Site Facilitation Of Distance Education Via Compressed Video In Rural Schools: A Case Study

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Abstract

Distance education delivered via broadband networks and sophisticated electronic technologies is one innovation often recommended for helping rural schools and their communities provide students with curricula and educational opportunities necessary for success in a global economy. This case study explored how eight rural Virginia school systems with little prior experience involving these technologies implemented a regional telecommunications network (SVCC-TN, part of Net.Work.Virginia). Over a one year period, 54 administrators, teachers, and students (representing nine schools) joined together in multi-role telecommunications teams to learn how the technology functioned and could enhance teaching and learning opportunities, and then facilitated implementation at their local sites.

The following questions were addressed: (a) How was the process of implementing distance education initially characterized? (b) What barriers did schools face? (c) How did school teams function? (d) How did this process affect perceived attitudes, concerns, and self-efficacy of participants? and (e) In what ways did individuals and schools redefine, reorganize or reinvent the initial process in order to optimize implementation?

Qualitative research methods, supported by qualitative and quantitative data collection instruments, were utilized. Teachers and administrators on school telecommunications teams completed questionnaires at the start and close of the study that addressed attitude, concerns

(measured via Concerns-Based Adoption Model [CBAM] instrument) and self-efficacy. Additional data was obtained from analysis of open-ended surveys; focus group transcripts; documents; interviews; and researcher notes, comments, and observations of workshops and meetings attended by school teams and superintendents.

The outcomes of this study identified that both technical and top-level institutional leadership are needed to support full-scale implementation of distance education within a regional consortium and that a multi-role collaborative approach to staff development utilizing hands-on strategies is an effective strategy for enhancing participants' self-efficacy towards technology. Findings identified (1) barriers and drivers of distance education; (2) initial programming strategies; and (3) needs to cultivate a wider audience of users, increase communications, and establish new organizational structures for promoting cross-district utilization of distance education. Recommendations are presented for enhancing distance education in rural schools.

Dedication

This work is dedicated to the administrators, teachers, and students in the nine high schools associated with Southside Virginia Community College Telecommunications Network (SVCC-TN) who were members of their school telecommunications teams between December 1996 and November 1997. These individuals shared their experiences with me and allowed me to observe their progress in learning, understanding, and working with the new technologies available to their school through SVCC-TN. Through their dedicated efforts, their schools and communities now have access to expanded opportunities for sharing and exchanging resources and information. These individuals are the true "local heroes." They continue to be leaders by demonstrating to their schools how the new technologies can augment the teaching and learning process.

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Chapter 1

Introduction

Issues

Change: A challenge for schools and society. Revolutionary changes in technology are shifting the way people think, and the ways they learn, receive information, conduct business, and communicate with others. Access to information and communication technologies is becoming essential for economic and social productivity. "A new society is emerging from the residue of the industrial age based on information which has become integral to the well-being of our social, political, organizational, and personal lives" (Blumhardt and Cross, 1996, p. 13).

Schools, often the last group to embrace change, cannot escape the impact of the developments in electronic communications that are taking place.

> The education reform movement (of the 90s) challenges teachers to transform their practice by adopting high standards for all their students; new curricula emphasizing higher-order thinking skills; constructivist, student-centered teaching methods; and--increasingly--instructional uses of computers and other technologies (Means and Olson, 1995a, p. 1) .

"Effective districts are highly engaged with their schools, which they see as centers of learning and development of both staff and students" (Fullan 1991, p. 343).

Challenges for rural schools. Change is a challenge for all schools, but especially so for rural schools that face triple threats to their existence due to low population density, geographic isolation and low economic base. While celebrating the contributions of rural America to the strength and moral fiber of the nation, a comprehensive report (Stern, 1994) on rural schools documented persistent problems related to finance, facilities, drop-out rate, teacher and administrator compensation, curriculum, and student achievement. Previous attempts to solve these problems have led to consolidation of schools. Unfortunately, the closing of rural schools has denied citizens a focal point for their community. Moreover, school closings have generated feelings of disenfranchisement of citizens from their own children and have led to a further decline

of the economic base for the area (Lambert, 1991; Herzog and Pittman, 1995; Howley and Howley, 1995; Seal and Harmon, 1995; Theobald and Nachtigal, 1995).

Concerned citizens have come to recognize that their rural schools must survive to ensure both the culture and the viability of the rural community. Walter Annenberg has pledged $500 million to fund Rural Challenge (Sher, 1995) in order to promote the incorporation of values found in rural communities into rural school reform initiatives. Innovative partnerships, such as Program for Academic and Cultural Enhancement of Rural Schools (PACERS) and Rural Entrepreneurship through Active Learning (REAL) have been established (Haas and Lambert, 1995). These and similar cooperative efforts support traditional economic development, while also nurturing the growth of small businesses and local community operations. Monk (1989) and Barker and Taylor (1993) have argued persuasively about the possibilities of employing distance education via electronic technologies to alleviate both short and long-term threats to rural schools and rural life in general.

Distance education: Potential benefits for K-12 schools. Distance education delivery systems, once available only to higher education and the corporate world, now are becoming increasingly affordable for K-12 schools. (See Appendix A for a list of terms pertinent to distance education.) Technological advances in communications have dramatically lowered costs of installation, equipment, and operation while delivering a more powerful product. Interactive communication with two-way audio and video is now possible using high speed T-1 and ISDN (Integrated Services Digital Network) lines and classroom teleconferencing equipment (Hanson, 1995; Barker and Dickson, 1996b). Advanced broadband networks employing Internet Protocol (IP) over ATM (asynchronous transfer mode) networks, such as Virginia's new Net.Work.Virginia (Dillehay, 1997; Net.Work.Virginia, 1997), now allow simultaneous transfer of voice, video and data over one fiber, rather than requiring multiple lines. These systems offer a means of keeping students in their home school, while providing them access to increased curricular offerings and a wide range of information and support services.

Where animosity based on resistance to school consolidation once existed, alliances between neighboring districts are being sought as schools plan for, acquire and implement

distance education (Pacific Mountain Network, 1994; Bretz, 1995; Ivanovic, 1995; Walsh and Reese, 1995; Barker and Dickson, 1996a; Branstad, 1996; Schatz, 1996). Although collaboration in development of distance education programs at national and international levels is a growing practice, cross-district collaboration is relatively new. Strategic alliances now are being developed that bring together disparate groups with common needs. By cooperating and sharing materials and skills, these groups are expanding the practice of distance education. They envision making the richness of educational resources available to a wider group of clients that includes students, teachers, and staff at individual schools, across districts, and eventually across state lines ("Explosive Growth in Distance Education," 1997).

Introducing change into any social system is difficult. According to Fullan (1993), implementing successful change is a complex process. It involves "putting into practice an idea, a program or a set of activities and structures new to the people attempting to or expected to change" (Fullan, 1991, p. 65). There is often great discrepancy between claims of potential benefits and reality in education innovations (Cuban 1990). To be successful, change requires both "top-down" and "bottom-up" strategies (Fullan, 1994). It calls for administrative and budgeting policies and practices that support and enhance innovation, as well as changes in the practices and performance of those responsible for the change. Effective leaders must strike a balance between forces pushing for innovation and change and those that argue for maintaining a comfortable status quo.

Implementing distance education in rural schools represents an immense challenge. Envisioning success for new technology-based modes of teaching and learning, such as is possible with distance education, requires a rethinking of the traditional organization of learning to one that includes new roles for teachers and students and use of distributed resources (Dede, 1997). Policy makers at all levels of education are faced with decisions regarding allocations of limited resources as they consider plans to purchase technology, train staff and build "teachers' knowledge and skills in alternative types of pedagogy and content (Dede, 1997). The costs of maintaining currency with technology innovations are prohibitive. There is always something

"new" on the horizon that is accompanied by claims of even greater performance enhancement for students, teachers, and schools.

For rural schools that serve areas of low population density and have small enrollments, a distance education program that involves a network of school divisions provides special benefits not easily achieved by individual districts. Moreover, state standards of learning and colleges are asking that students complete advanced courses in science, math, technology, and foreign languages. Individual school districts are finding that they can enhance their curricular offerings by incorporating distance education. For schools that do embrace distance learning programs, school culture and the climate for learning can be expected to be affected by the greater opportunities for access to external resources, for collaboration, and for the interactive programming that distance education can provide (Walsh and Reese, 1995). As Fullan (1992) noted, institutions themselves often become changed in the process of implementing an innovation.

Through utilization of distance learning technologies, new forms of expression can become possible. Learners, separated in time and place, can experience interpersonal interactions in virtual communities. Knowledge webs can complement teachers, texts, and print material as sources of information.

> The innovative kinds of pedagogy empowered by these emerging media, messages, and experiences make possible a transformation of conventional distance education--which replicates traditional classroom teaching across barriers of distance and time--into an alternative instructional paradigm: distributed learning (Dede, 1996, p. 25).

The challenge to educators lies in promoting collaboration among dispersed groups of learners, incorporating multi-media and hyper-media into teaching and learning experiences, and in weaving learner-centered constructivist usage of linked, on-line materials into the curriculum and culture of traditional educational institutions (Dede, 1996). For administrators, the challenge is to recognize and nurture the efforts of those who initiate practices involving distance education technologies, as well as to ensure that the school climate encourages the continuing professional development and renewal of all teachers.

Statement of the Problem

Embracing distance education as an option for assuring equity of opportunity and student access to a broad range of curriculum offerings poses challenges for schools. Rural schools that exhibit interest in implementing distance education as an alternative to consolidation, in particular, face several barriers that must be overcome before this mode of instruction becomes an accepted enhancement to traditional curricula. Typically, teachers and administrators in rural schools have fewer academic credentials and less access to computers than do their counterparts in urban areas (Stern, 1994). They may have had little interaction with the external professional community in their area of expertise. They may feel "uncomfortable" in originating instruction in a distance education program. Moreover, technical support is limited. Additionally, rural schools that serve only as receiving sites may not have individuals with the current skills and knowledge-base needed to facilitate and implement distance education effectively. Cost also is a factor; schools may not feel they have the resources to allocate to develop, deliver, and facilitate distance education courses.

The problem faced by rural schools is how to prepare their institutions, staff, and students to face the impact of changes brought upon them by the arrival of "information age" technologies. The literature provides little guidance for implementing these changes to schools that are used to operating under a traditional hierarchical management system and face-to-face teaching practices .

Literature reports of successful distance education programs established for high school students attribute success of implementing these programs to the dedicated efforts of a few visionary leaders (Sullivan, Jolly, Foster, and Tompkins, 1994). Can groups that may not have these visionaries create a climate for change in their institutions? How might these groups gain knowledge and expertise about new methods of teaching and learning via distance technologies? What organizational structure(s) might help schools recognize and accept leadership from groups and individuals not assigned traditional leadership roles? How can these individuals and institutions work together to share their knowledge and practices and maintain currency as further changes in technology emerge? These are questions faced by schools as they attempt to

incorporate distance education and associated technologies into their instructional programs. Most research studies involving distance education as an innovation have been directed towards attitudes and performance of adult learners (Kirby, 1995; Willis, 1992), not towards developing programs for K-12 schools.

The failure of traditional "one-shot" staff development programs, typically the method used to increase staff and teachers' awareness and provide information about a proposed innovation, is well documented (Berman and McLaughlin, 1978; Rosenblum and Louis, 1979; Miles, 1980; Berman, 1981; Fullan, 1982, 1985, 1992, 1993). Long-term implementation of the innovation rarely is a product of such short-term efforts (Fullan, 1992).

One potential solution to the problem of developing staff awareness and expertise towards an innovation such as distance education is to assemble a group of individuals (innovators) who are committed to building their skills in this area. Both research and anecdotal evidence attest to the critical role of site facilitators in assuring the success of a distance education program in secondary schools (Moore, Burton, and Dodl, 1991; Smith, 1993; Talab and Newhouse, 1993; Wagner, 1993; Kirby, 1995). One way to minimize the impact of existing, limited technical expertise and to maximize contributions of varied stakeholders is to (a) utilize on-site facilitators, such as multi-role school teams that are composed of individuals with differing levels of authority, who work and learn together at individual school sites; (b) deliver broad-based formal workshops to team members, supplemented by site-based technical support as needed on an on-going basis; and (c) provide numerous opportunities for reflection, feedback and discussion within and among site-based school teams. Such an approach can lead to a group of site-based school leaders who then can serve to facilitate the process of promoting and diffusing the innovation throughout their school community.

Purpose of the Study

The purpose of this study was to examine what factors, strategies, and practices rural schools with such heteroarchical teams adopted and adapted in their efforts to implement a regional telecommunications network. Because case studies provide valued insight into change processes, I elected to use this approach for my research. I traced the efforts of nine rural

Virginia high schools in their transition process from a traditional classroom model of operation to one that embraced the use of telecommunication technologies.

This study covered an 17-month time period. It was composed of three stages: (a) planning; (b) formal and informal training; and (c) on-site experimentation, which included three months of scheduled distance education classes. Close attention was paid to the implementation process and how it changed due to training or to unanticipated problems and delays.

A VTEL compressed video teleconferencing system was installed at each site. Together with a variety of supporting technologies, this system provided schools with new opportunities for teaching, learning, and interacting with individuals and materials located at a distance. All sites could initiate and receive interactive programming from each other and from the two higher education institutions (Southside Virginia Community College and Longwood College) associated with the network.

Building principals selected school telecommunications team members to serve as school leaders in the implementation process. Teams were composed of the principal, two to four classroom facilitators, a teacher responsible for technical support, and several students (depending upon the school setting).

Research Questions to be Answered

The following specific research questions were addressed in the study:

- How was the process of implementation of distance education through a two-way audio, two-way video (VTEL) telecommunications system (the innovation) characterized in the local high school institution?

- What barriers did schools face as they addressed delivering instruction via a regional telecommunications network?

- How did the school telecommunication teams function in the staff development and implementation process?

- How did ongoing staff development, coupled with initial stages of implementation of the telecommunications network at the high school sites, affect:
    - the perceived attitudes towards the innovation?
    - the perceived Levels of Concern/Acceptance of the innovation?

- the level of perceived self-efficacy towards the innovation?

- In what ways did individuals and schools redefine, reorganize or reinvent the process of implementing distance education in order to optimize the implementation?

The initial phase of any innovation is critical. How is this phase handled in rural school districts that have had little, if any, prior experience with distance education? How is staff development implemented and received? What adjustment do autonomous school districts need to make to become viable participants in the collaborative environment necessary for successful operation of a regional telecommunications network? Much can be learned from observing this initial process and detailing what seems to work and what doesn't.

Conceptual Background for the Study

Analysis of past research in the areas of distance education theory, educational change, staff development, and the constructs of attitude and self-efficacy were used to place this study in perspective and justify the approach.

Theories of distance education. Several theories for distance education have been proposed. Keegan (1986), Holmberg (1986, 1989), and Peters (1988) viewed distance education theory in a manner distinct from traditional educational theory. The theory supported by Shale (1990) and Simonson and Schlosser (1995) is that the concept of education is the same, whether it occurs in a classroom where the students meet face-to-face with an instructor, or in an electronic media environment, separated in distance (and maybe time) from the instructor. This is the model employed as a theoretical basis for distance education in this study. However, while the methodology for good teaching may be the same for both on-site and distance education, teaching at a distance requires that the instructor carefully plan and structure opportunities for interaction (Cyrs and Smith, 1990; Wagner, 1993; Bruce and Shade, 1995; Lehman, 1996; Schrum, 1996).

Theories of change. The complexities of the implementation process for any innovation and the slow development of the meaning of change at the individual level are factors that explain the failure of "one-shot" systems of staff development. Research has shown that successful

implementation of an innovation is associated with a staff development program that combines concrete teacher-specific training activities with opportunities for continuous assistance, interaction, exchange of ideas, and support during the implementation process (Fullan, 1982; Huberman, 1988). Turner (1994) demonstrated that an instructional design team composed of a teacher, a group of five students, and a support person that participated in a "HyperStudio" staff development program led to effective diffusion of the innovation into the school instructional program.

Wu (1988) studied the many and varied factors involved with change. "In addressing the issue of change, one must consider questions such as: 'What should staff developers know about the nature of change as well as the nature of resistance to that change? Why is change difficult to enact?'" (p. 17). Knowledge alone usually can not effect a change in behavior (McClelland, 1968). According to Hall, Wallace, and Dossett (1973), change is a process. In their Concerns-Based Adoption Model (CBAM) model, they proposed that individuals pass through seven basic levels: awareness, informational, personal, management, consequence, collaboration, and refocusing, as they internalize and integrate newly-learned information or skills into practice. This model focused on understanding the needs of the individual (or object of the reform or innovation), and on designing intervention strategies that allow the individual to move successfully through the stages of the adoption process (Hall and Hord, 1984).

Attitude and self-efficacy. The change process is influenced and affected by attitude and by feelings of competency of individuals. Attitude, the result of a person's experiences, beliefs, and background, is defined by Rogers and Shoemaker (1971) as a "relatively enduring organization of an individual's beliefs about an object that predisposes his action" (p. 109). Creating a positive change in attitude involves understanding how an individual forms attitudes. Several models have been proposed to examine attitudinal change (Heider, 1946; Festinger, 1957; Bem, 1970). Gable (1986) believed that perceptions of situations greatly influenced peoples' attitudes.

Talab and Newhouse (1993) supported the 1991 findings of Bichelmeyer (as cited in Talab and Newhouse, 1993), who reported that the technological innovations that have been

embraced by teachers are those that offer solutions to problems that teachers themselves considered important. Rogers and Shoemaker (1971) suggested that there are five "attributes of innovation" that are associated with a person's attitude towards innovation. They are: relative advantage of the innovation; compatibility of the innovation with the values, needs, philosophy and past experiences of the individual; perceived complexity of the innovation; opportunity to examine the innovation on a trial basis; and observability (whether the results of using the innovation can be readily observed).

Self-efficacy, also known as expectancy efficacy, refers to personal judgments of one's capability to organize and implement actions in specific situations that may contain novel, unpredictable, and possibly stressful features (Bandura, 1977, 1981, 1982). Delcourt and Kinzie (1993) reported that research conducted by Owen (as cited in Delcourt and Kinzie, 1993) suggested that self-efficacy can be measured reliably and that such measurement is facilitated by the identification of a clearly defined set of skills. Delcourt and Kinzie (1993) showed that training and experience in use of computer technologies served as predictors of self-efficacy. Their work validated the previous findings of Ashton and Webb (1986) and Madsen and Sebastiani (1987), which showed that efficacy and attitudes are strongly influenced by prior training.

Role of school culture. Acceptance of an innovation is extremely dependent upon the culture of a school (Sarason, 1982). Berman and McLaughin (1978, 1980), in their Rand study of federal change agent programs, found that characteristics of schools and attributes of teachers significantly affected project outcomes.

> The importance of the principal to both short-and long-run effects of innovations can hardly be overstated. The principal's unique contribution lies...in giving moral support to the staff and in creating an organizational climate that gives the project "legitimacy."...The teacher's sense of efficacy...showed positive effects on all outcomes (1978, p. viii).

Involvement of students in school staff development. Research by Turner (1994) demonstrated that teams comprised of various stakeholders (including students) with differing levels of authority were successful in implementing change. Further support for including

students on school teams comes from research in the areas of school governance (Roberts and Dungan, 1993) and Organizational Development ([OD]; Arends, Schmuck, and Arends, 1980).

Kentucky's Student Technology Leadership Program (STLP) "harnesses student enthusiasm and technical expertise for K-12 technology training state-wide" (Holzberg, 1997, p. 34) by having students work in technical crews to mentor teachers who are using new technologies. In Seattle, over 300 high school students are involved in helping the districts' schools maintain networks and Internet services (Trotter, 1997a).

Scope and Assumptions of this Study

For the purpose of this study, the "new" technologies included the compressed videoteleconferencing system; a regional telecommunications network; and the use, by individuals other than administrators, of electronic mail and facsimile equipment. These technologies are not new in terms of their development, but rather *new* to the groups involved in this study. Collectively, they were considered to be the "innovation."

According to Rogers (1997), there are three main phases through which all innovations proceed: adoption, implementation, and institutionalization. Rogers felt that an innovation may "die" or disappear during any of these phases if it does not have the support or meet the needs of the group for which it was intended. Research has shown that "it takes from three to five years for any meaningful implementation of a major educational change" (Orlich, 1989, p. 165).

This research involved only the initial phase of the implementation process. At this point in time it is not possible to predict if the current technology and approach to distance learning will become institutionalized. Advances in technology are occurring rapidly. Changes in the initial system design of the telecommunications network occurred during the course of this research. Before distance education is fully implemented in these schools, other changes can be anticipated. For example, computer conferencing systems, while part of future plans for instructional delivery, were not included in the initial plans.

A unique situation exists among schools in this telecommunications network. All had a previous history of Dual Enrollment courses offered jointly by the local school district and the

local community college. Students who enroll in these courses have the opportunity to earn both high school and college credits (L. Sheffield, personal communication, August 13, 1996).

One semester before the schools achieved on-line capability, the local community college began offering instruction via the compressed video VTEL teleconferencing system to their own students located at their two campus sites, Alberta (Christanna) and Keysville (Daniels). When high schools came on-line, they had a ready source of instructional programming available to them. This meant that they could initiate participation in the telecommunications network by enrolling students in courses originating at the community college that were delivered over the telecommunications network.

At the start of the planning for the regional network, the minimum expectation was that the high school teachers who were members of the school telecommunications teams would become classroom facilitators for distance education classes delivered via the network. However, based on reports in the literature (Talab and Newhouse, 1993; Johnson, 1996), it was anticipated that individual high school teachers, who initially had served as classroom facilitators, would subsequently use the network themselves to deliver instruction. Furthermore, it also was envisioned that the network would be used for staff development, co-curricular activities, and community events.

Responsibility for selection and purchase of equipment was the responsibility of the telecommunications network project coordinator. This process was completed prior to the association of the researcher with the project. Chapter 4 includes a discussion of the historical and planning aspects associated with formation of the network, as well as a description of the staff development plans and training.

I used five methods to gather data in this study: open and closed-ended surveys; my observations, recorded comments and reflections as a researcher; principal narrative reports; review of documents; and focus groups. Each has limitations. In responding to a survey, respondents may conceal the truth. "In some instances, this concealment may reflect a respondent's desire to answer in a way that is socially acceptable" (Ferber, Sheatsley, Turner, and Waksberg, 1980, p. 19). All participants may not agree to answer some or all questions on a

survey, fearing that their answers may have negative repercussions. Respondents may not know the information requested, or may misinterpret the questions.

Problems involving use of observers' notes and comments may arise because observers may have an inherent bias that affects the validity of their interpretations. Focus groups can generate collective impressions of a group, but membership in a focus group may not be representative of the whole population. Moreover, group dynamics may sway the nature of the discussion. What is important to the group may not be what is important to the researcher (Stewart and Shamdasami, 1990).

Research studies show that combining data derived from both quantitative and qualitative instruments allows a researcher to "better understand a concept being...explored" (Creswell, 1994, p. 177) and to "add scope and breadth to a study" (p. 189). The CBAM model of Hall, Wallace and Dossett (1973) utilized a closed-ended questionnaire to measure the feeling, thoughts, and information needs of the information user involved with an innovation. A second component of the CBAM model, Level of Use (LoU), employed a structured focus interview to measure the individual's level of use (Loucks, Newlove, and Hall, 1995). Taken together, the combination of instruments produced a rich understanding of the innovation process and the concerns of individuals who were immersed in the accompanying activities.

Based on the above research findings, I used a combination of instruments in this study in an attempt to gain greater insight into the process of implementing distance education into rural high schools.

Significance of this Study

Many schools are considering distance education through technology as a strategy to help them address their limited staff and financial resources amidst an environment of rising state standards. Additionally, school reform literature places new emphasis on learner-centeredness and interaction among learners. "The distance education literature reflects the increasing interest in the potential of current technologies to alter the traditional teacher-student relationships" (Wurster, 1997, p. 18). By characterizing the transformation of school processes due to the

implementation of telecommunications technologies, data from this study add to both distance education and school reform literature.

This study is particularly significant because several variables that often accompany technology innovations were not relevant. An external coordinator had responsibility for technology decisions and interaction with vendors; external sources of financing were available for purchase of equipment, network installation, and training; external sources of expert technical support were provided on site as needed; and external sources of training were available for schools. Consequently, in this study I was able to focus on how schools implemented a distance education system and what plans and policies they developed to involve a community of learners, beyond the initial group of innovators, in accessing and utilizing the potential offered by the telecommunications network.

This study has application to all schools concerned with implementing change that involves cross-district collaboration and use of emerging technologies. School reform efforts of the 90s are geared towards providing all students with the "intellectual tools and social skills they need to cope with the complex human technical problems they will face in the future" (Cawelti, 1995, p. 5). New workforce practices now require workers to function in virtual teams and communicate via electronic technologies. Employers look to schools to prepare their students to function in such an environment. According to Mehlinger (1996a), the only way this can be accomplished is through school restructuring and reculturing, with technology serving as a catalyst for these reform efforts. For small rural schools, cross-district collaboration and use of emerging technologies, such as distance education via compressed video, can stretch limited resources; can extend the professional expertise of individual participants to a wider audience; and can provide a learning environment that challenges students and teachers to collaborate and utilize distributed resources. Additionally, according to Senge (1990), viable and competitive organizations in today's society are "learning organizations." Implementation of distance learning challenges all individuals involved in the process to engage in learning. By participating in this process, schools model the behaviors associated with this organizational model.

This study provides support for establishing ongoing staff development for all participants involved in a change process; provides insight into the attitudes and development of self-efficacy among individuals who serve as facilitators in high school distance education programs; and demonstrates the synergistic potential of an integrated telecommunications team that includes administrators, faculty, staff, and students. By illuminating key institutional factors that lead to implementation of a successful telecommunications network in rural high schools, this study contributes to the growing literature in the emerging field of distance education.

Limitations of the Study

The findings of this research can be expected to apply only to rural school systems who use two-way interactive compressed videoconferencing and who conduct heteroarchical, team-based staff development. There was no attempt to compare data from individuals using other distance education technologies or who undergo "one-shot training." The findings were dependent totally upon participants' self-reporting data and upon observations by the researcher. Participation was voluntary. All participants were promised confidentiality. It is assumed that they reported accurately and completely.

Chapter 2

Review of Literature

Introduction

To establish a context for this inquiry, an overview of school reform in education is provided. Models for change are examined, as are the roles that attitude and self-efficacy serve in describing how individuals react to change. A review of systemic reform in the 1990s is presented in which technology is proposed as a component of rural school reform and as a catalyst for change in all schools. The characteristics for leadership in effecting change are detailed, along with a discussion of roles for the principal and teachers in schools that engage in systemic reform. Two projects featuring schools that have successfully undergone systemic change are described. A conceptual framework for viewing schools as a learning organization is developed in which the contributions of all participants are viewed as being necessary for significant evolution of organization culture. Some current theories of effective staff development are profiled.

A short review of distance education is presented, including a discussion of various theories proposed to explain this practice. A general discussion of current distance education practices in the K-12 setting follows. This section concludes with an examination of research on site facilitators in secondary school, roles reported as critical to the success of distance education in this setting.

Traditional Role of Education in Society

Education is proclaimed to be the most important, the most concrete way society has to prepare individuals to assume their role in society. To educate is to communicate; the medium may be speech, text, image, voice, or symbols. The interaction of four factors: learner, teacher, knowledge, and a problem in a particular context constitutes the fundamental communication process that is known as education (Tiffin and Rajasingham, 1995).

Education is a social activity. Nevertheless, educational institutions are intertwined with historical and political interests. The history of education from the late 18th century until the

present is linked with a pattern of thought grounded in logical positivism and the psychology of human knowing and acting, with the vision for policy and practice being dominated by a group of people characterized as "experts" (Muffoletto, 1994).

Public education systems in the United States are a remnant of the Industrial Age (Cuban, 1982, 1990; Tiffin and Rajasingham, 1995). The way time, space, knowledge and students are organized and managed is reflective of the operation of a factory-like environment. The classroom, with a teacher in front of the room, is the standard image of a school--the paradigm. (This term, "paradigm," was introduced by Kuhn [1962] in his book on scientific revolutions to describe accepted examples of key ideas and models that explain specific observations.) For Tiffin and Rajasingham (1995) paradigm means a "supraview of an established system, recognizing not just its functionality, but also the faith in that functionality" (p. 11).

School Reform: 1900 - 1990

Reforms of education have been proposed periodically, focusing on realigning the goals of education with current social values and expectations. As the nation moved from an agrarian to an industrial society, existing social and political forces of the time molded schools into a factory structure; the goal was to prepare the next generation of workers. While elementary schools have demonstrated some ability to change over time, Cuban (1982) claimed his study on high school classrooms from 1900-1980 conducted for the National Institute of Education (NIE), "demonstrates how impervious high school classrooms have been to reform efforts over the last half century" (pp. 116-117).

The launch of Sputnik in 1957 aroused cries that our schools and teachers were not preparing students in math and science. This event led to a series of "teacher-proof" curricula being developed in the 60s by university professors. "Many (but not all) of the previous decade's curricular reforms evaporated by the early 1970s as efforts redoubled to differentiate courses and schools for low-income and minority children" (Cuban, 1990, p. 4).

The reform movement of the 70s called for competency-based education (back-to-the-basics), academic excellence, higher standards, more homework and year-round schooling—items that provided check-points for teacher competency and shifted the decision-making center to

outside the school (Muffoletto, 1994). According to Cuban (1986), the driving agent of change was not thoughtful, reflective considerations of the problems, but instead was legislated reform, driven by special interest groups, politics, and economics.

The report of The National Commission on Excellence in Education, "A Nation at Risk" (1983), stating that the current educational system was not serving the nation well, heralded an alarm to the country. As a result, education reform efforts of the 80s focused on literacy, on improving student achievement in content acquisition, and on emphasizing content, coverage and testing for content retention (Stewart, 1990). By the late 80s, reports such as those of the Holmes Group and the Carnegie Forum formed the foundation of a "second wave" of reforms, focusing "on the need to improve education by improving the status and power of teachers and by 'professionalizing' the occupation of teaching" (Darling-Hammond and Berry, 1988, p. 53). The resulting educational reform movements placed administrators, teachers, and students in central roles for finding solutions to problems that plagued education. While successfully raising standards in schools, these reform movements of the 80s, nevertheless, according to Daggett (1992), "failed to prepare youth adequately for the requirements of the workplace" (p. 1).

Despite much effort, all of the reform efforts led to little permanent change, with the result that schools today look and act much like they did one hundred years ago (Cuban, 1990). The problem, according to Shanker (1990) and others, is that the bureaucratic nature of the education system precludes change. According to Sheingold (1991),

> ...the successful transformation of student learning in the Nineties will require the bringing together of three agendas of reform: an emerging consensus about learning and teaching, a movement toward well-integrated uses of technology, and the push for restructuring the entire institution that we know as "school" (p. 17).

Neither of these agendas alone, according to Sheingold, can realize its full potential in the absence of the other two; they must be pursued concurrently to be maximally effective. Cawelti (1995) supported Sheingold's view. He felt that schools needed to examine restructuring and systemwide change in order to provide all students with the "intellectual tools and social skills they need to cope with the complex human and technical problems they will face in the future" (p. 5).

Technology

Definitions of technology. Technology has been advocated as a tool for creating school environments that are places where students consistently comprehend, conceptualize, think critically, and apply curriculum content to real issues. "Technology, like education, is situated in philosophical, social, and economic constructs which work to serve larger interests and benefits" (Muffoletto, 1994, p. 24). Technology is commonly thought of in terms of gadgets, instruments, machines, and devices: a technocratic vision (Postman, 1992). Using this definition, film, radio, instructional television (ITV), computers, video disc players, CD-ROMs, Internet connections, and fiber-optic cable are devices that are components of educational technology.

