrick,1988) support the effectiveness of these endeavors. According to Jordahl (1989), although "such data is forthcoming, its interpretation will be problematic since many participating schools reserve satellite courses for honor students who would likely show achievement gains regardless of the instructional method employed" (p.37).

While this data is being anxiously awaited, the advantages of satellite networks should not be overlooked. In addition to increasing educational opportunities that would not normally be available to rural school districts, satellite networks are cost-effective. Budget-constrained administrators "are able to save significantly on travel expenses associated with staff development by subscribing to the inservice programming that many of the satellite networks provide" (p.37). Also, these low-enrollment, advanced courses that are offered by satellite networks can be delivered at a fraction of the cost of a teachers' annual salary. Jordahl concludes by stating that the deciding factor in how well satellite networks are integrated into rural districts will be determined by the level of support and direction given by administrators involved in such endeavors.

> Even though satellite technology is currently being embraced at a rapidily-expanding rate, its long-range success will be determined by how well administrators manage the fundamental change that satellite dish represents for rural education. Human elements such as staff resistance and student apathy will limit the success of even the most well-designed distance learning project without strong administrative leadership (p.37).

Factors that should be considered when choosing among satellite networks include "cost, maintenance, upgrading of equipment, extent of course offerings, limitations on class size, frequency of instructional broadcasts, quality of instruction provided by the teaching staff, skill of the instructional staff to force interaction with students, etc." (Barker and Patrick, p.16). Also, it is important to know whether all receiving sites are capable of interacting via telephone lines. Some networks permit only select on-line classes to call in to the home site (p.16).

The advantages of satellite transmission are its wide coverage transmission; and the cost is distance insensitive. The disadvantages are the uplinks are expensive; there is high transmission cost; FCC licensing of uplinks are required; and it is subject to interference from microwave transmission and rain (Linking for Learning, p.61).

A review of literature on two-way interactive television in education would not be complete without an examination of the literature on satellite networks. This research suggest that, although these networks are not fully two-way (video) interactive, they do offer a viable and affordable alternative for rural educators who are trying to provide equitable educational opportunities for students that would other-wise not be available.

Systems in Action

Literature on two-way interactive television efforts that employ cable, microwave transmission, fiber optics, or a combination of the three, will be the focus of the following analysis of a few ITV projects that are going on across the United States.

Nelson (1985) and Jones (1985) reported on a small cluster of schools in southeastern Iowa that are using microwave transmission to deliver two-way interactive television to their classrooms. In 1978, school districts in Morning Sun, Waco, Wapello, and Winfield in an effort to thwart declining enrollments, tightening budgets, rising cost and possible consolidation looked toward technology and cooperative programming as a means of alleviating their problems (Nelson, 1985, p.38). Enrollment at the time ranged from 275 students (Morning Sun) to 1,001 (Wapello) (Jones, p.4). Through the cooperative efforts of local school administrators this consortium was awarded a $250,000 federal grant "to fund the purchase of the audio and video equipment that enables each school to transmit and receive microwave signals from a specially equipped classroom" (Nelson, p.38).

The goals of the project, called TWIT, were to: (1) expand their course offerings in mathematics, science, and foreign language; (2) offer students a more balanced curriculum; (3) offer an uninterrupted sequence of classes; (4) assign teachers to areas of major expertise only; and (5) operate cost effectively (p.38).

The system is designed so that each school has a tower and a six foot microwave receiving dish. All four schools are capable of sending and receiving audio and video signals thus allowing each school the capability of originating and receiving a class. Classrooms are set up with "one portable color camera equipped with a macro zoom lens, three modified television monitors, two wall mounted external speakers, two unidirectional microphones, and a custom-designed audio/video switching unit" (p.39). The instructor in the originating class views students at remote sites on a special television that has a split screen monitor. "The instructor is in direct video contact with every student, and with proper camera placement in each classroom it is possible to simulate eye contact between student and teacher, thus creating a normal classroom situation" (p.39).

The TWIT project became operational in October 1980. During the first year, the four school districts developed a common school calendar and bell schedule. This allowed classes scheduled in one district to coincide with classes in other districts. Class material was initially dispensed using an interschool busing arrangement. In 1982 facsimile machines were installed, which allowed instantaneous transmission of printed material (Jones, p.4).

The curriculum is decided on by the school principals, who meet in March after preregistration. "Advanced mathematics, advanced science, and two sequential offerings of a foreign language are a given in planning the schedule" (Nelson, p.39). The remaining three offerings come from a priority list established by the principals. Past offerings have included: creative writing; vocational agriculture; psychology; sociology; shorthand; and third and fourth year foreign language (p.39). Criteria for students taking TWIT classes are no different than the requirements for traditional classes. "As a general rule the TWIT classes appeal to the more highly motivated and conscientious students, which has allowed schools to operate with limited classroom supervision and has allowed staff members to be assigned to more meaningful duties" (p.40).

Teachers are selected on the basis of expertise in the subject area, organizational skills, personality, ability to project demonstrated level of self-confidence, ability to perform, and willingness to accept the challenge of interactive television (p.40). "Many factors have contributed to the success of TWIT; however, the greatest single factor has been the enthusiasm and continued support of the participating teachers" (p.40). Other factors that have contributed to the success of TWIT include: from the beginning involving all personnel, faculty, and students in the development of the system; cooperation and commitment from all participating school districts; cooperation of the faculty and student body; and a thorough and ongoing inservice program (P.40).

Robinson and West (1986) reported on a two-way interactive project that began in Illinois in August 1983, called the Carroll Instructional Television Consortium. This project utilizes an existing cable network that was already serving the participating school districts and was the first cooperative educational program of its kind in Illinois. The idea for this project grew out of the common need of four small rural high schools who wanted to provide academic opportunities for their students which otherwise would have been available to only one school due to a shortage of specialized teachers (p.1).

The specific goals of the project are: (1) to increase the total number of course offerings available to students enrolled in the participating districts; (2) to provide fully qualified, experienced, and effective faculty to teach advanced level course work in mathematics, science and foreign languages; (3) to motivate and challenge talented and gifted students through association with comparable students from other districts; (4) to promote high levels of student achievement as measured by content mastery of advanced level course work; and (5) to increase the efficiency of teacher instructional time in traditionally low enrollment advanced level curricular offerings (p.2).

Based on Robinson and West's findings all of the above goals were met and in some cases surpassed (p.6). The only goal not fully met was to increase the efficiency of teacher instructional time. "Because of occasional equipment start-up problems, and inter-district scheduling conflicts, teacher instructional time has not been positively effected" (p.6).

According to Robinson and West there are inherent problems associated with ITV, which may be unsolvable but do not negate the positive effects. First, "not all students will find learning via technology to be conducive to their learning style. Not all students in interactive television classrooms feel comfortable learning from a distant teacher, nor do they feel that they get an opportunity to know classmates in other schools" (p.7). The research points out that while teachers have developed techniques to help improve the classroom environment, "interactive television systems can not eliminate the problems of geographic distance" (p.7).

Second, the technology itself is not perfect. "Any time technology is involved, the learning process can be interrupted" (p.7). ITV systems that employ microwave or cable technology are susceptible to atmospheric and external interference. "In this project, the cable system can be rendered inoperative by snow, interference from C.B. radio or other low band audio broadcast, or by cable or power outages" (p.7).

Robinson and West conclude by stating that although ITV in education is fairly new, "the research is beginning to indicate that systems can be effective, cost efficient, and viable alternatives to live instruction". However, "the benefits, problems, and drawbacks need continued research before a definitive statement can be made about this technological solution to an educational problem" (p.7).

During the late 1970s and early 80's, Minnesota began exploring the use of television technologies to help create greater parity between rural school districts and larger urban and suburban districts (Morehouse, 1987 p.3). In 1983, the Minnesota Legislature appropriated funding for the Technology Demonstration Program. Aimed at increasing the use of computers, television and other technologies, the demonstration projects were intended to serve as models of the use of technology for instruction and instructional management (p.3). "The fundamental underlying presumption was that the use of television and other technologies could increase the availability of educational opportunities, modernize curricula, and minimize the inequities between small, outstate and large, urban and suburban districts, thereby obviating the need for politically unpopular pairing or consolidation" (p.3).

Of the nineteen projects funded between 1983 and 1987, ten were demonstrations of the use of ITV. These ten projects, which involve 58 school districts in consortia of different sizes, in addition to post-secondary institutions and businesses, used various delivery technologies, ranging from coaxial cable to fiber optics and several broadcast options. Expenditures for these ten projects was $5.7 million (p.3).

Morehouse, who conducted a four year investigation of these projects, found that "technical and essential educational planning, negotiation of sometimes complex inter-district agreements and cooperative agreements with cable franchise holders, utilities, broadcast entities and the FCC, fundraising and other factors imposed significant implementation delays" (p.4). Morehouse suggests that school districts who are considering an ITV system should anticipate two to three years for the implementation process (p.4).

Student achievement was assessed by testing student achievement on ITV courses with achievement in the same courses taught traditionally. Of the nearly one thousand individual grades and test scores analyzed, no statistically significant difference was evident. Morehouse concludes that "the medium of television and two-or multi-way delivery of course content had no significant impact on levels of achievement" (p.4).

Student attitudes were judged very favorable toward ITV classes according to Morehouse. "They were generally comfortable with the medium, could see and hear the teacher and each other, and talk with the teacher as often as they wished" (p.5). She further reports that there was no apparent difference in attitude between students at remote sites and those in live or originating sites. Most students felt that teachers did not pay more attention to the live class than the remote sites.

Teachers participating in ITV classes also expressed generally favorable attitudes. Morehouse notes that teachers needed more preparation time for ITV classes and tended to employ more visual aids in an effort to maintain student interest, involvement and interaction (p.5). "Ingredients essential to the participation and satisfaction of teachers were participation in decision-making, adequate inservice, practice and hands-on experience with equipment, opportunities for self and peer-criticism, and ongoing support from principals and project directors" (p.5).

Teachers believed that students in ITV were learning about as much as they would in traditional classes and that they liked their televised classes. However, "inherent disadvantages were noted, including a greater frequency of cheating, lack of personal contact with students, movement and space restrictions, occasional technical problems, delays in material transfer, problems with the logistics of make-up work, and conflicting school calendars and daily schedules" (p.5).

Cost of the ten demonstration sites, which included planning and construction cost, "ranged from a low of $131,400 (for a cable system) to a high of $1,082,805 (for an ITFS system)" (p.5). The average costs were $589,253. Operating costs for a year ranged from $36,500 to $1,177,617, with an average of $40,974 (p.5).

Morehouse concluded that ITV affects school districts in at least three ways: (1) it requires and promotes cooperation among districts; (2) it permits districts to offer an enlarged curriculum; and (3) it provides opportunities for expanded community and adult education (p.5). She concludes by stating that the Technology Demonstration Program in Minnesota has allowed, "at least short term, the continued independent survival of a number of school districts which otherwise would have been forced to pair or consolidate programs" (p.5).

Kitchen (1987), examined two fiber optics projects located in Minnesota. Mid-State Educational Telecommunications Cooperative (MSET), was the "first fiber optics telecommunications partnership ever developed between a rural telephone cooperative (Upsala, MN), and a multi-school district consortium" (p.6). The consortium is comprised of seven school districts in the communities of Holdingford, Little Falls, Long Prairie, Pierz, Royalton, Swanville, and Upsala, which are located in central Minnesota. In 1985, these two entities formed a partnership to share the cost of constructing a 78 mile fiber optics network consisting of four to eight fibers (p.6). The Upsala Telephone Cooperative, which serves only two of the seven communities with telephone service, "will be using the network to upgrade their telephone system and to carry all of their long distance toll calls to an AT&T switch thus by-passing the Bell Operating Company which used to carry this traffic" (p.6).

The school districts benefit "by being able to transmit one channel of video, with audio, from each high school and with the capability of each high school being able to receive all of the other six high schools' signals simultaneously, this (ITV) system provides the most educationally effective and accepted alternative method of delivering distance education" (p.7).

In 1986, the seven school districts, whose enrollment ranged from Upsala's 444 to Littles Falls' 3086, began delivering 16 different high school classes. The courses offered were: Spanish I (two classes); German I (two classes); German II; French I (two classes); Accounting II (two classes); Advanced Placement English; Advanced Computers; Computer Logic; Music Theory; and Shorthand (p.7).

In addition to the above classes, the system also offered adult community education classes, staff in-service programs, interdistrict meetings, and other similar programs.

Kitchen reported on a similar project under construction called the Tri-County Telecommunications Cooperative. Located in Grand Rapids Minnesota, the entities involved are "six school districts (Coleraine, Deer River, Grand Rapids, Hill City, Nashwauk-Keewatin, and Remer), two community colleges (Hibbing and Grand Rapids), five small, independent telephone companies (Arvig Telecom, Johnson Telco, Paul Bunyan Telco, People's Telco, and Northland Telco), and a Minnesota-based long distance carrier (U.S. Link)" (p.8).

When completed, this network will consist of 140 miles of fiber optic cable that will consist of eight to twelve fibers. The benefits of the project are similar to the Mid-State Educational Telecommunications Cooperative, except that residents in this area will have an option for their long distance services. The cost of construction is being shared equally among the participating entities, with maintenance being provide by the telephone companies on a time-and-materials only basis (p.8).

Kitchen emphasizes the use of fiber optics technology "because it does lend itself well for two-way interactive television systems due to its high channel capacity and that fiber optics system may contribute to a community's economic development plans by providing a state-of-the-art telecommunications infrastructure for information-based businesses" (p.9). In comparison to microwave and cable, fiber optics technology has recently become competitive. However, according to Kitchen, this should not limit the development of partnerships using other technologies including microwave, coaxial cable, and satellite (p.9).

Cost Considerations

"The cost of distance learning technologies are difficult to analyze because technological options are so varied and are changing so rapidly" (Linking for Learning, p.79). The technologies employed in distance learning activities today are more powerful than those used in the past. At the same time, cost for these systems has also steadily declined. "These two trends have produced systems that are increasingly less expensive for the capabilities they offer teachers and learners" (p.79).

It is impractical to give a proper cost comparison between the different delivery technologies due to the individual nature of each system. According to OTA's report, "key factors affecting overall cost of distance learning systems include:

Instructional design : What types of connections are needed? Instructional design requirements, particularly interaction, will affect the cost and type of system chosen.

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

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

Partnerships : Who can schools share cost with? Cooperative arrangements with business or higher education can substantially reduce cost by sharing facilities and resources.

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

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

Programming : What types of programming are desired? Broadcast quality video production is very expensive. Other forms of audio, video, or computer materials may be far less expensive (Linking for Learning, p.80).

In summary, this review suggests that improvements in telecommunication technologies have given schools many options for delivering instruction to distance students and teachers. Further, this review suggests that two-way interactive technology can help solve identified educational problems (shared academic programming), and that it is a viable alternative to more traditional methods such as consolidation, moving students, or moving teachers.

The technologies reviewed, ITFS, terrestrial microwave, and coaxial cable, are the most common methods used today for two-way interactive interconnect systems. Each technology has its advantages and disadvantages in terms of channel capacity and overall effectiveness. Although a cable systems channel capacity is constrained by the limits of coaxial cable, it still is the most practical choice for K-12 schools because of the availability of existing cable infrastructures and its low maintenance requirements.

Cost considerations will ultimately be the deciding factor when choosing between technologies. Further advances in technology will see the deployment of fiber optics, which offers unlimited speed and capacity for voice, data, and video applications. Finally, with the availability of satellite networks, some schools may find that this type of shared academic programming meets their needs at a fraction of the cost of constructing a two-way interactive network.

Research suggest (McNeil, 1989) that telecommunication technologies can be an impetus for a new age in education:

> Technology has the capacity to do more than aid the exchange of information and ideas. It can enhance students' power of analysis, sharpen their capacity to think critically, improve their writing skills, and increase their ability to develop independent judgements. If used properly, it is likely to alter the learning environment to such an extent that the old institutional models of campuses, classes, lectures, schedules, timetables, and tests will not survive in their present forms. How, when, what, and where we teach will change (p.A44).

CHAPTER III

METHODOLOGY

A case study, as defined by Yin (1984), is "an empirical inquiry that uses multiple sources of evidence to investigate a contemporary phenomenon within its real-life context in which the boundaries between the phenomenon and its context are not clearly evident." Mouly describes the case study as "not so much a unique method of investigation as it is the application of all relevant techniques to the study of a person, a group, an institution, or even a community. Consequently, it resembles almost all other types of research in some way or another" (Mouly, 1970 p.347).