Technology has other meanings, ones that are related to ideas about systems and ways of understanding the world through positivism and empirical science (Muffoletto, 1994). Educational technology (sometimes called instructional technology), as defined by the Association for Educational Communications and Technology (AECT, 1977), is "a complex, integrated process involving people, procedures, ideas, devices and organizations for analyzing problems and devising, implementing, evaluating and managing solutions to those problems involved in all aspects of human learning" (p. 153).

Technology is also a way of thought. Muffoletto (1994) wrote, "Technology has not only affected how we think about ourselves in the world and our relationships to others, but also how we know about the world and others" (p. 26). Postman (1995) noted that new technologies make war against old technologies. "Technological change is not additive; it is ecological. A new technology does not merely add something; it changes everything" (p. 192).

Technology in schools. In the past, application of technology to education was predicated on the goal of producing "teacher-proof" instruction. Forecasts that film, radio and instructional technology (IT) would improve learning and revolutionize education have been unrealized (Hannafin and Savenye, 1993). The Information Infrastructure Task Force (1994) found that, despite technology and the innovations it allows, the way America teaches is largely unchanged from a century ago. The textbook remains the basic unit of instruction; "chalk and talk" actions dominate the classroom; teachers generally work in isolation from their peers. A

U.S. Congress document (1995), "Teachers & Technology: Making the Connection," reported results of a National Education Association (NEA) study conducted in 1991. This report revealed that 68% of teachers stated that personal computers were readily available in their schools, but only 42% used this resource for instruction; and that 51% of teachers reported availability of tool software, but only 25% were using these materials regularly.

By the 1996-97 academic year, schools in the United States had approximately one computer for every seven students (Market Data Retrieval, 1997, cited in Trotter, 1997b, p. 8). This ratio is decreasing as schools, pressured by parents, rush to buy additional computers. An increasing body of literature of technology implementation efforts (Dwyer, 1994; Wilson, 1994; Means and Olson, 1995a, 1995b; U.S. Congress, 1995) supports the framework that technology and teachers must work together to form more challenging learning opportunities for students and to create a learning culture that transcends the classroom.

Authentic uses of technology. Changing to a technology-rich, student-centered classroom places increasing demands on teachers to obtain new skills for both delivery and assessment of instruction; they must learn the operation and potential of electronic communication media. The role of the teacher is changing, from being a deliverer of instruction to a facilitator of instruction. Teachers report that they now spend their time coaching, guiding, and encouraging student learners (U.S. Congress, 1995).

New leaders are emerging in schools; these are the individuals who have embraced the use of technology as a catalyst to support the acquisition of higher-order thinking skills: problem solving, mathematical reasoning, and the acquisition and analysis of data. This "authentic" application of technology, is promoting changes in the classroom, and not only for students. By providing students with experiences in selecting appropriate technology tools and in applying technologies in the searching, analyzing and presenting of information, teachers can create a learning culture that prepares students for work in the information age.

Rural Communities and Rural Schools

Demographics. Many definitions exist for what constitutes a rural school or rural school district. Different policy interests focus on different organizational features of the educational

enterprise. All include variables of isolation, small scale and sparsity of population (Stern, 1994). Rural students are found in all parts of the country and in every state. During the 1991-92 school year, according to the National Center for Education Statistics (NCES; reported in Stern, 1994), about 6.9 million students attended some 22,400 rural schools, accounting for 16.7 percent of regular public school students and 28 percent of regular public schools. "Seventy-three percent of rural secondary schools have fewer than 400 students and account for nearly 40 percent of all rural secondary students" (Stern, 1994, p. 15).

Since the 1920s, rural America has seen a steady migration of its young to the urban centers. The period 1979 to 1982 was one of the worst recessionary periods in American history. As a consequence, rural communities endured a crisis in agriculture that cost thousands of farmers their land; industry saw a loss of millions of jobs due to foreign competition. In the following years, a sharp decrease in energy prices caused areas depending on drilling and mining to suffer economic hardships (Stern, 1994). School consolidation was the recommended solution for communities faced with these economic crises (Lambert, 1991; Stern, 1994; Seal and Harmon, 1995; Theobald and Nachtigal, 1995). DeYoung and Lawrence (1995) reported that the number of schools in the U.S. was reduced from 238,000 to 79,876 in the period between 1903 and 1992. Most of these that disappeared were small rural schools.

Rural research studies. Concerned rural citizens recognize that the survival of their community is intertwined with the survival of their local school (Sullivan, Jolly, Foster, and Tompkins, 1994). Grass-roots efforts are active in maintaining the rural school as a vigorous part of rural community life. Theobald and Mills (1995) have called for schools to rediscover community and instill a feeling of caring. Berry (1990) argued for rural education to be considered as education for community --"thoughtful care for local places."

A number of successful rural community projects exist or are in developmental stages. Through the Program for Academic and Cultural Enhancement of Rural Schools (PACERS) Cooperative of Small Schools, rural communities and schools are strengthening themselves.

> They claim their own resources, identify and address local problems, build their own social and physical infrastructures, and generate the information they need. Students take their place with other community residents in the recovery and

> creation of knowledge, culture, and the skills of self-sufficiency necessary to live well in rural places (Haas and Lambert, 1995, pp. 137-138).

Rural Entrepreneurship through Action Learning (REAL) is another successful rural project, one that targets vocational training. It is based on "principles of partnership, building on the local community, balancing autonomy and assistance, supporting traditional economic development while nurturing the growth of small business and recognizing the importance of perseverance" (Haas and Lambert, 1995, p. 138).

Groups such as these are forming in other states (Hammer, 1996; "Community Development Efforts," 1997). The Annenberg Rural Challenge, initiated in August 1995, is designed to support or help create a "powerful and sustainable rural school reform movement that actively involves families, communities, and the broader public, as well as education professionals" (Sher, 1995, p. 147).

Technology and rural school reform efforts. Today, by almost any standards, rural residents are disadvantaged when compared with urban residents (Butler, 1991). Many researchers and policy makers view technology as being an emancipating resource for rural citizens (Carlson, 1994; Kentucky Board of Education, 1995; North Central Regional Educational Laboratory, 1995; Seal and Harmon, 1995), yet few communities and fewer schools have the technological resources common to metropolitan centers. "Rural research, particularly education research, is undertaken by comparatively few scholars" (Stern, 1994, p. 4).

To address this situation, the U.S. Department of Education in 1991 released a brochure, "An Agenda for Research and Development on Rural Education," outlining the topics that representatives of the rural research community, educational associations and federal agencies considered most important. The Appalachian Educational Laboratory (AEL) was designated to develop rural education as its national area of specialization (Hammer, 1996). Each of the ten regional education laboratories (RELs), however, has Rural Education Programs (REP). A newer initiative, the Rural Systemic Initiatives (RSI), has been undertaken by the National Science Foundation and is designed "to address barriers to systemic and sustainable improvements in science, mathematics, and technology education in rural, economically disadvantaged regions of

the Nation" (Eisenhower National Clearinghouse for Mathematics and Science Education, 1995, pp. 2-30).

Other organizations have begun to research and provide models for rural education (Barker and Taylor, 1993). AEL (1997) keeps readers abreast of a wide variety of these resources through its Home Page on the Internet. The Eric Clearinghouse on Rural Education and Small Schools (ERIC/CRESS, 1997) reviews articles and documents on rural education. Its data base and other resources on rural education can be accessed on its Web page.

Change

Change in organizations. Change is difficult to enact (Wu, 1988). According to Hersey and Blanchard (1982), there are four kinds of changes in education: (a) changes in knowledge, (b) changes in attitudes, (c) changes in behavior, and (d) changes in group or organizational performance. As one moves from (a) to (d), achieving change becomes more difficult and more time consuming.

There has been widespread agreement during the last decade that schools are not working for a large number of students (Sheingold, 1991). Yet most of the previous efforts on school reforms (e.g., recommendations from state agencies, the National Governors' Association, the Business Roundtable, the U.S. Chamber of Commerce, and the National Alliance for Business), which focused on imposing new sets of bureaucratic procedures, failed to meet their expectations (Mehlinger, 1996b). In most cases, the human aspect of the educational environment was ignored.

A new wave of reform currently prevails: one that assumes that the entire system known as school must be reorganized. It operates on a different set of expectations and incentives. "An organization structure must be created in which authority and responsibility are aligned—in which those who are charged with getting the job done, namely schools and teachers, have the authority and the support they need to do it" (Sheingold, 1991, p. 21). Shanker (1990) supported this view, stating, "If change is to occur, ordinary people must be able carry it out and, because today's reform may be tomorrow's problems, the capacity for responding to new challenges must itself be institutionalized" (p. 346).

A common theme in restructuring goals is an emphasis on the improvement and development of instructional practices. Mertens and Yarger (1988) claimed we need...

> ...structures for facilitating teachers in translating the knowledge base on teaching into actual classroom practice...formal structures for ensuring that teachers are empowered, that is, have the basic authority and power to practice teaching based on professional knowledge; and (that) teachers are involved in the process of making decisions which affect the conduct of the professional practice (p. 35).

Models for change. A number of models for change have been proposed. Hord, Rutherford, Huling-Austin, and Hall (1987) summarized the assumptions that form the basis for the Concerns-Based Adoption Model (CBAM), first conceptualized by Hall, Wallace and Dossett (1973):

- Change is a process;
- Change is accomplished by individuals;
- Change is a highly personal experience;
- Change involves developmental growth;
- Change is best understood in operational terms; and
- The focus of facilitation should be on individuals, innovations and the context (wherein change takes place) (pp. 5-6).

The CBAM model proposed that individuals, irregardless of the particular change or innovation, pass through seven basic levels of concern: awareness, informational, personal, management, consequence, collaboration, and refocusing, as they integrate new information or skills into actual practice (Hord et al., 1987). This model has been used extensively with schools that are implementing innovations or innovative practices.

Wood, McQuarrie, and Thompson (1982) supported the idea that change is a process. They proposed a five stage model: Readiness, Planning, Training, Implementation, and Maintenance (RPTIM) for designing effective teacher inservices. Joyce and Showers (1982) concurred with the idea that change is a process. They suggested that suggested that coaching can facilitate the acquisition of new behaviors acquired during the change process.

Studies by Berman and McLaughlin (1978), and Lawerence (1974) presented the view that the likelihood for success is enhanced if those involved in the change process provide input and feedback regarding whatever change is being implemented. Asher (1967) stated that,

"Individuals are more likely to change when they work on problems significant to them and when they share in the problem solving decision" (p. 13). These and other researchers (Orlich and Ezell, 1975) have noted that change is more likely to occur when people can relate the change to a need. Moreover, change causes a ripple effect (Wu, 1988). Change in one part of the organization causes change in another. Success breeds success, or, conversely, failure creates failure.

Barriers to change. A two year study of the barriers to school reform was undertaken by SouthEastern Regional Vision for Education (SERVE, 1995). This study showed that there are six prevailing obstacles to educational reform in the Southeast:

- Instability of political leadership,
- Poor economic conditions,
- Stop and start reforms,
- Inability to reach consensus on goals,
- Under-investment in training, and
- Lack of trust.

Another concern that...

> ...loomed so large on the education horizon that SERVE commissioned a separate study to review the issues and recommend a new framework for state accountability system...was the tendency toward rapid implementation of "high stakes" state accountability systems before goals and standards had been put in place (p. 1).

Attitude and change. Attitudes are the result of a person's experiences, beliefs, and background. Rogers and Shoemaker (1971) defined attitude as a "relatively enduring organization of an individual's beliefs about an object that predisposes his actions" (p. 109).

Triandis (1971) categorized attitude formation as having three components: cognitive, affective, and behavioral. Human beings are bombarded constantly with streams of information daily. The cognitive aspect of attitude relates to the attempts people employ to organize or categorize information. While these may be useful strategies, Triandis (1971) felt that misconceptions can arise, causing people to view the world incorrectly. The affective domain of attitude involves the feelings and emotions that people exhibit towards a stimulus. These may be

positive or negative. "The behavioral component (of attitude) involves the person's overt behavior directed toward the object or person" (Zimbardo and Ebbesen, 1970, p. 7). However, research by Bem (1970) indicated that, contrary to common opinion, behavior caused attitudes.

While relatively constant, attitudes do not exist in a vacuum. Bem (1970) felt that people strive for "cognitive consistency," and in their attempts to resolve external inconsistency may change their attitudes. Triandis (1971) and Zimbardo and Ebbesen (1970) likewise felt attitudes were often in a state of flux. Although attitude formation can be influenced by verbal information (Wager, 1979), formation of attitudes or attitudinal change is not easily achieved solely by rhetorical activities (Festinger, 1964; Greenwald, 1965). More positive attitude changes in learners result if the learner is an actual participant (Bem, 1970). Research by Loyd and colleagues (as cited in Delcourt and Kinzie, 1993) suggested that (hands-on) experience, if "closely related to attitudes toward computers on the part of middle school students, high school students, and inservice teachers" (p. 40), changes attitudes. The more an individual becomes actively involved, the greater the change in attitude and the more persistent is the change in attitude over time, as compared to a situation in which the individual is placed in a passive receiver role (Bem, 1970, Festinger, 1957).

Attitudes change in response to interaction with others that we value. Changes in attitude may not be immediate, but may require a period of reflection. "All techniques of attitude change rely on the assumption that change comes out of conflict, discrepancy, inconsistency, or discontent with the status quo" (Zimbardo and Ebbesen, 1970, p. 20).

Introduction of change into an organization may be in the form of a process, a product, or an event. The term "innovation" relates to "an idea, practice, or objective perceived as new by the individual" (Rogers and Shoemaker, 1971, p. 19). Rhodes (1995, 1996a, 1996b, 1996c) explored the role of connectivity in organizational change. He felt that...

> ...any permanent changes in schools can come only from changes in that mental workplace where personal and organizational routines are stored in the form of beliefs, assumptions, and previously effective strategies....For systemic value to override technology's costs in education will require its use as an enabler for the changed roles and relationships of the new learning environments proposed by major reform efforts (Rhodes, 1996c, pp. 46-47).

The resulting changes associated with introduction of technology into schools and workplace require a total rethinking of attitudes and behaviors towards the organization. Although individual products are involved, the changes needed are so encompassing that technology changes are perceived as being process innovations: changes that involve organization-wide, systemic changes (Rhodes, 1996a, 1996c).

Rogers and Shoemaker (1971) envisioned a series of steps as necessary between awareness and eventual adoption of an innovation. Likewise, Hall et al. (1973) in their CBAM model recognized that change proceeds in stages. They proposed that individuals pass through seven levels between the awareness stage and successful adoption of a particular innovation. Rogers and Shoemaker (1971) proposed five attributes as being critical to the acceptance or rejection of an innovation: (a) relative advantage, (b) compatibility, (c) complexity, (d) treatability, and (e) observability (p. 137). Attitudes of individuals may be expected to change towards these elements as they proceed through the implementation process.

Self-efficacy and change. "Central to the concepts of ownership and authority is 'self-efficacy'" (Talab and Newhouse, 1993, p. 4). Self-efficacy, also known as expectancy efficacy, refers to personal judgments of one's capability to organize and implement actions in specific situations that may contain novel, unpredictable, and possibly stressful features (Bandura, 1977, 1981, 1982). "In forming efficacy judgments, people take into account factors such as perceived ability, task difficulty, effort expenditure, performance aids, and outcome patterns (Schunk, 1984, p. 48). High correlations often are found between reported self-efficacy and subsequent performance (Bandura, 1977; Bandura and Adams, 1977; Bandura, Adams, and Beyer, 1977). Berman and McLaughlin (1978) found that self-efficacy for teachers was strongly associated with increased student learning and the percentage of program goals achieved.

Research by Delcourt and Kinzie (1993) with teacher education students and practicing teachers who use computer technologies suggested that greater experience and more positive attitudes were related to higher levels of self-efficacy. Kinzie, Delcourt, and Powers (1994) developed an instrument to measure attitude and self-efficacy for a broad group of computer

technologies across undergraduate disciplines. For the population they measured, they concluded that "attitudes toward computer technologies, along with experience...are critical areas for examination in the study of self-efficacy" (p. 766). These results, they felt, indicated that training and experience with a new technology positively affects feelings of confidence for educators who subsequently use that technology.

Based upon previous research involving the role of efficacy expectations, Hill, Smith, and Mann (1987) concluded that self-efficacy was linked to intentions and subsequent enrollment in computer science courses. Results reported by Schunk (1981) suggested that perceived self-efficacy was related to academic success. Brophy (1979) reported that "the more successful teachers have a 'can do' attitude, perceiving their students as capable of learning the material, and themselves as capable of teaching it to them effectively" (p. 737). Talab and Newhouse (1993) reported results of Gibson and Dembo, who claimed that teachers who internalize a concept employ that concept more effectively.

Systemic School Reform in the 90s

Reculturing/restructuring. According to a number of educators and policy makers (Fullan, 1993; Clark and Astuto, 1994), approaches to teaching and learning must be changed fundamentally if schools are to meet the needs of an information-based society. According to Sheingold (1991)...

> ...teaching (in an information-based society) will involve less telling and more supporting, facilitating, and coaching of students; learning will become, "not the acquisition of a stable body of facts and truths, but rather a dynamic process of understanding knowledge and its human creation (p. 19).

Fundamental to this view is the premise that learning will change from a teacher-centered effort to a student-centered, learning-centered, constructivist enterprise. For this to occur, nothing short of systemic reform is needed.

Fullan has addressed the issue of the changes he felt were needed for education in numerous publications (1981, 1982, 1985, 1992, 1993, 1994, 1996).

> There is an overwhelming amount of evidence that educational change is inherently, endemically, and ineluctably *non-linear* [italics]. This means that the

> most systemically sophisticated plan imaginable will unfold in a nonlinear, broken-front, back-and-forth manner. It will be fragmented (1996, p. 421).

Fullan believed that non-linearity was built into the dynamics of the educational changes he envisioned. "No amount of sheer brilliance, authority, or power could possibly resolve the problem of nonlinearity because it is organically part and parcel of the way complex societies must [italics] evolve" (1996, p. 421). He supported systemic reform for education, but not an *orchestrated* format for systemic reform.

> A new realization about systemic reform has entered the equation. Not only does the education system need to become more coherent internally, but it must also become more coherently related, as a system, to other social and economic services and agencies (1996, p. 421).

He continued, asking the question, "What can the top and the bottom do <u>in combination</u> that will maximize the impact of learning outcomes?" (p. 421).

What Fullan viewed as systemic reforms were those that increase the capacity of systems to manage change on a continuous basis. For these reforms to be successful, large numbers of individuals must commit. Therefore Fullan advocated seeking those strategies that "are most likely to mobilize large numbers of people in new directions" (1996, p. 423). He noted that two powerful sets of strategies now in place, networking and reculturing/restructuring, could effect large scale systemic change in schools. The strategic and tactical features of networking assumes that...

> ...people need integrating (coherence-making) mechanisms, that continuous skills development is essential, that people need to experience new kinds of environments with regard to pressure and support, and that change requires external facilitation to support internal capacity building (1996, p. 422).

Reculturing involves developing new values, beliefs, and norms about teaching, learning, assessing, and about the roles of teachers. Restructuring is associated with changes in the roles, structures, and climate that enable new cultures to thrive. These sets of strategies, according to Fullan (1996), can help develop and mobilize the conceptions, skills and motivation among educators. In the process, they can help create a "critical mass" of individuals who are committed to making needed radical changes in teacher preparation, in the design and culture of

schools and in the role of the teacher. According to Fullan, "the role of the teacher of the future will be both wider and deeper, involving at least six domains of commitment, knowledge, and skills: teaching and learning, collegiality, context, continuous learning, moral purpose, and change process" (1996, p. 422).

Technology as a catalyst for change. Mehlinger (1996a, b) envisioned technology serving as a catalyst for reform efforts.

> Information Age technology is like...(a) volcano. It is changing the landscape of American culture in ways we either take for granted or scarcely notice....The use of the new technologies will have a profound effect on schools. The very relationship between students and teachers will be challenged because the technologies enable learners to gain control of their learning....Schools will be unable to resist the new technology. And they will be profoundly changed thereby (1996a, p. 400; p. 402).

Sheingold (1991) shared these views. "Technology tied to learning and teaching...can be still more powerful (than it currently is) if its use is encouraged and supported in environments in which change, reorganization, and reflective experiments are valued" (p. 27). Like Fullan, Sheingold argued for coherence of educational goals, approaches, tools, and structures.

The conclusions of a 1994 study conducted by an independent technology consulting firm, Interactive Educational Systems Design, Inc. (1996), provides confirming support for the role of technology in school reform. Their report, based on 133 research reviews and reports of original research projects, covered research on educational technology that had been conducted from 1990 through 1994. Some of the conclusions of that study were:

- Educational technology has a significant positive impact on achievement in all subject areas, across all levels of school, and in regular classrooms as well as those for special-needs students.

- Educational technology has positive effects on student attitudes.

- The degree of effectiveness is influenced by the student population, the instructional design, the teacher's role, how students are grouped, and the levels of student access to technology.

- Technology makes instruction more student-centered, encourages cooperative learning, and stimulates increased teacher/student interaction.

- Positive changes in the learning environment evolve over time and do not occur quickly.

Technologies that included pre-packaged, teacher-proof, computer-based instruction units drove former reform efforts. Current reform actions perceive technology as a tool to help teachers and students achieve greater connectivity, foster new interaction patterns, transform data and information into institutional knowledge, and optimize a school district's resources by matching the needs and strengths of its staff with the needs and strength of the community (Sheingold, 1991; Hannafin and Savenye, 1993; Milone, 1996; Rhodes, 1996c). As such, technology can be a catalyst for change; it can help the institution "learn."

Schools as learning organizations. The American Association of School Administrators (AASA) and the Northern Telecom Integrated Community Networks Group sponsored a seminar in 1994 that provided participants a forum for exploring how "a complete educational organization can function when using already-available information technologies to take advantage of the natural interdependence of individuals' roles in the schools and communities" (Rhodes, 1996c, p. 45). One of the underlying assumptions of the discussions was, "If an organization is a system of connected people, that organization then can be reshaped, restructured, or reformed by changing the information and communication interactions and patterns among those people" (Rhodes, 1996c, p. 47). Seminar participants concurred that "school practitioners need technological and process scaffolds that support the mental stretching required when what used to work no longer does" (p. 47).

For this to happen, new roles need to be established for all participants in an organization. Deal (1986) stated, "If we accept the idea that schools are complex human systems where goals and roles, power and conflict, human needs and skills, symbols and meaning all play a central role, approaches to reform take on a new cast" (p. 5). Louis, Kruse, and Raywid (1996) wrote, "When schools are seen as learning organizations and professional communities, attention is focused on teachers' work as a key instrument of reform" (p. 9), thereby allowing the principal

to lead from the center rather than from the top of the organization. "The 'learning organizations' required for survival in today's dynamically changing world are not possible until we can create connected organizations of learners" (Rhodes, 1996c, p. 47).

Moreover, in schools that function as learning organizations, the image of the role of technology changes.

> When we viewed technology in school through our "old lens," or paradigm, we tended to think of "infrastructure" as things--tangible objects, materials, buildings, equipment, and wires. But from a system perspective (the new paradigm), the permanent infrastructure lies in the relationships between the parts required to accomplish the system's purposes (Rhodes, 1996b, p. 39).
>
> Information technologies can support the scope and depth of collaborative knowledge-building required for schools to develop the capacity to change themselves (Rhodes, 1996c, p. 48).

Rhodes suggested that educational leadership for internal uses of technology to create person-to-person, technology-supported and facilitated infrastructures will need to come from the private sector--a group that already has an established and successful experience base with such applications. He envisions the need for creation of a new form of learning partnership--one involving America's public and private sectors. Both these groups share a common purpose. They both need to develop an understanding of how to support the learning and acquisition of skills that they both require of today's students, who face an ever-changing world of work.

Successful school reform efforts: Reports of two projects. Two recent studies document successful reform efforts. Apple Computer has conducted a 10-year project in multiple sites, Apple Classrooms of Tomorrow (ACOT). This project was designed to carry out long-term research and development on productive uses of technology in K-12 schools. Students, teachers and families involved in this study have wide-spread access to computers. What was observed over time was that teachers' beliefs and practices changed as they moved from entry, to adoption, and then to adaptation, appropriate to an innovation mode. (Fisher, Dwyer, and Yocam, (1996). Teachers changed their mode of instruction from one employing direct instruction towards one using inquiry-driven, knowledge-construction strategies; they

changed their assessments to include more criterion-referenced and open-ended assignments. In a review of this project, Mehlinger (1996a) wrote:

> Classroom observers noticed changes in the behavior of teachers and students. Students were taking more responsibility for their own learning, and teachers were working more as mentors and less as presenters of information....But perhaps the most important finding was the difference exhibited by these students in how they did their work. The ACOT students routinely and without prompting employed inquiry, collaboration, and technological and problem-solving skills of the kind promoted by the school reform movement (pp. 404-405).

Dwyer (1994) commented on the findings of this project:

> As time with the project increased, the catalytic impact of technology in these environments can not be underestimated. We have watched technology profoundly disturb the inertia of the traditional classroom....Technology stands out in our classrooms as a symbol to teachers, parents, and students that schooling can and will change (p. 9).

The second project involved a case study of nine sites and was conducted by Means and Olson (1995a, b) for the U.S. Department of Education's Office of Educational Research and Improvement (OERI). All sites met the following criteria: (a) they were using technology to enhance restructuring of the classroom to meet students' needs, and (b) had a population of economically disadvantaged students. Project-based activities employing higher-order skills (such as design, composition, and analysis), as well as the more basic skills of writing, formed the centerpiece of the project. This study showed that teachers found technology supported their efforts by:

- adding to the students' perception that their work is authentic and important,
- increasing the complexity with which students can deal successfully,
- dramatically enhancing student motivation and self-esteem,
- making obvious the need for longer blocks of time,
- creating a multiplicity of roles,
- instigating greater collaboration, and
- giving teachers additional impetus to take on a coaching and advisory role. (p. S-2).

In addition, Means and Olson reported that teachers felt that technology increased their pedagogical skills and provided dividends in terms of their own professional growth--even though the technology-supported classroom projects required a great deal of time and effort.

In both the ACOT and OERI studies, technology has played a critical role in restructuring of the schools involved. New roles were created for both teachers and students.

Future research efforts. Research into the effectiveness of an innovation generally is judged by the standards of quantitative research that seeks to "establish relationships among phenomena by careful, objective measurement, the use of established statistical procedures, and by accounting for all the variables that could be involved" (Tiffin and Rajasingham, 1995, p. 11). The quantitative approach, with its focus on measuring what exists within a given paradigm, not what could exist, may actually hinder determining the effectiveness of an innovation like use of technology in the classroom. Innovations offer possibilities of what can exist. Thus, according to Tiffin and Rajasingham, what is needed is "a new paradigm with new standards and outcomes, something that may have no resemblance to classrooms as we know them" (p. 12). A new paradigm cannot be evaluated in terms of the old paradigm from which it shifts (Kuhn, 1962). "Qualitative research which allows for a more subjective and intuitive approach to the study and description of the complexity which characterizes (sic) human phenomena" (Tiffin and Rajasingham, 1995, p. 11) offers an alternative approach for studying educational innovations and has "become common in recent years in the education departments of universities" (p. 11).

Changes in the type and uses of technology are occurring rapidly. Proof of the effectiveness of a given method may no longer be relevant or may have little external validity by the time the results are known. Further, many studies are context and process-dependent. In 1990, Philip Jackson, the president of the American Educational Research Association, called for "marrow bone" thinking and new approaches in educational research (Jackson, 1990) that involve a naturalistic approach and qualitative research methodology. Burge (1990) applied Jackson's arguments for employing qualitative research strategies in research studies involving distance education.

Leadership in Education: Requirements for the 90s

The thrust for school restructuring and reorganization has its basis in the intense transformations that have permeated society in the last several decades of the 20th century. Transactional leadership, popular in the 70s and 80s with its emphasis on supervision and administration, only works "when both leaders and followers understand and agree about the important tasks to be performed" (Mitchell and Tucker, 1992, p. 31). Traditional leadership patterns need to change. Weakening social and cultural support for schools, coupled with a belief that student and teacher attitudes and behaviors must change to meet the challenges of an information society, have made leadership the "dominant theme in school improvement" (Mitchell and Tucker, 1992, p. 34). The educational contract for 19th century schooling, designed to produce workers and citizens who would advance the economy by following the rules of machine and factory-driven production, does not serve as the educational covenant for the 21st century (Marshall, 1995).

A number of researchers (Avolio and Bass, 1988; Sarason, 1990; Leithwood, 1992; Wheatley, 1992) have suggested that linear, predictable, hierarchically controlled and rigidly structured organizational practices no longer are valid to respond to the complexities inherent in the world of today. According to Marshall (1995), "educational leaders for the 21st century must re-invent two things: our institutions and ourselves" (p. 8). Marshall believed that the current context of education...

> ...must allow for the emergence of self-organizing systems that are held together by a compelling and shared vision of what they can become, by a deep set of core values, and by a commitment to goals and objectives, collaboratively established, collectively assessed, and individually supported" (p. 13).

According to Fullan (1993), "change occurs when enough kindred spirits coalesce in the same change direction" (p. 143).

In her highly acclaimed book, "Leadership and the New Science," Wheatley (1992) likened the failure of many current organizational practices to the failure of Newtonian physics in being able to explain processes that underlie matter. Wheatley employed extensive cross-disciplinary thinking adapted from "the new science"--the discoveries and hypotheses in biology, chemistry, and physics that challenged fundamental world views--to organizational change.

Noting that the characteristics and energy flow of subatomic particles change according to their environment, Wheatley suggested altering hierarchical organizational structures in order to bring new life to organizations. For schools, this means allowing new educational linkages between schools, families and communities to evolve, ones that may involve uncertainty in the process of self-renewal, but which allow a "journey of mutual and simultaneous exploration" (Wheatley, 1992, p. 151). In an interview for "The School Administrator," Wheatley elaborated on her view of the role of a school leader for today's challenges, saying,

> "I believe the destiny of every organization is to become a learning, living organism that can change constantly as needed" (Quoted in Steinberger, 1995, p. 16).

> "I think...the function of the leader...is one of conscience, of holding up for people or reflecting back to them what has been decided as a purpose. It means asking, 'Is what we are doing, if observed from the outside, congruent with who we say we are trying to become?'" (Quoted in Steinberger, 1995, p. 20).

Concepts like "restructuring" or "re-inventing school organizations" are embodied in the transformational leadership approach to school improvement (Mitchell and Tucker, 1992). Transformational leaders feel responsible for redefining educational goals and articulating a vision. According to Leithwood (1994), transformational leadership is better able than hierarchical governance to provide the energy and support needed to sustain schools operating under the context of a school-restructuring agenda. This is especially true when the means and ends are uncertain--as they are with broad goals like "creating schools that are more responsive to the demands of the 21st century" (p. 501), or restructuring schools to stress higher-order thinking skills. Transformational leadership practices (a) engage stakeholders through a climate of commitment, (b) develop a widely shared vision for schools that provides individualized support and intellectual stimulation, (c) create productive work cultures, and (d) distribute responsibility and power for leadership widely throughout a school.

The essential qualities of individuals who exhibit successful transformational leadership are similar to those proposed by Dede (1993) for individuals that are needed to lead education through this next reform movement. These attributes include:

- envisioning opportunities in a rapidly changing environment;
- displacing cherished misconceptions about teaching and learning and shifting communities to alternative visions for education that involve new roles for educational stakeholders, development and implementation of instruction-oriented technologies, and experiential applications;
- inspiring others to work towards a shared vision for the future that diverges from the past; and
- sharing the authority for leadership.

Schools must become learning environments; all students must have opportunities to develop communication, critical thinking, technological and personal skills that are vital for success in a high-tech, information-oriented society. Dede (1993) advocates for everyone to lead, always. If indeed that situation exists, "educational technology could be the driveshaft for restructuring education and shaping a bright future for our society" (p. 11).

What is noteworthy is that Dede's attributes for leadership involving educational technology do not include technical expertise. Vision and inspiration are what are needed for leaders. Dede viewed managerial skills as distinct from leadership skills. "Competent managers are adept at organizing operations so that an institution's efficiency in accomplishing plans is optimized" (p. 9). Leithwood (1994) did not distinguish the role of manager from that of leader and stated, "Distinctions between management and leadership cannot be made in terms of overt behavior....Transformational effects depend on school leaders infusing day-to-day routines with meaning and purpose for themselves and their colleagues" (p. 515).

Despite their differences, Wheatley, Dede, and Leithwood share the views proposed by Senge (1990) who wrote,

> The nature of successful organizations will be those that are "learning organizations," where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning how to learn together (p. 3).

Change Facilitators

Definition. In a systemic, learning organization, various individuals assume the role of change facilitators. They are the people who have the ability to help implement--and sustain--the change process. Hall and Hord (1984) identified six categories of interventions that they called "categories game plan components" (GPC), which change facilitators use. These categories are (a) developing supportive organizational arrangements, (b) training (staff development), (c) consulting and reinforcing, (d) monitoring, (e) communicating, and (f) disseminating information about the innovation.

In transformative leadership, leaders and followers are joined in pursuit of common goals. New leaders may arise. Hord, Rutherford, Huling-Austin, and Hall (1987) reported that early studies using their Concerns-Based Adoption Model (CBAM) assumed principals to be the only "key to change" in the school. "To our surprise, we found others...playing significant roles in support of teacher change" (p. 84). Hord et al. identified these people as second change agents, or second change facilitators (CF). "The second CF was sometimes the assistant principal, sometimes department or grade-level chairs, resource teachers, or teachers on special assignment" (p. 84).

For Leithwood (1992), transformational leadership, emphasizing the empowerment of one's colleagues, encourages school administrators to focus energy on the capacities and motives of other individuals. Rather than to concentrate solely on the frontline staff to provide direction, these other individuals then would be in a position to offer additional direct leadership within an organization.

The CBAM model of Hall, Wallace, and Dossett (1973) focused on the changes individuals undergo during the innovation process. A newer theory, Organizational Development (OD), recognized these changes, but maintained that the emphasis should be on the system, rather than on the individual. Fullan (1993), a leading researcher on OD as it applies to schools, suggested similar forces acting on both individuals and schools as they adapt to change. Wheatley (1992) likewise defined change in terms of forces acting on the organization.

Role of principal as a change facilitator for technology. Restructuring of schools means redefining the roles for both principals and teachers. The role of the principal as an

instructional leader or agent for change has been well documented in the literature (Blumberg and Greenfield, 1980; Bossert, Dwyer, Rowan, and Lee, 1982; Lightfoot, 1983). Bennett (1996), in an article on schools, technology and educational leadership stated, "If technology is to be integrated into the school curriculum, the meaning of educational leadership and the role of the school principal within a technological paradigm must be redefined" (p. 57).

First and foremost according to Bennett (1996), principals need to define a technological mission. Following that, principals must act on their vision for technology; they must develop a plan to minimize negative influences and maximize positive opportunities for promoting technology at their school. Collaborative goal setting and planning that includes all stakeholders must ensue.

> Principals must send a strong, repeated message emphasizing the importance of technology to teachers, students, parents, and community and business organizations...Most important, principals must model the message by becoming active participants in whatever programs are established (Bennett, 1996, p. 61).

The Office of Technology Assessment (U.S. Congress, 1989, 1995), in their reports on teaching and technology, concluded that administrators who are knowledgeable and comfortable with technology become leaders in implementing technology into their schools.

Empowerment of teachers in restructuring schools. Empowerment is a construct in organization life that emerged in the 1980s and now is a dominant theme in all types of organizations, including business, industry, service organizations--and schools (Lightfoot, 1986; Maeroff, 1988). It can be defined as "the act of building, developing, and increasing power through sharing and collaboratively working together" (Wilson, 1993, p. 727). Wilson summarized Block's theory on empowerment that centered on the need for individuals to have a sense of autonomy.

> Individuals...need to (a) be concerned with service to other and less concerned about receiving external rewards; (b) have the courage to take action and do what they think is right; (c) express to others their ideas and feeling; (d) be willing to listen to others and engage in discussions that promote growth through knowledge; and (e) relate to others in an open, honest, nonmanipulative manner (p. 728).

Studies by Leithwood and Jantzi (1991) demonstrated a sizable influence of transformational practices on teacher collaboration. Leithwood (1992) reported that another of his studies, Leithwood et al. 1991, "demonstrated highly significant relationships between aspects of transformational leadership and teachers' own reports of changes in both attitudes toward school improvement and altered instructional behavior" (p. 12).

Erlandson and Bifano (1987) recommended that restructuring be employed to diminish hierarchical differences and allow teachers professional autonomy and genuine collegial involvement in decisionmaking. They asserted that "the most effective principals are those whose teachers have ownership in the mission of the school and a vital interest in its effective implementation" (p. 35). De Frank (1993) echoed this view, and stated, "The feeling...is that any real, positive change must involve teachers empowered to help analyze the need for change as well as plan, implement, and institutionalize it" (p. 60).

Sergiovanni (1987, 1989) showed strong support for the empowerment of teachers. He viewed teachers as leaders and the principal as a "cultural leader of leaders who uses power and authority to drive toward educational ends rather than to control people" (1989, p. 110).

Fullan, Bennett, and Rolheiser-Bennett (1990) stated that "systemic and cultural change in schools as workplaces and in teaching as a profession are intimately linked; and these links represent a powerful route to educational reform" (p. 19). Their framework model for school improvement placed the "teacher as learner" in the center, bounded on one side by classroom improvement, and other by school improvement. They suggested that progress requires that individuals interact with others and build systematic links across classrooms. "Sustained, cumulative improvements at the classroom and the school level, by each and every teacher in the school, are required to meet the challenge of our collective vision of the potential of schools" (p. 19). Moreover, Fullan, Bennett and Rolheiser-Bennett felt that as teachers gained more experience with an innovation, their sense of efficacy would be enhanced, a feeling shared by White (1992).

When teachers receive validation for their efforts, i.e. become empowered, they receive the incentive to continue working with an innovation (Rogers, 1983), thereby markedly increasing

the probability that the innovation will become integrated into a teacher's set of practices and, ultimately, into the structure of the school (Erlandson and Bifano, 1988; Mertens and Yarger, 1988; Fullan, 1993).

In their summary of research on teacher empowerment, Erlandson and Bifano (1987) gave the following advice to principals:

1. Structure your school organization in such a way that hierarchical differences are diminished and teachers have professional autonomy and genuine collegial involvement in decisions.

2. Proceed with caution since not all teachers are prepared to assume such a collegial relationship (p. 35).

Role of technology as a change facilitator. Educational settings traditionally have been places where disconnects in purpose, space and time have hindered interactivity, even among people who share common interests. Rhodes (1996c) believed technology could be the unifying force for developing sustainable people-to-people infrastructures in schools (and organizations) as they adapt to changed roles and attempt to change themselves. Information technologies can serve "first as obvious connectors between those who have needed knowledge and experience, and second, as 'platforms' to support the development within the organization of new knowledge from new experiences" (p. 48).

Currently, the installation of telecommunications networks across school, county and state boundaries is fostering new interactions among both students and educators. In the process, it is changing the way education is delivered and information is exchanged (Sullivan, Jolly, Foster, and Tompkins, 1994; Ivanovic, 1995; Itzel, 1996; Schatz, 1996; West, 1996).

Staff Development

Although technology has transformed how business operates, it has not changed education as rapidly as proponents envisioned (Solomon and Solomon, 1995). "There are many forces maintaining the status quo. When change occurs, it is because some pressure has built up that leads to action" (Fullan, 1992, p. 25).

Research shows that "when teachers believe technology addresses a need, solves a problem, makes life easier, or offers information that they can't get otherwise (or as easily) [sic], they will use it" (Solomon and Solomon, 1995, p. 38). Creating a critical mass of teachers to give technology a try, however, is a challenging issue. The answer, according to Solomon and Solomon (1995) lies in improving staff development.

Attributes of effective staff development design have evolved through numerous research studies over the years. Guskey (1979, 1985, 1986), in his research on change, concluded that staff development is a critical component in almost every proposal for initiating change in teaching and learning processes. Accompanying research in learning theory over the years has altered the methods used in delivering staff development in ways that make it more effective. The ideas of Gagne (1985), who has written extensively about learning, reflect an instructional systems design approach to staff development. For Gagne, learning represented the identification of the internal processing that occurs as individuals move information from short-term to long-term memory over a period of time. It is a change in human disposition or capability that lasts over a period of time.

Current recommendations for professional training programs state that theory and specific knowledge about a proposed change to an institution be provided to participants, as well as hands-on sessions for individuals to learn, practice and refine their new skills over a period of time. Promotion of collaborative interactions and provision for on-site technical support during the implementation phase are other characteristics of effective staff development programs (Solomon and Solomon, 1995; National Commission on Teaching & America's Future, 1996; Texas Staff Development Council, 1996). Often considered as an afterthought, evaluation is an essential component of any staff development program (Orlich, 1989) and should be part of the planning process.

Professional development models currently being advocated fit the education model known as androgogy, characterized by Knowles (1975) as the art and science of helping adults learn. With the learner as the central focus of activities, androgogy shares many similarities with

constructivism, a model proposed for learning wherein learners construct their own meaning based upon experience (Jonassen, Davidson, Collins, Campbell, and Haag, 1995).

> We know that adults don't learn very well by being "talked at"....They learn best when they're allowed to talk about the subject, to relate it to their own experiences, and to discover for themselves the validity and usefulness of the skills or knowledge in question. Above all, they learn better when they get to practice doing the thing we're supposedly teaching them to do (Shaw, 1995, p. 62)

One of the recommendations of the National Institute for Science Education (NISE, 1996), is that instructional methods used to train math and science educators incorporate adult learning principles. NISE advocates that trainers include constructivist principles and provide opportunities for teachers to construct their own knowledge by becoming immersed in math and science processes.

Research has identified the following attributes of effective staff development design, as represented in **Table 1**:

Table 1. Theoretical Support for Critical Features of Staff Development

Attribute	Theoretical support
• Incorporates a balance between the objectivist, symbolic reasoning approach to knowledge and a situated learning approach to cognition	Bredo, 1994; Jonassen et al, 1995.
• Is experientially based	Wood and Thompson, 1980; Sparks, 1983; Guskey, 1985; Stallings, cited in Fullan, 1991.
• Incorporates available knowledge base	Loucks-Horsley, Stallings, cited in Fullan, 1991.
• Involves problem solving and reflection	Stallings, cited in Fullan, 1991; Clark and Yinger, cited in Fullan, 1982.
• Utilizes outside professional support in technical areas	Berman and McLaughlin, 1978, 1980; Fullan, 1981; Cox, 1983; Loucks and Zacchei, 1983;
• Includes the general components of training: presentation, modeling or demonstration, practice, feedback, and coaching	Joyce and Showers, 1980, 1981.
• Occurs in a risk-free, informal atmosphere, with interaction among learners	Wood and Thompson, 1980; Fullan, 1982.
• Promotes collaboration with others and continued coaching during the implementation stage by peers	Joyce and Showers, 1981; Showers, 1985.
• Allocates resources for released time during the instructional day for staff development	Tanner, Canady, and Rettig, 1995.
• Involves the principal in the technology training (Implementation of innovation is directly related to immediate administrative support)	Carlson, cited in Orlich, 1989; Havelock, cited in Orlich, 1989; Bennett, 1996.
• Creates a "critical mass" of advocates before an "innovation" is implemented	Greenwood, Mann, and McLaughlin, cited in Orlich, 1989; Orlich, Cited in Orlich, 1989; Floden, Goertz and O'Day, 1995.
• Meshes innovation and those who will be implementing the adoption	Rogers, 1962, 1983.
• Plan for evaluation	Hall, Loucks, Rutherford, and Newlove, 1975; Little, 1984; Scriven, cited in Orlich, 1989.

Enthusiasm generally is high during the formal training and informal practice sessions. According to Fullan (1992), a combination of pressure and support is needed to move individuals

forward in the implementation process in order to counteract a "dip" that occurs as individuals return to the classroom. Turner (1994) reported on this "dip," stating,

> Those courageous enough to experiment with implementation are likely to encounter feelings of inadequacy, uncertainty, and insecurity engendered by gaps in burgeoning knowledge and concepts, unseasoned skills, and unanticipated problems associated with implementation (p. 10).

Collegial interaction among the participants, opportunities for problem solving coupled with time for reflection, and availability of further support and coaching in a non-threatening environment promote further progress towards adoption of the innovation (Joyce and Showers, 1981, 1982).

The period after staff development, when individuals have the opportunity to practice and "play with" the innovation, is the critical phase for implementation of an innovation. It is during this period that individuals involved in the project often change their beliefs and behaviors, and ultimately, even their attitude, towards the innovation (Fullan, 1992). Fullan (1992) believed that successful change involved a combination of factors.

> The characteristics of the nature of the change, the make-up of the local district, the character of individual schools and teachers, and the existence and form of external relationships interact to produce conditions for change....It takes a fortunate combination of the right factors--a critical mass--to support and guide the process of re-learning, which respects the maintenance needs of individuals and groups and at the same time facilitates, stimulates, and prods people to change through a process of incremental and decremental fits and starts on the way to institutionalizing (or, if appropriate, rejecting) the change in question (p. 26).

Continued support of individuals engaged in staff development activities is critical. Guskey (1986) wrote, "Teachers who...gained evidence of improvement in the learning outcomes of their students expressed more positive attitudes toward teaching and greater personal responsibility for their students' learning---similar to a sense of self-efficacy" (p. 8). Kinzie, Delcourt, and Powers (1994) showed that experience and frequency of use, correlated with positive attitudes towards use of computer technologies, served as predictors of self-efficacy. Guskey (1979) believed that only changes in teachers' classroom practices that led to changes in student learning outcomes effected a change in teachers' beliefs and attitudes towards an innovation. Once teachers have changed their beliefs about the innovation, they tend to generate

new meaning, understanding, and attitude towards the innovation (Rogers, 1983; Fullan, 1992). "What Matters Most: Teaching for America's Future," a report based on a two-year study by the National Commission on Teaching & America's Future (1996), proclaimed that access to high-quality preparation, induction, and professional development is a teacher's right and must be available to all because, "What teachers know and can do makes the crucial difference in what children learn" (p. 5).

Distance Education

Rationale. Society is undergoing a dramatic transformation in the way people communicate. Rapid developments in digital and fiber optic technologies allow any kind of information or service to be available, any time, anywhere in the world. According to Hanson (1995), two factors have combined in recent years to make education using telecommunication technologies a rapidly growing component of education.

> The first is the current educational restructuring movement, which contends that schools are out of step with the times and that nothing less than a major restructuring will make a difference. The second factor is the explosion in the amount of information available to teachers and students (p. 8).

As industrial societies become information societies, conventional communication systems become information systems. Computers and networks of telecommunications systems are used to move information, be it at a global, national, organizational, group, interpersonal or personal level. Learning is no longer confined to a classroom. Telecommunication technologies have expanded the world for the learner and have provided multiple ways of transferring information and of enabling shared virtual activities and experiences. Because society is changing, schools are changing. In today's evolving information-based society, a paradigm shift is taking place, one that challenges traditional educational patterns. The rapid declines in cost and improvements in the telecommunication technologies have created heightened interest in distance education as a way of providing equity to underserved groups of students and for enhancing learning opportunities for all students (Barker and Dickson, 1996b).

Definition of distance education. Moore (1990b) defined distance education as consisting of "all arrangements for providing instruction through print or electronic

communications media to persons engaged in planned learning in a place or time different from that of the instructor or instructors" (p. xv). Distance education is a particularly significant practice for geographically isolated rural schools, where a shift is in progress from isolation and communication deprivation, to communication access and exchange (Sullivan, Jolly, Foster, and Tompkins, 1994). Hall (1990), noting the emergence of distance learning in Third World countries, stated that distance education is the fastest-growing instructional pattern in the world.

History of distance education. Throughout the ages, people all over the world have used technology to make their lives richer and better. The printing press, an example of a technological tool that transformed society, expanded the opportunity of learning to the masses. Print, considered the first type of distance learning, was the medium of exchange for the "correspondence courses created by universities during the middle 1800s to disseminate learning beyond the walls of existing institutions" (Brown and Brown, 1994, p. 5). William Rainey Harper, the first president of the University of Chicago, is often referred to as the "father of corresponding teaching." He organized a correspondence program involving Hebrew for the Chautauqua College of Liberal Arts and established the first university "corresponding teaching" department (Garrison, 1989; Hanson, 1995). In 1969 the Open University was established in Great Britain (Brown and Brown, 1994), an event that marked the change from correspondence education to distance education.

Over the years, print has been shown to be an exemplary medium for transfer of information. The latest electronic machines of the information age are not just newer technologies to transport information; they offer the potential to expand and enhance teaching and learning experiences. Critical "new" elements in distance education efforts (using 2-way audio and video conferencing systems, supplemented by electronic conferencing) provide opportunities for interaction between learner and teachers, and between learner and learner through shared virtual activities and experiences. The Office of Technology Assessment (OTA) report, Linking for Learning (U.S. Congress, 1989) stated,

> New technological advances and reconfiguration and combination of older technologies offer an expanding array of learning options. Distance learning has changed dramatically in response to new technologies and new needs.

> Technologies for learning at a distance are also enlarging our definitions of how students learn, where they learn, and who teaches them (p. 4).

Today, almost all states have some form of distance education for K-12 schools (Herrenan-Cabrara, 1994). Typical distance learning systems involve a collection of technologies. Although two-way audio and video communication can be accomplished by one of several formats, compressed digital television systems, employing digital transmission over terrestrial telephone systems (either fiber optic or copper) appear to be gaining in popularity for cooperation networks involving two to ten or more schools linked together (Barker and Dickson, 1996a). Additional communication between the instructor and students may involve use of fax machines, computer communications using e-mail and computer conferencing software, as well as the traditional modes of print, multimedia, and telephones (Dede, 1994).

Worldwide, distance education has had a major impact on education. Besides the Open University in England, other large distance education programs exist in Israel, China, Korea, South Africa and throughout the European Union (Perraton, 1982; Hanson, Maushak, Schlosser, Anderson, Sorensen, and Simonson, 1996). "Today's open systems vary in character from the purely electronic, high speed networks, to the more conventional methods of distribution such as correspondence packages in print" (Crilly, 1996, p. 17).

Several recent reviews give a good summary of the literature on distance education as it has progressed through various communication modes such as radio, educational television, satellite, video, to current interactive technologies (Moore, 1990a; Schlosser and Anderson, 1994; Hanson, 1995; Sherry, 1995; Hanson, et al., 1996;). The lack of two-way communications in radio and television broadcast systems was a major barrier to their being widely used for distance education. As more sophisticated interactive communications technologies became available, they readily were adopted by distance educators (Schamber, 1988; Barron and Orwig, 1993; Portway and Lane, 1994).

Distance education involves a network of individuals. Most distance education programs traditionally have addressed the needs of adult learners. Collaboration between instructors and facilitators in programs serving adults ensures that administrative and educational support is

available to students at receiving sites. The instructor is involved with the organization of the course and in the selection and delivery of information. The facilitator at the receiving site shares in implementing instruction and is responsible for creating and managing an environment supportive to learning (Willis, 1992; Granger and Benke, 1995; Gant, 1996).

Theories of distance education. Numerous efforts have been made to provide a theoretical basis for distance education in order to describe the structural patterns inherent to distance education that will allow explanations of its effects (Holmberg, 1985). In 1986 Holmberg wrote, "Further theoretical considerations will contribute results of a kind to give to distance educators a firmly based theory, a touchstone against which decisions can be taken with confidence" (p. 132). He persisted in recognizing the need for a unifying theory for distance education, and developed his own theory that contained both predictive and explanatory features.

> The requirements which my theory is meant to satisfy are those usually expected of educational theories, i.e. that they should
>
> 1. have internal consistency as logical systems;
> 2. establish functional relationships between the teaching and the outcomes of learning;
> 3. be acceptable of generating specific hypotheses and predictions; and
> 4. be expressed in such a way that research data capable of possibly refuting (falsifying) the theory can be collected (pp. 167-168).

Disagreement exists as to whether distance education theory is distinct from traditional education theory (Kirby, 1995). In 1986, Keegan classified distance education theories into three categories:

- theories of learner independence and autonomy,
- theory of industrialization of teaching, and
- theories of interaction and communication.

Other theorists such as Garrison (1989) and Shale (1990) have offered a newer theory that is a synthesis of existing theories of communication and education. For these individuals, the concept of education is the same, whether it occurs in a classroom where the students meet face-to-face

with an instructor, or in an electronic media environment, separated in distance (and maybe time) from the instructor. The technology is transparent.

Kirby (1995) suggested that the differences between the group of theories described by Keegan (1986), and those of Garrison (1989) and Shale (1990), are due to the context of the research contributing to the theory, as well as to the attributes of existing distance education systems. The majority of the theories reviewed by Keegan (1986, 1990), developed in the 1960s and 1970s, were applied to educational systems serving adult learners that employed correspondence or correspondence supplemented by audio-visual or telephone delivery systems. Simonson (1995) wrote,

> If distance education is to be a successful and mainstream approach then distance education systems should be based on the belief that the more similar the learning experience of the distant student is to that of the local student, the more similar will be the outcomes of the learning experience....Those in the field should strive to use technology and technological approaches to make the experiences of distance and local learners positive and equivalent (p. 12).

The telecommunications systems in the mid-1990s, with virtual classrooms and two-way audio and video, offer distance education students experiences much like traditional face-to-face instruction. This is especially true for videoconferencing systems currently being delivered to secondary school students. Schlosser and Anderson (1994) concluded that as a result of the new technologies, good education theory and good distance education theory may well be synonymous.

A critical issue facing education theorists is whether what is defined as knowledge is a representation that is internally constructed by the learner (the constructivist view), or is the material that is transmitted by the instructor to the student via an external representation (the cognitive view). See Bredo (1994) for a review of these both theories. The two confounding ideas pose a challenge for instructional designers working with distance education programs, as well as for those using traditional instructional delivery systems.

One of the reasons that a unifying theory for distance education has not emerged may well be the lack of substantive research that "lacks any semblance of cohesiveness or direction"

(Dean, Biner, and Coenen, 1996, p. J-2). Hundreds of media comparison studies support the finding that the means of delivery of instruction have no effect on effectiveness of that instruction (Clark, 1994). Most of this research, unfortunately, is anecdotal in nature and does not employ strict scientific methodology (Dean, Biner, and Coenen, 1996).

Quantitative approaches may not be the best approach to use to derive a theory. Dean, Biner, and Coenen (1996) have suggested that a better approach to addressing the problems plaguing tele-educational evaluation research is to use a systems approach. In this model, "learner variables, instructor variables, presentational elements, course content elements, and outcome variables potentially interact with one another within the context of the distance learning process" (p. J-2). Other researchers (Moore, 1993; Moore and Kearsley, 1996) have argued for a "systems approach" to distance education and advocate that educational resources and processes using telecommunications should address the desired ends, rather than being used just to transport a classroom teacher to a remote site.

Other researchers, noting the complex contextual factors operative in schools and in learning, have argued that qualitative research, with its emphasis on a conceptual, context-embedded, interpretive inquiry, be included as a research methodology for distance education (Burge, 1990; Morgan, 1991; Russell, 1991). Traditional positivist approaches, with an emphasis on quantitative methods, fail to capture important teaching functions and the climate operative in different school settings. "Even if a previously found 'effective' learning environment could be replicated exactly, it would be very unlikely to lead to the same learning outcomes, even in an identical physical environment using genetic clones of the original teacher and students" (Cziko, 1989, p. 20).

Recognizing that each of the two paradigms, positivistic/quantitative and naturalistic/qualitative, offer different insight into a research setting, a number of researchers are now combining the two methodologies (VonPrummer and Rossie, 1990, cited in Burge, 1990). By employing a mixed-methodology design and triangulating and analyzing the data from each source, researchers can show convergence in results. "More recently, authors have broadened the purposes for mixing methods to include an examination of overlapping and different facets, to use

the methods sequentially, to find contradictions and new perspectives, and to add scope and breadth to a study" (Creswell, 1996, p. 189).

Distance education in American secondary schools. Implementation of distance education into traditional secondary school settings requires cooperative efforts beyond those needed for adult learners. Schools are political and bureaucratic institutions with established hierarchies. Any change in the established order involves numerous administrative collaborative interactions and decisions. For distance education programs involving regional consortia, additional collaboration is needed between schools and the network coordinator, and among the participating schools. Issues that must be resolved include course selection, timing of programming, certification, and assessment. There are individual and differing school cultures to consider. For successful implementation of distance education in a school program, there must be a shared understanding among all stakeholders of both the capabilities and limitations of the delivery system.

Kirby (1995) found little distance education research dedicated to the kindergarten through twelfth grade (K-12). Much of what is available has emerged from the U.S. Department of Education Star Schools Program (U.S. Congress, 1987), first authorized in 1988, and reauthorized more recently under Title III of the Improving America's School Act (PL 103-382; U.S. Department of Education, 1997). The Star Schools program has served as a national study of the change process involving distance education technology. A wide range of multi-media applications, including semester courses, instructional modules, teleconferences, and electronic field trips for students, as well as professional development for teachers has been offered through this program.

Originally designed to increase science, math and foreign language opportunities to students in remote areas, the Star Schools program has been the stimulus for numerous projects throughout the United States. It has provided services to more than 6,000 schools in every state, the District of Columbia, and several territories. Approximately 1,6000,000 learners have participated in the student, staff development, parental and community-based activities. Unfortunately many of the results have been anecdotal or were not submitted for publication.

Martin (1993), in her 1992 survey of the thirty-five Oklahoma schools that received satellite downlinks as part of the 1988-90 Midlands Consortium Star Schools grant, found that "85% of the thirty-three schools completing the survey no longer keep a written log documenting use of the downlink" (p. 55), making it difficult to collect accurate data.

Much of the research in K-12 distance education has been directed towards the study of student attitudes towards distance and student performance in distance education programs as compared to traditional programs. Holden (1991) surveyed 137 students in 15 states who enrolled in distance education courses as part of the Texas Interactive Instructional Network (TI-IN), a private vendor of instructional materials delivered at a distance, and found positive attitudes of students towards the technology and the instructional program. In his review of the literature, Hinnant (1994) found that "achievement of students in distance learning programs does not differ significantly from the achievement of students taught in the traditional manner and student attitudes generally are positive about the experience" (p. 55).

Communication and teaching patterns that contribute to student participation were examined by Schoenfelder (1995). This study involved forty-four students and several teachers who were participants in a State of Iowa instructional television course that utilized two-way video and audio communication.

> Students and teachers agreed that it was important for a teacher to create and maintain eye contact with students while talking to them...and that it was important for teachers to address students by name....All of the teachers and students surveyed agreed that an enthusiastic teacher who demonstrated a sense of humor at appropriate times enhanced student involvement in the class (p. 83).

Shoenfelder's study demonstrated that high school students value interaction with the instructor. Two strategies that were almost universally recommended by students for increasing involvement were varied use of visuals and opportunities to complete some assignments during class time so as to have the instructor available to answer questions.

Few schools have approached distance education with an integrated plan that includes selection of hardware, software, staff, training, and appropriate courseware. Hanrahan (1995), in her literature review, found few published reports that focused on the planning process for K-12

distance learning. Johnson (1996) concluded that three sets of interdependent components affect successful implementation of distance education into secondary schools: leadership and advocacy within a school, meshing of programs with local needs, and provision for hands-on learning experiences.

Rapid improvement in technology and corresponding reduction in costs of technology are changing the environment for learning. When consortium-delivered programming such as that provided by Satellite Educational Resources Consortium, Inc. (SERC), Texas Interactive Instructional Network (TI-IN), Westcott Telecommunications Educational Network, Dallas, Texas; Kansas City Educational Network (KC-EDNET) and others was the prime source of distance learning materials for secondary school, responsibility for planning fell to the providers. Today, compressed video technologies offer schools a relatively low cost opportunity to deliver a wide range of their own curricular materials. New linkages are emerging between and among schools, community colleges and institutions of higher education (Itzel, 1996; West, 1996). More changes will occur once students have full access to the Internet (Barker and Dickson, 1996a, b). Schools characterized by small size and geographic isolation previously were limited in their ability to provide a quality educational curriculum and equity of access. Now they are able to offer their community enriched learning experiences. Art, music, vocational education, and virtual field trips are among the variety of options becoming available to schools that have distance learning capabilities, with classroom teachers often providing the instruction.

While planning models related to instructional systems design and diffusion of innovations offer some strategies for implementing distance education, the efforts of most individuals at the secondary school setting are experimental. They, like their students are "learning by doing." So, too, are the telephone carriers, whose technologies are being expanded to meet the needs of schools participating in distance education networks (L. Sheffield, personal communication, August 13, 1997).

Role of facilitators in secondary schools. The integrated efforts of several participant groups are required in order for instruction to be effectively delivered to high school students using distance education technologies. Willis (1992) identified students, faculty, facilitators,

support staff and administrators as critical to the success of a distance education program; each of these groups may function in a variety of roles. Smith's study of the implementation of satellite distance learning in Illinois rural secondary schools (1993) provided evidence that a "democratic style of leadership in a healthy school environment or climate is crucial to successful implementation of an educational innovation" (p 104). In addition, a leader with the influence, knowledge, vision, and commitment to actively implement the innovation, as well as to build a dedicated team, is needed to maintain support of a distance education program.

The two individuals who have the greatest responsibility for the success of distance education at a receiving site are the principal (site facilitator) and classroom facilitator(s) (Smith, 1993; Kirby, 1995). The principal is the link to the community; this individual has the responsibility to advise all stakeholders of the opportunities available to students and citizens through the distance learning network. According to Sherry (1995), the principal (or school facilitator) is responsible for (a) assigning staff to be classroom facilitators, (b) ensuring that staff and students have access to equipment and support materials, (c) encouraging teachers to deliver courses using the new technology, (d) articulating the program to students and parents, and (e) providing a supportive climate that promotes understanding of the distance education opportunities available to students and members of the school community. In larger school districts, the building principal may delegate some of the administrative responsibilities associated with delivery of a distance education system to an individual known as a distance education coordinator.

In her study of Illinois high schools, Smith (1993) identified that the support and commitment of an effective administration led to successful integration of distance education. She identified the following issues as needing clarification at the administrative level: (a) selection and scheduling of courses and activities, (b) allocation of staff and resources, and (c) funding and selection of physical plant facilities and technical materials and equipment.