This case study examined how a two-way interactive television system was implemented into the Jackson County Intermediate School District (JCISD), located in Jackson, Michigan. The project, called Two-way Interactive Delivery System For Schools (TIDSS), involves twelve constituent school districts: Columbia, Concord, East Jackson, Grass Lake, Hanover-Horton, Jackson, Michigan Center, Napoleon, Northwest, Springport, Vandercook Lake, and Western School District. The total enrollment for these schools as of March, 1989, was 24,259. More specifically, this investigation attempted to establish the criterion for successful implementation of a two-way interactive educational delivery system employing coaxial cable and microwave technologies. While each two-way interactive delivery system is unique to some degree, a list of criteria may assist in the implementation of future systems.

The research starts by establishing a chronological history of the TIDSS project. The purpose was to establish what methods and procedures were deemed most important in the implementation process. There are many basic questions that needed to be addressed in order to ascertain facts relevant to this study. For example, who initiated the project? What needs were project organizers trying to satisfy through project TIDSS? How was the project funded? How have the formation of cooperatives between local utility companies assisted in the project? With a history of the project established, an attempt was made to determine whether the goals of project TIDSS had been met. Also, this research hoped to ascertain the perceived level of success of the project by administrators, project coordinators, teachers, and students.

The research methods used to ascertain the answers to these questions were direct observation, examination of existing documents, and systematic interviews. A questionnaire, designed individually for administrators, the project coordinator, teachers, and students was used to assist the interview process.

Expert opinion as defined by Simon (1969), is "the judgments and estimates made by people who have spent much of their time working with a particular subject and who have gathered much general information that has been filtered through their minds and stored in their memories" (p.274). Expert opinion for this study will be provided by Gerald A. Lang, REMC 15 (director of the TIDSS project), Carl Brasseur, General Manager of Summit-Leoni cable company, school Superintendents Robert Bass, Western School District; and Al Widner, Concord Community Schools; Assistant Superintendent Ron Bennett, Vandercook Lake Public Schools; and Principal Denny Love, Concord Community Schools. Teachers and students will also be interviewed.

In addition to ascertaining information through the interview process, a case study will be conducted of the present use of project TIDSS. Specifically, the researcher will examine existing documents pertaining to project TIDSS and observe classes being taught through this two-way interactive delivery system. Classroom observation will allow the researcher the opportunity to meet personally with students and faculty in this technological environment.

One of the advantages of the case study technique, according to Wimmer and Dominick (1987) is that it "can suggest *why* something has occurred" (p.156). This study will attempt to explain why and how the TIDSS project came to be.

CHAPTER IV

RESULTS

The purpose of this research was to examine how the Jackson County Intermediate School District (JCISD) implemented TIDSS, a two-way interactive delivery system, into their curriculum. The following information was gathered from a case study conducted between March 19-23, 1990, in the JCISD, Jackson, Michigan. This research is an amalgamation of information gathered from personal interviews, on-site class inspection, and archival research.

The chronological history of the project was largely established from articles that appeared in the *Jackson Citizen Patriot* from July 23,1984 through November 23, 1989 and a grant proposal written by the JCISD. Interviews were conducted with Gerald A. Lang, REMC 15 (director of the TIDSS project); Carl Brasseur, General Manager of Summit-Leoni cable company, school Superintendents Robert Bass, Western School District and Al Widner, Concord Community Schools; Assistant Superintendent Ron Bennett, Vandercook Lake Public Schools; and Principle Denny Love, Concord Community Schools. Teachers and students were also interviewed.

The chapter begins with an explanation of how Michigans' Educational system is structured. This is followed by an overview of the Jackson County Intermediate School District prior to the implementation of TIDSS. As will be seen, the JCISD faced serious enrollment declines during this period. This overview will help establish why educators in the JCISD turned toward technology as a means for sharing academic programming.

Michigans' Educational Structure

Michigan employs a three-tiered educational structure: the Department of Education, the Intermediate School Districts, and the Local School Districts. The Intermediate School District acts as a liaison between the Department of Education and the local school districts. Although the ISDs are not exactly a wing of the Department of Education, their role is cooperative programming, facilitation, and assisting local school districts. All activities of the ISD have to be initiated by the local school districts. In addition, Michigan has 22 Regional Educational Media Centers (REMCs), which were created in 1970 to provide educational services to local school districts (G. Lang, personal communication, March 19, 1990).

An Overview of the JCISD

The intent of this overview is to examine the educational problems the JCISD faced during the mid-1970's and early 80's. Specifically, this overview will examine how the JCISD tried to solve an identified problem, shared academic programming. This will lead up to, and include, when the JCISD decided to turn toward technology as a means to solve this identified problem. The following information was taken largely from a grant proposal written by the

JCISD titled "TIDSS: Two-way Interactive Delivery Systems For Schools. A Cooperative Educational Venture, Phase II".

As mentioned, the Jackson County Intermediate School District (JCISD) includes 12 school districts -- Columbia, Concord, East Jackson, Grass Lake, Hanover-Horton, Jackson, Michigan Center, Napoleon, Northwest, Springport, Vandercook Lake, and Western school districts. Total enrollment as of March 1989, was 24,259 (Inventory of Instructional Telecommunications, 1989).

The JCISD is located in the lower south central area of Michigan. This area is approximately 100 miles west of Detroit and 35 miles south of Lansing, the state capital. A majority of the region is comprised of small towns and villages with the exception being the City of Jackson with a population of 45,500. A majority of the population resides in the City of Jackson and three outlying townships of Blackman, Summit, and Leoni. "The region is extremely economically depressed with the City of Jackson having the highest unemployment rate in the State of Michigan" (TIDSS: Two-Way, 1985, preface). The region has seen the loss of major employers such as Goodyear Tire and also smaller employers mainly in the auto related industries. The region is slowly beginning to attract new employers to the area. "The Greater Jackson Area Chamber of Commerce sees the quality of education in the area as a prime 'quality of life' indicator that is crucial in attracting new business and industry to the County" (TIDSS: Two-Way, 1985 preface).

In Michigan in the late 1970's and early 80's, there were vast enrollment declines in the K-12 schools due to problems with the economy. The JCISD, like most other districts in Michigan and the nation, had been losing student enrollment at a rapid pace. Student enrollment had declined by 8,611 students or 24.8%, with the 1973-74 enrollment being 34,597 and the 1983-84 enrollment being 25,986 (TIDSS: Two-Way, 1985 p.4). This dramatic enrollment decline, coupled with a reduction in teaching staffs and the depletion of instructional resources caused by increased costs and decreasing local, state and federal revenues had forced the JCISD to reduce curriculum to a minimum. Most districts had already curtailed or eliminated athletics, music, extra curricular activities and academic courses which are high cost or low demand/enrollment. An excerpt from the grant proposal states the following:

> Many districts have limited or non-existent foreign language offerings. The language offered is often determined by who on staff can teach what language. Most districts offer little advance math beyond Algebra II, thus handicapping the student needing Trigonometry or Calculus. Science courses are also limited, with several districts offering only Basic Biology and Chemistry classes. Most districts offer little in the way of advanced or specialized courses in English, Geography or the Political and Social Sciences. In some cases these academic courses are not offered because there is no one qualified on the district staff to teach the course and resources are not available to hire additional staff. In other cases, these academic courses are not offered because only small numbers of students need or want the course, thus making the offering of the course non cost effective.
>
> Therefore, it appears obvious that a cooperative effort by constituent districts could result in overcoming several barriers present in providing a comprehensive school district curriculum. Teaching facilities could be shared, students could be bused to central locations so that sufficient enrollment existed to make course offerings cost effective and teaching

> staffs could be combined and more appropriate teaching assignments made and state and federal aid could be shared as appropriate.
>
> While the above appears as an obvious solution for maintaining and expanding constituent district curriculums, history and experience have shown that physical movement of staff or students is not a viable option for providing cooperative academic programming among the constituent school districts within the JCISD. Previous local history with these approaches has shown that vast amounts of valuable instructional time are lost when physical relocation of staff and/or students is required (TIDSS: Two-Way, 1985 p.5).

According to Lang (1990), by 1980 consolidation had already reduced the JCISD from 60 regular, small districts down to 12. "When you lose that many kids what happens is, number one, you lose critical masses so that you have little pockets of kids in the districts around the county. Maybe you've got a half dozen kids that need an advance course or they need physics or they need calculus. You can't afford to do that with one teacher at that site because the numbers are too small or possibly become too high," Lang said.

Directly related to the enrollment declines were teacher lay offs. Union contracts in the JCISD count for lay off by seniority and have no relationship to class need. Consequently, teachers who were certified or qualified to teach the advanced courses were being laid off leaving a void in the curriculum. "At one point in time we had districts here that had people laid off [with] up to 16 years seniority," said Lang (1990).

In 1981, under the direction of the Jackson County Superintendents' Association, the Cooperative Program Committee was formed. Its purpose was to explore alternative methods for offering low enrollment high school classes on a cooperative basis. The committee conducted a comprehensive survey of all high schools to assess local interest and curricular needs. From this survey, five courses were identified and offered at the Jackson Area Career Center for the fall of 1981. However, an insufficient number of students registered for classes. The primary reason was that students did not want to leave their home school.

The following year, the committee decided to investigate methods of cooperative programming which would allow students to remain on site. They determined that any approach to cooperative programming would have to meet the following criteria to be successful:

1. The program must have the potential to serve all of the constituent school districts the comprise the JCISD.
2. Local control and autonomy must be preserved.
3. Students should not be bused to other sites.
4. Teachers should not be moved or rotated.
5. The instructional process must be as "normal" as possible.
6. The program must be cost effective (TIDSS: Two-Way, 1985 p.8).

The committee also determined that they had, basically, four general alternatives to work with, to meet the criteria they had established; move teachers; move students; use technology to deliver instruction; or a combination of the three. After considering their options, the committee determined that the only viable means for providing cooperative academic programming among the constituent school districts of the JCISD was to employ some form of technology as a delivery system for traditional instructional approaches.

Project TIDSS was initiated by the local school districts who, after exhausting more traditional means of cooperative programming, decided to look at what technologies were available to help solve their problems. According to Lang (1990), they (local educators) approached the Intermediate School District and said, "Would you facilitate it and coordinate it and work with us in a consortium to see what can happen?"

In 1981, under the direction of the Jackson County Superintendents Association, the Cooperative Program Committee was formed. Its purpose was to investigate methods for offering low enrollment and low incident courses on a cooperative basis to all constituent school districts that comprise the JCISD. The committee determined that the most viable option would be to employ some form of technology as a delivery system for traditional instructional purposes. The local districts approached the JCISD and asked them to facilitate it, coordinate it and work with them in a consortium to see what was available.

A Local Feasibility Study

The Cooperative Programming Committee conducted a local feasibility study to assess the various technologies that were available at the time. The districts had specific goals for the technology when they looked at the project. Those goals included that it have full motion video, it had to be fully interactive and all sites had to be interactive with one another. "They (local districts) felt that that was important for the kind of audience that we were dealing with. We looked at multiple kinds of technology to be able to do that. We never really strayed off from that being the minimum of what they wanted to do," said Lang (1990). "When they started talking about this, which would have been in '80 or '81, satellite networks such as the TI-IN academic program, the SERC program, Oklahoma State were not existent. So they were not really an option at that point."

One-way interactive telecourses did not meet the criteria established by the districts. According to Lang (1990), the perception that local districts had regarding one-way interactive telecourses was that "they work well if you are not talking about a public high school setting. One-way telecourses work very well with motivated learners, adult learners, college learners, industrial training type of learners, but when we are talking high school students, who may tend to be a little bit less than motivated, I'm not sure that they would do all that well in a one-way situation".

On May 10-11, 1984 representatives from the Cooperative Programming Committee traveled to Morning Sun, Iowa to examine project TWIT, an instructional television system which electronically links four small school districts, allowing them to share educational programming (Jackson Citizen Patriot, July 23, 1984 p.A-1). The TWIT project employes a line-of-sight microwave network. Lang, director of the Regional Educational Media Center (REMC 15) at the JCISD, was one of the educators who traveled to Iowa to view project TWIT. His assessment of the project was that it was unlike the old type of instructional television people are used to. "This is flexible and interactive" (p.A-1). Lang further explained that local educators saw the two-way interactive television system as a cost effective way to restore diversity and richness to school curriculums. "As enrollments fall, many districts find they no longer have enough students to justify specialized classes. Advanced math or physics classes are cut as more of the shrinking educational dollar is devoted to basics" (p.A-2). The visitation team, impressed with the potential of such a delivery system, was particularly intrigued by the fact that the technology was, in effect, transparent to the instructional process. "What was observed by the team was effective instruction, not technology" (TIDSS: Two-Way, 1985, p.8).

The committee also visited projects in Minnesota and Wisconsin, which employed fiber optic and ITFS technologies. With 12 school districts to interlink, a microwave network appeared to be the most feasible and affordable method at the time. Lang estimated that a complete countywide microwave network would cost $750,000 to $1,000,000 depending on how sophisticated the system was (Jackson Citizen Patriot, July 23, 1984, p.A2). The JCISD did not rule out other alternative delivery systems available. In fact, part of the feasibility study was to determine the best way to link schools. "Microwave relays might be preferred in one part of the county while a ground system using existing cable television might be best somewhere else" (p.A-2). At this juncture, all options were considered, including a fiber optic system.

On May 29, 1984, the Cooperative Program Committee presented the following recommendations to the Jackson County Superintendents Association:

> 1) A need exists among the 12 constituent school districts of the JCISD for a means to provide cooperative academic programming to restore, maintain and expand local district curricula that will at the same time preserve local district control, autonomy and identity.
>
> 2) Several existing and emerging technologies have the potential to be an effective delivery system for cooperative programming among the constituent school districts within the JCISD, while meeting the criteria noted above.
>
> 3) It is proposed that alternative technologies for the establishment of an interactive aural/visual instructional delivery system be explored for inter-connecting all 12 constituent school districts and the Jackson County Intermediate School District, and a plan be developed to design, finance, install and operate such a delivery system for the benefit of all participating schools (TIDSS: Two-Way, 1985 p.10).

The recommendation was approved along with a request that each constituent district and the JCISD contribute an initial $500, which would fund engineering and technical studies. (All districts formally improved involvement in the project by August 1, 1984). "The JCISD was requested to coordinate the project on behalf of the 12 constituent districts, and a committee to work on programming, planning and implementing was established" (TIDSS: Two-Way, 1985 p.11).

Project Goals

At this point, a three phase plan was devised by the JCISD to implement a local TWIT (the acronym TWIT was initially used), system into the JCISD. Actual implementation was contingent upon the JCISD receiving state funding. Phase I included identifying three or four schools which would be electronically in one pod or cluster. In Phase II more clusters would be linked together with the JCISD serving as the central hub. Phase II would also include the purchase of a single satellite receiving dish which would be placed at the JCISD media center. This receiving dish would be used to tap into the M*STAR Network (Michigan Statewide Telecommunications Access to Resources). The system is operated by the Central Education Network, a consortium of 26 states, including Michigan. The Michigan Department of Education pays for the right to use the network, which provides 2,800 hours of educational programming each year. If districts were connected to a microwave network, only one dish would be needed to collect the programs. Phase III would include a system for sending information between districts - an "electronic mail" system linking school computers (Jackson Citizen Patriot, July 23, 1984 p.A2).

According to Lang (1990), "The curriculum goal was threefold; maintain present curriculum; expand that curriculum; and enrich the curriculum. We had a second goal which was the ability to be able to electronically distribute learning resources. We wanted to be able to carry certain things live out to local districts or be able to distribute live time, some other kinds of satellite programming. The third goal was to be able to use the system to transport data. That's been abandoned because of changes in technology. Districts now can go stand alone much more cost effectively than they can go to a central processing area. So the need for that has pretty much gone."

Planning Grant

In August the JCISD applied for a $30,000 planning/implementation grant from the state to develop a two-way interactive television system for the twelve school districts in the county. According to Gerald B. Kratz, JCISD Superintendent, the $30,000 would supplement the $6,500 that was already provided by local districts to help fund a feasibility study (Jackson Citizen Patriot, Aug. 10, 1984 P.A-3). Superintendent Kratz further added that if the proposal was approved, the feasibility study would be completed by late October and the system could be placed into the first schools by January, 1986. Also in August, 1984, the JCISD showed its commitment to the project by approving the purchase of a $7,500 satellite receiving dish and related equipment, that would permit reception of programs transmitted by the M*STAR network (p.A-3).