The classroom facilitator role varies, depending upon the capabilities of the individual selected as well as upon the nature of the students enrolled in distance education classes. Classroom facilitators in secondary schools are individuals who belong to one of three groups:

teachers certified in the subject area, certificated teachers not certified in the subject area, and individuals serving as teachers' aides or in a paraprofessional capacity (Willis, 1992; Kirby, 1995). Generally the classroom facilitator assumes responsibility for interacting with the instructor, managing administrative tasks associated with the program, encouraging student interaction at a site and with the instructor, and providing motivation. Research has shown that:

> ...site facilitators (classroom facilitators) who have successfully incorporated technology into their classrooms:
>
> - are committed to the concept of equality of education that distance education provides,
> - see opportunities for professional advancement through learning new skills and networking,
> - seem revitalized by the observation of a master teacher and exceptional instructional design,
> - realize that the program will not work without their participation, and
> - receive training in satellite-based instruction (This study involved a similar delivery system.), either live or on tape, professional troubleshooting, and program feedback (Sherry, 1995, p. 358).

Five characteristics, the "Five Cs", were identified by Moore (1995) as defining a good local coordinator (facilitator): communication, competence, continuity, control and confidence, and caring. Talab and Newhouse (1993) and Johnson (1996) have noted that successful facilitation of distance education courses often serves as staff development for individuals who later become distance education instructors..

As distance education becomes more available, programming will be developed to meet the interests of a broader range of students than could be served by the early satellite delivery systems. Schools will want to assure the success of the greatest number of students possible choosing to learn through this medium. With interactivity and a learner-centered approach to instruction being crucial to conducting quality distance learning courses, the role of classroom facilitator can be expected to assume greater importance. Schools must make certain, through on-

going staff development, collegial learning experiences and just-in-time technical support, that the classroom facilitators understand the technology associated with distance education and their role in assuring that students have expanded access to information and increased opportunities for learning. Schools need to select the personnel carefully who perform this function, because they are the individuals who link school, community, learner, technology, instructor, and subject material (Johnson, 1996).

Conclusion

Distance education is a field with great potential. Walsh and Reese (1995) stated that "distance learning has become a core educational strategy in the 1990s....It has truly become an essential tool in helping to reach more students with the quality education they deserve" (pp. 58, 62). Nevertheless, insightful and substantive work in a number of areas is still needed. Distance learning represents a change from learning in the conventional classroom. The emerging technologies associated with distance education present schools and teachers with many questions regarding its effectiveness and impact upon learning. The challenge for educators, school and community leaders is to explore the network-based resources, the inquiry-based learning opportunities, the visual imagery experiences that now are available through telecommunications, and make those that are relevant to their needs available to their community. For this to happen, schools need to have individuals who exhibit leadership with vision...

> ...leadership with meaning, leadership for problem solving, collegial leadership, leadership as shared responsibility, leadership that serves school purposes, leadership that is tough enough to demand a great deal from everyone, and leadership that is tender enough to encourage the heart (Sergiovanni, 1996, pp. 184-5).

CHAPTER 3

Research Methods and Instruments

Methods

A case study approach, supported by qualitative and quantitative data collection, was applied to explore the process of implementation of distance education, an innovation, via a two-way audio, two-way video (VTEL) telecommunications system in a rural high school setting. The nine schools that participated represented eight school divisions and were members of a regional telecommunications network (Southside Virginia Community College Telecommunications Network, SVCC-TN) that included a local community college and four-year public institution. The goal of this network is to provide not only classroom instruction appropriate for all learners in the rural high schools, but eventually to serve as a community network in ways that are responsive to local issues and circumstances (L. Sheffield, personal communication, August 13,1996; "Telecommunications Network...," 1996, p. 2). Dr. Linda Sheffield, Assistant to the President of Southside Virginia Community College, served as project coordinator.

I served in several roles in this study. As a researcher, I suggested that schools create heteroarchical telecommunications teams composed of administrators, teachers, staff, and students that could serve as facilitators for initial implementation efforts at the local site. The ensuing staff development efforts were targeted to this group of individuals. As a facilitator, I

- created a staff development plan for preparing school representatives (telecommunications teams) to implement this innovation;
- created the instruments described in this study that were used to (a) help schools determine resources and needs and select participants, (b) characterize perceived attitudes, concerns, and self-efficacy of participants, and (c) serve as formative evaluation instruments;
- acted as a co-trainer for the staff development provided to participants; and

- obtained and shared resources relevant to delivery of distance education via videoconferencing devliery systems.

All materials were reviewed by the project coordinator. With the exception of the final questionnaire (and materials distributed to the first group that attended the first training session), all instruments were administered to participants by the project coordinator. Dr. Sheffield was the facilitator for the overall Network implementation and the point contact for schools.

As a researcher/participant/observer, I conducted a document review and employed a collection of quantitative and qualitative research instruments to gain insight and gather descriptive information on the (a) implementation process and its outcomes, (b) barriers to the implementation process, (c) perceived attitudes, concerns, and self-efficacy of site facilitators, (d) role served by school telecommunications teams in the implementation process, and (e) ways in which individuals and schools redefined the process in order to optimize implementation.

In addition to closed-ended questionnaires that were administered prior to the start of staff development in December 1996 (29 were completed), and at the close of the study in November 1997 (21 were completed), the data gathered for this study included:

- selected documents,

- observations and comments (recorded on open-ended surveys) of participants at training sessions,

- three focus group interviews administered at the end of the study (recorded and transcribed for further analysis),

- narratives completed by principals (four) at the end of the study, and

- my field notes and comments as an observer obtained from:
  - three Superintendents' Meetings (September 23, 1996, April 29,1997 and October 29, 1997),
  - two Ad Hoc Distance Learning Committee Meetings (October 8, 1996 and November 12, 1996),
  - interviews of key participants,
  - on-site visits to schools,
  - two summer planning meetings (June 18, 1997 and August 18, 1997),
  - all staff development workshops and focus group interviews, and

- face-to-face and telephone conversations and e-mail correspondence throughout the study with L. G. Sheffield, project coordinator.

Timeline for Study

A time line that represents the progression of this study is displayed in **Table 2**. More detailed information about the history of SVCC-TN, roles of varied groups of participants and progress of the innovation is provided in Chapter 4.

The shaded area on **Table 2** represents activities that occured prior to my involvement with SVCC-TN and Dr. Sheffield. When I joined the project in July 1996, funding had been acquired to establish and equip the network, the network architecture had been identified, and equipment for the high schools had been selected and ordered. Although training had been planned for the high schools (and funds had been allocated), no specific plans had been designed.

Table 2. Timeline for Development of SVCC-TN (Including this study)

Timeline for SVCC-Telecommunications Network

	1993	1994	1995	1996----1996									1997------1997										
				A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
SVCC-TN Timeline																								
Preplanning	●	●	●	●	●	●	●																	
Planning								●	●	●	●	●	●	●	●	●	●	●	●	●				
Low-speed (56K) transmission									●	●	●	●												
SVCC connected to ATM													●	●	●	●	●	●	●	●	●	●	●	●
Funding Application for K-12 schools			●	●	●	●	●	●	●	●	●	●	●	●	●	●								
Select Equipment for K-12 schools				●	●	●																		
Order Equipment for K-12 schools							●	●									●							
2-day Seminar: Supt. &2/School					●																			
This Case Study							●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Planning and Staff Development								●	●	●	●	●	●	●	●	●	●	●	●					
VTEL equipment arrives (K-12)									●															
Superintendents' Meetings									●							●						●		
Ad-Hoc Planning Mtgs.										●	●													
Workshop #1												●												
Initial Questionnaire												●												
Open-ended Surveys												●	●	●		●								
Workshop #2--hands-on													●	●										
Workshop #3--Teleconference																●								
K-12 Schools Connected to ATM																	●	●	●	●	●	●	●	●
Summer Scheduling Meetings																		●		●				
School Internet Hookups																				●	●	●	●	
School use of Network																				●	●	●	●	●
Final Questionnaire																							●	
Focus Group Interviews																							●	
Principal Narrative Report																							●	

Between July and September 1996, based on a review of the literature (described in Chapters 2 and 4), I prepared a plan, acquired resources, and developed materials for staff development activities targeted to the needs of participating high schools. These were reviewed by the project coordinator, and distributed as appropriate (they are described more completely in later sections of this document). The equipment was received at high school sites in early fall of 1996, with expectations that phone line installations would follow shortly. Staff development began in December 1996; three formal sessions were conducted between that time and April 1997, utilizing the telecommunication network that was operational at the community college sites. Both small group and large group formats were used for training. Individual sessions of hands-on workshops were held for each of the school teams. All training was held during the school day, with funding allocated for travel and substitutes. Chapter 4 provides a description of the model used for the staff development activities.

Numerous technical difficulties delayed the installation of the network from January until May 1997. A period for on-site experimentation and initial programming activities followed. The study ended in November 1997.

Site for the Study

The Southside Virginia Community College Telecommunications Network (SVCC-TN) served as the site for this research. It covers a 4000 square mile area. The regional partnership included two campuses of both Southside Virginia Community College (SVCC) and Longwood College, as well as the Virginia public school divisions of Brunswick, Buckingham, Charlotte, Greensville, Halifax, Lunenburg, Mecklenburg, and Prince Edward. Each school division had one high school, with the exception of Mecklenburg, which had two. Figures 1 and 2 show the location of these sites in Virginia.

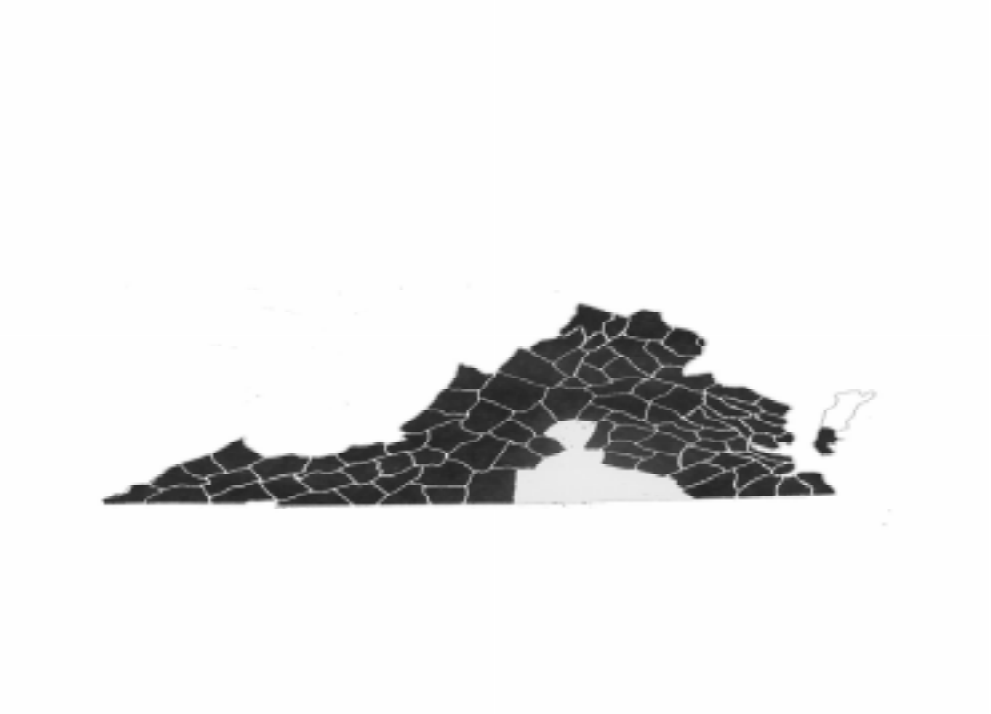

Figure 1. **Southside Virginia Community College Telecommunications Network (SVCC-TN).** The light region represents the area covered by SVCC-TN.

Counties of:

Brunswick	Halifax
Buckingham	Lunenburg
Charlotte	Mecklenburg
Greensville	Prince Edward

SVCC-TN High School Sites: 58-63; 84; 87

Available: (Hyperlink to site)
http://www.networkvirginia.net/images/NWV_key_9-26.htm/[1998, January 4].

Figure 2. Locations of Sites connected to Net.Work.Virginia and Connection Dates.

The region covered by SVCC-TN is a rural area, having an average population density of 36 persons per square mile (L. Sheffield, personal communication, August 13, 1996). African-American students make up 41 to 74 percent of the school populations (Virginia Department of Education, 1996). The *Composite Index of Locality Ability-To-Pay Costs of the Standards of Quality* (Virginia Education Association, 1995, p. 9) for these schools ranged from $0.2169 to $0.2905. The highest composite index for schools in Virginia for the same 1993-4 academic year was $0.8000; this was the amount paid by the "wealthiest" districts. The average was $0.4500. Schools associated with SVCC-TN ranked from 95-132 out of 138 localities in the state of Virginia.

There were nine high school sites at the start of the research; a tenth joined in January 1998. All high schools involved in the SVCC-TN Network participated in a program known as "Dual Enrollment." This program allowed high school students to obtain both high school and college credit for certain courses that were given, either by staff at the local community college, or by teachers with recognized credentials at the local high school. The school districts are small; 1995 student membership varied from 2102 students in Lunenburg to 6453 students in Halifax (Virginia Department of Education, 1996).

Technology associated with the network. The nine high schools were connected via T-1 (high-speed digital channel) lines through DS-1 switches to a statewide asynchronous transfer mode (ATM) network, Net.Work.Virginia (known initially as Vision Alliance) (Dillehay, 1997). This system was developed by Virginia Tech, in association with Old Dominion University and the Virginia Community College System. It is an advanced, broadband network employing

Internet Protocol (IP) that allows video, audio, and data to be transported simultaneously over one fiber. ATM protocol allows the bandwidth used for transmitting information to be flexibly allocated and reallocated as needed. Through Net.Work.Virginia, educational, state and local governmental institutions have equitable access to advanced communications services due to a level pricing system negotiated by Virginia Tech and Bell Atlantic (Crowder, 1997).

In this study a consortium of local exchange (local area telephone access, LATA) companies, led by Bell Atlantic-Virginia, provided local access and intraLATA switching services. An interLATA ATM backbone was provided by Sprint via an ATM connection to SprintLink, with backbone switches being managed and controlled at Virginia Tech. Sprint also provided an Internet backbone gateway via a connection from one of the backbone switches to SprintLink, Sprint's Internet service.

All participating sites had access to a VTEL videoconferencing system that allowed each site to serve as an originating or receiving site. Each school had point-to-point transmission capability. Multipoint transmission required intervention of a "bridge" which was housed at SVCC; connectivity was readily accessible via a telephone call. Autotracking cameras that allowed the camera to focus on the instructor and each individual speaker were available in all sites, as was access to a phone and fax machine. During the period of research, all sites received Site-C licenses for Internet services that allowed them to set up individual accounts for students and teachers. Technical support was provided by staff at SVCC.

Funding for sites. Funding for purchase and installation of equipment and for training was provided through grants awarded by the Rural Utilities Service (RUS, sponsored by the U.S. Department of Agriculture) and Public Telecommunications Facilities Program (PTFP, (sponsored by the U. S. Department of Commerce), the Virginia state legislature, and the Virginia Community College System (VCCS), among others. Individual schools were responsible for identifying and equipping space appropriate for distance education. They also were responsible for providing supplemental equipment beyond the basic teleconferencing system that included two monitors, two cameras, and three microphones.

Sample

The subjects for this research included: (a) superintendents of the eight participating school divisions, (b) principals of the nine high schools and (c) 54 other individuals--teachers, staff and students who (together with principals) were members of school telecommunications teams. Superintendents delegated responsibility for implementing the telecommunications network to the principals in their high schools.

Each school established a telecommunications team, composed of individuals representing different levels of authority within the school. Principals, acting as site facilitators with responsibility for overall facilitation of distance education at the building level, selected two to four individuals to serve on the school telecommunications team in the role of classroom facilitators. These individuals were chosen from one of three groups: teachers certified in the general subject area of the distance learning program (anticipated for delivery); certificated teachers not certified in the general subject area of the distance learning program (anticipated); or non-certificated individuals, hired as classroom aides. Since SVCC began teaching teaching classes over the Network in January 1997, it was expected that the instructors for the initial distance education classes for high school students would come from the pool of instructors at SVCC who already were teaching via the Network. Initially, high school teachers were expected to be facilitators for the SVCC classes, but were considered to be potential instructors for high school distance education classes. Research has shown (Talab and Newhouse, 1993; Johnson, 1996) that classroom facilitators often form a potential pool of future distance education instructors.

Other members of the school telecommunications team included the principal (or assistant principal), a teacher or staff member responsible for technical support, and two to four students. School telecommunications teams attended three staff development sessions and became facilitators for implementing distance education at local sites.

For this study, there were nine school telecommunications teams that participated in one or more of the staff development sessions and completed open-ended surveys following each meeting. Nearly 100% response rate was obtained for these instruments. There were 42 adults (nine administrators and 33 school-based academic and support staff) and 12 students represented on the teams. Four schools placed students on their teams for this phase of the

implementation of distance education; five did not (one of these schools selectected students, but chose to wait before involving them in training and planning). Other school staff occasionally attended some of the training sessions.

Initial sample. Demographic characteristics of non-student members on the school telecommunications team were identified through responses to closed-ended questionnaires administered prior to staff development in December 1996. Since technical support personnel varied widely in initial expertise, they were excluded from the pool of individuals asked to respond to the initial questionnaire. (They did complete the final questionnaire.)

Eight school teams (45 individuals: 38 adults and 7 students) participated in the first staff development session. Thirty-three individuals received questionnaires and 28 of these (85% completion rate) completed this instrument. The principal of the team that did not attend mailed a completed questionnaire to me, thus expanding the initial sample to 29.

The results are presented in **Table 3.** Eighteen (62.1%) identified themselves as classroom facilitators, five (17.2%) as administrators, and six (20.7%) as other (librarian, e.g.). Twelve (41.4%) were male and 17 (58.6%) were female. Eighteen (62.1%) had completed a masters degree, and sixteen (55.2%) had enrolled in graduate courses within the last three years. Nine (31.0%) had less than seven years experience, and eight (27.6%) had between 13 and 20 years experience in an academic setting. Seven (24.1%) of the individuals had spent more than 12 years in their current position.

Final sample. The same questionnaire was administered at the close of the study in November 1997. The size of the group associated with analysis of this instrument was slightly smaller: 21 as compared to the initial 29. Only those participants who had attended at least two workshops, including the hands-on training (verified by attendance records and an identifying code on open-ended questionnaires) were included in the data set. Fifteen of this group had completed the initial questionnaire; six of the final group of 21 had not. (Two of these six were administrators who had been present, but who had not submitted a questionnaire at the first session in December 1996.) All individuals had been involved in their school team during the entire period. There were four administrators and 17 school staff in the final data set. This latter

group was composed of individuals who were technical support personnel or those who were potential distance education classroom instructors or classroom facilitators.

Table 3. Characteristics of School Telecommunication Teams (Building and Classroom Facilitators) that Completed Initial Questionnaires

Characteristic	N	Percent
Gender		
Female	17	58.6
Male	12	41.4
Role in project		
Classroom facilitator	18	62.1
Administrator	5	17.2
Other	6	20.7
Levels of Education		
HS	1	3.4
BA/BS	8	27.6
MA/MS	15	51.7
MA/MS+30	3	10.3
Doctorate	0	0
Other	2	6.9
Graduate Work Past 3 Yrs.		
Yes	16	55.2
No	13	44.8
Years in Academic Setting		
0-2	4	13.8
3-6	5	17.2
7-12	6	20.7
13-20	8	27.6
21-30	5	17.2
Over 30	1	3.4
Years in Current Position		
0-2	7	24.1
3-6	7	24.1
7-12	8	27.6
13-20	5	17.2
21-30	2	6.9
Over 30	0	0

Justification for Research Methods

Distance education is a rapidly evolving method of delivering instruction. Technologies are changing. Schools themselves are complex social and cultural systems. It is difficult to isolate discrete events and examine independent and dependent variables. Distance education itself is a multi-faceted and challenging endeavor, demanding collective efforts and creative resources. In this study, implementation of distance education occurred in a relatively isolated setting with a group of rural schools. This situation adds further challenges to a researcher regarding the processes of gathering information and assessing progress. Consequently, a purely analytical approach to this research may be inappropriate. Using only descriptive statistics may obscure some of the underlying factors that affect the process of implementation and the attitudes, level of adoption, and self-efficacy of participants towards implementation of distance education. A number of scholars (Creswell, 1994; Greene, Caracelli, and Graham, 1989) support a multimethod approach (or two-phase design) to research. In this study, descriptive statistics provided some information on trends among participants, but analysis of qualitative data served as a major source of evidence for the conclusions reached.

Support for use of qualitative research methods. Support for the use of qualitative research methods for distance education research is shared by many researchers who work in the area of distance education (Burge, 1990; Kember, Lai, Murphy, Shaw, Wong, and Yuen, 1990). Russell (1991) proposed that..

> Qualitative research may be the best methodology for determining what facilitators and students actually do in distance classes. This type of research may provide valuable insight into what facilitators know about facilitating and how they facilitate student interaction with the distance teacher and the course content. It may also provide information about other factors which influence student achievement (p. 770).

Other researchers (Kember and Harper, 1987; Morgan, 1991; Willis, 1991) also have recommended including some qualitative data collection in studies involving distance education.

Additionally, the process of implementing distance education involves change. It is an innovation. Newlove and Hall (1976) recognized that a deeper understanding of factors involving

change could be identified by using open-ended questioning protocols as a supplement to their Concerns Based Adoption Model (CBAM) questionnaire. "One simple and straight-forward way to find out what innovation-user and non-user concerns are is to use the Open-Ended Statement of Concern About an Innovation" (p. 1). Consequently, based on the research involving both the change process and distance education, it was decided to include both quantitative and qualitative instruments in this qualitative study.

Support for case study design. Lincoln and Guba (1985) reported criteria for assessing naturalistic inquiries that they felt were more applicable to the study of human behavior than those supporting the positivistic research of the physical sciences. Naturalistic researchers make the assumption that multiple, interacting factors shape rather than cause one another; they look for patterns and themes that suggest plausible connections between phenomena. Lincoln and Guba (1985) advocated conducting research in the natural environment because "phenomena of study, whatever they may be...take their meaning as much from their context as they do from themselves" (p. 189). In their more recent writing, "they have begun using the term 'constructivism' to characterize their methodology, although they acknowledge that constructivist, interpretive and naturalistic...are all similar notions" (Schwandt, 1994, p. 128).

Although there is no single procedure that characterizes naturalistic methodology, there are a number of common features to this approach. A case study design is one strategy for obtaining insight into the natural environment (Stake, 1994, 1995). As researcher, I chose this methodology because it allowed involvement in both the process of learning how rural schools implemented distance learning and in the production of a record of that process. Case studies portray an educational problem in all its personal and social complexities "The essence of a case study is that it tries to illuminate a decision or set of decisions: why they were taken, how they were implemented, and with what result" (Schramm, 1971, p. 3).

Yin (1984) felt that a variety of data collection techniques were appropriate for case studies, including interviews; direct observations; review of existing documents and other artifacts; archival records, including survey data; and participant observation. I have employed

all these techniques in this case study of the process of implementation of distance education into rural schools.

The high schools that are associated with SVCC-TN share a common goal. All want to enhance student opportunities for learning and communicating. This goal is the unifying force that integrates their efforts in working together. However, in a way, each setting is unique; each school has its own culture. Moreover, the process of learning about distance education is iterative; it requires active involvement of participants, followed by reflection, critique, and further experimentation. Inquiry into such a setting is appropriately examined through holistic, systemic methodologies such as is offered by a case study (Yin, 1984; Kirby, 1995)--and through application of a combination of qualitative and quantitative methodologies.

Instruments

Closed-ended Questionnaire

This questionnaire (Appendix D) consisted of four parts: *Section I (Attitude towards innovation), Section II (Level of adoption of innovation), Section III (Self-efficacy),* and *Section IV (Descriptive information and demographics)*. It was used to explore issues regarding perceived attitudes, and levels of self-efficacy and of concerns towards the innovation. For the purpose of this research, the "innovation" was defined as introduction of distance education into the high school setting using compressed video and associated technologies.

Section I: Attitude towards innovation. This instrument was a modification of the 31-item Distance Education Survey Instrument (DESI), prepared and validated by Lucas (1995) for implementing distance education into high schools. Lucas (personal communication, October 1996) granted permission for me to use this survey instrument. Questions 17 and 27 of Lucas' questionnaire were modified to reflect the sample involved in this study. The categories represented those developed by Rogers (1962, 1983) and Rogers and Shoemaker (1971) in earlier studies regarding diffusion of innovations. The questions in the survey presented subjects with a five-point Likert scale (1-5: Strongly Disagree, Disagree, Undecided, Agree, and Strongly Agree) that they were asked to use in responding to statements regarding attributes of the innovation.

Rogers (1983) defined diffusion as "the process by which an innovation is communicated through certain channels, over time, among members of a social system" (p. 5). Rogers and Shoemaker (1971) identified five characteristics of innovations that influence the decision to adopt: relative advantage, compatibility, complexity, trialability, and observability.

- Relative advantage represents the degree to which an individual perceives an innovation as a benefit to the program. The greater the perceived advantage, the faster the rate of adoption.
- Compatibility of an innovation relates to the rate at which an innovation is adopted. It is a measure of the meshing of the existing culture or environment with the values, needs, philosophy and past experiences of an individual making the adoption. Innovations that are perceived as compatible with existing values of a social system will be adopted more readily than those that are not.
- Complexity involves the perception on the part of the adopter regarding the ease of use or level of difficulty in understanding. Unlike the other five attributes, complexity has a ***negative*** relationship to rate of adoption. If an innovation is perceived as being too complex to use or understand, it will not be adopted as quickly as one that is easy to comprehend and utilize.
- Trialability relates to the opportunity for "trying out" and experimenting with the new innovation, prior to investing large amounts of time and money on a project, to see if it meets the needs of the adopter. Perceived trialability of an innovation is **positively** related to its rate of adoption
- Observability. represents the degree to which the results of using the innovation can be readily observed. The greater the degree of observability, the higher the rate of adoption. In this current age of "accountability," evidence must be presented to justify educational programs. Those with visible results are more likely to be adopted.

The Cronbach's Alpha computed by Lucas (1995) for each subscale of the DESI using *SPSS/PC* were as follows:

Relative Advantage (7 items)	.79
Compatibility (6 items)	.79
Complexity (6 items)	.81
Trialability (6 items)	.71
Observability (6 items)	.77

A relatively high Alpha value (above .70) attests to the homogeneity of items, a characteristic of the "reliability" of the items selected to measure a particular construct (Gable, 1986).

Section II: Level of adoption of innovation. This section included the Stages of Concern About the Innovation (SoC) Questionnaire developed by Hall, Wallace, and Dossett (1973) as the first dimension of their Concerns-Based Adoption Model (CBAM). Southwest Educational Development Laboratory and Dr. S. Hord granted permission (August 6, 1996) for me to use this questionnaire. The purpose of the CBAM is to (a) identify an individual's or group's level of concern, and (b) to proscribe appropriate interventions so as to alleviate concerns and move the individual further along the process of adoption of the innovation.

The SoC questionnaire consists of 35 items. Subjects were asked to respond to a seven point Likert scale (1: "Not true of me now" to 7: "Very true of me now;" plus "0" = "Irrelevant") that represented their current feelings regarding the innovation. The Stages of Concern (SoC) dimension of the CBAM that focuses on the concerns of individuals involved in change (Hall, George, and Rutherford, 1979/1986) can be summarized by the model represented in **Table 4** (Hord, Rutherford, Huling-Austin, and Hall, 1987).

Table 4. Stages of Concern: Typical Expressions of Concern about the Innovation

	Stages of Concern		Expressions of concern
IMPACT TASK	6	Refocusing	• I have some ideas about something that would work even better.
	5	Collaboration	• I am concerned about relating what I am doing with what other instructors are doing.
	4	Consequences	• How is my use affecting kids?
	3	Management	• I seem to be spending all my time getting material ready.
SELF	2	Personal	• How will using it affect me?
	1	Informational	• I would like to know more about it.
	0	Awareness	• I am aware of the innovation.

The reliability of the SoC Questionnaire was determined by Hall et al. (1979/1986). The test-retest correlations of the stage scores ranged from 0.65 to 0.86; four of the seven correlations were above 0.80. Internal reliability ranged from 0.64 to 0.83. A series of validity studies resulting from its use in longitudinal studies "provide increased confidence that the SoC Questionnaire measures the hypothesized Stages of Concern" (Hall et. al, 1979/1986, p.20; S. Hord, personal communication, August 6, 1996).

Section III: Self-efficacy. The third section of the instrument used in this study measured self-efficacy of site facilitators towards the innovation. Two components were adapted from items included on surveys developed by Delcourt and Kinzie (1993) and Kinzie,

Delcourt, and Powers (1994) for measuring attitudes and self-efficacy toward computer technologies. (Professor M. Kinzie gave me permission to adapt these surveys, August 1996.) These sub-sections included questions on (a) comfort level/anxiety towards distance education involving compressed video and (b) use of electronic mail.

Two other measures of self-efficacy covered items associated with operation of the hardware associated with the distance education delivery system: (a) use of a fax machine to transmit and receive information and (b) use of the compressed video system. The final two measures for examining self-efficacy were adapted from Talab and Newhouse (1993) and included items regarding individuals' self-assessment of their roles as (a) change facilitators, and (b) potential users of the system to deliver programming and information to a designated audience. A five-point Likert scale (1-5: Strongly Disagree, Disagree, Undecided, Agree, Strongly Agree) was used. The self-efficacy section was reviewed for validity by a panel of experts who were practitioners in the field of distance education.

Section IV: Descriptive information and demographics. The final section of the instrument asked for descriptive and demographic data that profiled the characteristics of the building and classroom facilitators.

Open-ended Instruments

Formative questionnaires following each training session. Open-ended questionnaires (Appendix E) were distributed following each of three scheduled training sessions. Site facilitators were asked to comment on what they thought was positive, negative, and interesting regarding the session, as well as to list any comments or suggestions for improvement.

Open-ended question added to final questionnaire. The following question was added to all questionnaires administered at the end of the study (November 1997).

Do you have any comments/ suggestion regarding:

- the Southside Virginia Community College Telecommunications Network?
- additional staff development for use of VTEL equipment/Internet?
- professional staff development using compressed video?
- other concerns?

Narrative. An open-ended questionnaire (Appendix I) was sent to the principal of each of the participating schools at the end of the study (November 1997). Items on the questionnaire addressed current and future use of the Network and asked participants to relay any comments/concerns they had regarding the network.

Focus group interviews. At the close of the study, in November 1997, I conducted three focus group interviews. This was midway through the actual implementation period, but six months following installation of the regional network and the videoconferencing system in the high school sites. The network was fully operational at this point in time; most "glitches" had been resolved (Focus Group Interview #1 Transcript, page 22, November 6, 1997).

Based upon the literature review, document analysis, results of initial closed and open-ended questionnaires, direct observations and key interviews associated with this study, I developed focus group questions and categorized them into the following domains:

- Value/effect of the 3 workshops,
- Current status of Network equipment at school site,
- Development of school and community awareness of the Network,
- Plans for future use of the Network,
- Current utilization of the Network, and
- Thoughts on future organizational structure for the Network.

The questions for the focus group interviews were refined and finalized following collaboration with the Network Coordinator. A copy of the questions may be found in Appendix J.

Procedures

I used a case study approach that included some quantitative data to explore (a) the installation and implementation of distance education via a VTEL videoteleconferencing system in nine rural high schools, (b) the functioning of the school teams during the training and initial implementation phases, (c) and the perceived effectiveness of an on-going, iterative, staff development process. The study was conducted over a 17 month period, from July 1996 through November 1997.