On October 3, 1984, the State awarded the JCISD $28,000 which, along with the $6,500, gave the JCISD $34,5000 to complete phase I of the project. Part of Phase I included: conducting engineering and program feasibility studies; determine the best form of transmission: cable, fiber optics, ITFS, microwave, or open broadcast; design the distribution system including the identification of 3 or 4 clusters of districts that will be distribution pods; develop equipment lists and bid specifications; secure any FCC licenses required; formalize staffing, contractual, enrollment and other agreements among all constituent districts; conduct interest and awareness sessions for key groups; and develop overall cost parameters, funding plan and funding source matrix (TIDSS: Two-Way, 1985 p.11).

Consultants

The feasibility study was conducted by Tele-Systems Associates, Inc. (TSA) of Minneapolis, Minnesota. "TSA is a consulting company whose philosophy and practice is to develop business/education partnerships that will provide rural communities with an alternative way to deliver enhanced and enriched educational opportunities to students and adults and to assist the telephone cooperatives/companies with a more cost-effective way to improve their telephone systems" (Kitchen, 1987 p.10). Other services offered to their clients include technical and educational planning, development, and implementation. "Specific services available include technical design development, partnership development, financing alternative identification, teacher training workshops, grants development, and legislative lobbying" (p.10). Tele-Systems Associates was chosen because "they were about the only ones in the ball game at that point in time," Lang said. (1990).

Lang further discusses the importance of using consultants in the implementation process:

> We used initially Tele-Systems Associates out of Minnesota. And we also used throughout the project, many other consultants for specific phases, like certain people from the microwave worked, certain people from cable worked, and so forth. You know, you get people in the feasibility end of it, you get people in the engineering end of it, you get people who will take it all the way from Point A to Point z. You get people who will come in and do a little piece or a little part of it. You've got somebody who will come in and do your teacher training, and so forth, so on. They (Tele-Systems Associates) helped conceptualize the project and some of what might happen or could possibly happen with some of the cooperative relationships to make things happen. That was probably the most valuable service that they performed. They had an individual who spoke 'cable' very well and was very helpful in the initial entrees with the cable people in getting contacts in place and that sort of thing (1990).

The final report was submitted by TSA to the ISD on April 2, 1985. The report included a feasibility study, a design concept, cost estimate implementation, and timetables for the activation of a multi-school district two-way, interactive, interconnected video system. An excerpt from TSA's report states:

> After investigating numerous technologies and their specific applications, we have chosen to recommend a cooperative public/private venture to accomplish interconnections. We believe such a joint venture, utilizing existing resources, to be more economical and reasonable than the construction of a totally separate educational network.
>
> Telecommunications development and implementation for education is much more than designing a technical system, purchasing the technology, and building the system. The technological considerations must be considered the given element of a telecommunications system. The technology will

> do anything asked of it, if those who are doing the asking are willing to pay for that capability. The most important consideration to be looked at is the human element - those who use it and those who may benefit from it. The emphasis should be placed on how well the technology is being used to meet the understood needs of each educational institution and its students (Pellant, Kitchen, 1985).

TSA had already made contacts with private cable TV, microwave and public utility companies to discuss the use of their existing communication systems and facilities on a fee basis using formal contracts. After reviewing all options, TSA concluded that the best method for interconnecting the Jackson area was through a hybrid system; using existing cable TV systems, with some areas linked by microwave transmission. Construction cost for the system proposed by TSA was around $350,000, with an annual maintenance fee of $13,000 to $18,000. In addition, building one television equipped classroom in each district (at about $15,000 each) would cost $180,000. Another $70,000 would be needed to evaluate the system according to state requirements. Total cost for the system was estimated at $600,000.

An excerpt from "A Grant for a Cable Television System" states TSA's findings:

> 1) The consortium could be feasibly interconnected using a hybrid system of copper cable and microwave, 2) 10 districts could be tied together with copper cable by constructing some small amount of "plant" and utilizing the facilities of four existent cable companies, 3) three districts would need to construct microwave facilities to interconnect with the network, 4) costs for the interconnect network would be around $350,000 - far less than early projections, exclusive of the costs for the interactive classrooms, 5) the potential

exists to develop a public-private partnership for the purposes of system maintenance, 6) in addition to instructional use, the system can be used for administrative data transmission, 7) because of inherent systems design problems, each member of the consortium will have varying amounts of capacity on the system but no one will have less than one channel "upstream" and one channel "downstream", 8) additional educational institutions in the community such as Jackson Community College, Spring Arbor College and the non-public schools can be provided, at costs, access to the system and 9) the entire network could potentially be completely activated by Fall, 1986 (A Grant for a Cable, 1985 p.9).

Superintendent Kratz stated that construction of the system was contingent on the JCISD receiving a state grant that would cover development cost. Also at this time the name of the project was changed from TWIT, for Two-Way Instructional Television, to TIDSS, for Two-Way Interactive Distribution Systems for Schools (Jackson Citizen Patriot, April 25, 1985 p.A-3).

$5,000 Gamble

On May 10, the JCISD gambled on receiving state funding by contracting Continental Cablevision of Michigan Inc. to do $5,000 worth of work on the first section of project TIDSS. According to Lang, Continental Cablevision would install cable for the TIDSS at the same time it does its own cable installation, thus saving considerably on the cost. In order to take advantage of the situation, the ISD had to make at least a down payment on the work. The 8.7-mile section was built between the Northwest School District and ISD headquarters. Estimated cost for the work was $37,833. If the line was installed at a later date, cost could run as high as $120,000. Lang explained that the district received a cost break because the JCISD work could be combined with renovation work Continental Cablevision was doing in the area. If state funding was not approved, then work on the 8.7-mile section would be halted (Jackson Citizen Patriot, May 10, 1985 p.A-5).

Construction Grant

The JCISD and two other districts, who were also vying for state development funds, made presentations on May 20, 1985 before the state Board of Education in Lansing in an attempt to secure funding for the development of a model two-way interactive television system.

An excerpt from "A Grant for a Cable Television System" states:

> The Jackson County Intermediate School District is aware of efforts of other regions in this state to establish similar projects. The Eastern Upper Peninsula Intermediate School District; REMC #10, comprising Huron, Sanilac and Tuscola Intermediate School Districts; and REMC #2, comprising the 7 Intermediate School Districts in the northwest quadrant of the lower peninsula, are attempting to put instructional delivery systems in place utilizing a variety of technologies.
>
> The Jackson County Intermediate School District provides a unique avenue for the establishment of a pilot project to demonstrate the feasibility of a technology based cooperative instructional delivery system that would provide a viable State model for replication. Advantages to establishing such a project in the Jackson County Intermediate School District are:
>
> 1. A spirit and desire for cooperation exists among all 12 constituent school districts.

2. The cooperative programming needs of the region are similar to most other areas of the State.
3. The region has adequate enrollment to make the project cost effective.
4. The geographic area to be included is of realistic size considering technological alternatives now affordable and available.
5. The region has an urban/rural makeup similar to many other areas of the State.
6. The cultural/ethnic/minority makeup of the region is representative of a majority of the State.
7. The region is conveniently located for others to observe the pilot project.
8. The dire economic depression of the region can provide great potential for using the system to accelerate job training and re-training efforts.
9. The possibility exists to extend the delivery system to the Academic School of the State Prison of Southern Michigan, thus providing some unique models for compensatory and adult education.
10. Hillsdale County Intermediate School District and its 8 constituent school districts to our south are exploring a similar system to be networked with this delivery system, thus providing a model for State-wide networking (A Grant for a Cable, 1985, p.25).

On May 23, the state Department of Education approved funding for a $350,000 grant to develop a two-way television educational system. It was believed that the JCISD system was the front runner because the Jackson system was thought to be significantly less expensive than the other two under consideration. If the JCISD did receive the grant, they would still have to go through one more application process before receiving the funds (Jackson Citizen Patriot, May 24, 1985 p.A-1).

A state House-Senate conference agreed on July 9, to allocate $350,000 for a two-way communication system to be developed by the JCISD. The project was to be the first of its kind in the state and serve as a model for other districts. According to Lang, "This really gives us the green light to go ahead with the full implementation of the network" (July 10, 1985, p.A-3). The final bureaucratic hurdle required approval of the funding by the state Legislature.

On January 7, 1986, the JCISD received the $350,000 state grant from the state Board of Education. Ned S, Hubbell, acting Assistant Superintendent for public affairs for the State Board of Education, said that the Jackson project was chosen over the others because it showed thorough planning. Another reason the Jackson proposal was selected was because it "showed the cooperation of local school districts and a commitment of local funds to continue the project after state funding is exhausted" (Jan. 8, 1986, p.A-1).

System Cost

According to Lang (1990), the JCISD originally received a $28,000 planning grant that was matched with $500 from each district and $2000 from the ISD bringing the total amount for the planning grant to $36,000. The state provided $350,000 initial construction grant, and then a $60,000 supplemental construction grant to take care of cost overruns. "The total for the actual system, construction of the network was right around $600,000. There was another $150,000 that was spent for the individual classroom installation. So that brought it right out to about $750,000," Lang said. Further, Lang discussed how the cost was shared among the constituent school districts:

> Essentially what we did with the consortium was take the signal to their building, into the outside wall of their building at no cost to them. We got $410,000 in state grants to build the construction. The intermediate district or county unit put in $190,000. That raised $600,000 and that paid for the construction of the electronic highway. Then, each local district was required to pay for the installation of their classroom. We had one contractor install them all at the same time for about $8500 to $10,000 apiece. So initially all the districts put in $500 for the feasibility study. They put in about $10,000 for a classroom. And then from about 1984 on, there were assessments to pay for some of the planning, some of the staffing that took place during construction. It was about $1.25 a year per student that they were assessed. So they put in five dollars a student over a period of four years while the system was being built and that was for operational cost (Lang, 1990).

Business/Education Partnerships

JCISD officials had already begun working on establishing cooperative contracts with the local cable companies to share transmission lines and developing engineer plans for microwave and fiber optic links (Jackson Citizen Patriot, Jan.8, 1986 p.A-1). The local cable companies, when initially approached, were reluctant to get involved because they thought: (a) the schools wanted free channel space; and/or (b) they were concerned that the JCISD were looking for free service.

According to Lang, "Historically, when educators go to commercial concerns they usually go with their hand out and say, "Give me". The approach the JCISD took was to let the local telecommunication companies know up front that, "We are coming in with our checkbook in our pocket". We don't want you to see us as a profit center, nor do we want to cost you any money. We want to pay our going rate; we want to pay our fair share. We want you to look at running this on a no profit basis as a community service." According to Lang, the telecommunications companies' main benefit has been a great deal of favorable publicity for being involved in the project. The JCISD made a concerted effort to "always parade them out front and to point out the cooperation, help and assistance that we've gotten," Lang said. "I've asked some of them why they are involved (in the project). One of the reasons I get is, they have employees who are members of the community too, and their employees will eventually benefit from it. The local cable companies in the Jackson County area didn't have a lot going on in terms of public access cable, so I think the cable companies were feeling guilty in terms of trying to do something for the community," Lang said. "I think the public relations aspect has been a major approach for them. I don't think we've caused them any problems, and I think they have found it to be a very positive experience."

The JCISD paid actual cost to the telecommunication companies for the overlashing of the cable, splicing amplifiers, and mounting antennas. In one case, Summit-Leoni Cable agreed to let the JCISD use their tower to mount an antenna but the tower was not strong enough to support what they wanted to put on it. The JCISD paid for the strengthening of the towers. "The telecommunication companies billed us back for their actual costs. That's how that was worked out. It was on an actual time and materials basis", said Lang.

Carl Brasseur (1990, March 22), General Manager of Summit-Leoni Cable TV, discussed the role his company played in the TIDSS project:

> Each (cable) contract is a little different. (See Appendix C.) What we do for the ISD, what we ageed to do was, give them space in our headend facility, and give them tower space for the microwave links. We also have an agreement with the ISD to maintain the system. Because of the massive involvement with the different entities (different cable operators), the ISD chose to contract one individual to maintain the whole thing.
>
> We made no money on this. I mean, this is all public service basically. Our company feels very strongly about education for our children. So what we've done is free, so to speak. The TIDSS system is its own independent system. The signal does not travel on our coax. We contracted a company to come in and overlash our system, so it's all totally independent. We never sent them a bill for any of our time (Brasseur, 1990).

The local cable companies, because of the legal problems involved, could not legally sublet access to the poles to another entity. "We cannot sublet our lease because we lease these poles from the utility companies," said Brasseur. Overlashing the JCISD cable onto the local cable companies existing lines proved to be the most practical solution for getting around this legal problem. Although the JCISD bought the cable and paid for the installation, the local cable companies, on paper, legally own the system. "In essence we own the cable, they bought it, we have to own it legally," Brasseur said. "It's all paper, it's theirs, we maintain it." In addition, overlashing assured the JCISD of its own private network; the signal can only be accessed by the participating school districts. The only exception according to Lang (1990), "is with Clear Cable out in Brooklyn. We are on their subscriber system, but up above the normal band where the normal home won't see them." The reason the JCISD did that rather than overlash was because Clear Cable had just rebuilt the system and it was underground. "It was less expensive for us just to merely rent some channel space from them," said Lang. "We have got two channels on the subscriber system going out to the school."

According to Brasseur, there were enormous problems initially getting the system up and running. "Too many hands in the soup," Brasseur said. "One company did the design for the CATV, which we should have done because we basically redesigned the whole system. Another company did the signal search for the microwave path studies and the licensing for that. They had another company who put this all together. They had to deal with the FAA for permits because of the towers and the airport; county right-of-ways that we obtained for them. And then, just interacting with the various cable companies, who all have different policies, because we're under different ownership. In addition, each and every site had to have an FCC license" (Brasseur, 1990).

Continental Cable Vision in Michigan is the other main cable company used by the JCISD. The JCISD uses their 250 foot tower and their headend building for the use of mounting microwave dishes and equipment. In addition, the JCISD is overlashed on parts of Continental's system. Horizon Cable is being used in several areas to help carry signals from the microwave towers to the schools and back. This is also an overlash agreement.

Consumers Power, a local utilities company offered in-kind engineering assistance. However, except for possibly utilizing their power poles to attach cable and a few tower sites, they did not have a communication network that could be used by the JCISD.

Construction

Actual construction began in May, 1985, when the JCISD contracted Continental Cablevision to install an 8.7-mile section that would connect Northwest School District and the JCISD headquarters. The rest of the construction began after the JCISD received the construction grant on January 7. At that time, the network was scheduled to be completed and in operation by September,1986. However, "There are two primary aspects to all educational interconnect projects; construction of the physical delivery system (EXTERNAL), and the political-people coordination (INTERNAL)" (Pellant and Kitchen, 1985, p.11). These forces delayed the debut of TIDDS until the fall of the 1987-88 school year, when seven districts were brought online and three classes (two Latin classes and a vocational agriculture class), were offered. By the fall of '88' all districts came online.