As a researcher/participant/observer, I met superintendents and principals in September, some team members in October and November, and the balance of the school teams in December 1996. Further details and explanation of my multiple roles in this project are detailed in Chapter 4.

In September and October 1996, Dr. Sheffield and I presented principals with the plan I had developed for staff development. Principals were asked to form a telecommunications team and to select individuals to serve on that team. Based upon criteria established in the literature, I prepared and distributed a set of general guidelines that related roles, responsibilities and characteristics of successful facilitators for telecommunications projects. Basically, interest and an ability to work with others were identified as the main criteria for selection.

My plan for staff development recommended that individuals with differing levels of authority within the school be represented on school telecommunications team. I suggested that this could be accomplished by creating a team with the following composition:

- individuals who were to serve as classroom facilitators, once Network (SVCC-TN) programming was available;
- one person who could assume responsibility for the technology (supported by technical staff at SVCC and Longwood);
- students (2 - 4); and the
- principal (or designated administrator).

To assist them with the team selection process, I provided principals with a form (Appendix C) that helped them develop a profile for each member of their team.

Administration of Questionnaires

Prior to the start of the research in December 1996, I shared the intent of my study with the 45 individuals (eight schools, 38 adults and 7 students) who attended the first workshop that was held at the Blackstone Conference Center. I provided them with written assurance of confidentiality of all information collected in this study. A copy of a close-ended questionnaire (Appendix D) was distributed to 38 site facilitators (building administrators and classroom

facilitators, omitting technical support staff) who were present. Twenty-nine individuals completed this questionnaire.

I administered the same questionnaire again, eleven months later, at the close of the research in early November 1997. During this period of time, training and on-site experimentation involving varied distance education programming activities took place. It is recognized that caution is needed in interpreting the results of surveys. Besides uncertainties resulting from design of surveys and interpretation of the wording and rating scales made by participants, there are concerns regarding rates of response and validity of self-reported perceptions (Fowler, 1993).

The final questionnaire was distributed through building principals at participating school sites. In order to obtain total response of all 42 adult members of their school teams, I addressed letters (Appendix H) to principals at each of nine sites, enclosed a list of their school telecommunication team members (adults only), and asked that the principals distribute the accompanying packets containing questionnaires to individuals on the list. A stamped, addressed envelope was provided in the packet to each individual for return of the material. A follow-up telephone call was given to principals one week after mailing of the letter and questionnaires. As an added incentive, each participant was given several pencils inscribed with "*Southside Virginia Community College Telecommunications Network. SVCC-TN: Providing Tomorrow's Technologies for Today's Students."*

Six individuals responded to the final questionnaire that had not completed the initial one. I developed a data profile of the six new respondents by calculating the means for the seven stages of concern obtained from an analysis of *Section II* of the questionnaire (the method is described below), and then comparing those means with the values obtained on the final questionnaire for the original 15 respondents. Results were essentially indistinguishable, and I combined the two groups to produce a final subject pool of 21.

There can be several explanations for the decrease in size of the initial group. I decided to include only participants who had attended at least two training sessions, including the hands-on workshop, in the final data set. Those who attended the hands-on training appeared more

committed than those who missed this training. Only three of the five administrators who had completed the initial questionnaire had attended the hands-on training. One principal in this group moved to another school district during the course of this study. This informaction accounted for a decrease of three subjects from the original group. One school never arranged for hands-on training (decrease of one subject), and another school sent only one adult, along with a student team (decrease of two subjects) to the hands-on training. It is also possible that several other members of the initial group may have moved and/or may no longer have been associated with their school telecommunications team, making this a factor that would account for some of the decrease between numbers of initial and final responses to the questionnaire.

There were no responses to the final questionnaire from the original participants of one school (decrease of three subjects). In a follow-up telephone conversation with the principal's secretary, I learned that "the administrative leadership team is all new here...Several teachers said they had lost the survey" (Researcher Notes. Telephone conversation, November 13, 1997). Upon her request, I sent an additional mailing to this school, but this action produced no further responses to the questionnaires. The blank forms were returned to me. This school did, however, send a representative to the focus group meeting on November 6, 1997.

Focus Group Interviews

I scheduled three focus group interviews at the close of the study in November 1997. In one focus group, participants met face-to face. I used the teleconferencing system to conduct the other two interviews. In these interviews, participants viewed me and each other on their television monitors. The Network Coordinator joined me in conducting these session. Guiding questions for the interviews may be found in Appendix J. The sessions were audiotaped and transcribed for further review and analysis.

Focus group interview #1. The first focus group interview was conducted on November 6, 1997, at Southside Virginia Community College, Keysville campus. Fourteen representatives of five participating schools and Longwood College were present. The group was composed of two administrators, three technical support personnel from schools, the distance education

coordinator from Longwood College and eight teacher/facilitators, together with myself and Dr. Sheffield from SVCC.

Focus group interview #2. This interview was scheduled via the Network for November 6, 1997. The original schedule identified three sites as participating in the focus group interview. Due to technical difficulties, one site was unable to connect to the bridge. Therefore this session, was conducted between two sites, the Keysville campus of SVCC and a high school site. It involved only one individual other than Dr. Sheffield and myself, a school team (School G--system of identification is described later in this chapter) technology support staff member.

Numerous attempts were made to connect the third site during this session. Dr. Sheffield called the missing school; the SVCC technology coordinator joined our videoteleconference from his location at the Alberta campus of SVCC. He called the missing school, verified protocols at the bridge and sent a technician was sent to the missing site (It was located close to the Alberta campus). None of these attempts was successful in connecting this site.

Focus group interview #3. The third focus group interview was conducted via the Network on November 7, 1997. It involved two high school sites. There were five participants: four students representing two additional schools and a teacher/facilitator/technical support contact from one of these schools.

Collection of Additional Qualitative Data

Qualitative information regarding the installation and progress of the implementation of the innovation, the functioning of the school team, and concerns of the individuals involved in the change process was collected by me in my role as researcher through observations, personal interviews, focus group interviews, document analysis and review of open-ended surveys. I attended and recorded notes of all policy meetings involving the project director, school superintendents and building principals, as well as of the training sessions. I observed the installation of the videoteleconferencing system at two sites. I attended a class delivered via the network. I conducted two interviews with one superintendent, including one on the day the network was installed in that school division. (He visited the site at that time.) In addition to observer notes, I developed a second component of field notes, identified as Researcher

Comments. These contained reflective comments and included thoughts and ideas that provided a context for the observed activities, speculations about meanings, and possible relationships with previous observations. This process has been recommended by Bogdan and Biklen (1992).

Throughout the study, further information regarding the progress of the innovation was obtained from reading e-mail and list-serv postings from the technology director at SVCC, Mr. Bill Wilson. Additional information was acquired through visits to selected sites, as well as from interviews of one superintendent and of technical personnel from SVCC and Virginia Tech. Throughout the study, I remained in close contact with the project director, Dr. Linda Sheffield. We met over a dozen times, spoke frequently on the telephone, and exchanged weekly or bi-weekly mail and/or e-mail messages throughout this period. She provided insight into the historical aspects of the telecommunication Network and granted access to archival records (1993-96) involving creation of the Network and grant applications for financial support from various governmental and private agencies.

Provisions for Treatment of Human Subjects.

Verbal consent to conduct this research was obtained from the project director and from the district superintendents involved in the SVCC-TN. To assure this research study complied with accepted ethical standards for research involving human subjects, a research proposal reflecting these principles was submitted to and approved by Virginia Polytechnic Institute and State University Human Subjects Committee. A copy of the Facilitator Consent form may be found in Appendix F. The Parent Consent form is found in Appendix G. For tracking purposes only, questionnaires were coded by school and by the last four digits of a participant's Social Security Number.

Prior to beginning research, I informed participants of the nature of the activities associated with the study, sought to engage their cooperation, explained the significance of their roles as change agents in implementing the new technologies associated with distance learning, and provided them with an informed consent form. So that collected data would not embarrass or harm them, participants were promised confidentiality. No attempt was made to coerce

participation. Participants were told that results would be shared with all those participating in the research in a general manner that would not identify individuals or sites.

Analysis of Data

The data in the closed-ended questionnaires were analyzed using *SPSS-PC.* Means and standard deviations were calculated for the questions in *Section I* involving attitude towards the five attributes of innovation and *Section III* involving self-efficacy. Category means for attitude and self-efficacy were determined. The data in *Section II* involving level of concern towards the innovation were transformed into a State of Concern (SoC) score using the Quick Scoring Device for the States of Concern Questionnaire developed by Parker and Griffin (1979). This is a form that organizes responses to the 35 items in the questionnaire into categories and provides a percentile rating for sums of items in each category, thereby creating a profile for each individual. Each profile shows the intensity level for an individual on each of the seven stages of concern. It is a valuable record of an individual's level of concerns (Hord et al., 1987).

Means for each stage were calculated for the overall sample and for each of the sub-groups: (classroom) facilitators and administrators. Additionally, as suggested by Hall, George, and Rutherford (1979/1986), frequencies and percentages for high and second-high stages were calculated. This method allows a researcher to create a more complete representation of the top levels of concern for a group of individuals.

Descriptive statistics were used to analyze the demographic information in *Section IV*. Frequencies and percentages were reported.

Focus group interviews were taped and transcribed. They were analyzed using open and axial coding to draw inferences and clarify meanings. Open coding is a process of analyzing information that has been gathered in depth by breaking down the information into categories so as to identify key concepts (Strauss and Corbin, 1990). Axial coding allows the researcher to take apart the open-coded data that has been collected and organized into key concepts and categories, and rearrange these in different ways so as to let the data tell a story.

To generate general categories pertinent to this study, data from the close-ended and open-ended instruments were triangulated, along with my field notes and comments regarding observations and interviews conducted during the implementation process. According to Lincoln and Guba (1985), field data must be analyzed inductively, starting with raw units of data and working towards subsuming categories so as to define working propositions. This involves (a) developing a coding structure that represents the themes that occur in the data, (b) placing the data into these categories, (c) evaluating the categorized data to identify similar patterns, and (d) generating a set of theoretical statements that cover the findings represented in the data (Miles and Huberman, 1984). This is one of the most effective ways to avoid charges of subjectivity, since researcher observations can be correlated with evidence obtained from other independent sources. This was conducted twice during the study: once following the 1996-97 academic year, and again (using all the data) at the close of the study in November 1997. Findings from the initial analysis were used to develop focus group interview questions.

Chapter 5 contains both descriptive and analytical findings associated with this study. The process of implementing distance education through involvement of heteroarchical school teams is detailed in this chapter. The impact of staff development, coupled with on-site experimentation, on the perceived attitudes, level of adoption, and self-efficacy of the site facilitators is reported. Descriptions of the context, setting, and activities of the participants are included. In addition, this chapter includes suggestions and recommendations for enhanced use of the network that were provided by participants.

Role of Researcher

This research involved studying the process of implementing distance education in the high school environment. I, as researcher, was a facilitator, an observer and a participant.

As a facilitator, I developed the plan for staff development, produced the instruments used to collect data, and served as a co-trainer for the staff development. As an observer, I noted, recorded, and interpreted the efforts, attitudes, and oral and written comments of participants as they defined, redefined and adapted their strategies to respond to (a) changes in the technology, (b) delays in connectivity, and (c) their growing awareness and understanding of the technology

and how it could be used to deliver and enhance teaching and learning. As a researcher, I analyzed open and closed-ended questionnaires, transcripts of focus group interviews, as well as the archival records associated with the development and formation of the Network. Through interviews with key personnel, in particular Dr. Sheffield, the project coordinator, and Dr. Paul Stapleton, Superintendent, Charlotte County Public Schools, I gained varied insight into the planning and implementation process, as well as expectations for its full utilization.

As a participant, I collaborated (at least) weekly throughout the project, via telephone, e-mail, or in person, with the project coordinator, Dr. Linda Sheffield. I provided Dr. Sheffield with information and resources on distance education and instructional applications of technology based upon a review of literature, personal and professional contacts, and on-line list-serv postings. She was the point contact for all schools associated with the network.

A more detailed description of the staff development model employed in this study is presented in Chapter 4. All results obtained from this study were shared with the project coordinator. Every attempt was made to protect the confidentiality of participants.

Potential Bias of the Researcher

I as the researcher brought an unconscious bias to the study. As a former science curriculum specialist in a large suburban school system that had large economic and technological resources, I knew of current trends in staff development and expectations for student performance. My research associated with this study expanded my knowledge of the school change literature and of research studies involving applications of technology to teaching and learning via distance mediums. I shared relevant materials in these areas with the project coordinator.

The participants in this study graciously allowed me into their lives. All were committed to providing better opportunities for their students. While I never directly influenced any individual or school actions, I provided whatever resources I knew to be available, either in terms of literature references, publications, or personal contacts to the Network Coordinator. It was she who then made the decision of how to distribute or utilize these resources. I joined the

Network Coordinator in development and presentation of the three workshops. Details of the workshops may be found in Chapter 4.

The varied sources of data collection processes that I employed in this study, I believe, overcame any subconscious expectations I held for success of the network. I administered initial (29) and final (21) closed-ended questionnaires that contained items that addressed perceived and self-reported attitudes, concerns, and feelings of self-efficacy of participants. Almost 100% of participants (There were 54 school telecommunication members--42 adults and 12 students) completed open-ended surveys following each of the three workshops. All nine schools provided written or oral statements regarding the functioning of the network and plans and concerns for the future. Four schools completed Principal Narrative Reports. Seven of the eight schools that achieved connectivity to Net.Work.Virginia were represented in the focus interviews, as were Longwood College and SVCC. During the course of the study, I observed three superintendents' meetings, 2 Ad Hoc planning meetings, two summer scheduling meetings. Interviews with key participants filled out the picture of the school environment as it related to operation of the Network and incorporation of delivery of educational programming via a telecommunications network. The breadth of these data collection methods, I feel, compensated for any potential researcher bias.

Chapter 4

Planning and Staff Development

Introduction

The planning necessary for creating and installing a telecommunication network and a model for training site facilitators are described in this chapter. Based upon best practices reported in the literature, and refined as needed to meet the needs of the individual participants, I as researcher worked with the project director between July 1996 and throughout November 1997 to (a) develop plans and strategies for training the school telecommunication teams associated with SVCC-TN and (b) conduct formative evaluations of the progress of the implementation of this innovation. This chapter describes the preplanning phase (1993-July 1996) for the overall SVCC-TN planning, and the planning and the staff development phase (August 1996-August 1997) during implementation of this regional network for the high school sites. The chapter also reports research that supports the procedures employed. **Table 2** (p. 61) contains a time-line that summarizes the major activities for SVCC-TN and this study.

Preplanning

The term "pre-planning" covered the phase of the Network (1993-July 1996) in which decisions were made to (a) form the Network, (b) select a coordinator, (c) obtain financial resources, (d) select the technology, (e) identify technical support resources, and (f) establish the goals for the Network.

Coordination among SVCC and the local school divisions was essential for initiating the regional network. Although the principal and the classroom facilitators are two roles that have been shown to be very important in assuring the success of implementing a distance education program in an individual school, effective preliminary planning involving many different stakeholders is essential (Smith, 1993; Kirby, 1995; Thach and Murphy, 1995).

The "VISION"

In most cases the decision to collaborate and create a telecommunications network is the result of efforts originating from a group of visionaries within a local geographic area (Sullivan,

Jolly, Foster, and Tompkins, 1994). The idea for formation of the Southside Virginia Community College Telecommunications Network (SVCC-TN) emerged from a series of meetings beginning in 1993 (Schauer, 1993; Southside Virginia Community College, 1994). The "visionaries" for this group included representatives from the Virginia legislature; three regional telephone companies: Sprint, GTE, and C&P (now Bell Atlantic); Southside Virginia Community College (SVCC) and Longwood College, two institutions of higher education involved in the Network; local medical institutions; the regional Governor's School; and superintendents (or designated representatives) of seven (Buckingham, Charlotte, Greensville, Halifax, Lunenburg, Mecklenburg, and Prince Edward) of the eight school divisions currently involved in the Network. Representatives from these groups attended at least one of the planning meetings.

Central Coordination

As part of the Virginia Community College System, Southside Virginia Community College (SVCC) was involved in the planning and eventual utilization of the statewide broadband network, now known as Net.Work.Virginia. SVCC was well qualified to direct the creation and evolution of an expanded regional telecommunications network that included Longwood College and eight neighboring school divisions.

This section contains a description of the roles assumed by SVCC and the school divisions in creating the network, as well as a discussion of financial support and technical issues that impacted upon the progress of the network. Supporting research literature is cited as justification for the behaviors and actions of critical individuals and groups.

Role of project coordinator. One to two years often elapse between initial vision and actual operation of a telecommunications network. Decisions involving selection of delivery channel and hardware are determined by local needs and fiscal restraints and should be made after careful examination and observation of representative systems (Pacific Mountain Network, 1994). Once commitment has been made by participants to collaborate in a telecommunications project and a set of goals have been established, responsibility for the next stage generally is assigned to a project coordinator, or network administrator (Grossman, 1994). For this project, Dr. Sheffield assumed the leadership role of coordinator of SVCC-TN. She served as the grant

writer, met with various stakeholders and technology vendors, and (together with representatives from Longwood College) developed the overall design of the network.

Concurrent with her efforts to implement a network to serve high school students, Dr. Sheffield also was responsible for establishing videoconferencing capability and scheduling of classes for college students for the two campus locations of SVCC through the Virginia Community College System (VCCS) telecommunications network. Both the technology and the equipment for the VCCS network and those for the high school sites were the same. In fact, once the high schools achieved network capability, they had a ready of source of programming available to them.

Initial training for those participating in the establishment of a telecommunications network is generally the responsibility of the project coordinator (Pacific Mountain Network, 1994; Sullivan, Jolly, Foster, and Tompkins, 1994). In February 1995, in order to determine the interest level of potential participants, Dr. Sheffield distributed a Distance Learning Survey to the eight public secondary schools within the service area associated with the "Southside Educational Network" (Name of the Network at this point in time). There were separate forms for administrators, faculty and students. Results indicated that:

- 100% of the administrators either very strongly or strongly supported the development of distance learning options for their school.

- 84% of the students expressed excitement about the proposed network and a willingness to try it.

- 71% of the faculty either strongly or very strongly supported the development of distance learning options for their school (L. Sheffield, personal communication, October 1996).

In May 1996, Dr. Sheffield offered the first of several types of training: a two day demonstration workshop on distance education that was delivered by the Teletraining Institute, Stillwater, OK. Representatives from seven school divisions (At this point in time there were seven school divisions associated with the Network.) attended (L. Sheffield, personal communication, August 13, 1996).

During Spring 1996 the decision was made by Dr. Sheffield and the technology staff at SVCC and Longwood College to install a VTEL compressed videoteleconferencing system in each of the high schools. This was the technology being used throughout the Virginia Community College System for their network. The equipment was ordered in May, with the expectation that the T-1 lines would be installed during the fall..

Role of local school administration. Initial planning for the Southside Virginia Community College Telecommunications Network (SVCC-TN) involved school administrators at the high school and superintendent level. Superintendents had attended early discussions (1993-96) on planning for the network. Selected superintendents and school principals learned about the technology through visits to demonstration sites during 1995 or through attendance at the May 1996 workshop at the Christanna campus of SVCC. They appeared enthusiastic about the prospect of distance learning (L. Sheffield, personal communication, August 13, 1996), but did not become involved in identification of the network architecture and selection of equipment. Responsibility for these decisions was delegated to the Network coordinator and technology staff at Longwood College. Use of an external coordinator is common practice in establishment of telecommunication networks (Grossman, 1994; Sullivan, Jolly, Foster, and Tompkins, 1994). School districts set policies for organization of their schools and delivery of instruction (Hanson, 1995), but often need to rely on outside specialists for technical advice in the initial stages of technology implementation (Trotter, 1997a). Periodically throughout the project, Dr. Sheffield delivered oral and written reports to the superintendents of the participating school districts.

Research provides strong justification for the critical effect of leadership exhibited by school administrators towards programs in their schools involving educational change. Berman and McLaughlin (1978, 1980), in their longitudinal study of educational change, concluded that school organizational climate and leadership had a powerful effect upon a project's implementation and continuation. Three elements were perceived to be critical: the quality of working relationships among teachers, the active support of principals, and the effectiveness of project directors.

Financial support. Establishment of telecommunication networks is expensive. The hardware and software investment for each classroom was about $75,000. This included a VTEL 227/232 Video Codec unit, two cameras (front and rear), two monitors, cell access technology, ethernet transceiver, microphones, and associated software. A combination of grants (See Chapter 3, p. 65) and school district funds provided support for the establishment of SVCC-TN. Each school site was responsible for room preparation and provision of auxiliary hardware and supporting software, e.g. fax machine, e-mail programs, document camera, etc.

Technical support. It was considered unlikely that school staff and or local rural businesses could provide sufficient maintenance and training for schools associated with implementing the telecommunications Network. Therefore, the two institutions of higher education, SVCC and Longwood College, were designated the initial providers of technical support services to local schools. Using funds acquired through the grants, the project coordinator allocated money for technical support and for training individuals at each of the schools identified as school technical support personnel. This level of training varied, depending on individual levels of expertise.

Planning Phase: August 1996-August 1997

General Activities and Time Frame

The planning phase refers to the period of time in which network installation and specific training and staff development activities related to distance education occurred: July 1996-August 1997. Local sites were not connected to the Network during most of this period, but it was in this planning phase that schools made their commitment to staff development, programming and co-curricular uses of distance education for the 1997-98 academic year.

My relationship with Dr. Sheffield began in July 1996. In exchange for becoming a researcher/observer of the implementation of the SVCC-TN in the high school locations, I agreed to help in the facilitation of this process. Dr. Sheffield shared all historical documents associated with the formation of the telecommunications network with me, as well as copies of grant applications and relevant memos and reports that were developed during the course of this study,

July 1996-November 1997. I began attending meetings involving school district personnel associated with the network in September 1996, and recorded field notes and comments of these sessions.

Superintendents and principals from eight school districts participating in SVCC-TN met together with the project coordinator in September 1996. This was their first opportunity to have a joint discussion of the Network and to learn about the opportunities that it would offer their students. Funding had only been obtained for seven school districts at this point in time. Although no funds were available for equipment at this point in time (Funding was eventually acquired in May 1997, allowing hook-up to the Network in January 1998.), the eighth district joined the discussions and participated in the training (L. Sheffield, personal communication, May 1997; October 1997). Dr. Sheffield introduced and explained my role as a researcher/participant/observer to the superintendents. She presented the plan I had designed for staff development for the 1996-97 academic year. Together we distributed copies of materials I had prepared to help schools (a) understand the role of facilitators in distance education programs, (b) determine their equipment and curriculum needs and resources for distance education (Appendix B), (c) become aware of the recommended composition of school telecommunications teams (Appendix C), and (d) identify individuals to participate on their telecommunication teams (Appendix C). Two more meetings followed prior to the start of formal training. These Ad Hoc Planning Meetings were held in October and November 1996, and involved principals and selected representatives from participating schools. I attended and recorded notes and reflections at all three of these meetings.

In October 1996 , the SVCC component of the SVCC Telecommunications Network was operational. However, communication at optimum transmission (T-1) did not occur, until January 1997. Nevertheless, school representatives (teachers and principals) of the nine high schools (eight school divisions), who met at one or another of the two campuses of SVCC, were able to experiment with the technology and use the Network for the October and November meetings. Dr. Sheffield and I were present at different sites. Dr. Sheffield introduced me to the groups present at the Ad Hoc meetings. At these meetings, I explained the role of facilitators in a

distance education program based upon research data and the justification for developing a school team composed of individuals possessing differing levels of authority. I explained the plans for staff development and distributed copies of the same materials provided to the superintendents and principals at the September meeting. Schools had opportunities to form small groups to brainstorm and exchange ideas on possible uses of the Network in their school and community, as well as to express their concerns. Individual teachers and principals used the Network to relay their group results to participants at their local site and at the remote site. Dr. Sheffield compiled this information and distributed a written summary to all schools and superintendents.

Dr. Sheffield asked schools to include names and certifications of teachers currently teaching or capable of teaching "Dual Enrollment" courses on the needs assessment form (Appendix B); and to send completed the completed forms, along with a copies of their school telecommunication team selection forms (Appendix C) to her at SVCC by mid-November.

During November 1996, schools identified members of their school telecommunication team. These individuals attended three formal training sessions between December 1996 and April 1997. Individuals designated as school technical support attended an additional workshop targeted to their needs in December 1996.

Installation of the Network and hook-up to the Internet occurred at seven of the eight high school sites during May and August 1997. The eighth site achieved Internet capability in November 1997; the ninth site will be connected to the Network in January 1998. On-site support and training, as needed, were provided for technical personnel at the time of installation and throughout the implementation period. In late spring 1997 and fall 1997, some individual schools conducted site-based workshops appropriate to their needs, usually involving use of the Internet. Schools began their actual delivery of distance education programming and utilization of the capacity of the regional network in August 1997.

Facilitation of Information Exchange

Throughout the planning and initial operation of the SVCC-TN at the high school sites, the Network coordinator facilitated needed exchange of information among school sites. She organized, compiled, and distributed the results of individual school needs assessments and

resource capabilities. All participants received a list of sites that contained names of teachers with recognized certifications and site requests for programming, thereby allowing participants to be aware of the collective resources and needs of all participants in the Network. Dr. Sheffield kept superintendents informed of progress of the network at semi-annual meetings at SVCC and through periodic memos sent to them. I attended three of these meetings: September 23, 1996, April 29, 1997, and October 29, 1997, and recorded notes and comments.

Based upon personal research, I identified several print and multi-media resources that were relevant to schools that were involved in the process of implementing distant education. I obtained copyright releases to distribute the materials. Dr. Sheffield reviewed the materials and arranged for copies to be made for each school site. During the workshop sessions, we discussed these materials with school team members, explained how they related to the current project, and suggested that these items be used to provide their schools with a beginning library of reference materials relating to distance education. Appendix M contains a list of these resources.

Personal exchanges among participants of various school sites attending the training sessions furthered the flow of information. Two scheduling meetings of school representatives were held in Summer 1997, one in June and the second in August, to discuss and confirm programming plans for Fall 1997 that involved SVCC-TN.

Staff development: The model

I as researcher collaborated extensively with the project coordinator, Dr. Linda Sheffield, in planning the training for the high schools. I developed a staff development model (that was reviewed by Dr. Sheffield) that was based upon research from the change literature (Sarason, 1982; Cox, 1983; Miles, 1983; Huberman, 1988; Hord, Rutherford, Huling-Austin and Hall, 1987; Fullan 1991; Jacobs, 1994), adult learning theories (Knowles, 1975, 1984), and staff development studies (Joyce and Showers, 1982; Sparks, 1983; Joyce, 1991; National Staff Development Council, 1995; Tanner, Canady, and Rettig, 1995; Harrington-Lueker, 1996; Sparks, 1996). Critical aspects of this model are discussed below.

Timing of Staff Development

Teachers need time to explore the uses and operation of various technologies. The design of this study reflected research results of Guskey (1986), who reported that structuring training throughout the year and providing time for discussion and review of implementation attempts were key factors in implementing changes in teachers' practices. As the National Commission on Time and Learning (1994) noted, it is a "myth that schools can be transformed without giving teachers the time they need to re-tool themselves and reorganize their work" (p. 8). The Commission cautioned against taking staff development time from instructional time. "We will never have truly effective schools while teachers' needs are met at the expense of students' learning time" (p. 36). The Commission suggested embedding periods of staff development during the school day and providing opportunities for selected groups of participants to receive training on a rotating basis. It also noted that holding staff development during the school day sends a strong message to participants regarding the importance of the material. In this study Dr. Sheffield, the SVCC-TN coordinator, used grant funds to pay for substitutes and for travel so school teams could receive staff development during the school day. This allowed a group of teachers and administrators to receive training without disrupting the school day for the majority of students, a recommendation also supported by Tanner, Canady, and Rettig (1995).

Features of Staff Development Model

The model used to plan and develop staff development activities for high schools participating in SVCC-TN had four major components. These were similar to elements associated with the implementation plans for other innovations, but contained features that were specific to the introduction of distance education in rural schools. Plans for staff development associated with SVCC-TN included:

1. Selection of a heteroarchical telecommunications team by each school that reflected the broad interests and levels of authority of the school staff and student population.

2. Completion of a needs and resource assessment by each school prior to training and implementation, and again, during the training/implementation process.

3. A continuous program of staff development with numerous opportunities for feedback, interaction, and learning, followed by an on-site trial period. In this model, staff development does not end with delivery of programming. It is intended to continue throughout the evolution of the Network.

4. A plan for continuous evaluation that included survey, observational, and interview data that was analyzed using qualitative or quantitative methodologies, as appropriate. Evaluation extended throughout the operating phase when schools had access to the Internet and could originate and receive distance education programming. The end of study questionnaires and focus group interviews were part of the evaluation process.

Each component is discussed below in further detail.

1. School Telecommunications Team. Reports in the literature show that "top-down," "bottom-up," and "intermediate-level" approaches, collectively, are needed to diffuse innovations (Loucks-Horsley, 1988; Fullan, 1994). "Organizations that build an adaptive capacity to innovate tend to accelerate future adaptions" (Orlich, 1989, p. 162). One way to promote an adaptive capacity is to change the traditional hierarchical management structure prevalent in schools. Numerous groups and organizations now advocate an interdisciplinary, teamed approach involving school staff, faculty (and even students) for implementation of new programs (Turner, 1994; National Staff Development Council, 1995; "Inside AEL: Interdisciplinary Teamed Instruction, 1996; National Commission on Teaching & America's Future, 1996). The school telecommunication teams developed in this study represented differing levels of authority.

Because members of a school team represented different constituencies within the school community, it was thought that a school team approach to training would be an effective strategy for diffusing progress of the innovation within local sites. Training, therefore would create a talent pool for each school. Using this approach, team members would:

- become knowledgeable about distance education and the use of the VTEL equipment,

- have the opportunity to observe distance learning practices that other groups found effective for their needs, and

- be able to experiment with distance education delivery on a trial basis.

Team members, it was felt, could then return to their school setting and become the "change agents" who would facilitate discussions regarding the applications and potential of distance education. Thus, they could help diffuse distance learning practices and opportunities throughout the school community. This approach incorporated the findings of Rogers and Shoemaker (1971). These authors felt that institutions were more likely to adopt a mandated change (a) if they see an advantage to using it, (b) if it is not too complex, (c) if it is compatible with their own values, (d) if they can observe its effectiveness, and (e) if they can experiment with it on a trial basis.

Additionally it was anticipated that a school teams approach to training teams would offer school teams the opportunity to utilize the varied expertise of team members to enhance the learning experience for each other. This type of collegial support and peer-coaching are well-recognized as enhancing the progress of an innovation (Joyce and Showers, 1982; Showers, 1985; Seller and Hannay, 1988; Sergiovanni, 1996).

Rationale for including the principal on the team. Support for including the principal on the School Telecommunications Team is provided by research associated with transformational school leadership (Mitchell and Tucker, 1992; Leithwood, 1994) and change literature (Berman and McLaughlin, 1978). According to Fullan (1982), "All major research on innovation and school effectiveness shows that the principal strongly influences the likelihood of change" (p. 71). According to Leithwood (1994), school restructuring requires...

> ...a form of leadership that is sensitive to organization building: developing shared vision, creating productive work cultures, distributing leadership to others, and the like....Transformational forms of leadership especially are attuned to the influence of, for example, organization structure and culture on the meaning people associate with their work and their willingness to risk change (Leithwood, 1994, p. 501).

Research on the adoption of innovations in schools has consistently noted the key role of administrative leaders in successful implementation. According to Fullan (1991), involved and

supportive superintendents are central to districtwide reform efforts, and principals are key to implementation at the building level within the school building.

Bennett (1996) discussed the involvement of principals in projects associated with infusion of technology into their schools.

> Effective principals understand not only what hardware and software are capable of doing, but also how they can be used effectively in the classroom....Principals must model the message by becoming active participants in whatever programs are established (p. 61).

Other research studies and reports involving technology integration (Bozeman, Raucher and Spuck, 1991; U.S. Congress, 1995; Armstrong, Davis, and Young, 1996) have confirmed the critical role of the principal. "Principals need to be involved in training, not only to learn the skills, but to build trust and become a member of a community of learners" (Armstrong, Davis, and Young, 1996, p. 87). The Office of Technology Assessment (OTA) "has consistently found that when administrators are informed about and comfortable with technology, they become key players in leading and supporting technology integration activities in their schools" (U.S. Congress, 1995, p. 153). Gerry House, superintendent of schools in Memphis, TN, commented on the dramatic change in the role of the principal in the last few years in an interview with Harrington-Lueker.

> "With the push toward making certain that all children learn to high standards, a principal has to first and foremost be an instructional leader. In technology, that means having the principal learning...how technology works and what it look like in the classroom...Sometimes (the training) will be alongside teachers, and sometimes it will be with just other principals" (quoted in Harrington-Lueker, 1996, p. 43).

Rationale for including students on the team. School-based management practices have a history of involving students in some levels of governance (Myers and Stonehill, 1993). As early as 1980, Arends, Schmuck, and Arends (1980), researchers associated with organizational development (OD), recommended students as organizational participants in schools. In reviewing student involvement in the Georgia-based League of Professional Schools,

Roberts and Dungan (1993) cited as a weakness the low student involvement, implying that more student input would be valued.

Students often are more technologically literate than many teachers. According to Harrington-Lueker (1996), "When it comes to using instructional technology, the kids keep passing us by" (p. 33). Students may have perceptions that differ from the adults; their comments may be very beneficial in the progress of the innovation. The insight of students who serve as participants in the staff development activities also may prove very valuable in creating a school climate receptive to new learning processes. Students are the individuals whose learning is being affected by the introduction of the compressed video technology; they need to be involved in the training. This view is supported by other school districts that are beginning to involve their students in managing school technology resources (Holzberg, 1997; Trotter, 1997a).

2. Needs Assessment. According to Krumholz and Johnstone (1988), effective staff development must be based on a profile of the intended audience. The form I developed (Appendix B) is a very simple needs assessment form, but I felt it was non-threatening to schools. It identified the critical components needed to operate a telecommunications network within the local site and asked schools to collect this information. Information on this form regarding telephone and fax numbers assured that SVCC had current communication information for all school sites.

3. Continuous program of staff development. For students to become technologically competent, teachers must become knowledgeable about technology. As the National Commission on Teaching & America's Future (1996) stated, "What teachers know and can do makes the crucial difference in what children learn" (p. 5). Yet, despite its importance, training is an often overlooked component of the cost of introducing an innovation. A national research survey conducted in 1992-93 (Market Data Retrieval, 1993) reported data about U. S. school district expenditures for educational technology. This survey found that an average of 55 percent of all technology spending went for hardware, with about 30 percent allocated for software, and only 15 percent for staff development and training. This amount for training is about half of what technology experts in some states have recommended be spent in this area ("A

Technology-Ready State," 1993; Anderson, 1994). Some "states--Florida, Texas, and California among them--have begun to specifically target technology professional development by requiring local school districts to spend as much as 30 percent of certain state technology funds on teacher training" (Harrington-Lueker, 1996, p. 33). White (1997) reported on the technology training programs for West Virginia, "a state that often receives praise for its school-technology efforts" (p. 13). In this state about 30 percent of the funds allocated for technology now are ear-marked for professional development programs.

In this study, school teams received both formal and informal training opportunities over a several months period. Not only is it considered important that funding be allocated to provide initial training, but it must be budgeted for continued support of schools involved in a project. "Some experts believe that 50% of the resources set aside for staff development should be directed at follow-up" (National Staff Development Council, 1995, p. 31). Groups like the National Commission on Teaching & America's Future (1996) and the Texas Staff Development Council (1996) concur.

There were two group training sessions, one in December 1996 and another in April 1997. In order to have a manageable size cluster, school telecommunications teams were divided into two sections for the December training. Groups attended on successive days. At the start of the training, I distributed a list of goals and objectives (that I had prepared and Dr. Sheffield had reviewed) for the entire training process (Appendix K).

I conducted training on the first day by myself (Dr. Sheffield was unable to attend); Dr. Sheffield joined me on the second day. This training session covered the changing role of technology in society and in schools, with an emphasis on the evaluation of distance education in K-12 schools. (Appendix L contains the agenda for this session.) The format included lecture, large and small group discussions, and videos (donated to me by Pacific Mountain Network of Denver, CO) that displayed various applications of distance education in schools throughout the U.S.

Following each staff development session, school teams were assigned "homework." Each team was given copies of videos and relevant research articles on distance education. Teams

were asked to prepare a 2-4 minute multi-media presentation that showcased their schools and could be demonstrated over the teleconferencing system at future workshops. It was hoped that these assignments would help school teams bond with one another and would promote learning about technology applications and the potential of the teleconferencing system. "A common strategy to train teachers in many different topic areas is 'train the trainers'" (U.S. Congress, 1995, p. 145). Based on this premise, it was hoped that school telecommunications team members would become the "trainers" and would diffuse information regarding distance education and progress of the Network among their local sites. Dr. Sheffield asked teams to relay the information about distance education and the VTEL conferencing system that they had gained through the workshops and extended activities to various groups that included teachers, administrators, school boards, students, and local community leaders, etc. at their local sites.

Feedback from open-ended questionnaires (Appendix E) distributed at the first training session communicated that participants were very nervous regarding their ability to work with the teleconferencing equipment. As a result, the project coordinator (Personal communication, L. Sheffield, January 1997) decided to offer individual hands-on training for each school team. These sessions were held during January and February 1997 (Representatives from eight of the nine schools in the network attended a hands-on training session.). They generally lasted four to five hours, with time allowed for everyone to experiment with the equipment, and for questions, discussion, and feedback. During the session, school teams demonstrated their multi-media presentations that highlighted features of their schools sites. These were designed to serve as "feeds-ins" for future distance education programming, a feature recommended by Drops (1996).

Original training plans envisioned that SVCC-TN participants would use the third session and multi-point to multi-point transmission to deliver mini-lessons to one another. The delays in school connectivity necessitated a change in design. Consequently, the third session, held in April 1997, became an interactive videoteleconference (that I arranged). The VTEL system was used to link four sites located throughout Virginia: Northern Virginia Community College (NOVA), Southwest Virginia Community College , and the two campuses of Southside Virginia Community College (Keysville and Alberta). Ms. Virginia Ward, an instructor at NOVA,

presented an interactive German lesson. At Southwest Virginia Community College, Mr. Steve Perry, technology coordinator of Tazewell County Public Schools, led a panel consisting of five teachers and a facilitator, parent and student, that discussed the advantages and opportunities, as well as the problems that Tazewell County had faced in its three year old distance education program. All of the teachers presented examples that demonstrated how they had integrated the technology into their curricula with effective, and in some case, enhanced pedagogy. They emphasized their own classroom experiences--in English, social studies, math, foreign language and art classes--with teaching at a distance. Participants located at remote sites exchanged questions and answers; discussion followed.

During the first three to four months following the hookup to SVCC-TN, schools experimented with a variety of programming so as to give instructors, classroom facilitators, and students experience in working with distance education technology. Establishment of Internet accounts for schools expanded use of the system and facilitated exchange of information.

Fullan (1992) described an "implementation dip" that occurs in implementation programs once formal staff development activities end and participants return to the classroom. Anticipating this "implementation dip," it was hoped that (a) school telecommunications teams could support one another during training and experimentation, and (b) the availability of technical support staff from SVCC or Longwood College to the high schools might help prevent, or at least diminish, the dip. The project coordinator requested frequent feedback so that she could monitor the progress of school plans for distance education, the actual installation and implementation of distance education operations, and make adjustments as needed. Once school lines were installed, schools had access to distance education courses originating at SVCC. School telecommunication teams were invited to communicate with instructors who were delivering instruction via the VTEL system to students at remote sights.

4. Continuous Evaluation. According to Orlich (1989), evaluation of an innovation needs to be continuous in order to adjust and improve components in a timely manner. The CBAM model views change as a process, not an event (Hord, Rutherford, Huling-Austin, and Hall, 1987). It offers a strategy for identifying concerns and enabling "change facilitators to

provide vital assistance through appropriate actions...(thereby) maximizing the prospects for successful school improvement projects while minimizing the innovation-related frustrations of individuals" (p. 7).

For this project, several forms of formative evaluation were employed. Informally, schools communicated extensively via telephone and, once lines were activated, via e-mail with the project coordinator regarding their needs and concerns. The coordinator shared progress of the Network with me via e-mail or telephone, and I recorded notes of these conversations.

The same closed-ended questionnaire that addressed perceived attitudes, level of concern, and self-efficacy toward delivery of distance education was administered to site facilitators (administrators, teachers and selected staff) prior to training and, again, at the close of the study in November 1997 [Appendix D]). One component (*Section II)* included the 35-item Stages of Concern (SoC) questionnaire from the CBAM model. An open-ended question was included at the end of the final questionnaire that asked for information regarding concerns about distance education and use of the Network. Open-ended surveys (Appendix E) were distributed at each of the staff development workshops. Using these surveys in this study correlates with the strategy advocated by Newlove and Hall (1987) who stated, "One simple and straight-forward way to find out what innovation user and nonuser concerns are is to use the 'Open-ended Statement of Concern About an Innovation'" (p. 1).

Focus groups were employed to engender additional responses. After two to three months of a trial period, school telecommunications team members were asked to participate in one of three focus groups. Further information was collected from principals at the close of the study. Principals were asked to complete a Principal's Narrative Report that detailed current use and future plans for the network, as well as issues of concern.

The questionnaires and focus groups served two purposes. They provided formative evaluation and offered varied formats for site facilitators to communicate their concerns and the progress of the distance education program. Notes, interviews, recorded observations and reflections of the researcher added to the information that I collected as a researcher/participant in this study.

Each of the evaluation methods has limitations. Self-reporting, written questionnaires provide useful, but incomplete information regarding the progress of an innovation and the concerns of those involved in its implementation. Focus groups provide a different type of feedback than do self-reporting, written questionnaires. The presence and interaction of the group often provides insights that may have been missed by individual responses to surveys (Stewart and Shamdasani, 1990).

Research on evaluative methodologies supported the evaluations that were used in the staff development process. Participants had many opportunities and differing formats for conveying their questions and concerns. According to Fetterman (1989) and Kirby (1995), employing multiple data collection techniques and a variety of data sources assures comprehensive empirical evidence is collected and participants' experiences and beliefs are documented.

Based on feedback from the participants, the project coordinator was able to modify activities for future staff development efforts. For example, based upon participants' concerns, as expressed in an open-ended questionnaire distributed after the first training session, she decided to offer each school hands-on training for their team, rather than conduct large group training. Focus group interviews served as a rich source of suggestions for future activities and operation of the Network (See Chapter 5).

Conclusion

It is important to get feedback regarding all components of an innovation at periodic intervals, long before a final "summative" evaluation can be conducted. According to Berman and McLaughlin (1978, 1980), innovations often take five years for complete integration. For a comprehensive evaluation of distance education using compressed video, it is necessary to obtain periodic formative evaluations on the quality of the technology; the instructional materials and delivery; the attitudes, the performance, satisfaction and self-efficacy of each group of participants; and the overall perceived effectiveness and utilization of the innovation throughout

the school community. The surveys and focus groups associated with this study provided valuable insight into needs and concerns of participants.

However, this study focused only on the initial process of implementation of distance education in rural high schools. It was devoted to observing the behaviors of a cadre of leaders in schools who participated in a joint effort that linked eight different rural school districts (nine high schools) with both a 2-yr. and 4-yr. institution of higher education in a telecommunications network. Only a flexible staff development process, one that could adapt to just-in time training, could meet the needs of this diverse group of learners. For the next stage in the implementation process, the network itself holds the key for future learning opportunities. Involvement of policy makers will be critical for optimizing the potential of the network.

Chapter 5

Results

The findings of this case study that examined the process of implementing distance education into nine rural high schools during the period October 1996-November 1997 are described in this chapter. References to unpublished documents that provided historical background for this study and to data that supported the findings are identified by upper-case numerals, e.g.

> **"The Vision"** of Southside Virginia Community College Telecommunications Network (SVCC-TN) was to provide distance learning, information sharing, enhanced learning, resource sharing and access to national and global resources to secondary and post-secondary schools (Sheffield and Bratcher, 1996).[1]

Full citation of these references is found in the **footnotes** below.

To generate my overall findings, I analyzed data obtained from closed-ended questionnaires, administered prior to the start of staff development and at the close of the study, and varied qualitative data collection sources. These findings provided me with information on the current status of SVCC-TN at high school sites and insight into the nature of the responses of these school sites and the corresponding school systems to the new communication technologies available through the telecommunications network. Although this was a single case study, the findings of this research might be expected to reflect the challenges and experiences of other rural schools as they explore enhanced teaching and learning opportunities available via emerging telecommunication technologies.

This chapter is divided into four sections. The first section contains key indicators that represented the state of the network at the close of the study (November 1997) and how it was being utilized in schools. The second section provides results of the closed-ended questionnaires, administered both before the staff development began (December 1996) and at the end of study

[1] L. G. Sheffield and R. W. Bratcher. Overview: Southside Virginia Community College Telecommunications System. Developing A High Performance Learning Community. December 1995.

(November 1997). The third section documents the results obtained from triangulation of all quantitative and qualitative data collection sources and includes support for each of these findings. The fourth section is a summary of the results and answers the research questions that were posed at the start of the study.

Status of the Network: November 1997

In November 1997, all nine high schools participating in Southside Virginia Community College Telecommunications Network (SVCC-TN) provided some form of input into the findings of this case study, either through principal narrative (4 out of 9 schools), completion of questionnaires (7 out of 9 schools), or attendance at one of the three scheduled focus group interviews (7 out of 9 schools). I obtained further information regarding the status and future plans for the network from Dr. Frank Moore, a representative from Longwood College who was present in the focus group interviews. This was significant because one of the goals of the network was to connect high school sites to higher education facilities so that both students and teachers could take advantage of enhanced learning opportunities. Dr. L. G. Sheffield of SVCC, coordinator for the telecommunications network, joined me as a co-moderator of the focus groups. The key features that represented the high schools' participation in SVCC-TN are listed in **Table 5**.

By November 1997, eight of the nine sites in the study had been connected to the Network.[2] By January 1998, the ninth will have been connected and, at that time, will be joined by a 10th site, Cumberland County High School. Initial efforts of schools appeared to have been directed towards enhanced communication opportunities and sharing of resources. Six of the eight schools were using the Internet through the Network. Only two schools had established student and faculty E-mail accounts through the Network, but others were working towards this goal.[3]

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[2] Researcher Notes. Superintendents' Meeting (October 29, 1997).

[3] Sheffield, L. (SVSHEFL@sv.cc.va.us). (1997, November 11). Re: Internet. E-mail to J. McNeal (JMCNEAL@vais.net).

Thirteen distance education courses were offered in Fall 1997 to high school sites by SVCC via the Network.[4] Four high school sites had enrolled students in distance education courses. One site had only adult education students enrolled; one site had adults and high school students, and two schools (both in the same district) were delivering a Dual Enrollment, college-level course between these two sites.[5, 6, 7, 8]

In focus group interview #1, Dr. F. Moore announced that Longwood College would be offering three staff development courses via the Network that "*will be tied to the SOL's*"[9] during Spring 1998. The SVCC Distance Education Spring 1998 Course Schedule,[10] distributed October 1997, showed that thirteen courses would be offered via the Network in Spring 1998 and would be open to high school students.

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[4] Schedule for Fall 1997 Southside Virginia Communications Network Classes.

[5] Sheffield, L. (SVSHEFL@sv.cc.va.us). (1997, September 10) Re: SVTN. E-mail to J. McNeal (JMCNEAL@vais.net).

[6] Researcher Notes. (1997, September 16). Telephone conversation between L. Sheffield and J. McNeal.

[7] Researcher Notes. (1997, September 16). Telephone conversation between L. Sheffield and J. McNeal.

[8] Researcher Notes. (1997, October 29). Superintendents' Meeting.

[9] Researcher Notes, November 6, 1997.

[10] Spring 1998 SVTN Communications Network Classes.

Table 5. High School Utilization of SVCC-TN: November 1997

Sources of information	Number
1. # Schools providing feedback at end of study through focus groups, interviews and narratives.	9/9
2. # Principal/administrator narratives received.	4/9
3. # Schools represented in focus groups (Longwood College and Southside Virginia Community were also present).	7/9
4. # Schools whose team members returned questionnaires.	7/9
Status of Technology and Use of Network (Nov. 1997)	
1. # Schools hooked up to Network (SVCC-TN). (A 10th will join in January 1998).	8/9 9th and 10th hookups are imminent
2. # Schools using Internet through Network.	5/8 of those connected
3. # Schools using Network for student/faculty E-mail accounts.	2/8 of those connected 3rd school is near goal
4. # College courses offered Fall 1997 by SVCC via Network and available at high school sites.	13
5. # High school sites enrolling students in courses delivered via Network. Fall 1997.	4
5. # High school sites enrolling high school student in courses delivered via Network. Fall 1997.	3
6. # Schools using Network to deliver high school courses.	0
Attendance/Participation in Workshops	
1. # School teams attending hands-on training.	8/9
2. # Schools whose administrators attended hands-on training.	5/9
3. # Schools with students represented on teams (in this initial phase).	4/9
Technology Support at School Level	
1. # Schools that have identified technical contact for Network.	8/9
2. # Schools that have identified Distance Learning Coordinator.	7/9
Change in Leadership in Schools/Districts: 1996-7 to 1997-8	
1. # School divisions with new superintendents (between September 1996 and September 1997).	2/8 3rd change: June 1998
2. # Schools with new principal (Actually 3 administrators) between January 1997 and September 1997	1/9
Spring 1998 Network Courses Planned for Spring 1998	
1. # Courses originating from SVCC.	13
2. # Staff development courses originating from Longwood College.	3
3. Dual Enrollment Japanese originating from Randolph-Henry High School and received at Longwood College.	1

Findings from Closed-ended Questionnaires

Perceived Attitudes Towards Implementation of Distance Education

The attitude component of the questionnaire (*Section I)* was composed of 31 items that related to the five attributes of innovation identified by Rogers and Shoemaker (1971) as being critical to the acceptance or rejection of an innovation: relative advantage, compatibility, complexity, trialability, observability. Participants responded to a 5-point Likert scale (1=Strongly Disagree; 2=Disagree; 3=Undecided; 4=Agree; 5=Strongly Agree). Items with negative stems were reverse scored.

I calculated the means and standard deviations for each statement on the initial questionnaire for the entire group and for the two sub-groups, administrators and classroom facilitators. It is noteworthy that the means of each of the five categories relating to the attributes of innovations are essentially the same for the total sample and for the two sub-groups of administrators and classroom facilitators (referred to hereafter as "facilitators" [**Table 6**]). As a result, I used whole group data for further analysis and reporting. Administrators did exhibit a slightly more positive attitude towards distance education than the facilitator sub-group, but the

Table 6. Category Means for **ATTITUDES** towards Distance Education (Initial Questionnaire)

Category	All Participants (n =29)	(Classroom) Facilitators (n = 24)	Administrators (n = 5)
Relative Advantage	3.88	3.85	4.06
Trialability	3.79	3.79	3.73
Observability	3.68	3.62	3.97
Compatibility	3.43	3.41	3.50
Complexity	3.13	3.11	3.23
AVERAGE	3.58	3.56	3.70

size of the sample rendered any statistical significance of the results meaningless. Trends however, can be established from these results that might be expected to pertain to similar samples.

Using data obtained from the initial questionnaire, I found the most positive level of responses to be for the three attributes: "relative advantage" (mean = 3.88), "trialability" (mean = 3.79), and "observability" (mean = 3.68). For this study, statements that related to "relative advantage" addressed the value of the innovation as an enhancement to the school's academic program and for providing equity for the district. "Trialability" related to the issue of providing a trial period before distance delivery of programming became institutionalized. Perceived trialability of an innovation has been shown to be positively related to its rate of adoption (Rogers, 1983). Statements that addressed "observability" pertained to whether or not the innovation was perceived by students and the community to provides resources to meet different learning styles, heighten student interest, and demonstrate use of technology in the school setting. According to Rogers (1983), the greater the degree of observability, the higher the rate of adoption.

The means and standard deviations, as well as the magnitude of the change, for each statement associated with attitude towards distance education, are listed in **Table 7**. Columns one and two represent data obtained prior to research; columns three and four are for data collected at the close of the study; column five shows the change between the two means.

Prior to the start of the study, the most positive response was obtained for the statement:

> *"1: Distance education can be a valuable addition to the programs in my district" (mean = 4.41).*

This result indicated that school team members recognized the potential for enhancing learning opportunities through participating in a telecommunications network. Respondents also felt strongly that there was a need for involving administrators in the in-service training involving distance education as measured by their positive response to Item 17:

TABLE 7.

Initial and Final Means and Standard Deviations and Changes in Means for Items Dedicated to *Attitudes Towards Distance Education (Section I of questionnaire)*

Administrators and Classroom Facilitators--Total Group

Item	Category	Initial		Final		Change
		Mean	SD	Mean	SD	
	RELATIVE ADVANTAGE					
6	costs outweigh potential benefit	3.28	0.83	3.19	1.01	-0.09
26	prepares students for "information age"	3.66	0.85	4.15	0.58	+0.49
31	can make students more effective learners	3.76	0.78	3.60	0.58	-0.16
21	can help provide equity for the district	3.97	0.67	3.75	0.70	-0.22
16	can do little to enhance district's courses	4.03	0.77	4.10	0.62	+0.07
11	can expand/enhance curricular offerings	4.07	0.58	4.05	0.58	-0.02
1	valuable addition to our school's program	4.41	0.72	4.52	0.66	+0.11
	COMPATIBILITY					
14	hard to coordinate with other schools	2.83	1.05	2.29	1.20	-0.54
24	public is in favor of distance education	3.14	0.43	3.05	0.50	-0.09
30	teachers will not see it as a job threat	3.38	0.81	3.45	0.81	+0.07
4	is a current fad	3.52	0.85	3.81	0.91	+0.29
19	is compatible with maximizing learning	3.66	0.66	4.00	0.55	+0.34
9	valuable enrichment programs possible	4.03	0.72	4.29	0.55	+0.26
	COMPLEXITY					
15	difficult to know how to start a program	2.62	0.77	2.57	0.85	-0.05
10	difficult to find non-technical articles	3.03	0.62	3.14	0.77	+0.11
29	confused by technical terms	3.14	0.90	3.45	0.81	+0.31
5	is not difficult to understand	3.17	0.91	3.81	0.85	+0.64
25	feel comfortable with the technology	3.28	0.79	3.80	0.68	+0.52
20	stresses technology over education	3.55	0.68	3.85	0.65	+0.30
	TRIALABILITY					
12	should be able to quit if unsuccessful	3.28	0.74	3.67	0.71	+0.39
2	no trial period before purchase	3.52	1.33	3.38	1.25	-0.14
27	too hard to institute without trial period	3.52	0.82	3.20	0.87	-0.32
7	should be tried on a small scale first	3.83	0.59	3.67	0.95	-0.16
22	belongs more in developing countries	4.28	0.74	4.00	0.55	-0.28
17	not involve administrators in inservice	4.28	0.86	4.40	0.49	0.12
	OBSERVABILITY					
18	won't see more student/teacher interaction	3.07	0.90	2.90	0.91	-0.17
28	teachers won't respond positively to distance education	3.34	0.66	3.30	0.71	-0.04
13	won't lead to increased student interest	3.86	0.78	3.48	0.68	-0.38
3	provides resources to meet learning styles	3.90	0.66	3.62	0.72	-0.28
8	shows parents school use of technology	3.93	0.45	4.05	0.72	+0.12
23	teachers and students will use dist.ed.	3.97	0.62	4.00	0.63	+0.03
		n = 29		n = 21		

* ITEMS UNDERLINED REFLECT NEGATIVE STEMS. Values listed are the reverse scores.

> *"17 (reverse scored): It is not necessary to involve school administrators in distance education in-service programs" (Mean = 4.28).*

The lowest initial level of positive response was obtained from questions addressing the compatibility and complexity of the innovation, in particular to questions that addressed starting a program:

> *"15 (reverse scored): It is difficult to know where to begin when you want to start a distance education program" (Mean = 2.62)*

and coordinating the program with other schools:

> *"14 (reverse scored): Distance education programs are hard to coordinate when they involve more than one school system" (Mean = 2.83).*

The category means relating to perceived attitude for questionnaires obtained at the start and at the close of the study are listed in **Table 8**. Four of the five attributes associated with attitudes towards innovation: "relative advantage," "compatibility," "trialability," and "observability" showed essentially no change.

Table 8. Category Means and Changes in Means for **ATTITUDES** Towards Distance Education delivered via Compressed Video

Category	Initial (n =29)	Final (n = 21)	Change
Relative Advantage	3.88	3.91	+0.03
Trialability	3.79	3.72	-0.07
Observability	3.68	3.56	-0.12
Compatibility	3.43	3.48	+0.05
Complexity	3.13	3.44	+0.31
AVERAGE	3.58	3.62	+0.04

The change in means varied between -0.12 and +0.05. The category mean that showed the largest change was related to ease of use (Complexity). This mean had a positive gain of +0.31, from 3.13 to 3.44, and indicated that team members felt more comfortable with distance

education technology following staff development and their experience at their schools. "Relative Advantage" (mean = 3.91/5.00 at end of study) and "Trialability" (mean = 3.72/5.00 at end of study) were the most positive response categories at the start and at the end of the study. These values indicated that participants recognized that distance education would be a valuable addition to their school educational program, but that they would like to have a trial and experimentation period before formalizing the program.

Positive changes greater than 0.40 between the start and the close of the study (Table 7) were found for means of individual statements relating to "complexity":

"5: Distance education is not difficult to understand" (+0.64),

"25: I feel comfortable with distance education technology" (+0.52),

and "relative advantage":

"26: Distance education is effective in preparing students for learning in the information age" (+0.49).

The largest negative change in means was calculated for the statement addressing coordination with other schools:

"14 (reverse-scored): Distance education programs are hard to coordinate when they involve more than one school system" (-0.54).

At the close of the study this statement received the most negative response, 2.29/5.00.

Perceived Self-Efficacy Towards the Innovation

The self-efficacy component of the survey *(Section III)* was composed of 28 items that addressed skills and competencies associated with implementation of distance education. These were classified into five sub-categories: comfort/anxiety towards the innovation; comfort levels regarding use of electronic mail, fax machine, videoconferencing equipment; and serving as a change agent in helping students learn via distance education programming. Participants responded to a 5-point Likert scale (1=Strongly Disagree; 2=Disagree: 3=Undecided; 4=Agree; 5=Strongly Agree). Items with negative stems were reverse scored. The category means for the total group and the two sub-groups of administrators and classroom facilitators at the start of the

study were calculated and are listed in **Table 9.** Differences between the groups ([classroom] facilitators and administrators) were insignificant for two categories: comfort/anxiety level and comfort level towards use of videoteleconferencing equipment. Although not statistically significant, administrators reported greater confidence than facilitators towards use of fax equipment (mean = 4.40 for administrators; mean = 3.74 for [classroom] facilitators), for electronic mail (mean = 3.83 for administrators; mean = 3.42 for [classroom] facilitators); and for serving as change agents to help implement distance education in schools (mean = 3.17 for administrators; mean = 2.84 for facilitators). These results confirmed a traditional division of responsibilities in secondary schools.

Table 9. Category Means for **SELF-EFFICACY** towards Distance Education (Initial Questionnaire)

Category	All Participants (n = 29)	(Classroom) Facilitators (n = 24)	Administrators (n = 5)
Fax Machine	3.85	3.74	4.40
Comfort/Anxiety	3.67	3.65	3.77
Electronic Mail	3.49	3.42	3.83
Change Agent	2.90	2.84	3.17
Videoteleconferencing	2.65	2.63	2.73
AVERAGE	3.31	3.26	3.58

The lowest level of perceived self-efficacy was reported by participants in the category involving use of the videoteleconferencing equipment (mean = 2.65 for the combined group). This value, reported prior to any training, appeared to be high. Some individuals had attended an information session given in May. However, even though participants were asked to respond at their *current* comfort level, these were a group of highly motivated and competent individuals (who had been selected by their principals for these traits) and may not have felt comfortable

responding, "*I strongly disagree...*" to questions regarding their confidence regarding use of videoconferencing equipment. The observer overheard conversations among participants of this nature, e.g., "*Of course, I can do this; you just have to show me what to do*," while they were completing the questionnaire.[11]

For each of the statements associated with self-efficacy, I combined the data for administrators and facilitators and determined the means and standard deviations. Those values, calculated at the start and the close of the study, are presented in **Table 10**, as well as the amount of change that occurred over time. The values in the first two columns represent the means and standard deviations for all participants at the start of the study. Columns three and four represent data obtained at the close of the study; the change in means between the initial and final questionnaires is listed in column five.

At the start of the study, the most positive results were found for statements associated with "Comfort/Anxiety" towards distance education.

> *"1: I feel at ease learning about distance education technologies." (Mean = 4.00) and*
>
> *"2: (reverse scored): The thought of using distance education technologies frightens me" (Mean = 4.03).*

The strongest negative responses were calculated for statements that addressed use of the videoteleconferencing system (Items 17-21: means 2.31-2.93) and confidence levels for serving as potential change agents who would use or manage a distance education program (Items 23-28; means = 2.72-3.10). The two statements receiving the lowest means in the latter category included:

> *"26: I feel confident managing a distance education course as a receiving site." (Mean = 2.72) and*
>
> *"28: I feel confident in using the distance education system to deliver programming to a community audience." (Mean = 2.76).*

[11] Researcher Notes, December 3, 1996.

TABLE 10.