System Design

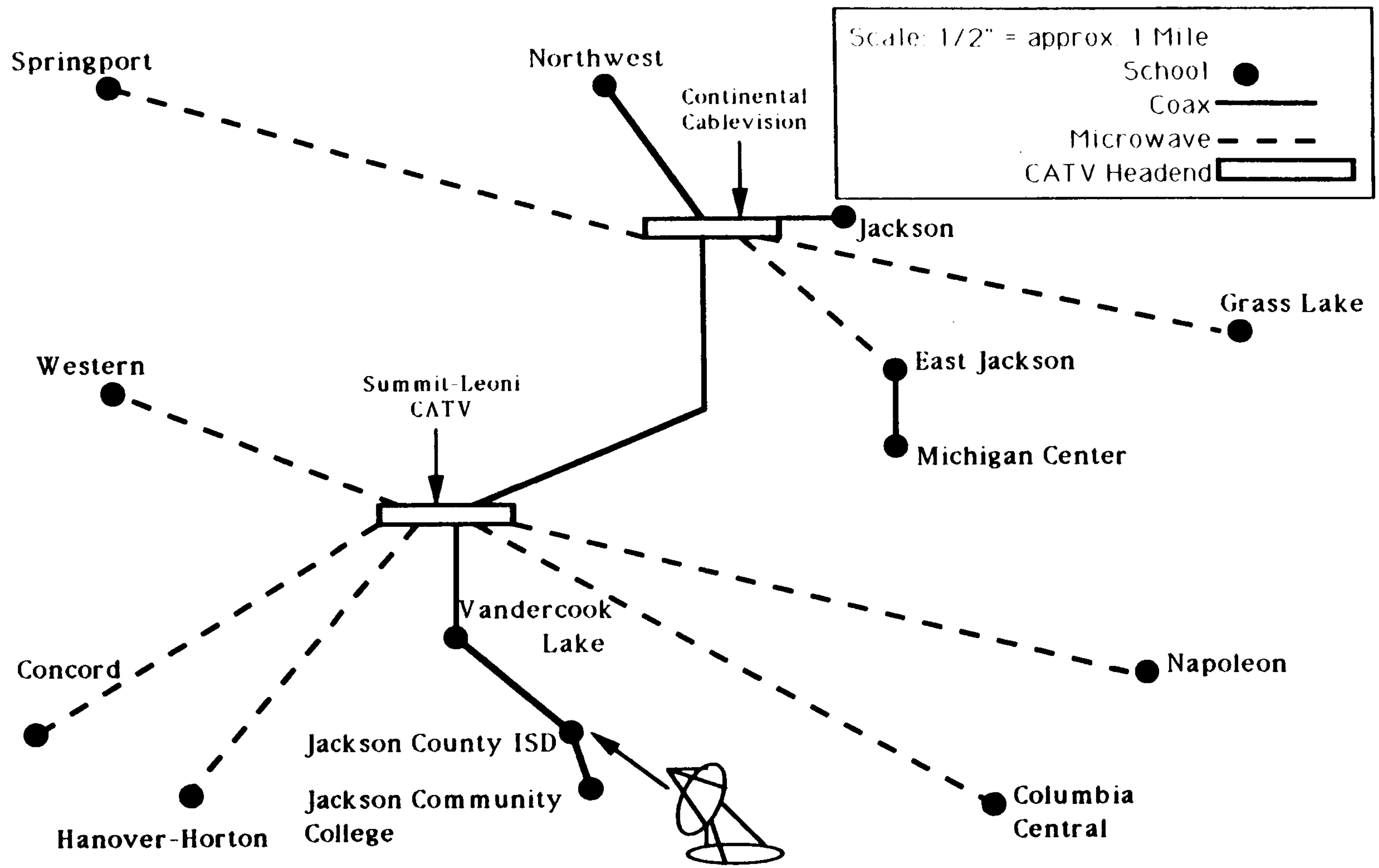
The system design is called a hybrid system because it utilizes a combination of technologies; in this case coaxial cable and microwave. (See Figure 2.) There are two headends (Continental Cablevision and Summit-Leoni Cable TV), where all signals travel to for redistribution. In addition, these two headends are tied together by coaxial cable.

Continental Cablevision Headend

The following schools are connected to Continentals headend via coaxial cable : Northwest and Jackson. In addition, the headend at Continental Cablevision is connected via coaxial cable to the headend at Summit-Leoni Cable TV. Springport, East Jackson and Grass Lake are connected to Continentals headend via microwave transmission.

Summit-Leoni Cable TV Headend

The following schools are connected to Summit-Leoni Cable TV headend via coaxial cable: Vandercook Lake, Jackson Community College and the Regional Education Media Center (REMCs #15). Michigan Center and East Jackson are tied together via cable overlash on the Summit-Leoni system. However, a signal from Michigan Center has to travel to East Jackson and then go out through the microwave system to reach Continentals headend for redistribution. Western, Concord, Hanover-Horton, Napoleon and Columbia Central are connected to Summit-Leoni Cable TV headend via microwave transmission.



JCISD Project TIDSS: Network Configuration
Figure 2

There is a satellite downlink located at the REMC site which can be used to distribute the M*STAR network to all schools via the TIDSS system. Currently, M*STAR is being used over the TIDSS system only for special events. The REMC center downloads all of the M*STAR programming daily and makes duplicates. Districts can then access this programming through the REMC center.

Channel Capacity

Microwave

In six of the microwave sites they are able to send out one signal or send out their site and receive back two other sites. Those two other sites can be any combination of the fourteen sites. Preprogram timers at the headend facilities at either Continental Cablevision or Summit-Leoni Cable TV switch what sites go out to the microwave sites at various times. Those are set up and programmed and switched automatically. Any combination can interact with any combination. At any one time microwave sites can send out a signal and they can receive back two other channels. In two of the microwave sites they can receive three other signals and send one out. "Microwave gets very expensive as you add channel capacity, so we limited it to two or three remotes," said Lang. "Our teacher contract says, "A teacher will teach to no more than three remote sites with no more than a total of twenty-five students in the originating and remote sites."

The longest microwave path is sixteen miles and the shortest five miles. Towers were built at Western, Napoleon, Hanover-Horton, and East Jackson High Schools. Cable towers are used in Concord and Columbia Central. Agreements to use water towers were made in Springport and Grass Lake. All these microwave signals travel either to Summit-Leoni or Continentals' headend for redistribution.

Cable

There are six sites on the cable backbone. Their receiving-sending capability is limited by the number of receivers and modulators that they have. Technically, this cable system has a thirty-six channel capacity. In other words, eighteen signals can be sent out and eighteen signals can be received back, or six can be sent out and twenty-four received back.

"Each of the sites can originate or receive. And at any one point in time it can be any configuration of the sites sending or receiving to one another and we can have multiple things going in the system," Lang said. "For example, on the schedule this year, I think two or three times of the day when we have got two or three things going on with different clusters. Next year, I think we have four different clusters functioning at the same time" (Lang, 1990).

This research indicates that cable transmission is preferred over microwave transmission because of increased channel capacity, it is easier and less expensive to maintain, and the JCISD was able to use the local cable companies existing infrastructure, thereby alleviating the cost of constructing a new network. Schools should try to stay off the subscriber channels if possible.

Maintenance

The consortium is responsible for maintaining and repairing the system. "In some of the approaches that are being made now on distance learning systems, there's a lot of cases where a third party is going in and selling this as a service," said Lang. "In that case, if something goes wrong you call the third party. If something goes wrong (with the TIDSS system), we're (the JCISD) the only people you call at this point" (1990). The JCISD maintains and repairs all the classroom equipment that's associated with TIDSS.

An arrangement was made with Summit-Leoni Cable TV for maintenance of the cable system. "We have traded back the cable company (Summit-Leoni) some capacity on our loop of the system. We have a thirty-five channel capacity at this point. They asked for four channels back to be able to use to transport some signals between the two cable companies (Summit-Leoni and Continental Cable). In lieu of any rent, they (Summit-Leoni) agreed to maintain the system. So the cable portions of the system are maintained at no charge to the project," stated Lang.

The JCISD has its own technician who is being trained to do the microwave maintenance. "Most of the microwave equipment is modular," said Lang. "We can identify a problem, pull out a component, slip in a spare, and so forth." According to Lang (1990), the major problem with microwave maintenance is with lighting. "We've taken in the last two years two major, direct lightning hits which has been very expensive."

Operational Budget

As of the 1988/89 school year, each school district was assessed one dollar per student to cover operational cost. That, coupled with other sources of income, provides for system maintenance and system operation. (See Appendix D.) This system costs around $25,000 a year to operate.

Instructional Budget

The course fee for the 1989/90 school year was $375.00 per student per year long course and $187.50 per student per semester course. (See Appendix E.) The originating site was then reimbursed $260.00 per student per year long course and $130.00 per student per semester course to help finance the initial preparation period required by first year teachers of the TIDSS system. "If you require the originating district to pay that, you're penalizing them for originating a class," Lang said. "The Consortium is reimbursing districts a portion of the first year prep period to cut down the impact of preparing a teacher to teach on TIDSS."

Problems

There were, of course, problems (external and internal) that arose during the construction and implementation of TIDSS. This research indicates that these problems were not unique to the TIDSS project, but rather, (after a review of literature), appear to be common problems associated with these types of interconnect systems.

The JCISD went to great lengths to avoid internal problems. During the main thrust of the implementation of TIDSS, there were seven project committees; Board of Directors; Executive Committee; Technical Concerns Task Force; Evaluation Task Force; Dissemination Task Force; Curricula Task Force; and Staff Development Task Force, which involved around 80 different people (Bennett, March 21). The Task Force Committees were comprised of representative teachers, administrators, community members, project staff and where appropriate, students and parents (A Grant for a Cable, 1985, p.4) The Jackson Education Association (JEA), the Jackson County Education Association (JCEA), and the Jackson County Intermediate Education Association (JCIEA), were involved in the project from its inception and had members participating on the various planning committees (p.18).

External

Most of the external problems with the TIDSS project occurred because the JCISD did not conduct a final engineering and design study. "We went from a feasibility and concept study right into construction without a final engineering and design study," said Lang (1990). "The feasibility study tells you what's possible and what the approximate cost will be. The engineering study takes those and pins them down. That is why we had cost overruns". According to Lang, the reason the engineering study was not conducted was because the project began to move vary rapidly after the feasibility study was conducted. "We had a number of local school officials who got excited about the feasibility study. They got the politicians in Lansing involved and at this point in time no one said, "Hold on, we need to do a final engineering study" (1990).

Another problem the JCISD had was dealing with four area cable companies. Negotiations with one cable company in particular, Home Theater Systems Inc., stalled construction in Western, Concord and Hanover-Horton school districts. Because an agreement could not be reached (the reason why could not be pinned down), the JCISD eventually installed microwave systems at those school districts (Jackson Citizen Patriot, March 15, 1987 p.A-1).

Inclement weather in December 1987 halted construction of a microwave tower. At the same time it was discovered that the tower at Summit-Leoni's headend would not support microwave dishes and would have to be reinforced (p.A-1).

Two direct lightning strikes on microwave dishes that were already erected caused more delays as well as expenses. The structure the dishes are connected to are often the tallest structure in the surrounding area, making them prime targets for lightening strikes (Lang, 1990).

Finally, Lang added that, "No one should ever try to put up 14 sites at one time. We tried to do too much at one particular time and as a result, there was total frustration" (Lang, 1990). Lang stated that a planned phase-in of small clusters of districts would have alleviated external and internal problems encountered in the first year of operation. The external problems were minor and dealt mainly with the audio transmission. It took time to properly set the audio levels so that there was not any feedback. However, before this problem could be resolved it compounded the internal skepticism some administrators and faculty had about the project in general.

Internal

Historically, when introducing new technology into education, there is some skepticism. The TIDSS project was no exception. According to Bennett (1990, March 21), not all school administrators jumped on the TIDSS bandwagon. "You've got to have the attitude that I'm going to make this work and getting them (administrators) to get that attitude was a challenge," said Bennett. The attitude some administrators had toward TIDSS was, "we have enough problems without adding something else on top of it," Bennett said. "We've had to convince them that this is going to help the kids in their district." Bennett added that once administrators saw the system in operation, saw the advantages of it and saw how receptive the students were to it, then they realized it was not going to be a major problem, as they anticipated.

According to Lang (1990), the Department of Education posed another problem. "One of the problems we have in establishing distance learning systems in the State of Michigan is the department of education. There is a lack of coordination, there is a lack of leadership, there is a lack of direction and there is a lack of funding. These systems are extremely expensive to put up". Lang added that "There needs to be standards established in these systems so that they eventually will be able to inner-link with one another. I am concerned that we are building systems that will be incompatible and I think somebody has got to assume the leadership role for doing that."

A major problem that resulted from the implementation of TIDSS was alleviating teacher fears concerning job security. "Initially there was a lot of concern on the teachers part about protection of jobs," said Widner (1990, March, 20). "The whole TIDSS project came at a time when we were having reduced enrollment and laying off people. Had we been growing and bringing on staff, I don't think it would have been that big of a question. But, because student population was decreasing and we were laying staff off, it became quite an issue."

The issue came to a head in September 1986. With the system nearing completion, the implications of the use of two-way interactive television ushered in precedent-setting teacher contract language. According to Pat E. Schopmeyer, president of the Jackson County Education Association (JCEA), current contracts had no provisions for this type of system and new language would have to be drafted to accommodate TIDSS (Sept. 16, 1986 p.A-1). Since the TIDSS project was to be the first of its kind in Michigan, the new contract "could set a precedent if all county school boards and teacher unions approve the contract language" (p.A-1). It should be noted that, all districts negotiated separate contracts and that all were represented by the JCEA or its affiliates.

The contract addition outlined class size, job security, teacher preparation time, and established a grievance procedure to handle disputes. (See Appendix F.) "The job security provision states that no teacher will lose a job because of TIDSS" (p.A-2). Some educators expressed concern that the new contract addition "could be the forerunner of a sweeping basic agreement for all teacher contracts, and would mean the end of local control of school districts" (p.A-2). They pointed out that while most districts were the same size, what was good for one district would not necessarily be good for the next.

All School districts who wanted to participate in the TIDSS project had to have the new contract addition approved by both the school board and the teachers. All 12 districts accepted the contract addendum.

"It would have been a lot easier if we didn't have the unions to deal with. That really slowed the process down originally, but it didn't hinder the end result," said Bass (1990, March, 20). "To my knowledge, either we did a good job with the contract or the issues that were raised really weren't relevant. I'm not aware of any formal grievance where a teacher says, "you've violated the contract or this isn't working."

Another internal problem is that most districts of the JCISD have different starting times, therefore the bell schedules are not coordinated. Some students may not arrive to TIDSS classes until fifteen minutes after the class starts. Because of the number of constituent schools involved, there appears no likely resolution to this problem. According to Bass (1990) a coordinated bell schedule would create more problems than its worth. "There are just too many reasons why schools start at different times to ever bring them together. I might only have three kids signed up for a TIDSS class so it's real easy to let them go early and arrive late. It's a lot easier than me trying to reschedule my whole school to start fifteen minutes earlier or later." Widner (1990) states, "Coordinating the time that a class starts up and finishes has been a major problem for us. It took about two or three years before there was some very good countywide offerings because of the difference in time schedules."

The external and internal problems experienced by the JCISD in implementing TIDSS, are common problems associated with most two-way interactive interconnect projects. Even though the TIDSS project was thoroughly planned and involved administrator, staff, teachers students and community members from the inception, issues still arose that caused delays in the implementation.

Curriculum and Teacher Selection

According to Bennett (1990), originally, there was a curriculum committee set up but "it was very cumbersome. It was back when we were saying, 'O.K. this school says they can offer this, and this school says they can offer this, etc. etc." It wasn't manageable, it wasn't a proactive approach. That committee has gone by the way-side."

The way the curriculum is established now is through a proactive approach. A letter is sent to each participating district superintendent and high school principal requesting a list of classes, the desired time of day, and whether the district wishes to be an originating site or remote district. This data is compiled and a tentative schedule is developed. The TIDSS Executive Committee then meets to review and approve course offerings. The schedule and course descriptions are sent back to all superintendents and high school principals. The districts indicate what courses they desire and the number of student slots to be reserved and return the information to the project director. A commitment form is sent to each participating district for final modification of student numbers and signature. Once this is returned, the participating districts are committed to pay for the number of slots reserved. Schools that are designated originating sites post the positions as per the contract addenda for teacher selection. Teachers are selected on a voluntary basis. If a teacher cannot be found at the originating site, a contract teacher will be hired to instruct the course. A contract teacher contract is handled through the JCISD. If no suitable teacher can be found, the course is dropped.

The advantage of this system is that instead of taking courses that are essentially 'leftover' from the established curriculum and putting them on TIDSS just for the sake of filling time, students and teachers are surveyed to see what their interest are. As a result, students are receiving classes which they can't normally get that they have a high interest in.

Curriculum On TIDSS

The following courses were offered in the 1989/90 school year: Latin I; Japanese I; French I-II; Spanish I; and College Preparatory Economics.

(For A Complete Course Description And Course Schedule Proposal For The 1990/91 School Year, See Appendix H.)

Teachers On TIDSS

The main concern teachers had regarding the TIDSS project dealt with job security. Entering its fourth year of operation, the TIDSS project has not caused any teacher layoffs. In fact, additional teachers have been hired as a result of TIDSS (Love, 1990, March 22).

The TIDSS system is only being used in grades 9-12 at this point. There is no formal prerequisite for a student to take a TIDSS class. However, according Love, most students who take TIDSS classes are highly motivated, A-B students (1990). Teachers do not receive special pay for teaching on TIDSS.

Preparation Hour

As mentioned, teachers are chosen on a voluntary basis. First time teachers on the TIDSS system receive an extra one hour preparation period. "Most districts have a six hour day. A teacher teaches five hours and has the sixth hour as a preparation hour. The first year teaching on TIDSS, a teacher will have a TIDSS preparation hour and their normal preparation hour" (Bennett).

Cheryl Marks has been a teacher for 11 years. She is currently teaching French at Western High School and for the second year, is teaching it over the TIDSS system. "Because of the extra prep time I was able to do more creative things the first year," said Marks (1990, March, 23). "If you want a quality program you need extra prep time because it is more of a demanding job. Even though I have fewer students in my home school, I still have the same amount of students that I would have in a regular class. But I'm having to make sure I mail their papers on time as opposed to just distributing them. I have to talk to their principals to find out when their grades are due. So it takes more time out of my own personal schedule. I think they should compensate the teacher with either more time or more money" (1990).

"I don't think you can ever substitute technology for one on one contact, especially in a foreign language where emphasis should be on the spoken word," Marks said. "It's a little artificial just hearing the pronunciation over the TV but as opposed to not being able to take a foreign language, this is the next best thing" (1990).

This research indicates that interaction between teacher and students was or could be the same as a traditional classroom setting. There was a problem hearing if more than one student talked at once, but really no more different than if the students were physically in the classroom with the teacher. The classrooms are set up so that the student camera at remote sites is set at a wide angle and students sit within this area. Students at remote sites turn on the camera and the monitors and set microphone levels. A teacher normally teaches using the overhead camera much like they would use the blackboard. A teacher also has a camera that's focused on them from a wide angle. They can switch back and forth between cameras using a simple switching device. The teacher also has access to a VCR, which is hooked into the system.

Delivery Service

The JCISD has their own delivery system that provides service to all constituent districts. Every ISD in the state provides that service. According to Widner, "At this point in time we don't see a need collectively to use fax machines" (1990). Bass says that the delivery system now in use "was great in the old days but today it's too slow. I think we are moving very rapidly toward the fax machine" (1990). Marks states, "With a fax , I would be able to plan more effectively and get immediate feedback to other schools" (1990).

How the delivery system works is students put their homework or test in a special TIDSS envelope and delivery it to their principals office. That day or possibly the next, the envelope is delivered to the JCISD headquarters. The next day it goes out to the originating class site. The teacher then grades the papers and the whole process is reversed. According to Marks (1990), at times there may be a two week delay before papers are returned at which point grades are relatively irrelevant to the students. To help alleviate this problem, Marks will sometimes have her students put their work under the overhead camera at their respective site and go over problems on TV. However, this process can be very time consuming and cuts down instruction time.

Inservice Training

A three day inservice workshop is held each summer for teachers wishing to learn more about TIDSS. "Operating the equipment is quite simple and in a matter of a couple short inservices the technology part of it can be covered," said Widner (1990). "The inservice is geared more toward delivery of service and less toward technology." While the inservice covers lesson development and special techniques for instructing on TIDSS, Marks (1990) felt that more classroom simulation needed to be done so teachers could get use to interacting with students at remote sites.

According to Marks (1990) and Lang (1990), there is a graduate course offered by Eastern Michigan University at the Jackson Community College in two-way teaching techniques. It is a twelve week course and it's offered over the TIDSS system.

This course is an indication that it requires special skills to teach over a two-way interactive television system. To avoid the infamous 'talking head', special training sessions will help teachers develop effective instructional design, television production and graphics design, and television etiquette. These sessions should provide hands-on practice for the use of the classroom technology. Unless teachers are well prepared and feel comfortable with the technology, two-way interactive television systems will be ineffective and a waste of time and money.

Students

Students who were interviewed all expressed positive feelings about the project. This research was not designed to test effective instruction, however, all the students who were interviewed said that instruction was about the same as traditional classroom instruction. All said that they would enroll for another TIDSS course.

Actual classroom environment is not much different than traditional classrooms in terms of interaction. This research suggest that a student does need to more motivated and disciplined than the average student in order to succeed in a two-way interactive class. The reason is that there is more work involved and the student does not always have the luxury of having the teacher available for individual consultation. The teacher does try to visit with the remote classes during the course of the year. However, budget restraints often limit these visits.

The JCISD has handled discipline problems by putting a monitor in each principals office. While all monitors have not been connected, all administrators interviewed conferred that discipline has not been a problem. Marks (1990) stated that when she gives a test she notifies the principal at each remote site.

Other Uses

Some classes have been offered over the TIDSS system for adult education. While more are planned for the future, the problem now is an administrative glitch. The state, which provides aid for adult education, stipulates that a teacher must be in direct face to face contact with students, before the student can be counted. The reason is because in the past, some of the local school districts were profiteering on adult education. This problem is close to being worked out.

The local Fire Fighting Training group uses the TIDSS system to have countywide meetings. This cuts down considerably on travel cost. Other community agencies are investigating the use of the system. According to Lang (1990), "once you get systems like this up, the needs kind of begin to multiply and escalate."

Project Evaluation

"We are not doing anything formal at this time in terms of research because essentially our initial findings showed no significant difference in learning takes place," stated Lang. "I meet frequently with the teachers involved and we talk about how things are going and that's essentially the only kinds of evaluation we are doing" (1990).

"Normally if you receive state funds you have a very thorough evaluation submitted at the end of the project. This was never established that way," said Bass(1990). "I think the system is working and is sufficient. The problem is if you wanted to duplicate this project someplace and you wanted to see an evaluation; does it work and why, we don't have that in a format that's customary. It's something we ought to do more with."

Basically it would be difficult for the JCISD to conduct formal evaluations because the classes being offered over the TIDSS system are the only time those classes are offered. There is no control group from which to draw a comparison. The JCISD have seen evaluations which show this type of technology to be an effective means of instruction. According to Lang (1990) the JCISD position is, "Why beat a dead horse."

Level of Success

While everyone interviewed felt the project was a success, Bennett (1990), summed it up best. "Most everyone is pleased with it. I'm pleased with it. I don't think there's any doubt that learning is taking place. And the educational opportunities that we can offer these kids far exceeds what an individual district can do."

This research suggest that while there were some problems getting the system up and going, the end result has been the construction of a viable alternative for shared academic programming. This research suggest that the project has been very successful.

Summary

In summary, this research indicates that there are three essential ingredients for every two-way interactive interconnect system. First, everyone involved must make a total commitment to the project. These systems are not inexpensive to put up. To get maximum use out of these systems everyone involved must make a long term commitment and work out any problems that may arise. Second, funding mechanisms must be firmly in place before proceeding with the project. This should include funding to cover the operational cost of the system after it comes online. Third, the actual construction should begin only after the system has been completely designed. A final engineering study will alleviate future headaches. This final construction design should include the establishment of all business/education partnerships, if such partnerships are to be part of the system design. By establishing partnerships with local telecommunication companies, schools can help alleviate the high cost of constructing a two-way interactive system. If possible, the interconnect design should take advantage of existing telecommunication infrastructures. At present, cable appears to be the most practical delivery system for K-12 schools do to the availability of existing infrastructures and ease of maintenance. However, schools should stay off the subscriber channels and install a private, closed network. Fiber optics, as it becomes more affordable, will probably become the technology of choice for interconnect systems.

Finally, all three of these ingredients should be firmly in place before preceding with the implementation process. This research suggest that a two-way interactive interconnect system takes two to three years to implement.

CHAPTER V

SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

The purpose of this research study was to answer the following questions: (1) What were the needs and goals that led the Jackson County Intermediate School District to develop a two-way interactive television system; (2) How was the system implemented; and, (3) what are the criteria for successful implementation of a two-way interactive television system here or everywhere? To address these questions, a case study was conducted between March 19-23, 1990, in the JCISD, Jackson, Michigan. Information was gathered from personal interviews, on-site class inspection, and archival research. Interview questions focussed on why this project was initiated, the needs and goals of the project, what funding was available, business/education partnerships, construction and design of the system, and the implementation of the system into the curriculum.

What were the needs and goals that led the Jackson County Intermediate School District to develop a two-way interactive television system?

The Jackson County Intermediate School District (JCISD) during the late 1970's and early 80's, experienced vast enrollment declines in their K-12 schools due to problems with the economy. Consolidation had reduced the JCISD from 60 small districts down to 12. Student enrollment had declined by 24.8%, from 1973-74 to

1983-84. Enrollment decline, coupled with reduction in teaching staffs and the depletion of instructional resources caused by increased costs and decreasing local, state and federal revenues had forced the JCISD to cut their curriculum to a minimum. Most districts had already curtailed or eliminated courses which were high cost or low demand/enrollment.

The identified problem became how to cooperatively share programming among the districts in order to pool there resources. In 1981, under the direction of the Jackson County Superintendents' Association, the Cooperative Program Committee was formed. The committee explored alternatives methods for offering low enrollment high school classes on a cooperative basis including moving teachers and moving students. None of these attempts proved to be successful or popular.

After more traditional methods of cooperative programming proved to be unsuccessful, the committee decided to investigate the use of a technology delivery system to help solve their problems. Specifically, they were looking for a technology that would serve all the districts; allow the districts to retain local control and autonomy; keep both students and teachers in their home schools; allow instruction to be as normal as possible; and be cost effective.

After viewing three two-way interactive sites, the committee determined that two-way interactive technology met their criteria.

In conclusion, local school districts who, after exhausting more traditional means of cooperative programming, decided to look at what technologies were available to help solve their problems. They decided that two-way interactive technology suited their need for shared academic programming.

How was the system implemented?

The Jackson County Intermediate School District (JCISD) is made up of 12 constituent school districts: Columbia, Concord, East Jackson, Grass Lake, Hanover-Horton, Jackson, Michigan Center, Napoleon, Northwest, Springport, Vandercook Lake, and Western school districts.

These districts came to the JCISD and asked them to work with them in a consortium to find a means for sharing academic programming. In 1981, under the direction of the Jackson County Superintendents' Association, the Cooperative Program Committee was formed. A local feasibility study was conducted that included visiting various two-way interactive sites in operation. The committee established that a technology delivery system would be a cost effective way for the 12 districts to share academic programming.

At this point, a three phase plan was devised to implement a local two-way interactive system into the JCISD. Phase I would see three or four schools electronically linked in one pod or cluster. In Phase II more clusters would be linked together with the JCISD serving as the central hub. Phase II would also include the purchase of a single satellite receiving dish which would be place at the JCISD media center. This receiving dish would be used to tap into the

M*STAR Network (Michigan Statewide Telecommunications Access to Resources). Phase III would include a system for sending information between districts - an "electronic mail" system linking school computers (Jackson Citizen Patriot, July 23, 1984 p.A2).

In August, 1984, the JCISD applied for a $30,000 planning/implementation grant from the State to develop a two-way interactive television system for the twelve school districts in the county.

On October 3, 1984, the State awarded the JCISD $28,000. The 12 school districts and the JCISD agreed to put in $500.00 each. This gave the JCISD $34,5000 to complete phase I of the project. Part of Phase I included conducting engineering and program feasibility studies.

The feasibility study was conducted by Tele-Systems Associates, Inc. (TSA) of Minneapolis, Minnesota. "TSA is a consulting company whose philosophy and practice is to develop business/education partnerships that will provide rural communities with an alternative way to deliver enhanced and enriched educational opportunities to students" (Kitchen, 1987 p.10). After reviewing all options, TSA concluded that the best method for interconnecting the Jackson area was through a hybrid system; using existing cable TV systems, with some areas linked by microwave transmission. Total cost for the system was estimated at $600,000.

In May, 1985, the JCISD applied to the state Board of Education for funding for the development of a model two-way interactive television system (Jackson Citizen Patriot, May 24, 1985 p.A-1).

On May 10, 1985, the JCISD gambled on receiving state funding by contracting Continental Cablevision of Michigan Inc. to do $5,000 worth of work on the first section of project TIDSS (Jackson Citizen Patriot, May 10, 1985 p.A-5).

On January 7, 1986, the JCISD received the $350,000 state grant from the state Board of Education. Ned S, Hubbell, acting Assistant Superintendent for public affairs for the State Board of Education, said that the Jackson project was chosen over the others because it showed thorough planning. Another reason the Jackson proposal was selected was because it "showed the cooperation of local school districts and a commitment of local funds to continue the project after state funding is exhausted" (Jan. 8, 1986 p.A-1).

Actual construction cost of the network was right around $600,000, with another $150,000 spent for the individual classroom installation. "So that brought it right out to about $750,000", said Lang (March 19).

JCISD officials established cooperative contracts with the local cable companies to share transmission lines and develop engineering plans for microwave links. The main principles involved were Summit-Leoni Cable TV and Continental Cablevision. The JCISD paid actual cost to the telecommunication companies for the overlashing of the cable, splicing amplifiers, and mounting antennas. The cable companies main benefit was favorable publicity for being involved in the project.

Actual construction began in May, 1985, when the JCISD contracted Continental Cablevision to install an 8.7-mile section cable line. However, "There are two primary aspects to all educational interconnect projects; construction of the physical delivery system (EXTERNAL), and the political-people coordination (INTERNAL)" (Pellant, 1985 p.11). These forces delayed the debut of TIDDS until the fall of the 1987-88 school year, when seven districts were brought online. By the fall of '88' all districts came online.

The system design is call a hybrid system. It utilizes a combination of technologies; coaxial cable and microwave transmission. There are two headends (Continental Cablevision and Summit-Leoni Cable TV), which all signals travel to for redistribution. In addition, these two headends are tied together by coaxial cable. Eight sites are linked by microwave transmission and six are linked by coaxial cable. "Each of the sites can originate or receive. And at any one point in time it can be any configuration of the sites sending or receiving to one another" (Lang, March 19). The consortium is responsible for maintaining and repairing the system.

The thrust of the operational cost, which provides for system maintenance and system operation is covered by a $1.00 assessment per student for each district.

The course fee for the 1989/90 school year was $375.00 per student per year long course and $187.50 per student per semester course. The originating site was then reimbursed $260.00 per student per year long course and $130.00 per student per semester course to help finance the initial preparation period required by first year teachers of the TIDSS system.

The main external problems that occurred resulted because the JCISD did not conduct a final engineering and design study. In fairness, this research concludes that the JCISD did an excellent job feeling their way through the project. There were a considerable number of entities who had to be dealt with in the construction of the project and this required a great deal of time and coordination; this is the largest two-way interconnect system in the country in terms of number of sites online. However, some problems could have been avoided had they conducted these final studies.

This research concludes that a lot of the internal problems the TIDSS project encountered are common problems associated with any two-way interconnect. The main problem this project raised concerned job security for teachers. Going into its fourth year of operation, the TIDSS project has not resulted in any teacher losing their job. In fact, teachers have been hired as a result of TIDSS.

In conclusion, this researcher feels that, considering the enormity of the project, the JCISD did an excellent job in constructing the TIDSS system. In addition, the on site class inspection left no doubt in this researchers mind that learning was taking place. And, once the novelty of the technology wore off, the technology became transparent.

What are the criteria for successful implementation of a two-way interactive television system here and everywhere?

This research concludes that the criteria for successfully implementing a two-way interactive delivery system includes but is not limited to: a long term commitment made by all participating principles; cooperation from all participants; funding mechanisms should be realistically established not only for actual construction cost but for ongoing operational cost as well; make sure all planning is complete before actual construction begins; involve staff, teachers, students, and anyone else who may be potentially involved in the planning and implementation process; use consultants and specialist in the planning and implementation process; bring a few sites on at a time instead of bringing the entire system up at once; go slow; and, above all, be flexible.

Implications

Historically, education has been slow to adopt new technology. Two-way interactive television instruction projects such as project TIDSS, are an example of the successful use of technology for education. However, these interconnect systems are not a panacea. This research indicates that there are inherent problems associated with this delivery system, which, however, should not negate the positive effects.

There was no question that learning was taking place in the TIDSS classroom. However, not all students will find this means of instruction to be conducive to their learning style. There is a degree of artificiality to the instruction, which may be difficult to get use to. While there is interaction with the instructor, some students may need more personalized one-on-one instruction. These systems cannot entirely eliminate the problem of distance. However, as opposed to not being able to offer students classes which would not be available do to various financial restraints, it's the next best thing.

This research suggest that two-way interactive systems could be implemented anywhere as long as there are funding resources and everyone involved makes a long term commitment toward making the project work. Technological advancements have brought us to a new age in education. If educators are not resistant to these changes, the coming decade will be an exciting time to be in education.

Limitations of the Study

There were obvious limitations to this research since it focuses solely on the implementation process, as opposed to the educational value of this phenomenon. There is insufficient data to support the effectiveness of instruction through this technology, as well as insufficient data that supports the quality or permanence of student learning through interactive television, in contrast to more traditional instructional techniques. While the success of two-way interactive television in education will ultimately be decided by the instructional effectiveness and permanence of learning, these aspects go beyond the scope of this research.