Initial and Final Means and Standard Deviations and Changes in Means for Items Dedicated to *Self-Efficacy towards Distance Education (Section III of questionnaire)*

Administrators and Classroom Facilitators--Total Group

Item	Category Statements	Initial		Final		Change
		Mean	SD	Mean	SD	
	COMFORT/ANXIETY					
6	am anxions about using distance ed. technologies; they may fail	3.00	1.02	3.70	1.14	+0.70
4	feel comfortable about my ability to work with distance education technologies	3.45	0.89	4.00	0.77	+0.55
5	distance ed. technologies are confusing	3.66	0.88	4.05	0.87	+0.39
3	am not the type to do well with electronic technologies	3.86	1.04	4.30	0.64	+0.44
1	feel at ease learning about dist. education	4.00	0.75	4.20	0.68	+0.02
2	thought of using dist. ed. technologies frightens me	4.03	0.92	4.00	1.09	-0.03
	ELECTRONIC MAIL-*I feel confident...*					
12	sending messages to multiple recipients	3.14	1.25	3.60	1.32	+0.46
10	deleting messages	3.52	1.31	4.15	1.24	+0.63
13	logging off	3.52	1.28	4.15	1.24	+0.63
7	logging on	3.52	1.33	4.20	1.21	+0.68
11	sending messages	3.52	1.31	4.20	1.21	+0.68
9	answering messages	3.59	1.28	4.20	1.21	+0.61
8	reading message	3.62	1.25	4.20	1.21	+0.58
	FAX MACHINE-*I feel confident...*					
14	connecting to remote site	3.79	1.30	4.45	1.12	+0.66
15	faxing a 1-page document	3.83	1.21	4.45	1.12	+0.62
16	faxing a multiple page document	3.93	1.14	4.45	1.12	+0.52
	VIDEOTELECONFERENCING *I feel confident...*					
22	operating the Elmo projector properly	2.31	1.09	3.33	0.95	+1.02
21	recording sessions with the VCR	2.52	1.22	3.05	1.09	+0.53
19	adjusting camera for viewing remote site	2.62	1.27	3.62	1.09	+1.00
18	adjusting camera for receiving site	2.66	1.30	3.62	1.09	+0.96
20	using the microphones properly	2.83	1.24	3.71	0.99	+0.88
17	dialing remote sites	2.93	1.34	3.38	1.09	+0.45
	CHANGE AGENT *--I feel confident...*					
26	managing a receiving site distance course	2.72	1.08	3.33	1.17	+0.61
28	using dist. ed. for community audience	2.76	1.10	3.24	1.15	+0.48
24	conducting discussions at receiving site	2.90	1.12	3.14	1.21	+0.24
25	helping students “connect” with dist.tchr	2.90	0.99	3.43	1.09	+0.53
23	helping student learn via dist. education	3.04	1.14	3.48	1.14	+0.44
27	helping implement dist. ed at my school	3.10	0.99	3.52	1.14	+0.42
		n = 29		n = 21		

ITEMS UNDERLINED REFLECT NEGATIVE STEMS. Values listed are the reverse scores.

There was much greater variability in responses in *Section III* of the questionnaire relating to self-efficacy (**Table 10**) as compared to questions from *Section I* of the questionnaire that addressed attitudes (**Table 7**). Both sections used the same scale (1-5), with positive responses represented by higher values. The mean standard deviation for all questions involving attitude was 0.73 at the start of the study, whereas the mean standard deviation for all questions involving self-efficacy was 1.14. (At the close of the study, the mean value for the standard deviation of self-efficacy was 1.08.) These results might be explained by the varied backgrounds and technology experiences of the participants involved in the study.

At the close of the study, gains were found for 27 of the 28 statements associated with self-efficacy. The most positive changes related to statements associated with use of the videoteleconferencing equipment:

> *"19: I feel confident adjusting camera for viewing remote sites" (Change in mean: +1.00)* and
>
> *"22: I feel confident operating the Elmo projector appropriately" (Change in mean: +1.02).*

Category means representing the five sub-categories associated with self-efficacy of participants towards distance education before and at the close of the study are presented in **Table 11** along with the changes in category means. Moderate to strong positive gains (+0.37 to +0.80) were found for all categories. The comfort level towards use of the videoconferencing equipment showed the most positive gain (+0.80). Means for three of the five categories associated with perceived self-efficacy of participants towards distance education, "comfort/anxiety" level, use of "electronic mail," and use of a "fax machine" were greater than 4.00, on a scale of "1-5."

These results showed that during the period of this study, the perceived self-efficacy of school team members towards working with distance education technologies had become more positive. Most participants had gained greater confidence working with associated technologies.

Final category means for "electronic mail" and "fax machine" were 4.10 and 4.45 (out of a possible 5.00), respectively.

Table 11. Category Means and Changes in Means for **SELF-EFFICACY** towards Distance Education Technologies

Category	Initial n = 29	Final n = 21	Change
Comfort/Anxiety	3.67	4.04	+0.37
Change Agent	2.90	3.36	+0.46
Fax Machine	3.85	4.45	+0.60
Electronic Mail	3.49	4.10	+0.61
Videoteleconferencing	2.65	3.45	+0.80
AVERAGE	3.31	3.88	+0.57

Within the comfort/anxiety category, the most positive response on the final questionnaire was found for the statement:

> *"3 (reverse scored): I am not the type to do well with electronic technologies" (Mean= 4.30).*

Perceived Concerns Towards Distance Education

The Concerns-Based Adoption Model (CBAM) was developed by researchers at University of Texas at Austin to learn more about changes in school improvement processes (Hord, Rutherford, Huling-Austin, and Hall, 1987). Its purpose is to serve both as a diagnostic tool that identifies an individual's stage(s) of concern, and as an intervention mechanism for program mangers to use so as to proscribe appropriate interventions for resolving these concerns. *Section II* of the questionnaire administered in this study contained the first component, *The Stages of Concern* (SoC), of the CBAM model. It is a 35-item set of questions that allows identification of concerns of potential users of an innovation.

Seven stages of concern "describe the dynamics of an individual innovation adopter" (Hall, George, and Rutherford, 1986/1979, p. 4). These include: 0=Awareness; 1=Informational; 2=Personal; 3=Management; 4=Consequence; 5=Collaboration; 6=Refocusing. Stages of concern for individuals asked to implement an innovation, according to Hord, Rutherford, Huling-Austin, and Hall (1987), move through three levels of concerns. These concerns evolve from an initial level involving concerns about SELF, to the TASK level, and finally to the IMPACT level. During initial stages of implementation of an innovation, teachers generally are at the SELF stages.

In this study, the Stage 0 category described participants who were not using the distance education (the innovation), but exhibited "Awareness" of it. Stage 1 and Stage 2 categories represented individuals whose personal concerns were primary. These individuals were concerned with acquiring "information" (Stage 1) or had concerns regarding the impact of the innovation upon themselves and their personal concerns (Stage 2) or on their ability to work with it. Stage 0, 1, and 2 are part of the SELF level. The TASK-related concerns category (Stage 3) described individuals whose major concerns rested with the managerial and organizational impact of distance education. Individuals who are identified as having IMPACT-related concerns are interested in the "Consequences" of implementation of educational programming via the telecommunications network, i.e. how it would affect students (Stage 4). In addition, they are interested in the "Collaborative" aspects (Stage 5) or "Refocusing" concerns (Stage 6) that involve rethinking or reviewing other ideas that might be able to achieve the same goal.

Once teachers' concerns begin to focus on the innovation itself and its impact on students, they have reached the IMPACT level. According to Hall, George, and Rutherford (1979/1986), movement towards the higher levels of concern depends not only upon an individual, but also upon the innovation itself and the environment.

Using the Quick Scoring Device for the Stage of Concern Questionnaire developed by Parker and Griffen (1979), I transformed the responses of each participant to the 35 SoC questions into a percentile score for each of the seven stages of concern. The values for the percentile scores created a Stages of Concern (SoC) profile. Twenty-eight questionnaires

collected at the start of the study and 21 collected at the end of the study provided valid data. I used three methods to interpret results of the questionnaires.

My first method involved calculating the overall means for each stage. These values are presented in **Table 12**. I calculated the means for each of the two subgroups, (classroom) facilitators and administrators at the start of the study; and for the total group at the start and close of the study. At the start of the study, mean stage scores showed the same trend and had similar values for both sub-groups and the total group.

Table 12. Means of Individual Stages of Concern (Initial and Final)

		Percentile Scores						
Stage		0	1	2	3	4	5	6
Group	**Number**	**Self**			**Task**	**Impact**		
		Aware-ness	**Informa-tional**	**Personal**				
Facilitators (Initial)	23	**80**	**83**	**82**	60	41	61	30
Administrators (Initial)	5	**89**	**79**	**79**	61	57	69	57
All (Initial)	28	**82**	**82**	**81**	60	44	63	35
All (Final)	21	**76**	**72**	**70**	59	39	61	38

Whole-group percentile means of 82, 82, and 81 were calculated for Stage 0, Stage 1, and Stage 2, respectively. Participants were either in the "Awareness" (Stage 0), "Informational" (Stage 1) or "Personal" (Stage 2) level. Little change in trend was found between questionnaires obtained at the start and at the close of the study; participants remained at the SELF level of concern.

The second method I used, as suggested by Hall, George, and Rutherford (1986/1979), involved determination of the frequency of highest concerns for all individuals involved in the study. These results are listed in **Table 13**.

Table 13. Frequency of Highest Concerns Stage (Initial and Final)

Highest Stage of Concern

Stage		0	1	2	3	4	5	6
Group	**Number**	**Self**			**Task**	**Impact**		
		Awareness	**Informational**	**Personal**				
Facilitators (Initial)	23 (2 ties)	**8**	**9**	**4**	1	0	3	0
Administrators (Initial)	5	**2**	**1**	**0**	0	0	2	0
All (Initial)	28 (2 ties)	**10**	**10**	**4**	1	0	5	0
All (Final)	21 (1 tie)	**10**	**2**	**7**	0	0	3	0

For facilitators, their initial peak stages of concern were Stage 0 (Awareness, n = 8) and Stage 1 (Informational, n = 9). Although the pool of administrators was very small, their responses are of interest. Three of the five members of this group were in Stage 0 or Stage 1. However, two of the five exhibited strongest concern about coordination and collaborative activities (Stage 5).

At the close of the study, the pattern for frequency of highest concern was similar to that obtained at the start of the study. Stages 0, 1 and 2 represented over 85% (n = 19/22) of participants' responses. Three profiles (out of 22) showed Stage 5 (Collaboration) as the prime concern. (Prior to the study, five out of 30 profiles had shown this as the major form of concern.) According to Hall, George, and Rutherford (1979/1986), individuals in Stage 5 exhibit "a focus on coordination and cooperation with others regarding use of the innovation" (p. 7).

The third way I used to interpret results of the SoC was to note the highest and second highest levels of concern and to report the frequency and the distribution of second highest stage of concern in relation to first highest stage of concern. Hall, George and Rutherford (1986/1979)

felt this method allowed more insight into concerns. These results of the calculations using this third method are displayed in Tables **14** (Initial questionnaire) and **15** (Final questionnaire)**.**

Table 14. Frequency and Percent Distribution of Second Highest Stage of Concern in Relation to First Highest Stage of Concern (Initial Questionnaire Results)

Second Highest Stage of Concern

		Aware-ness	Infor-mational	Personal						
Highest Stage of Concern		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**Row Total %**	**Row Total N**
Stage		**Self**			**Task**	**Impact**				
0	Awareness	**0 0**	**8 52%**	**5 38%**					36	13
1	Informational	**2 17%**	**0**	**7 58%**		**1 8%**	**1 8%**	**1 8%**	33	12
2	Personal	**2 50%**	**0**	**2 50%**					11	4
3	Management	**0**	**1**	**0 100%**					3	1
4	Consequence	**0**	**0**	**0**						
5	Collaboration	**2 33%**	**2 33%**	**2 33%**					17	6
6	Refocusing	**0**	**0**	**0**						
										*36

*Due to ties, n>28

Table 15. Frequency and Percent Distribution of Second Highest Stage of Concern in Relation to First Highest Stage of Concern (Final Questionnaire Results)

Second Highest Stage of Concern

		Aware-ness	Infor-mational	Personal						
Highest Stage of Concern		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**Row Total %**	**Row Total N**
Stage		**Self**			**Task**	**Impact**				
0	Awareness	**1 10%**	**4 30%**	**3 30%**	**1 10%**		**1 10%**		45.5	10
1	Informational	**0**	**0**	**1 100%**					33	1
2	Personal	**1 14%**	**5 71%**	**1 14%**					11	7
3	Management	**0**	**0**	**1 100%**					3	1
4	Consequence									
5	Collaboration	**0**	**0**	**1 33%**	**2 67%**				17	3
6	Refocusing									
										*22

*Due to ties, n>21

The results demonstrated that the highest two levels of concern for all participants at the start and at the close of the study were at the SELF level, at Stage 0, Stage 1 or Stage 2. These results are consistent with the findings of Hall, George, and Rutherford (1979/1986) who reported:

- For nonusers of the innovation, a high peak score on Stage 0 reflects awareness of a concern abut the innovation....
- A high Stage 1 score is indicative of intense concerns about what the innovation is and what use of the innovation entails...its structure and function....
- A high Stage 2 score is indicative of ego-oriented questions and uncertainties about the innovation. Concern about status, reward, and potential or real effects of the innovation on the respondent are of high concern....

- Usually non-users who are high on Stage 0 will also be high on Stages 1 and 2 (p. 31).

A few individuals had concerns with the overall collaborative efforts needed in implementing innovation. Establishment of cross-district academic programs would be expected to require involvement and collaboration at many levels of authority. However, the results showed that, during this study, the concerns of almost all school team members remained at the SELF level. These results are consistent with the level of implementation achieved at the end of the study as shown in **Table 5** (p. 108)**.** No high school sites had established high school level distance education classes between sites--a primary goal held at the start of the study.

Overall Findings of the Study

A synthesis of data obtained from both the quantitative and qualitative instruments employed in this study is presented in this section. Qualitative data was obtained from analysis of researcher notes, interviews of key participants, personal communications, document review, open-ended surveys administered following each of the workshops, written statements included on final questionnaires, and from transcriptions of focus group interviews conducted at the end of the study. During the three formal staff development workshops I recorded a set of notes and salient statements of participants. In the following section I have referred to these as Researcher Notes. Based upon attendance records, I obtained nearly 100% response to open-ended surveys from each session. Following each of the workshops, I added some additional personal written commentary to my Researcher Notes, describing my observations of the session and my interpretations of the prevailing climate, attitudes, and behaviors of the participants. I have referred to these in the following section as Researcher Comments.

I analyzed data from each of my quantitative and qualitative sources, triangulated the results and developed a general set of findings applicable to this study. This procedure was done twice--once at the end of the 1996-97 academic year, and again at the close of the study. In this section, I have documented supporting statements or presented other evidence to validate each of

my results. In order to preserve confidentiality of schools and participants, I have used no names and have referred to individual schools by the letters "A" through "H" (selected at random for each site). A triangulation of data sources matrix is displayed in **Table 16.**

1. Central coordination at initial stages facilitated the process of implementation of a multi-site telecommunications network.

Analysis of focus group transcripts, observations by the researcher and document analysis (documents, E-mail correspondence, Researcher Notes) showed how the actions and interactions of the central coordinator maintained progress of the implementation of the innovation.

1. The Network coordinator developed numerous grant proposals that funded the acquisition of hardware and software, training and technical support for the SVCC-TN.[12, 13, ,14] She met numerous times with individuals associated with funding organizations. Her efforts during this period secured additional funding from the Virginia Assembly, allowing a 9th site that was not part of the original funding proposals to participate in 1996-7 planning and connectivity schedule; and funding from Bell Atlantic to permit a 10th school district to join the Network during the 1997-8 academic year.[15, 16]

2. The Network coordinator assumed responsibility for collecting and distributing information to schools and superintendents associated with the Network involving:

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[12] Linda Sheffield. Rural Utilities Service (RUS) Grant Application. January 1995.

[13] Linda Sheffield Public Telecommunications Foundation Program (PTFP) Grant Application. September 1997.

[14] Linda Sheffield.(1997, November 12). Perkins Mini-Grant Proposal: FY 1996-97. *Fax* copy received by J.McNeal, November 12, 1997.

[15] Sheffield, L. (SVSHEFL@sv.cc.va.us). (1997, January 20; February 4; March 17). Re: Friday meeting; distance ed project; none. E-mail to J. McNeal (JMCNEAL@vais.net).

Comments about funding sources (Virginia General Assembly and RUS) for the regional telecommunications submitted to the Virginia General Assembly.

[16] Sheffield, L. (SVSHEFL@sv.cc.va.us). (1997, June 6). Re: Grant moneys. E-mail to J. McNeal (JMCNEAL@vais.net).

Table 16. Triangulation Data Sources Matrix

Information/Results of Study	Data Sources										
	Questionnaires	Open-ended Surveys	Document Analysis	Focus Group Interviews	Principal Narratives	E-Mail Correspondence	Researcher Notes/Obs.	Researcher Comments	Network Coord. Pers.Com.	Interviews/Other	
History of SVCC-TN			●						●		
Concerns towards Distance Education	●	●		●	●		●	●		●	
Attitude towards Distance Education	●	●		●			●	●			
Self-Efficacy towards Dist ance Ed.	●	●		●			●	●			
FINDINGS OF STUDY											
1. Value of Central Coordination			●	●		●	●		●		
2. Value of Technical Support			●	●		●	●		●	●	
3. Delays			●	●	●	●	●		●	●	
4. Teachers felt threatened by tech.	●	●		●			●	●			
5. Barriers needing admin. support	●	●	●	●		●	●		●		
6. Improve communication via Network				●	●	●			●		
7. Positive team interactions via Stf. Dvpt.		●		●			●	●			
8. Using equipment most impt. activity		●		●		●	●	●	●		
9. Students valued on teams		●		●				●	●		
10. Staff Development improved knowledge,awareness and self-efficacy	●	●		●	●		●	●			
11. Need advocacy at supt. level			●	●			●	●	●	●	
12. Need active involvement of principals	●		●	●		●	●	●	●	●	
13. Wait until technology ready for demos				●	●						
14. Give teachers time to prepare		●		●							
15. Expand staff dvpt. to wider group				●			●	●		●	
16. Develop new Network org. structure			●	●			●	●			
17. Team members enthusiastic re potential of Network; select distance education classes carefully	●	●	●	●	●		●	●			

- scheduling of all training sessions;[17, 18, 19, 20]
- progress of installations and operation of the Network;[21, 22, 23, 24]
- school needs, school schedules and staff certifications;[25, 26, 27, 28] and
- scheduling of installations.[29, 30]

3. The Network coordinator assumed responsibility for developing training for schools participating in the Network. As a researcher/participant observer, I participated in these efforts. Chapters 3 and 4 provide a detailed description of training activities.

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[17] Researcher Notes. (1997, January 3). Telephone conversation between L. Sheffield and J. McNeal regarding revising training schedules.

[18] Sheffield, L. (SVSHEFL@svccchr1.sv.cc.va.us). (1997, January 16) Re: Friday meeting. E-mail to to J. McNeal. (JMCNEAL@vais.net).

Message involved scheduling of Schools F and H for training.

[19] Sheffield, L. SVSHEFL@sv.cc.va.us). (1997, March 17). Re: None. E-mail to J. McNeal (JMCNEAL@vais.net).

Comments on scheduling for School I and for teleconference.

[20] L. Sheffield. (1997, August 5). Memo (Subject: Announcement of Scheduling Meeting to discuss scheduling of classes for Fall 1997). Sent to representatives of schools participatng in the regional network.

[21] L. G. Sheffield and R. W. Bratcher. Overview: Southside Virginia Community College Telecommunications System. Developing A High Performance Learning Community. December 1995.

Sent to Superintendents. This document summarized the project and provided a time-line for implementation ("System ready for full utilization: January 1997).

[22] L. Sheffield. Implementation Schedule, Revised. September 1996.

Information sheet distributed to superintendents present at Superintendents' Meeting, September 23, 1996.

Information sheet also was distributed to principals and other representatives of schools planning to participate in the regional network who were present at Distance Learning Ad Hoc Committee Meeting, October 8, 1996.

[23] L. Sheffield. (1997, April 29). Update on Progress of Regional Network. Summary of progress of the regional network. Sent to Superintendents prior to Superintendents' Meeting scheduled for April 29, 1997.

[24] Sheffield, L. (SVSHEFL@sv.cc.va.us). (1997, April 7) Re: April 18 to J. McNeal. E-mail to J. McNeal (JMCNEAL@vais.net).

Message discussed scheduling software that will be given to schools in the fall for their own scheduling of activities via the Network.

[25] 1996-97 School Schedules (for high schools associated with regional network). Collected by L. Sheffield and distributed at Ad Hoc Plannng Meeting, November 12, 1996.

[26] Researcher Notes. (1997, January 31) Recorded comments made by L. Sheffield to Team E at Hands-on School Training Workshop regarding different school schedules.

[27] Researcher Notes. (1997, January 23) Working session with L.G. Sheffield regarding certifications of teachers and school interests regarding use of the network during the forthcoming academic year.

[28] L. Sheffield. Report of Scheduling Committee Meeting: June 18, 1997.

Report summarized interests, needs, capabilities of schools regarding delivery of classes for Fall 1997 that were expressed by representatives of high schools, SVCC, and Longwood College who were present at this meeting. Included 1997-98 school schedules.

[29] L. Sheffield. (1997, April 23). Memo : Schedule for installation of equipment..Sent to High Schools Participating in Regional Network.

[30] Sheffield, L. (SVSHEFL@sv.cc.va.us). (1997, July 16). Re: hello. E-mail to J. McNeal (JMCNEAL@vais.net).

Message refers to scheduling of second camera installation at high schools.

4. The Network coordinator assumed responsibility for meeting with hardware and software current and potential vendors, for assessing the relevance of their materials, and for distributing appropriate information to schools.[31]

5. The Network Coordinator worked directly with the Community College instructional and technical staff during their own implementation of delivery of instruction via the telecommunications network. Based upon feedback from her direct observations and from participants, she constantly made adjustments to the hardware and technical capacity of the system being constructed for secondary schools.[34, 35]

> ***"Next week--July 7-9--I will be at JTCC for intensive training in VTEL repair and trouble shooting"*** (E-mail: L. Sheffield to J. McNeal. 7/2/97). [32]
>
> ***"The training session at JTÇC was excellent. Now I am certified in VTEL installation, trouble-shooting and repair"*** (E-mail: L. Sheffield to J. McNeal. 7/16/97).[33]

In order to be better able to understand the technical aspects of the VTEL system, she completed a one-week training program developed by VTEL for site technical support personnel.

6. The Network Coordinator worked directly with college staff and schools in coordinating schedules and establishing courses appropriate for secondary school participation.[36, 37]

> ***"Jane Andrews (SVCC staff) is working with department chairs and guidance at each of the schools to schedule classes"*** (Researcher Notes. Recorded comments made by L. Sheffield at Workshop #2 for Schools C and G, January 7, 1997).
>
> ***"We need your help and support to get classes. If there are any classes you would like, we will make arrangements. We will send you a contact person to (meet with representatives) from your school....We'll be glad to work with you"*** (Researcher Notes. (Recorded comments made by L. Sheffield to Superintendents at Meeting, October 29, 1997).

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[31] L. G. Sheffield and R. W. Bratcher. Overview: Southside Virginia Community College Telecommunications System. Developing A High Performance Learning Community. December 1995.

[32] Sheffield, L. (SVSHEFL@sv.cc.va.us). (1997, July 2). Re: Hello. E-mail to J. McNeal (JMCNEAL@vais.net).

[33] Sheffield, L. (SVSHEFL@sv.cc.va.us). (1997, July 16). Re: Hello: E-mail to J. McNeal (JMCNEAL@vais.net).

[34] Researcher Notes. (1997, January 7). Recorded comments made by L. Sheffield during *Training for Schools G and C*. regarding experiences of SVCC re lighting, sound proofing etc.

[35] Researcher Notes. (1997, February 7). Recorded comments made by L. Sheffield during *Training for School B*. regarding how SVCC is using Elmo and responses of SVCC staff towards use of teleconferencing system for delivering their classes.

[36] Schedule for Fall 1997. Southside Virginia Communications Network Classes (as of August 13, 1997). Distributed to schools.

[37] Schedule for Spring 1998. Southside Virginia Communications Network Classes. Distributed November 1997 to participants at Focus Group Interviews.

2. Access to a high level of technical support, including on-site service, facilitated the process of implementation of the regional network and promoted development of technical expertise at local sites.

My observations, document analysis (meeting agendas, E-mail correspondence), and analysis of researcher notes and focus group interview transcripts demonstrated the strong leadership and high quality of service provided by the technology coordinator for SVCC, Mr. Bill Wilson. He was involved in all aspects of the implementation process, including training and installation of equipment.

1. Mr. Wilson conducted a training session targeted to individuals identified by schools as their technology contact.[38]

2. Mr. Wilson was actively involved in the hands-on training (Workshop #2) for each of the schools. He developed a series of activities for groups to use in developing their facility with operation of the VTEL unit.[39]

3. Once the high speed telephone lines were installed (May for most schools), SVCC technology staff worked tirelessly to install all the equipment needed to make the VTEL system work to transmit voice, video, and data.

> ***"Bill and Bob will be going to the schools and installing the cell muxes and the routers and getting the information straight about the IP addresses"*** (E-mail: L. Sheffield to J. McNeal. 5/21/97).[40]

4. Mr. Wilson had a comprehensive knowledge of all aspects of the equipment and telecommunications system that enabled him to recognize causes of problems and needed modifications. In fact, in many cases, he knew more than vendors who provided equipment.[42]

> ***"Bill already knows more probably than the person who is providing the (VTEL) training sessions"*** (E-mail: L Sheffield to J. McNeal. 7/2/97).[41]

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[38] Agenda. Southside Virginia Telecommunications Network Technical Meeting. December 16, 1996.

[39] Hands-on Exercises Developed for SVCC-TN. January 6, 1997.

[40] Sheffield, L. (SVSHEFL@sv.cc.va.us). (1997, May 21). Re: VTEL installations. E-mail to J. McNeal (JMCNEAL@vais.net).

[41] Sheffield, L. (SVSHEFL@sv.cc.va.us). (1997, July 2) Re: Hello. E-mail to J. McNeal (JMCNEAL@vais.net).

[42] Wilson B. (1997, May 30). Equipment installations. *Multiple recipients of list SVTN.* [Online]. Available SVTN @sv.cc.va.us.

5. Mr. Wilson kept schools informed via a list-serv developed for SVTN users.[44]

> ***"We have received the MCU video switch which has been installed here at SVCC....Bob Upson (my counterpart on the Daniel campus) and I will continue with the insstallations at the other sites as soon as we receive the rest of the equipment"*** (E-mail: B. Wilson to SVTN list-serv. 5/30/97).[43]

During the second focus group interview, which was held via the Network, one of the schools that had been expected to be part of the group did not come "on-line." Mr. Wilson "checked in" to the conference from his location at the SVCC Christianna campus (Dr. Sheffield and I were at SVCC Keysville campus) and proceeded to get involved to help the missing site connect.[45] When the individual from School G being interviewed mentioned having problems with the location of the second camera that had been installed at that site that day, Mr. Wilson proposed possible strategies for improving the location.[46]

Comments made during the second focus group represented how oneschool felt regarding the technical support provided by SVCC.

> ***"The support has been excellent. Bill always has just been a phone-call away....He always has been there for any kind of problem or question"*** (Focus group interview #2 transcript, November 6, 1997, lines 136-40).
>
> ***"I think the Community College has done a really good job, thanks to Bill. As far as from a technical standpoint and that's really where my area is, the technical support has been very, very good. At the community college everyone has been very responsible, very receptive to problems and inquiries....As to what possible thing could be done to improve, at this time I can't think of anything"*** (Focus Group Interview #2 Transcript, November 6, 1997, lines 278-286).

3. Numerous delays accompanied the initial process of implementing distance education at high school sites.

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[43] Wilson B. (1997, May 30). Equipment installations. Multiple recipients of list SVTN. [Online]. Available SVTN@sv.cc.va.us.

[44] Wilson B. (1997, July 30). Current Progress. Multiple recipients of list SVTN. [Online]. Available SVTN@sv.cc.va.us.

[45] Focus Group Interview #2 Transcript, November 6, 1997, Lines 119-122

Document review and analysis of researcher notes, focus group interview transcripts, principal narratives and E-mail correspondence revealed a series of delays. The implementation plan presented to superintendents in December 1995 listed September 1996 as the date for installation of equipment; September-December 1996 as the period for trial runs; and January 1, 1997, the date for full utilization.[47] Lines were not installed until May 1997,[48] and the system was not ready for trial runs until August 1997.[49]

Various problems caused delays. These included postponement of dates to install

> • ***"The telephone companies had a large backlog of work to complete before they could attend to the needs of the telecommunications network"*** (Researcher Notes. Recorded comment of L. Sheffield. January 6, 1997).
>
> • ***"The unexpected popularity and rush for connectivity of multiple users of Net.Work.Virginia exceeded the current technical capacity of VA Tech and the telephone companies"*** (Researcher Notes. Recorded comment of L. Sheffield. February 7, 1997).
>
> • ***"Telephone company long-range planning had not envisioned that there could ever be a demand for connectivity between T-1 lines (relatively narrow band for them) and the ATM network"*** (Researcher Notes. Recorded comment of J. Crowder, Net.Work.Virginia engineer during Interview. June 25, 1997).
>
> • ***"Switches had to be re-engineered to meet the specifications of connecting T-1 lines to the ATM network"*** (Researcher Notes. Recorded comment of J. Crowder during Interview. June 25, 1997).
>
> • ***"Plans for Internet accessibility for all sites placed unanticipated demands upon hardware source provider, leading to delays in production and shipping of routers and multiplex components"*** (Researcher Notes. Recorded comment, B. Wilson, SVCC technical engineer. May 23, 1997).
>
> • ***"We have some problems with the PVC's (Permanent Virtual Circuits)which the telcos had put in--they did not allow enough bandwidth"*** (E-mail: L. Sheffield to J. McNeal. June 5, 1997).[50]

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[46] Focus Group Interview #2 Transcript, November 6, 1997, Lines 119-122.

[47] L. G. Sheffield and R. W. Bratcher. Overview: Southside Virginia Community College Telecommunications System. Developing A High Performance Learning Community. December 1995.

[48] Net.Work.Virginia. *Site by Type and Bankwidth*. (1997, September 26--last update). [Online}. Available: http://www.networkvirginia.net/images/NWV_key_9.26.htm/ [1998, January 5].

[49] Researcher Notes. (1997, August 13). Scheduling Meeting.

[50] Sheffield, L. (SVSHEFL@sv.cc.va.us). (1997, June 5). Re: Training. E-mail to J. McNeal (JMCNEAL@vais.net).

telephone lines and the need for re-engineering of switches for connecting high schools to the ATM network.[51] Peripheral equipment such as cell muxes (equipment that enables multi-point conferences) arrived "dead in the box."[52] Additional cell muxes were not available when requested from the manufacturer (May 1997), due to unexpected demands for site connections to the ATM network.[53, 54, 55, 56, 57] They did not arrive until mid-July.[58]

The last piece of equipment to arrive was the second camera for each site. Again there were delays. On July 16, Dr. Sheffield wrote in an E-mail to me, *"What is left is the installation of the second camera at each site and I plan to try to schedule that for next week."*[59] In fact, the cameras did not arrive until late October and installation took place in November. *"We just got our 2nd camera put in today,"* was a comment made during Focus group interview #2.[60]

Obtaining domain names for Internet access became a *"political challenge."*[61] This meant additional delays, but the problem was resolved prior to the start of fall classes. Once distance education classes began over the regional network there were additional problems. At that point in time, all connections to the ATM network for the community had to be arranged from a "bridge" (equipment that enables multi-point conferences) operating at Northern Virginia Community College.[62]

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[51] Wilson B. (1997, May 30). Equipment installations. Multiple recipients of list SVTN. [Online]. Available SVTN@sv.cc.va.us.

[52] Sheffield, L. (SVSHEFL@sv.cc.va.us). (1997, May 21). Re: VTEL installations. E-mail to J. McNeal (JMCNEAL@vais.net).

[53] Wilson B. (1997, June 16). Installation Update. Multiple recipients of list SVTN. [Online]. Available SVTN@sv.cc.va.us.

[54] Wilson B. (1997, July 8). Cell-muxes. Multiple recipients of list SVTN. [Online]. Available SVTN@sv.cc.va.us.

[55] Sheffield, L. (SVSHEFL@sv.cc.va.us). (1997, June 5). Re: Training. E-mail to J. McNeal (JMCNEAL@vais.net).