Therefore, the obvious limitation of this research is that it does not study the educational value of two-way interactive television, but rather the technological and communicative aspects of this phenomenon. The design of this research was based on naturalistic research propositions; the results were non-statistical, but rich in data about the implementation process, and the project's success. This research used a naturalistic paradigm to investigate a technologically innovative project using two-way interactive television as a means to enhance curriculum. However, time restraints limited the number of participants interviewed. This researcher tried to alleviate this problem by carefully choosing participants who had close ties to the implementation of the project. Finally, even though this researcher has taken every precaution to be as accurate and unbiased as possible, there is no measure for accuracy. Therefore, this research cannot be generalized.

Recommendations for Future Research Study

Researchers cannot ignore the power and promise two-way interactive television offers for education. This viable alternative for cooperative academic programming can be seen as the future of our educational system, especially as the cost of these systems goes down.

Certainly, more research needs to be conducted regarding the effectiveness of instruction via this delivery system. While research to date has shown that interactive television is an effective means of instruction for advanced high school students, their is insufficient data to support the quality or permanence of student learning in contrast to traditional classroom instruction. Also, there is insufficient data to support the effectiveness of instruction for middle school and remedial students. There is a need for more research regarding what kinds of courses are best suited for this technology and what instructional techniques are most effective. In addition, more case study analysis research would assist the development of future systems.

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APPENDICES

APPENDIX A

RESEARCH INSTRUMENT

The following is a list of general questions regarding the TIDSS project:

1. Why was the 'TIDSS' project initiated?

2. Who initiated it?

3. What role has the Michigan State Board of Education played in reference to planning, implementation, logistics, etc?

4. Who are the principals involved in the 'TIDSS' cooperative?

5. What were the specific needs and goals of the project?

6. Have these goals been met?

7. Were other alternatives considered?

   a. consolidation

   b. satellite networks (TI-IN)

   c. ITFS (Instruction Television Fixed Service)

   d. one-way interactive (telecourses)

   e. other

8. How are the participating telecommunication companies benefiting from this project?

9. How are the participating school districts benefiting from this project?

10. Did you use outside consultation during the development of this project?

11. (IF YES) How were they selected?

12. What skills did they bring to the project?

13. When was the current system in use constructed?

14. How was the cost of construction shared among the participating school districts?

15. How was the cost divided between the participating schools and the telecommunication companies involved?

16. Was there any funding provided for this project?

   a. Federal

   b. State

   c. Private

17. Who is responsible for maintenance and repairs?

18. What kind of delivery system are you currently using?

   a. satellite

   b. cable

   c. microwave

   d. low power

   e. fiber optics

19. Why did you select this system?

20. What are the audio and video channel capacities?

21. What other applications is this system being used for?

   a. Adult education?

   b. Community needs?

   c. Administrative needs?

   d. Other

22. Can instruction originate from each of the 12 sites?

23. How many sites can participate at a given time?

24. How is this project being evaluated?

25. Based on evaluations, what is the level of success?

26. If you could make any changes in the implementation of this system, what would those changes be?

27. What does the future hold for the TIDSS project?

28. In your opinion, what is the future of two-way interactive television in education?

29. When was the fiber optic network constructed?

30. What are the advantages of fiber optics over the current system in use?

31. What are the audio and video channel capacities?

32. When will you be starting up the fiber optic network?

33. What are the challenges associated with fiber optics?

The following questions will be directed toward school administrators:

1. Were faculty and staff involved in the planning phases?
2. How were teachers selected to be involved in the TIDSS project?
3. How were teachers involved in the development of the TIDSS project?
4. Who designs the curriculum?
5. How is the curriculum coordinated among the participating school districts?
6. How many classes are being taught via this system?
7. What types of courses are being taught?
8. What is the ideal number of remote classrooms?
9. What is the ideal class size?

10. Has the use of ITV raised any issues that may impact the teachers union?

11. Is teacher certification required to instruct via ITV?

12. Are teachers compensated extra for teaching on ITV?

13. What additional training is required for teachers to operate the equipment?

14. What kind of inservice training is provided?

15. Has ITV caused a loss of teaching jobs?

16. Are students at remote site supervised during instruction?

17. Is discipline at remote sites a problem?

18. Who is responsible for students at remote sites?

19. How is this project being evaluated?

20. Based on evaluations, what is the level of success?

21. If you could make any changes in the implementation of this system, what would those changes be?

22. What does the future hold for the TIDSS project?

23. In your opinion, what is the future of two-way interactive television in education?

The following questions will be directed toward teachers:

1. Do you enjoy teaching on ITV?

2. If you could make any changes in the way this system is used, what would those changes be?

3. In general, how do you feel about using two-way interactive technology in education?

4. What training was required for you to teach on ITV?

5. Was it effective?

6. How is your teaching method designed?

7. What other teaching methods do you use as a supplement to the TIDSS system?

    a. Books

    b. Library

    c. Audio/ Visual

    d. Private tutoring

    e. Other

8. How do you view remote sites?

9. Can students at remote locations interact with other students at other remote sites?

10. How often do you meet with students at remote sites?

11. In your opinion, what is the future of two-way interactive television in education?

The following questions will be directed toward students:

1. Do you enjoy learning on two-way interactive television?

2. If you could make any changes in the way this system is used, what would those changes be?

3. In general, how do you feel about using two-way interactive technology in education?

4. Would you say that learning by ITV is easier, harder, or the same as traditional classroom instruction?

The following questions will be directed toward the Summit-Leoni Cable Co.:

1. How did you become involved in this project?
2. How is Summit-Leoni Cable benefiting from this project?
3. What was the cost of construction?
4. How was the cost shared with the participating school districts?
5. How does this system operate?
6. If you could make any changes in the implementation of this system, what would those changes be?

APPENDIX B

DEFINITIONS OF TELECOMMUNICATION TECHNOLOGY

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

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

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

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

FCC: Federal Communications Commission.

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

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

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

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

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

Upstream: The direction a signal travels as it moves from a receive site back to the site of original transmission. Used especially in two-way cable television systems (Linking For Learning, 1989).

APPENDIX C

CABLE CONTRACT

MANAGEMENT AND SERVICE AGREEMENT

THIS AGREEMENT, made this 22nd day of October, 1986, by and between BOOTH AMERICAN COMPANY, a Michigan corporation doing business as SUMMIT-LEONI CABLE T.V. (hereinafter referred to as "Summit"), and the JACKSON COUNTY INTERMEDIATE SCHOOL DISTRICT (hereinafter referred to as "JCISD").

WITNESSETH:

WHEREAS, Summit is a current CATV franchise holder for the Townships of Summit (including the Vandercook Lake area), Leoni, Spring Arbor and Napoleon, in Jackson County, Michigan (hereinafter referred to as the "Townships"), with rights to construct and operate a cable television system, as set forth in the franchise issued by said communities; and

WHEREAS, JCISD desires to develop a Jackson County Education Interconnect (hereinafter referred to as "Interconnect"), supplementary to, but independent of the subscriber system referenced above, consisting of certain CATV channels, microwave transmitters and receivers, and system headend, antennas, and tower structures, approved by JCISD and designed for use by JCISD and its member school districts to cablecast bi-directional video, audio and data signals; and

WHEREAS, JCISD desires to utilize the Summit headend facility to transmit signals from the Interconnect; and

WHEREAS, JCISD desires Summit to provide certain management services with respect to the Interconnect, and Summit desires to provide such services upon the terms and conditions as hereinafter provided;

NOW, THEREFORE, in consideration of the mutual covenants and agreements hereinafter set forth, THE PARTIES AGREE AS FOLLOWS:

1. Term. This Agreement shall be for a term commencing on the date set forth above, and shall continue thereafter until terminated as provided in paragraph 4.

2. Allocation. During the term of this Agreement, the allocation of costs between Summit and JCISD shall be made in accordance with the following provisions:

(a) The Summit portion of the Interconnect shall be constructed by a contractor to be selected by Summit and shall consist of approximately five and one-half (5-1/2) miles of cable plant between the following end points: (i) Summit headend to Vandercook Lake High School, (ii) Michigan Center High School to East Jackson High School, and (iii) Summit headend to the JCISD Educational Service Center. Construction shall be pursuant to the specifications of JCISD; provided, however, Summit may request such reasonable alterations and additions to its facilities as may be necessary to accommodate the Interconnect. Summit does not warrant or otherwise guarantee nor shall it bear any responsibility or liability for the bids or cost estimates for the final construction costs of the Interconnect submitted by third parties. All bids and change orders shall be subject to the written approval of JCISD.

(b) JCISD shall bear the cost and expense of the construction of the Interconnect portion within Summit's franchise area. JCISD shall also bear the cost and maintenance of antennas and related materials for any portion of the Interconnect. Summit may provide future maintenance on a time and materials basis for microwave equipment upon written request of JCISD.

(c) JCISD and its member school districts shall be solely responsible for their on-premise equipment in the Summit headend buildings.

(d) Summit shall provide, at no cost to JCISD or member school districts, the use of floor space at the Summit headend to accommodate and house transmitters, receivers, signal processors and other electronic equipment necessary for the Interconnect; provided, however, Summit shall determine, in its sole judgment, the amount of space and final location of all such equipment. Any building modification costs required by the provision of such space shall be paid by JCISD.

(e) JCISD shall purchase, through Summit or directly from manufacturers and distributors, own and keep in good repair, such microwave transmitters, microwave receivers, spare parts, and such other related equipment as shall be necessary to allow a microwave connection for the Interconnect. Summit shall provide space on its tower, free of charge, for the Interconnect microwave equipment, provided JCISD shall pay all expenses for the installation of such equipment, together with any costs resulting from the modification of Summit's tower required by such installation.

(f) With respect to utility costs incurred for operation of the Interconnect:

(i) Any headend and power line usage utility costs incurred by and attributable to the Interconnect shall be paid by JCISD.

(ii) JCISD agrees to bear all utility costs required for operation of any microwave links which may be directed to or from the Summit Township headend tower. JCISD shall provide for separate metering of the utilities.

(g) With respect to repair, maintenance and replacement costs incurred from time to time:

(i) Summit agrees to maintain the cable plant and equipment related thereto in satisfactory working order, and will provide its best efforts to maintain quality signals which shall be equal to the initial design specifications. In addition, Summit shall at the request of JCISD provide timely repair and maintenance on its portion of the Interconnect, including JCISD headend equipment other than microwave related items, on a time and material basis to JCISD for the term of this Agreement. JCISD shall provide Summit with a reasonable spare parts inventory to service JCISD's portion of the Interconnect with respect to those parts which Summit does not use in the operation of its system.

(ii) JCISD and Summit shall each appoint one individual who will be the primary contact for each party to handle complaints, service and all associated matters involved with the Interconnect.

(h) All cable and electronic equipment overlashed to existing Summit cable facilities will remain the property of Summit during the term hereof. Upon the expiration of the term hereof or the termination of this Agreement, all electronic active equipment paid for by JCISD shall become the property of JCISD.

3. Payments by JCISD. Payments contemplated under this Agreement to be made by JCISD to Summit with respect to the construction, management, maintenance and repair of the Interconnect shall be paid within thirty (30) days after submission of statements to JCISD, provided the work or service covered by the statement has been completed. Construction work shall be billed not more frequently than monthly. Any routine expenditure of less than $100 for the Interconnect made in the ordinary course of business by Summit shall not require the prior consent of JCISD, nor need Summit be authorized by purchase order from JCISD or constituent school districts. All other expenditures shall require the prior written approval of JCISD.

4. Termination. If any of the following events occur during the term hereof, this Agreement and all rights granted herein shall terminate.

(a) This Agreement shall terminate automatically if Summit or its successors cease to operate the cable TV system in any of the Townships in which Summit's portion of the Interconnect is located.

(b) JCISD shall have the right to terminate this Agreement (i) at any time upon one (1) year's advance written notice to Summit, or (ii) by thirty (30) days' advance written notice if Summit is adjudicated a bankrupt (which for purposes hereof shall include voluntary or involuntary adjudication of bankruptcy by a court of competent jurisdiction or any assignment by Summit for the benefit of its creditors).

(c) Either party shall have the right to terminate this Agreement in the event of any material breach or non-performance of any of the covenants by the other party which is not cured within thirty (30) days after written notice thereof by the non-breaching party.

5. Liability and Insurance. Summit assumes all risk and liability for and agrees to indemnify, save and hold JCISD and its constituent school districts harmless from all claims and liens, all loss of or damage to the Interconnect equipment, and all loss, damage, claims, penalties, liability and expenses, including attorney fees, resulting from or arising out of Summit's construction and operation of the Interconnect or its performance of other services hereunder. Summit, at its own expense, shall carry public liability insurance against bodily injury, including death, and against property damage, with a single combined public liability limit of not less than $1,000,000, and with property damage limits of not less than $500,000, and shall keep the Interconnect equipment insured at its full insurable value against fire, theft, and

other insurable casualties.* Notwithstanding the foregoing, Summit shall not be required to indemnify JCISD or its constituent school districts against liability for damages arising out of bodily injury to persons or damage to property caused by or resulting from the sole negligence of JCISD or its constituent school districts, their agents or employees. All such liability and casualty insurance shall name Summit and JCISD as insureds, shall be with such companies and shall be approved by JCISD, and shall provide that it may be altered or canceled by the insurer only after fifteen (15) days' prior written notice to, and that losses shall be adjusted with and only with and paid to Summit and JCISD, as their interests may appear. A certificate or other evidence satisfactory to JCISD showing the existence of such insurance, the terms and conditions of the policy, and payment of the premium therefor shall be delivered to JCISD before the commencement of the term hereof. JCISD agrees to indemnify and save Summit harmless against any and all liability, including but not limited to lawsuits or claims of libel, slander, invasion of privacy or the infringement of statutory or common law copyright, or for unauthorized use of any trademark, service mark, trade name, or personal right or property right, arising from the use of the channel or from the material originated by JCISD pursuant to this Agreement and distributed over Summit's CATV system.

6. Notices. All notices or other communications required hereunder shall be in writing and shall be deemed to have been duly given as of the day and time of mailing by certified or registered mail, postage prepaid, to the following addresses, or to such other

*It shall be the responsibility of JCISD to insure its headend equipment located within the Summit headend facility.

address which the parties hereto shall, by like notice, from time to time, notify one another:

TO SUMMIT: Mr. Carl Brasseur, System Manager
Booth American Company, d/b/a
Summit-Leoni Cable TV
1901 Horton Road
Jackson, Michigan 48203

TO JCISD: Superintendent of Schools
Jackson County Intermediate School District
6700 Browns Lake Road
Jackson, Michigan 49201

7. Binding Effect. The parties agree that each and every representation, undertaking and agreement made in this Agreement on the part of any of the parties hereto was not made or intended to be made as a personal representation, undertaking or agreement on the part of any incorporator, stockholder, director, officer or partner, past, present or future, and no personal liability or personal responsibility is assumed by, nor shall any recourse at any time be asserted or enforced against any such incorporator, stockholder, director, officer or partner, past, present or future, any of which recourse, whether in common law, in equity, by statute or otherwise, is hereby forever waived and released.

8. Entire Agreement. This Agreement contains the entire understanding among the parties and shall supersede any prior understandings or written or oral agreements between the parties. This Agreement shall not be modified except in writing, signed by each of the parties hereto.

9. Headings. The descriptive headings of the several paragraphs of this Agreement are inserted for convenience of reference only, and shall not control or affect the meaning or construction of any provision hereof.

10. Severability. Whenever possible, each provision of this Agreement shall be interpreted in such manner as to be effective and valid under applicable law; but if any provision of this Agreement shall be prohibited by or invalid under applicable law, such provision shall be ineffective to the minimal extent of such prohibition or invalidity without invalidating the remainder of such provision or the remaining provisions of this Agreement.

11. Applicable Law. This Agreement shall be construed sand administered, and the validity thereof shall be determined, in accordance with the laws of the State of Michigan.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed as of the date first above written.

JACKSON COUNTY INTERMEDIATE
SCHOOL DISTRICT

By: [signature]

Its Sec/Board

BOOTH AMERICAN COMPANY, d/b/a
SUMMIT-LEONI CABLE TV
333 West Fort Street
Detroit, Michigan 48226

By: [signature]
Richard Lesley
Its Vice President

APPENDIX D

OPERATIONAL BUDGET

December 1, 1989

END OF YEAR REPORT
TIDSS PROJECT OPERATING BUDGET
1988/89

INCOME			BUDGET	ACTUAL
Carry over from 1987/88			$184.29	$184.29
Local District Contributions ($1.00 X 23985)			$23,985.00	$23,985.00
Jackson Community College Access Fee			$1,000.00	$00.00
ISD Contribution (Contingency)			$2,500.00	$2,500.00
Course Slots (Geography) 12 @ $260.00			$3,120.00	$2,838.00
TOTAL			$30,789.29	$29,507.29

EXPENDITURES				
Staff Expense (Zolton)			$6,632.95	$6,070.61
Salary	$5,365.00			
Fringes	$997.95	($705.61)		
Utility Charges			$5,370.00	$4,829.67
Summit Cable	$1,800.00	($1,122.27)		
Continental Cable	$1,800.00	($1,857.40)		
Irish Hills Cable	$120.00	($100.00)		
Irish Hills Channel Access Charge	$1,200.00	($1,000.00)		
Springport Village	$150.00	($300.00)		
Concord Village	$150.00	($150.00)		
Grass Lake UMC	$150.00	($300.00)		
Insurance/Legal (Liability/Comprehensive Loss)			$1,000.00	$1,000.00
Frequency Protection Service			$300.00	$240.00
Maintenance/spares			$10,000.00	$10,242.43
Staff Development/Training			$1,200.00	$589.24
Evaluation/Dissemination			$500.00	$00.00
Geography Course			$3,994.20	$3,984.64
Contract Teacher	$3,600.00			
Textbooks	$394.20	(384.64)		
TOTAL			$28,997.15	$26,956.59
ENDING BALANCE			$1,792.14	$2,550.70

Revised March 1, 1990

ADOPTED
TIDSS PROJECT OPERATING BUDGET
1989/90

INCOME

Carry over from 1988/89		$2,550.70
Local District Contributions ($1.00 X 23912)		$23,912.00
Jackson Community College Access Fee		$1,000.00
ISD Contribution (Contingency)		$2,500.00
TOTAL		**$29,962.70**

EXPENDITURES

Utility Charges		$5,170.00
Summit Cable	$1,400.00	
Continental Cable	$2,000.00	
Irish Hills Cable	$120.00	
Irish Hills Channel Access Charge	$1,200.00	
Springport Village	$150.00	
Concord Village	$150.00	
Grass Lake UMC	$150.00	
Insurance/Legal (Liability/Comprehensive Loss)		$1,000.00
Frequency Protection Service		$360.00
Maintenance/spares		$16,000.00
Test Equipment		$2,500.00
Staff Development/Training		$1,200.00
Evaluation/Dissemination		$500.00
TOTAL		**$26,730.00**
ENDING BALANCE		**$3,232.70**

December 1, 1989

TIDSS PROJECT PARTICIPATION FEE
7/1/89 - 6/30/90

TIDSS Project participation fee for 1989/90 school year based on $1.00 per student F.T.E., 1988/89 audited fourth Friday count, not including adult education.

DISTRICT	ENROLLMENT	FEE
Columbia School District	1913	$1,913.00
Concord Community Schools	996	$996.00
East Jackson Community Schools	1374	$1,374.00
Grass Lake Community Schools	794	$794.00
Hanover-Horton School District	1139	$1,139.00
Jackson Public Schools	7823	$7,823.00
Michigan Center School District	1315	$1,315.00
Napoleon Community Schools	1424	$1,424.00
Northwest School District	3084	$3,084.00
Springport Public Schools	1017	$1,017.00
Vandercook Lake Public Schools	1018	$1,018.00
Western School District	2015	$2,015.00
TOTALS	**23912**	**$23,912.00**

APPENDIX E

INSTRUCTIONAL BUDGET

December 1, 1989

COMMENTS ON THE PROPOSED
TIDSS PROJECT INSTRUCTIONAL BUDGET
1989/90

In the Spring of 1989, the TIDSS Project Executive Committee spent considerable time discussing various methods and procedures regarding the offering and origination of TIDSS courses. The prime problem identified was that many districts felt that they could not become originating sites because of costs involved in the initial preparation period granted to TIDSS teachers.

After discussion with the JCEA where alternatives to the initial preparation period were discussed and rejected, the Executive Committee decide that it would be necessary to establish a "pool" which could be used to assist local districts with the cost of the initial preparation period.

It was decided that funds for the "pool" would come from two sources:

1. Residual funds from TIDSS courses taught by contract teachers.

2. A cost override on the student slot fee which would be placed in the "pool."

and it was important that nothing be put in place which would further discourage local districts from becoming originating sites.

With the above in mind, the following budget is recommended based upon the following premises:

1. The course fee for the 1989/90 school year shall be $375.00 per student per year long course and $187.50 per student per semester course.

2. Originating site districts shall be reimbursed $260.00 per student per year long course and $130.00 per student per semester course.

3. As fiscal agent, the Jackson County Intermediate School District shall issue invoices, collect fees and distribute monies associated with the TIDSS instructional program.

4. Monies remaining at the end of the school year shall be placed in a "pool" to be used by the consortium to finance

future TIDSS instructional offerings.

After adoption of the proposed "**PROPOSED TIDSS PROJECT INSTRUCTIONAL BUDGET**," the Executive Committee still needs to reach a decision on the following two issues.

1. What amount or portion of the initial preparation period costs should be under written by the consortium?

2. Should some reimbursement be given to districts that have already absorbed the initial preparation period costs?

Revised March 1, 1990

ADOPTED
TIDSS PROJECT INSTRUCTIONAL BUDGET
1989/90

INCOME

98 Course slots @ $375.00 each		$36,750.00
7 Course slots @ $187.50 each		$ 1,312.50
	TOTAL	**$38,062.50**

EXPENDITURES

Reimbursement to Originating districts		$2,860.00
11 course slots @ $260.00		
Contract Teacher's Salaries		$19,500.00
Japanese I(2)	$7,800.00	
Spanish I	$3,900.00	
French I(2)	$7,800.00	
Mileage reimbursement		$9,600.00
Japanese I(2)	$3,600.00	
Spanish I	$1,800.00	
French I(2)	$4,200.00	
Textbooks and Instructional Supplies		$1,400.00
Miscellaneous		$800.00
Class dinners		
Training stipends		
Substitute fees		
Field trips		
	TOTAL	**$34,160.00**
	ENDING BALANCE	**$3,902.50**

APPENDIX F

TEACHER CONTRACT ADDENDA

Version 3.2
08/18/1988

TIDSS ADDENDA

(Contract Language for Constituent
Districts and Local Bargaining Units)

ADDENDA FOR TWO-WAY INTERACTIVE DISTRIBUTION SYSTEM FOR SCHOOLS

ADDENDA FOR TWO-WAY INTERACTIVE DISTRIBUTION SYSTEM FOR SCHOOLS

I. ADDENDA

A. This agreement hereinafter referred to as the **TIDSS ADDENDA** is entered into this 21st day of September, 1988, by and between the Jackson County Education Association and its respective local unit and Northwest schools.

B. The Two-Way Interactive Delivery System for Schools (TIDSS) is an electronic networking system that provides an alternative instructional delivery system for use by the constituent school districts comprising the Jackson County Intermediate School District. As such, the system is in effect an "educational utility system" operated cooperatively by constituent school districts. Districts participating in this consortium are: Columbia School District, Concord Community Schools, East Jackson Community Schools, Grass Lake Community Schools, Hanover-Horton School District, Jackson County Intermediate School District, Jackson Public Schools, Michigan Center School District, Napoleon Community Schools, Northwest School District, Springport Public Schools, Vandercook Lake Public Schools and the Western School District.

C. While each of the Districts participating in this consortium have cooperated in the development of this project and program, they have, except as limited by this Addenda, reserved to themselves the following responsibilities:

1. System programming and utilization
2. System staffing and assignment
3. System financial support

D. As each of the districts participating in the project are individual and autonomous school districts each with its own local bargaining unit and local collective bargaining agreement, it is evident that any employer-employee relationship remains with each constituent district and local bargaining unit as **TIDSS** will not be the employer of any instructional staff.

E. The contract language that follows is to be an addenda to each teacher contract in Jackson County. In order for this addenda to be in effect in any school district, it must be approved by the Board of Education for that school district and the Jackson County Education Association and its respective local. Areas not covered by the addenda shall be governed by the terms of the local collective bargaining agreement of each constituent district.

F. Any local school district that fails to ratify the **TIDSS ADDENDA** shall not participate in K-12 student instruction via the Two-Way Interactive Distribution System for Schools (**TIDSS**) and shall not act as either an originating site district or remote site district for K-12 student instruction as defined below. Failure to ratify the **TIDSS ADDENDA** shall not preclude local school district use for other purposes.

G. During the life of this Agreement, no party, other than a local school district that ratifies the **TIDSS ADDENDA**, shall offer K-12 credit courses over the **TIDSS** system during the regular school day. "Regular school day" shall be defined as the daytime K-12 teacher work day of each local constituent school district as determined by its local collective bargaining agreement.

II. DEFINITIONS

A. "Telecommunication" or "Telecommunications Classes" shall be defined as the teaching of students via a two-way interactive television system known as Two-Way Interactive Delivery System for Schools (**TIDSS**).

B. "Originating Site District" shall be defined as the location/designation in which the responsible teacher is located and wherein the Telecommunication Class is being taught.

C. "Remote Site District" shall be defined as the location/designation where class instruction is being received via television.

D. "**TIDSS**," an educational utility, shall be defined as Two-Way Interactive Delivery System for Schools

E. "District" shall be defined as the Jackson County Intermediate School District and the twelve individual, independent school districts as cited in ***Section IB.*** of this document.

III. RESPONSIBILITIES OF ORIGINATING AND REMOTE SITE DISTRICTS

A. The originating site district shall be responsible for the course content, material selection, instruction, testing and evaluation of students at the originating site district and at all remote site districts

B. Behavior or discipline and supervision of students at remote sites shall be the responsibility of the remote site district. If teachers are assigned classroom supervision at a remote site, such assignment shall be in lieu of a classroom or other supervisory assignment. No teacher will be regularly assigned to supervise remote site students during the teacher's preparation period or during the time he/she is performing his/her assigned duties.

IV. WORKING CONDITIONS

A. CLASS SIZE

The parties mutually agree that the purpose of **TIDSS** in Jackson County is to provide quality, cooperative academic programming in order to enrich educational opportunities for students. Accordingly, class sizes shall be based upon the appropriate number of students for the specific learning activity and shall be small enough to allow for full two-way interactive participation. Total class size, including students at the originating site district and those at remote sites, shall not exceed twenty five (25) students per teacher, per class hour in not more than one (1) originating and three (3) remote locations.

B. PREPARATION TIME

1. During the first semester or school year that a teacher is assigned to teach via **TIDSS**, he/she will be provided with an additional preparation period each day according to the following schedule:

   1 or 2 telecommunications classes: 1 additional preparation period

2. It is understood that the preparation time set forth herein shall be in addition to the normal preparation time provided under the local collective bargaining agreement. It is further understood that such preparation periods shall be of the same length, per period, as provided under the local collective bargaining agreement.

3. In lieu of receiving an additional preparation period as set forth above, the originating site teacher may, by mutual agreement of the teacher, the Association and the originating site district administration, be compensated for the preparation period at a pro rata amount of their normal daily rate of pay. This proposal shall only be applicable in those local districts where teachers cannot receive compensation in lieu of their local preparation period or time.

C. CLASS PREPARATIONS

Originating sites agree that for a teacher acting as a presenter of a telecommunications class, the telecommunications course taught shall count as one (1) preparation. The employer agrees that in districts having a seven (7) period day, any teacher acting as a presenter of a telecommunications class, shall have no more than four (4) different class preparations during the school day and in districts having a six (6) period day, any teacher acting as a presenter of a telecommunications class, shall have no more than three (3) different class preparations during the school day. The maximum number of daily preparations may be increased by mutual agreement of the teacher, the Association and the originating site district administration

D. CLASSES OUTSIDE THE NORMAL SCHOOL DAY/SCHOOL YEAR

Teachers presenting telecommunications classes which are scheduled outside of the normal school day or normal school year shall be compensated at a pro rata amount of their normal daily rate of pay.

E. EQUIPMENT

Each TIDSS participating district shall be responsible for the repair and maintenance of telecommunications classroom equipment at their site(s). Teachers shall not be responsible for setting up, maintaining or dismantling telecommunications equipment.

F. TRAINING

Initial and on-going Training in using telecommunications as an alternative educational delivery system shall be made available to teachers who will be presenting telecommunications classes. Telecommunications teachers participating in training outside of the normal school day/school year shall be compensated at the rate of .0007 times the previous year average B.A. base for Jackson County K-12 bargaining units, per hour, for such training

G. TEACHER EVALUATION

The evaluation of teachers of telecommunications courses shall be specifically subject to the evaluation process contained in the local collective bargaining agreement of the originating site district. All evaluations/observations shall require the physical presence of the evaluator. No observation for the purposes of evaluation shall be done or conducted by electronic means.

H. MILEAGE

Originating site district teachers who, from time to time, may be required to use their personal automobile to travel between sites or to training or to other meetings regarding **TIDSS** shall be reimbursed for their allowable mileage in a manner consistent with their local collective bargaining agreement, or at the current Internal Revenue Service rate if not specified in the local collective bargaining agreement.

V. JOB SECURITY

A. The intent and purpose of the **TIDSS PROJECT** is to provide a vehicle for the cooperative offering and sharing of educational opportunities among the districts listed in *Section 1B.* of this document and to provide educational resources to the students of these districts in a cost-effective and efficient manner.

B. It is not the intent and purpose of the **TIDSS PROJECT** to reduce the total number of bargaining unit members employed or the hours worked as a result of the implementation and use of telecommunications via **TIDSS**.

C. No member of the staff of a specific originating site district or the cluster of schools served by that given site shall be laid off or have hours worked reduced as a direct result of the implementation and use of telecommunications via **TIDSS.**

D. It is specifically understood that any local school district teacher presenting a K-12 telecommunications class shall be a member of the local/county bargaining unit.

VI. SCHEDULING AND ASSIGNMENTS

A. The **TIDSS** Task Force on Curriculum shall develop processes, procedures and recommendations for the annual determination of course offerings and the designation of originating and remote site district locations. The **TIDSS** Board of Directors shall make the final determination of course offerings, and site locations on or before May 1 of each year.

B. On or before May 1, of each year, (November 15 for second semester courses) the employer will post, in each building, a list of classes to be provided via two-way instructional television during the following school year. The list will indicate, with respect to each class, the districts that will be receiving same. The list will also identify the number and type of positions required to provided the classes listed. The J.C.E.A. will be sent a copy of each posting.

C. Teachers shall make their interest in teaching such classes known by sending notification of same to the Superintendent in their school district.

D. Assignments to telecommunications courses shall be made on a yearly basis and shall be by mutual agreement of the employee and the originating site district. Such positions shall be filled on the basis of certification in the subject area and length of service as illustrated on the local district seniority list as compared with all applicants.

E. Bids shall be considered and positions shall be awarded in the following order:

1. With respect to telecommunications classes being offered, assignments will first be awarded to the most senior applicants who are certified in the subject area and employed by the designated originating site district.

2. If E. 1 above does not result in the assignment of a teacher to the telecommunications class being offered, then the least senior teacher certified in the subject area and employed by the designated originating site district shall be assigned to such class.

F. Breaking of ties:

1. Should seniority ties occur between individuals bidding on telecommunications classes, such ties shall be broken and the assignment awarded on the basis of a random draw.

2. If, pursuant to E. 2. above, junior teachers subject to mandatory assignment to a telecommunications class are tied in seniority, such ties shall be broken by a random draw with the person whose lot is drawn being assigned to the telecommunications class.

3. Draws breaking seniority ties shall be announced in advance and shall be scheduled at a time and place when all concerned parties can reasonably be present.

VII. BROADCAST AND REBROADCAST CONDITIONS

In accepting any assignment to teach a telecommunications course, the teacher assigned agrees to and acknowledges the following:

A. A telecommunications class may be televised for demonstration purposes by mutual consent of the teacher and the originating site district. Videotapes of telecommunications classes may be used for other purposes by mutual consent of the teacher and the originating site district.

B. Videotapes of a telecommunications class may be used for makeup work for all students currently enrolled in that telecommunications class.

C. Videotapes of telecommunications classes are the property of the originating site district.

D. All instructional presentations broadcast over **TIDSS**, which teachers are paid to create and produce, may be copyrighted by, and are the sole property of, the designated originating site district.

VIII. ADDENDA REVIEW PROCEDURE

A. It is agreed that representatives of the **TIDSS** Executive Committee and the JCEA will meet on or before March 1, 1990 for the purposes of reviewing the **TIDSS ADDENDA**.

B. Inasmuch as the implementation and use of instruction by two-way interactive television in general and **TIDSS** specifically is developmental, the parties agree that it may be necessary to meet from time to time in order to resolve issues that were not contemplated or addressed in this addenda and shall be subject to the approval process as outlined in *Section 1. E. and Section 1. F.* of the **TIDSS ADDENDA**.

C. Either the Association or the Employer may initiate interim dialogue regarding the **TIDSS ADDENDA** by mutual consent that such is desired.

IX. GRIEVANCE PROCEDURE

A. In order to promptly and expeditiously resolve disputes which may arise regarding the implementation and usage of the two-way interactive delivery system for schools, the parties hereby establish the following grievance procedure. The parties agree that this procedure will in no way supersede or replace the grievance procedures contained in constituent local collective bargaining agreements. However, this procedure will be followed with respect to disputes which arise out of the **TIDSS ADDENDA** to the constituent local collective bargaining agreements.

B. A teacher, group of teachers or the Association believing that there has been a violation, misinterpretation, or misapplication of any provision of this **ADDENDA** or any rule, order, policy or regulation affecting the working conditions of the teachers of telecommunications classes may file a grievance and same will be processed as hereinafter provided.

C. When cause for complaint occurs, the affected bargaining unit member(s) shall, within five (5) days, request a meeting with his/her immediate (local) supervisor in an effort to resolve the complaint. The Association may be notified and a representative thereof may be present with the bargaining unit member at such meeting. Such meeting shall be scheduled within three (3) days of the request.

D. If the bargaining unit member is not satisfied with the result(s) of the meeting, he/she may formalize the complaint in writing as provided hereunder.

E. If a complaint is not resolved as provided above, the affected bargaining unit member(s) may formalize the complaint as a grievance. A formalized grievance shall be submitted, in writing, within five (5) days of the meeting between the supervisor and the affected bargaining unit member(s). A copy of the grievance shall be sent to the Association, the immediate (local) supervisor, the local district superintendent and the Director of **TIDSS**. The local district superintendent, or their designee, shall, within in five (5) days receipt of the grievance, arrange a meeting between the affected bargaining unit member(s), the Association and him/herself.

F. Within ten (10) days after the conclusion of the above meeting, the Employer shall render a written decision on the grievance with copies to the Association and the affected bargaining unit member(s).

G. If the Association is not satisfied with the Employer's written disposition on the grievance, it may, by serving notice on the local district superintendent, submit the grievance to arbitration provide that such notice to refer is given within ten (10) days from the Employer's written decision.

1. Within ten (10) days receipt of notice as noted in G. above, the Employer and Association shall meet for the purpose of selecting an arbitrator. If the Employer and Association are unable to agree on an arbitrator, then the arbitrator shall be selected according to the Rules of the American Arbitration Association.

2. Hearings held, pursuant to this grievance procedure, shall be conducted in accordance with the general rules of the American Arbitration Association. Neither the Association nor the Employer shall be permitted to assert in such hearing any ground, or to rely on any evidence not previously disclosed to the other party. Both parties agree to be bound by the award of the arbitrator, and judgment thereon may be entered in any court of competent jurisdiction.

3. The arbitrator, upon mutual agreement of both parties, will be empowered to render a "bench" decision on the issue heard. The arbitrator, at his/her discretion, may render such "bench" decision directly at the conclusion of hearings or may elect to render such decision via telephonic conference call within three (3) days of the hearing date. In such cases, a telephonic conference call will be arranged between the arbitrator, the Employer's representative and the Association's representative. In such cases, the arbitrator's written opinion and award will follow within the usual thirty (30) day time limit.

4. The fees and expenses of the arbitrator shall be shared equally by the Employer and the Association. All other expenses shall be borne by the party incurring them, and neither party shall be responsible for the expense of witnesses called by the other.

H. The term "days" when used in this procedure shall mean work days, Monday through Friday, excluding weekends, holidays, Christmas break and spring break as determined by the official calendar of the Employer. The time limits set forth herein may be extended by mutual agreement.

I. Notwithstanding the expiration of the **TIDSS ADDENDA**, any claim or grievance arising hereunder may be processed through this grievance procedure until resolution.

J. Grievances filed by the Association may, at the option of the Association, be initiated at the formal written level of this grievance procedure.

K. For the purposes of assisting a bargaining unit member(s) or the Association in the processing of any complaint or grievance hereunder, the Employer shall, in response to Association requests, provide the Association with the information necessary to facilitate such processing.

L. A bargaining unit member who must be involved in the grievance procedure or who is necessary to the processing of a grievance, (including hearings before an arbitrator,) shall be released with pay for that purpose.

X. COURIER SERVICE

The Jackson County Intermediate School District Delivery System may be used to provide regular courier service for the purpose of transporting documents, homework, class work, tests and materials between the various originating and remote site districts.

XI. LABOR DISPUTES

In constituent school districts where instructional employees are not at work due to a labor dispute with the said district, those students enrolled to participate in a telecommunications course(s) may attend and participate in telecommunications course(s) with prior agreement between the local school Board and the Association.

XII. ACCESS TO SYSTEM AND EQUIPMENT BY THE ASSOCIATION

A. Use of the **TIDSS** system is controlled by the **TIDSS** Governing Board or their designee and is subject to the limitations of the system as specified in the **TIDSS *Final System Engineering Specifications***

B. Use of the **TIDSS** system may be granted upon request, with the approval of the Executive Committee responsible for operating the **TIDSS** system.

C. Fees, as determined by the **TIDSS** Governing Board, may be assessed for use of the system.

XIII. DURATION

The parties agree that this **TIDSS ADDENDA** will continue in force and effect until August 15, 1990. The addenda shall not be extended orally and it is expressly understood that it shall expire on the date specified.

APPENDIX G

1990/91 COURSE SCHEDULE

March 2, 1990

1990/91 TIDSS CLASS SCHEDULE STUDENT SLOT RESERVATION FORM

RESPONSE REQUIRED BY NOON MARCH 30, 1990

TO: ALL JACKSON COUNTY SUPERINTENDENTS AND HIGH SCHOOL PRINCIPALS
FROM: TIDSS EXECUTIVE COMMITTEE
RE: TENTATIVE TIDSS CLASS SCHEDULE AND RESERVATION FORM

Based upon input from participating districts, enclosed are a Tentative 1990/91 PROJECT TIDSS **Class Schedule/Slot Reservation Form** and **Course Descriptions** for each of the proposed classes.

The tentative schedule was developed from the responses made by participating districts on the ***Course Request Form*** which was due on January 26, 1990. Where two or more districts have requested/offered a course, it has been incorporated into the tentative schedule. Obviously, some conflicts will exist and some modifications will have to be made to this tentative schedule.

Each participating district is requested to complete the enclosed ***Slot Reservation Form*** and return it by **NOON, Friday March 30, 1990**. SIGNING AND RETURNING THIS FORM DOES NOT COMMITT A DISTRICT TO FULL PAYMENT OF THE STUDENT COURSE FEE AT THIS TIME. IT ONLY RESERVES A SPECIFIC NUMBER OF STUDENT SLOTS IN A SPECIFIC SCHEDULED CLASS. Be sure to note any changes or modifications of the schedule that are needed.

Once all ***Slot Reservation Forms*** have been returned, the schedule will be finalized and ***Commitment Forms*** sent to participating districts on April 13, 1990. At that time, districts can make final adjustments regarding the actual number of slots needed before signing a commitment guaranteeing payment for these slots. ***Commitment Forms*** will be due back to the I.S.D. on April 27, 1990. At this time, it is anticipated that the Class Fee for the 1990/91 school year will remain at $375.00/student/two semester class and $187.50/student/one semester class.

We hope that the process of scheduling, reserving and committing to TIDSS Classes this year has been helpful. We appreciate your flexibility, cooperation and timely response which has helped to facilitate this scheduling process.

If you have any questions, concerns or comments regarding this request, please contact Gerry Lang at 787-2800, Ext. 201.

PROJECT TIDDS TENTATIVE CLASS SCHEDULE 1990/90
PARTICIPATING DISTRICT STUDENT SLOT RESERVATION FORM

DIRECTIONS: In the blank space provided, please indicate the number of student slots that your District wishes to reserve (either as an originating or a remote site District) for the following classes. Please have the District High School Principal sign the form and return it to the Intermediate School District by **NOON, FRIDAY, MARCH 30, 1990.**

TIME	COURSE	ORIGINATING DISTRICT	REQUESTED # of SLOTS to RESERVE
8:00 - 8:55	JAPANESE I Section 1	NORTHWEST H.S.	______________
8:05 - 8:58	LATIN I	JACKSON H.S	______________
9:00 - 9:55	JAPANESE II	NORTHWEST H.S.	______________
9:00 - 9:55	SPANISH II	T.B.D.	______________
9:00 - 9:55	GERMAN I	T.B.D.	______________
10:00 - 10:55	JAPANESE I Section 2	NORTHWEST H.S.	______________
10:00 - 10:55	SPANISH I	TBD	______________
10:02 - 11:00	FRENCH III	WESTERN H.S.	______________
10:30 - 11:25	CALCULUS	T.B.D.	______________
11:29 - 12:22 FALL SEMESTER	COLLEGE PREP. ECONOMICS	JACKSON H.S.	______________
11:29 - 12:22 SPRING SEMESTER	A. P. AMERICAN GOVERNMENT	JACKSON H.S.	______________

TIME	COURSE	ORIGINATING DISTRICT	REQUESTED # of SLOTS to RESERVE
11:52 - 12:42	FRENCH II	COLUMBIA CENTRAL	________
12:27 - 1:20 FALL SEMESTER	MYTHOLOGY	JACKSON H.S.	________
12:27 - 1:20 SPRING SEMESTER	HISTORY/DEVEL. WORLD RELIGIONS	JACKSON H.S.	________
12:46 - 1:36	A. P. ENGLISH	COLUMBIA CENTRAL	________
1:25 - 2:25	FRENCH I	WESTERN H.S.	________
1:30 - 2:25	RUSSIAN I	JACKSON H. S.	________

The following courses were either offered or requested by one District. At this time, a definite time of offering has not been established but if sufficient interest is shown by requests to reserve slots, an attempt will be made to add the class to the schedule. (Course descriptions upon request).

TIME T.B.A.	PHYSICS	T.B.D.	________
TIME T.B.A.	SPANISH 3/4	T.B.D.	________
TIME T.B.A.	FRENCH 3/4	T.B.D.	________
TIME T.B.A.	SHORTHAND	JACKSON H.S.	________
TIME T.B.A.	GEOGRAPHY	T.B.D.	________
TIME T.B.A.	SALES/MARKETING 2 HR. BLOCK	JACKSON H.S.	________
TIME T.B.A.	TRIGONOMETRY/ ANALYTICAL GEOMETRY	T.B.D.	________

SIGNING AND RETURNING THIS FORM DOES NOT COMMITT A DISTRICT TO FULL PAYMENT OF THE STUDENT COURSE FEE AT THIS TIME. IT ONLY RESERVES AN ESTIMATED NUMBER OF STUDENT SLOTS FOR THE ABOVE SCHEDULED CLASSES.

DISTRICT: ______________________________

HIGH SCHOOL PRINCIPAL'S SIGNATURE: ____________________ **DATE SIGNED:** ____________

PLEASE NOTE BELOW ANY PROBLEMS, SCHEDULING CONFLICTS OR REQUESTED TIME CHANGES:

March 2, 1990

PROJECT TIDSS COURSE DESCRIPTIONS
1990/91 School Year

ADVANCED PLACEMENT AMERICAN GOVERNMENT

Originating District: Jackson High School
Grade Level: 11/12
Length: one semester (2nd. Semester 1990/91)
Prerequisite: none

Description: This course is designed for the college bound student.and is designed to help high school Juniors or Seniors develop and in-depth understanding of the organization, function, and philosophy of the U. S. Federal Government.

ADVANCED PLACEMENT ENGLISH

Originating District: Columbia Central High School
Grade Level: 11/12
Length: two semesters
Prerequisite: English faculty recommendation

Description: An advanced placement course designed to be a college-level introductory course in reading and critical analysis of literature and language. Though the expectations for each student will be greater, the design of the course offers greater opportunity for individual accomplishment.

CALCULUS

Originating District: T.B.D.
Grade Level: 11/12
Length: two semesters
Prerequisite: advanced algebra, trigonometry

Description: a comprehensive course designed to develop mastery of the fundamentals of calculus.

COLLEGE PREPARATION ECONOMICS

Originating District: Jackson High School
Grade Level: 11/12
Length: one semester (1st. Semester 1990/91)

Prerequisite: none

Description: This course is designed for the college bound student. Economics deals with the study of how society, using limited resources, goes about producing, distributing and consuming goods and services in order to satisfy the unlimited wants of its members. This course will introduce students to basic concepts that will help them think more coherently and consistently about the wide range of social problems that economic theory illuminates. Special emphasis will be placed on the problems of inflation, recession, and the development of our current political economy.

FRENCH I

Originating District: Western High School
Grade Level:9/10/11/12
Length: two semesters
Prerequisite: none

Description: A first year French Student will be introduced to the four basic skills of foreign language acquisition; speaking, listening, reading and writing. Emphasis is placed on vocabulary development through practical approaches. Cultural lessons are integrated with grammar and structure materials.

FRENCH II

Originating District: Columbia Central High School
Grade Level:10/11/12
Length: two semesters
Prerequisite: successful completion of French I

Description: a second year sequel to French I.

FRENCH III

Originating District: Western High School
Grade Level:11/12
Length: two semesters
Prerequisite: successful completion of French II

Description: a third year sequel to French II.

GERMAN I

Originating District: T.B.D.

Grade Level: 9/10/11/12
Length: two semesters
Prerequisite: none

Description: This class provides the groundwork for the future development of the following German language skills: comprehension, conversation, reading and writing. In addition, it will encourage an understanding and acceptance of German culture, history, art and way of life. Emphasis is on speaking and comprehension and secondarily on grammar.

JAPANESE I: An Introduction to the Japanese Language
Originating District: Northwest High School
Grade Level: 9/10/11/12
Length: two semesters
Prerequisite: none

Description: This class serves to lay the groundwork for developing the ability to speak, understand, read and write the Japanese language and to develop an understanding of and appreciation for the cultures of the Japanese people.

Emphasis during the first year is in the areas of speaking and understanding and learning basic language skills which lead to reading and writing the language.

JAPANESE II
Originating District: Northwest High School
Grade Level: 10/11/12
Length: two semesters
Prerequisite: successful completion of Japanese I

Description: This class continues and intensifies the the exploration of the spoken and written Japanese language. Emphasis during the second year is in the areas of speaking, reading, and writing the language.

LATIN I
Originating District: Jackson High School
Grade Level: 10/11/12
Length: two semesters
Prerequisite: none (A minimum of a "C" average in English is recommended)

Description: Accentuating elemental Latin, students are expected to learn five declensions, four conjugations in both the active and passive voices, basic sentence structure, and about 400 Latin words. Vocabulary compounding is also stressed.

MYTHOLOGY

Originating District: Jackson High School
Grade Level: 10/11/12
Length: one semester(1st. semester 1990/91)
Prerequisite: successful completion of Spanish I

Description: An intense study of Greek and Roman Mythology as taught through a lecture and discussion format.

RUSSIAN I: An Introduction to the Russian Language

Originating District: Jackson High School
Grade Level: 9/10/11/12
Length: two semesters
Prerequisite: none

Description: This class serves to lay the groundwork for developing the ability to speak, understand, read and write the Russian language and to develop an understanding of and appreciation for the cultures of the Russian people.

Emphasis during the first year is in the areas of speaking and understanding and learning basic language skills which lead to reading and writing the language.

SPANISH I

Originating District: T.B.D.
Grade Level: 9/10/11/12
Length: two semesters
Prerequisite: none

Description: This class serves to lay the groundwork for developing the ability to speak, understand, read and write the Spanish language and to develop an understanding of and appreciation for the cultures of the Spanish speaking peoples of the world.

Emphasis during the first year is in the areas of speaking and understanding and learning basic language skills which lead to reading and writing the language.

SPANISH II
Originating District: T.B.D.
Grade Level:10/11/12
Length: two semesters
Prerequisite: successful completion of Spanish I

Description: a second year sequel to Spanish I.

WORLD RELIGIONS
Originating District: Jackson High School
Grade Level: 12
Length: one semester (2nd. semester 1990/91)
Prerequisites: none

Description: A study of the history and development of the five major world religions through a discussion and lecture format.

VITA

Timothy J. Hogan was born in Chester, South Carolina on February 1, 1960. He attended public schools in Marathon, Florida. In 1986, he received a Bachelor of Arts degree from Augusta College.

After moving to Knoxville in 1988, he entered graduate school at the University of Tennessee to pursue a master of science degree in Communications. In 1989, he received a graduate assistantship with the Office of Affirmative Action.