[56] Sheffield, L. (SVSHEFL@sv.cc.va.us). (1997, June 9). Re: Grant moneys. E-mail to J. McNeal (JMCNEAL@vais.net).

[57] Sheffield, L. (SVSHEFL@sv.cc.va.us). (1997, July 1). Re: Hello. E-mail to J. McNeal (JMCNEAL@vais.net).

[58] Sheffield, L. (SVSHEFL@sv.cc.va.us). (1997, July 16). Re: Hello. E-mail to J. McNeal (JMCNEAL@vais.net).

[59] Sheffield, L. (SVSHEFL@sv.cc.va.us). (1997, July 16). Re: Hello. E-mail to J. McNeal (JMCNEAL@vais.net).

[60] Focus Group #2 Interview Transcript, November 6, 1997, Line 131

[61] Researcher Notes. (1997, August 18). Ad Hoc Scheduling Meeting

[62] Researcher Notes. (1997, August 18). Ad Hoc Scheduling Meeting.

> ***"The technical problems in the early part of the year were bad. The students could not adjust to having the class one day and not having it the rest. It was also difficult when they knew class was continuing from the sending site"*** (Principal Narrative Report, School A. November 1997).

VC Wizard software was used for scheduling connections between sites and the ATM network. In early Fall 1997 it could not handle the demands being placed upon it throughout the state, leading to disruptions in transmission.[63, 64] From all accounts, however, all problems had been resolved by the end of October.[65, 66]

4. School team members felt teachers were threatened by technology and its impact upon their role in the classroom.

Analysis of questionnaires, open-ended surveys, focus group interview transcripts, my notes and comments, and recorded statements of participants during staff development workshops revealed the malaise felt by a number of schools and of teachers towards technology and distance education. Traditional expectations of teachers as competent knowledge providers had influenced the decision of five sites to limit team membership to adults (during this phase of the implementation process). A series of comments made by administrators or team representatives revealed some of the anxieties felt by schools.

> ***"Everyone is so terrified about the idea of teaching across the system"*** (Researcher Notes. Recorded Comment of School H team representative at Workshop #2. February 21, 1997).
>
> ***"We've decided not to bring students. Once we're up and running we'll bring them in"*** (Researcher Notes. Recorded Comment of School D Administrator, at Workshop #2. January 31 1997).
>
> ***"Our teachers need to feel comfortable with the technology first"*** (Researcher Notes. Recorded Comment of School G team representative at Workshop #2. January 7, 1997).
>
> ***"We want to use the system first for staff development. Then we'll think about classes for students"*** (Researcher Notes. Recorded Comment of School F representative at Scheduling meeting. June 18, 1997).

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[63] Sheffield, L. (SVSHEFL@sv.cc.va.us). (1997, September 10). Re: SVTN. E-mail to JMcNeal (JMCNEAL@vais.net).

[64] Researcher Notes. (1997, September 16). Telephone conversation between L. Sheffield and J. McNeal

[65] Researcher Notes. (1997, September 16). Telephone conversation between L. Sheffield and J. McNeal.

[66] Researcher Notes. (1997, October 29) Superintendents' Meeting

One of the speakers in the first focus group interview provided additional insight into concerns of teachers regarding issues associated with distance education delivery of courses via a videoteleconferencing system. They were worried that something might be offered that they at their school already offered. They were worried about their rating or "performance" as a teacher. Should they do something new, or something that they knew would work?

> ***"I think --our thinking is--that in (our) county, that, well, number one, it's not just a problem of scheduling. There is also a concern on the part of many of our administrators that something that may be offered, would be something that we might offer anyway...(Then) the administrators are thinking, 'I'd rather do what we've already done as opposed to start something new that we haven't tried yet, and don't know how it's going to work.'....***
>
> ***Another problem that comes up is (that) teachers are not just intimidated by the hardware or being in front of a camera, but teachers are also intimidated by the fact, that, 'Oh, you think someone's a better teacher than I am, so you're going to hire them to do this instead of me'"*** (Focus Group Interview #1 Transcript, November 6, 1997, p. 10).

5. Major barriers to implementation of distance education via the regional telecommunications network--requiring administrative intervention--were (a) varied local school academic schedules, (b) local school decision-making patterns, and (c) absence of cross-district policies to address student fees and teacher incentives for participation in the network.

Analysis of data obtained from multiple sources that included (a) document review of school schedules, (b) my observations and recorded comments that participants made during meetings and staff development workshops, (c) closed-ended and open-ended surveys, and (d) focus group interviews supported identification of these barriers limiting full implementation of the opportunities available to schools through their participation in the regional network.

1. Document review of schedules for schools showed that there were six different school calendars and bell schedules represented by the nine school districts. Some had various forms of block scheduling; some had 4 X 4 schedules and

completed a traditional year-long course in a semester; and some had a 7-period day bell schedule.[67, 68]

2. School principals identified scheduling issues as a primary concern at the first planning meeting, held before any training in October 1996, and requested that superintendents address these issues.[69]

3. Item 14 on *Section II* (Attitudes) of the closed-ended questionnaire ("*Distance education is hard to coordinate with other schools")* received the second least positive response on the initial administration, and the least positive response of any item (2.29/5.00) on the final administration of this questionnaire.

4. Written responses to open-ended surveys included statement after statement that cited scheduling concerns as a major barrier to implementation of distance education.

> ***Open-ended surveys administered following staff development workshops listed this question: "What are your concerns?"***
> ***The following are written responses submitted by school telecommunication team participants.***
>
> - ***"1. Cost of instruction; 2. Schedules of the schools, e.g. 4X4, reg 6-bell etc. 3. Scheduling students for classes"*** (Comment by School E team member after Workshop #1. January 6, 1997).
> - ***"'$' issues, scheduling conflicts"*** (Comment by School A team member after Workshop #2. January 24, 1997).
> - ***"Coordination of courses, schedules, etc. between school divisions/schools"*** (Comment by School D team member after Workshop #2. January 31, 1997).
> - ***"Schedule conflicts"*** (Comment by School G team member after Workshop #3. April 18, 1997).
> - ***"Scheduling with other schools....Coordination of different bell schedules, school calendars, class schedules"*** (Comments by School C team member after Workshop #3, April 18, 1997).

5. Comments made by participants in the focus group interviews held at the end of the study in November 1997 showed that scheduling remained a central issue.

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[67] 1996-97 School Schedules (for high schools associated with regional network). Collected by L. Sheffield and distributed at Ad Hoc Plannng Meeting, November 12, 1996.

[68] 1997-98 School Schedules (for high schools associated with regional netwok). Collected by L. Sheffield and distributed with copy of Notes summarizing June 18, 1997 Scheduling Meeting.

[69] Summary of Issues and Concerns Expressed at Last Meeting (October 8, 1996). Prepared by L. Sheffield and distributed at Ad Hoc Planning Meeting, November 12, 1997.

- ***"...and then the scheduling problem comes in, and, of course, (problems) with the counselors and how are you going to know far enough ahead (what will be offered), and everybody counts schedules at different times, and so forth"*** (Focus group interview #1 transcript, November 6, 1997, p. 10).

- ***"Have we solved any of the scheduling issues for classes?....I don't think you ever will"*** (Focus group interview #2 Transcript, November 6, 1997, lines 40-44).

- ***"...the scheduling seems it is going to be a real challenge as far as getting classes up and running"*** (Focus Group Interview #3 Transcript, November 7, 1997, p.4).

Locus of control issues within school divisions also contributed to misunderstandings regarding scheduling for installation of teleconferencing system.

"The day after the Superintendent's meeting...(the school representative) called me in a panic. I got the impression that (the superintendent) didn't know that the line orders for (this county) had not been sent in and he was expecting (his county) to be hooked up on the week of May 19th. Needless to say (school representative) faxed me the line order form and wanted desperately to have the lines put in to make the May 12th deadline" (E-mail, L. Sheffield to J. McNeal. 5/9/97).[70]

"The high school 'did not know anything about the training which was to be conducted on the day of the installation'. This according to (the school division technology coordinator). I let her know that the information went to the designated technical contact person at School E several weeks ago. According to (school division technology coordinator) it should have been sent to her" (E-mail, L. Sheffield to J. McNeal. 5/21/97).[71]

Issues relating to local school decision-making patterns and implementation of distance education technologies into school organizational structure surfaced during the focus interviews.

[70] Sheffield, L. (SVSHEFL@sv.cc.va.us).(1997, May 9). Re: Hello, summer). E-mail to J. McNeal (JMC NEAL@vais.net).

[71] Sheffield, L. (SVSHEFL@sv.cc.va.us).(1997, May 21). Re: VTEL installations). E-mail to J. McNeal (JMCNEAL@vais.net).

> ***"The meetings that have been held--we've had the technology peoples' meetings, and we've had the guidance/principals' meetings, and, of course, the superintendents' meetings. So it's been horizontal. We need to do it vertical within our own divisions and then bring those groups together"*** (Focus Group Interview #1 Transcript, School I speaker, November 6, 1997, pp. 16-17).
>
> ***"I really think that the individual school divisions need to get their thoughts together in terms of what they'd like to receive or offer before they go, you know, talking about what they can do, because what happens is that (Member X) and I are from the same school division and he doesn't go to the meetings (that I go to), so I don't know what he said and we end up crossing wires"*** (Focus Group Interview #1 Transcript, School B speaker, November 6, 1997, p. 35).
>
> ***"The problem is that the guidance people don't know soon enough to put it (distance classes) in the choices for the students to make. Well, how can you have the class if you didn't know there was going to be a class?"*** (Focus Group Interview #1 Transcript, November 6, 1997, p. 8).

Throughout the study, participants discussed concerns over salaries for (high school) teachers who taught students in different districts and fees for students enrolled in cross-district courses. Time for preparation was identified as an issue. *"We need a way between systems (to) deal with salary and enrollment issues,"* was one comment written in response to the open-ended question attached to the final questionnaire. Team members felt resolution of these issues to be the responsibility of the superintendents. Even though these items had been identified as concerns at the first planning meeting in October 1996,[72] analysis of my notes recorded at the Superintendents' Meeting, October 29, 1997, showed that they remained concerns at the end of the study.

6. Team members suggested using the regional network (SVCC-TN) to improve existing poor communications among participating school divisions.

[72] Summary of Issues and Concerns Expressed at Last Meeting (October 8, 1996). Prepared by L. Sheffield and distributed at Ad Hoc Planning Meeting, November 12, 1997.

Analysis of data obtained from focus group interviews identified a current lack of communication among school divisions. Communication *within* schools also surfaced as a problem. During Focus group interview #3,[73] students from School C indicated they did not know that their own school had a distance class with School D.

> ***"We don't have a school newspaper"*** (Comment from a teacher from School H. Focus Group Interview #3 Transcript, November 7, 1997).
>
> ***"I don't think we have a school newspaper"*** (Comment made by a student from School C. Focus Group Interview #3 Transcript, November 7, 1997).

Only four schools had had distance classes at their sites during Fall 1997. This limited use of the regional network for classes also meant that most schools could not demonstrate how the network was being used in their community.

Questions and comments made by individuals who attended the focus groups showed that they had had little knowledge of the overall progress of the implementation of the regional network.

> ***"Since we're not offering a class at this point, it is sort of difficult to explain. People like to see something in action so the fact that we don't have a class this semester is (a disadvantage)"*** (Focus Group Interview #3 Transcript, November 7, 1997, p. 4).
>
> ***"We haven't advertised it, so to speak. We're kind of waiting to see what we can offer. Because a lot of time...you can say, 'We've got distance learning equipment,' but if you can't say what we're using it for, then it doesn't do us any good to tell the community"*** (Focus Group Interview #2 Transcript, November 6, 1997, lines 313-316).

Frustration over lack of understanding regarding operational procedures for involving other school divisions in use of the teleconferencing system was expressed by one focus group participant.

> ***"With our network, the Southside network--Is anyone using it terms of classes or is anyone offering classes this term?"*** (Question raised by Focus Group #2 participant, Focus Group Interview #2 Transcript, November 6, 1997, lines 313-316).
>
> ***"I'm the librarian, and I know information is power ...I didn't know there was a list-serv (for the Network). I had no idea other than biology (until) you told me today...of what's already being offered, so if anyone asked me I wouldn't know"*** (Focus Group #1 participant from School D, Focus group #1 Interview Transcript, November 6, 1997, pages 24-25).

[73] Focus Group Interview Transcript, #3. November 7, 1997, p. 3.

> ***"I think our major drawback right now is the combination of...scheduling distance learning or staff development, or positive sorts of things and knowing who is out there that we can link up with. I don't know who to contact if we wanted to do a staff development opportunity on a certain topic. I don't know which studio or to which place or locality I should call. I need that kind of technical information"*** (Focus Group #3 Transcript, November 7, 1997, p. 8).

Participants in all three focus groups suggested using the capacity of the Network as a means of enhancing communications. They suggested setting up demonstrations or symposia for school staff, for student groups, for school boards, and community groups.

> ***"Now that the equipment is in place, it would be a good idea to say at this time, 'We are going to schedule a symposium where these people, and whoever else you want from your system (should) go to your unit, and Mecklenburg's go to their units and Greensville's go to theirs and we are going to have a meeting,' and that way everybody can see, number one, that it works, their units work"*** (Focus Group Interview #1 Transcript, November 6, 1997, pp. 18-19).

Analysis of Principal Narrative Reports and E-mail from Dr. Sheffield (11/1197)[74] confirmed that schools already had or were actively working to provide Internet access at their site through the Network. A number were establishing E-mail accounts through the system. During the focus group interviews, participants suggested expanding the list-serv as a means to improve communications.[75] Participants in each of the three focus groups suggested setting up a Web site for the regional network to serve as a means to improve communications among the different sites.

> ***"I think that a Web site might be very useful"*** (Focus Group Interview #3 Transcript, November 7, 1997, p. 8).

7. Staff development fostered positive interactions within and among school teams.

My analysis of written statements recorded on open-ended surveys (administered following each staff development workshop) supported the finding that staff development

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[74] Sheffield, L. (SVSHEFL@sv.cc.va.us).(1997, November 11). Re:Internet). E-mail to J. McNeal (JMCNEAL@vais.net).

[75] Focus Group Interveiw #1 Transcript, November 6, 1997, pp. 23-24.

fostered positive interactions within and among school teams. This finding was reinforced by analysis of my field notes and comments that described the atmosphere during the workshops.

- Administrators and students paired together in completing the structured hands-on practice activities. An easy-going atmosphere prevailed throughout all activities, and especially among those that involved non-hierarchical groupings.[76]

> **These are written comments recorded on open-ended surveys administered after workshops.**
>
> ***"I missed the interaction with other schools today"*** (Comment by School A team member following individual school hands-on training, Workshop #2, January 24, 1997).
>
> ***"Enjoyed meeting others from the consortium"*** (Comment by School E team member after Workshop #1, December 3, 1996).
>
> ***"I enjoyed the interaction with administrators, teachers, technical folks and students"*** (Comment by School B team member after Workshop #1, December 3, 1996).

- Participants appeared pleased to attend (this staff development session) and to be part of their school telecommunications team. There was a feeling of camaraderie exhibited within and among teams.[77]

Representatives from seven of the nine schools (plus Longwood College and SVCC) that participated in this study participated in one of the three focus group interviews. Analysis of the transcripts and of my field notes and comments confirmed that participants appeared pleased to be asked to provide some feedback regarding their experiences and applications involved with use of the Network.[78] Although not formally designed as a training activity, the focus groups served as a forum for promoting learning transfer, a feature acknowledged by researchers as a needed component for staff development (Meltzer and Sherman, 1996).

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[76] Researcher Notes and Comments. (January 7, 1997).

[77] Researcher Notes and Comments. (December 3, 1996).

[78] Researcher Notes and Comments. (November 7, 1997). Comments made following Focus Group Interviews, November 7, 1997.

8. "Using the equipment" was identified as the most important activity for generating interest, enthusiasm and a vision for potential applications of the videoteleconferencing system.

Analysis of focus group transcripts, open-ended surveys, E-mail correspondence, and my researcher notes and comments showed that participants felt that using the equipment helped them become enthusiastic about opportunities available through the regional network.

> ***"The first workshop that I went to was here and you had two different sites and we broadcast back and forth and we made presentations and really got a feel for everything. And that's what made me enthusiastic about it."*** (Focus Group Interview #1 Transcript, November 6, 1997, p. 3).
>
> ***"In order to be able to use the equipment, you have to use it...Once you get familiar with what you're using, you can think of ways how you're going to be teaching with it"*** (Focus Group #1 Transcript, November 6, 1997, p. 6).
>
> ***"People need to experience it and it makes a big difference. I can tell you Ted Bennett's*** **(William Ted Welden Bennett, Jr., District 60 Representative to Virginia's House of Delegates, Member of Education Committee)** ***a real strong supporter now, after that Joint Commission Meeting*** **(Virginia's Joint Commission on Technology and Science)*, 'cause he actually watched me use the control panel. Then all at once he just reached over there and he started using it and he kept saying, 'This is unbelievable'"*** (Focus Group Interview #1 Transcript, November 6, 1997, pp. 14-15).
>
> ***"Yes, a senator from Lynchburg was convinced within five minutes at a state senate meeting"*** (Focus Group Interview #1 Transcript, November 6, 1997 p. 15).

Participants recognized that their own attitudes and expectations for use of the network had changed after using the teleconferencing system. They suggested conducting demonstrations for showcasing the technology to other groups. In the focus group interviews, a number of schools reported that they were planning demonstrations for different school and community groups. Longwood College reported on

> ***"We're planning as a matter of fact next month to show the School Board exactly what the equipment is capable of doing and demonstrate Internet use"*** (Focus Group Interview #2 Transcript, November 6, 1997, lines 157-59).

how they had been able to show their staff how the teleconferencing worked.

> ***"So what we did, we put out a call to our faculty, if you're interested in experiencing this, we're going to meet in hall 128, and we gave a date and a time and then we set up a two-way conference with the folks down in the CEC (Continuing Education Center), for thirty-five minutes and we hooked twenty-five faculty immediately"*** (Focus group #1 transcript, November 6, 1996, p. 13).

Dr. Sheffield reported that one of the superintendents had indicated at the Superintendent's Meeting in late October that the school division would be demonstrating the system for the County Board of Supervisors in early December.[79]

At the third focus group interview, one of the students suggested that it would be useful to have a demonstration for students.

> *"I agree that they need to know, because a lot of students, they're like, there are two new TV's up in the library, and...it's like you need to get them to know what we can do with it and you may have to call a meeting in the auditorium. The special interest groups are in their own little groups and they need to find out about the stuff"* (Focus Group Interview #3 Transcript, November 7, 1997, p. 10).

Dr. Sheffield continued the conversation, and asked if it would be...

> *"...helpful to set up ...some demonstrations for certain...student groups at the schools and just invite them in--like today. It's no major thing to set up. Do you think something like that would be good to make the students more aware?"* (Focus Group Interview #3 Transcript, November 7, 1997, p. 10)

The student response was...

> *"That would work well. A small group from each, from each larger group coming in here and we say, 'This is what we can do with this.' Just have a group like this"* (Focus Group Interview #3 Transcript, November 7, 1997, p. 10).

Having an opportunity to use the equipment during the hands-on workshops transformed opinions participants had previously held regarding the teleconferencing system. Analysis of E-mail correspondence between Dr. Sheffield and myself describing a hands-on workshop, as well as my own notes regarding another workshop, supported the effectiveness of hands-on experiences in changing attitudes of participants towards the technologies.

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[79] Focus Group Interview #1 Transcript, November 6, 1997, p. 14.

"The Superintendent and Assistant Superintendent were among those in attendance. The people they brought were those who were opposed to this system. As a result I spent a great deal of time answering questions....Some of the time I felt that I was facilitating a meeting of these people as they discussed their concerns and what they felt were issues....The session was excellent and everyone seemed to enjoy it and everyone participated. Even the Superintendent and Assistant Superintendent took one of the assignments each and used the control pad. With the exception of one person, the rest seemed to be more excited about the system and the possibilities after having seen it and used it....The Superintendent...indicated that he wanted a large cadre of faculty trained in how to use the system.

This is the first Superintendent who has attended any of these training sessions, and I think his presence demonstrated his commitment to the possible use of this technology as a teaching tool in School F to others from the school who attended. He proved to be a real asset in the session" (E-mail: L. Sheffield to J. McNeal. 2/17/97).[80]

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"This session started in a rather hostile, yet polite environment. The principal and librarian were quite negative regarding all the problems associated with using the system.

(Changes in attitudes began to occur as participants tried the system and began to ask questions.) ***'That opens a lot of possibilities,'*** said the principal. The principal seemed almost relieved to realize that schools didn't have to do everything by themselves. He realized that there were classes his students could take under Dual Enrollment (via the Network).

This is now about the time that questions start 'barreling' about possible uses. Now everyone is starting to think about possibilities. Talk is about animal husbandry, perhaps health career, and other special courses. ***'I don't see it as cutting teachers, but about enhancing opportunities, and in fact growing,'*** said the principal....The meeting ends on a very positive note" (Researcher's Notes. Researcher Comments. Workshop #2 for School D, January 31, 1997).

The third staff development session was an multi-point interactive videoteleconference that connected four sites in Virginia: the two campuses of Southside Virginia Community College, Northern Virginia Community College at Annandale, and Southwest Virginia Community College. The format included delivery of a German lesson and a panel discussion among educators, a

[80] Sheffield, L. SVSHEFL@sv.cc.va.su). (1997, January 17). Re: Friday meeting). E-mail to J. McNeal (JMCNEAL@vais.net).

parent and a student from Tazewell County, VA, and SVCC-TN telecommunication team members. Tazewell is a county that was in its third year of using distance education technologies to deliver instruction to its four high schools. For most SVCC-TN team members, this was the first time they had experienced the full operating capacity of the Network.

School team members were genuinely impressed--and surprised--with the clarity of the sound and picture quality. They welcomed the opportunity to ask questions of the panel and the German instructor--people who had real experience with distance education.

- The audio and visual impact of the interactive videoteleconference was more effective than watching videos, reading about, listening to descriptions of learning via a distance. The distances involved (200-400 miles from point to point) would have prevented any other type of meeting of these groups of people.

- The enthusiasm of the Tazewell participants for distance learning as a means to enhance the educational program for students, teachers and community members in their county became clear to school teams during the course of the teleconference.[81]

Written responses to question on Open-ended Survey (administered following teleconference, April 18, 1997) :

"What was positive about your experiences today?"

- ***"Comments on Tazewell's experience"***
- ***"Input from Tazewell was very enlightening"*** (Comments from School G team members).

- ***"Share ideas from folks who have used system"***
- ***"It was beneficial to hear from Tazewell and Annandale about their experience with distance learning"*** (Comments from School E team member).

- ***"That this equipment is very beneficial to student who want learn over 'television communications'" (sic),***
- ***"See how the teachers will teach over the system",*** **and**
- ***"Listening to positive and negative comments from a system already using distance delivery"*** (Comments from School C team member).

[81] Researcher Notes, Researcher Comments. April 18, 1997.

At this point in time, teachers on school teams did not appear concerned about becoming instructors over the Network. Many felt and expressed their opinions that initial student use of the Network would be for Dual Enrollment courses, and that, for these, SVCC would assume responsibility for obtaining the instructors.[82] Following this session, SVCC-TN members appeared eager to have staff development courses available to them via the Network. The Network had "proved" itself. For many, staff development delivered via the Network would be their only opportunity to get additional training and graduate course work due to distance and time restraints.[83]

Written answers on Open-ended Surveys in response to question:

- ***"What was interesting about your experiences today?"***
- ***(Open-ended survey administered following Workshop #3, April 18, 1997).***

- ***"See how easy it is to interact over the system"*** (Comment from School C team member).

- ***"Comments from a student who had taken a class in this environment"*** (Comment from School C team member).
-
- ***"Hearing the "pros" and "cons" of the system from people who use distance learning on a regular basis"*** (Comment from a School G team member).

- ***"The student and teacher perspectives of distance learning. They obviously enjoy it"*** (Comment from School G team member).

9. Student involvement in working with distance education technologies was valued.

Analysis of my field notes and comments, recorded comments of participants at workshops, open-ended surveys and focus group transcripts conveyed that school teams valued the presence of students in the group.

[82] Researcher Notes, Researcher Comments. April 18, 1997.
[83] Researcher Notes, Researcher Comments. April 18, 1997.

- Teams without student representation invited students from other teams to join them in group discussions (Researcher Notes, Researcher Comments. December 3, 1996).

- The students were much quicker than the adults to grasp operation of the VTEL equipment. They are as quick as can be about using controls. They don't even have to be instructed--almost--and they have never seen the equipment (before today) (Researcher Notes. Researcher Comments for Workshop #3 for School H, February 21, 1997).

> ***"Let's have some students over here. We need to have their input on what makes a good teacher"*** (Researcher Notes. Recorded comment made by administrator made during small group activity at Workshop #1, December 3, 1996).
>
> ***"Our students (5 students) put our tape (the multi-media presentation) together"*** (Researcher Notes, Recorded comment from School B team member at Workshop #2, January 24, 1997).
>
> ***"The students did everything" (They prepared a Power Point multi-media presentation showcasing the school.)*** (Researcher Notes, Recorded comment from School H team member at Session #2, February 21, 1997).

The adeptness of students towards the technology was elaborated further by students who spoke during the focus group interviews. Students felt the equipment was "*fairly easy to use. Pretty much anyone could use it.*"[84]

> ***"Students are very adaptive towards the VTEL equipment. The two students that we had that were taking the class, I mean, they learned how to use the equipment and they--they managed themselves. They didn't need anybody there to manage for them.***
>
> ***The night class that I'm doing has a student--a work study student--that comes and she manages the equipment for the other students that are taking the class and they're just right at home with all the electronics and technology"*** (Focus Group Interview #1 Transcript, November 6, 1997, p. 40).

Participants indicated that students on the teams "*were interested in being able to follow-up, but I don't think they really had the opportunity to see the follow-up yet.*"[85]

10. Staff development expanded awareness and knowledge of distance education and enhanced the self-efficacy of school team members towards the technologies.

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[84] Focus Group Interview #3 Transcript, November 7, 1997, p. 3.
[85] Focus group Inteview #1 Transcript, November 6, 1997, p. 38.

Analysis of questionnaires, written comments recorded on open-ended surveys distributed after each of the staff development workshops, my notes and comments, and focus group transcripts confirmed that staff development enhanced understanding of distance education and related technologies among team members.

Written comments recorded on Open-ended Surveys.

- ***(I have a) "better understanding of how it works"*** (Comment after Workshop #3 from School E team member, April 18, 1997).
- ***(Learning about) "the great possibilities available in using distance learning"*** (Comment from School E team member after Workshop #3, April 18, 1997).
- ***"Learned how to use the equipment"*** (Comment from School H team member after Workshop #, 2, February 21, 1997).
- ***"I liked learning how to use the cameras"*** (Comment from School H team member after Workshop #2, February 21, 1997).
- ***(Got) "lots of good technical info, practice time, hands-on"*** (Comment from School H team member after Workshop #2, February 21, 1997).
- ***"I learned of the many possibilities related to distance learning. I was impressed with audio and visual clarity of the system...(Positive experiences were) "learning the capabilities of this new technology and their positive impacts on learning in the classroom"*** (Comment from School B team member after Workshop #2, February 7, 1997).
- ***"The session provided an excellent hands-on experience"*** (Comment from School B team member after Workshop #2, February 7, 1997).
- ***"Hands-on--learned more, understand more, and feel more comfortable with the innovation"*** (Comment of School D team member after Workshop #2, January 31, 1997).
- ***"Received much valuable info concerning distance learning, particularly about the role of the facilitator... (I liked) the overview of the total program for the new members of the team"*** (Comment of School E team member after Workshop #1, December 2, 1996).

Analysis of the self-efficacy component of the questionnaires (**Table 10,** p. 116, and **Table 11,** p. 118**)** revealed that self-efficacy of participants increased in every category as a result of staff development. School team members showed greater self-efficacy and comfort level towards using technologies associated with the videoconferencing system, in particular, E-mail (Change in category mean: +0.61/5.00) and fax equipment (Change in category mean: +.60/5.00). The largest change was shown to be self-efficacy towards use of the videoconferencing equipment (Change in category mean: +0.80/5.00). Participants exhibited more positive feeling towards serving as a change agent in schools (Change in category mean: + 0.46/5.00). Their "comfort/anxiety" level had become more positive (Change in category mean: +0.37/5.00). "Item

3," the statement regarding *"being the type to do well with electronic technologies,"* received the most positive response at the close of the study in this category: 4.30/5.00.

Written comments on open-ended surveys administered following each of the staff development workshops revealed both changes in attitude and self-efficacy of participants over time. Initial anxieties and intense personal focus on manipulation of the technology (present prior to staff development and expressed on open-ended surveys following Workshop #1) dissipated after the individual school hands-on training (Workshop #2) and the interactive videoteleconference (Workshop #3).

Workshop #1 did not include any use of videoconferencing equipment. At that time (December 1996), the high-speed DS-1 lines had not been installed at SVCC. The system was operating via "Switch 56" capacity, which is much slower and more jerky than DS-1.

Workshop #2 was conducted for individual school teams (One school failed to schedule this session). Team members worked in pairs to complete a set of prepared scenarios that required them to use the varied capabilities of the videoconferencing equipment and document camera.[86] Comments of participants recorded on open-ended surveys reflected a much lower anxiety level following Workshop #2 and the teleconference that was part of Workshop #3 than had been expressed following Workshop #1.

Concerns after Session #1 recorded on Open-ended Surveys.

"Lack of hands-on with the equipment" (Comment from School E team member in answer to question involving 'concerns', December 3, 1996).

"Not enough hands-on work...Not being able to use the equipment" (Comment from School E team member in response to concerns, December 3, 1996).

"More use of the technology" *(*Comment from School B team member) in response to suggestions for improvement, December 3, 1996).

"I need the hands on. I know it will come" (Comment from School I team member) regarding suggestions for improvement, December 3, 1996).

"I would enjoy learning more about the equipment" (Comment from School H team member regarding suggestions for improvement, December 3, 1996).

[86] Researcher Notes. January 7, 1997.

Written comments recorded after Sessions #2 and #3 on Open-ended Surveys.

> ***"The hands-on use of the equipment was wonderful...I feel much more comfortable about the use of the equipment"*** (Comment from School A team member after Workshop #2, January 24, 1997).
>
> ***"Hands-on (was positive experience). I learned more, understand more, and feel more comfortable with the innovation"*** (Comment from School D team member after Workshop #2, January 31, 1997).
>
> ***(It was interesting) "seeing how easy it is to interact over the system"*** (Comment from School C team member after Session #3, April 18, 1997).

The focus group interviews provided much greater insight into school plans for utilization of the network for distance education and for communication than was obtained from the questionnaire administered at the end of the study.[87] Results of *Section II* that dealt with Concerns showed no essential change between data obtained at the start and at the end of the study. At the end of the study, most respondents were still at Stage 0, indicating that they were aware of the innovation, or at Stage 1 or Stage 2, which indicated that they were concerned about how the innovation affected them personally.

One interpretation of these somewhat conflicting results: positive changes in perceived facilitator self-efficacy and ability to use electronic equipment (indicators of progress in implementing the innovation), and the absence of any change in Stage level of concerns between the start and close of the study might be that the goal facilitators set for themselves was too high. The original goal of the Network was to enable high school students to be able to take classes via distance education. That goal had not been achieved to any great extent during the relatively short time that the system had been operative. However, facilitators had made a great deal of progress in their understanding of how the technology worked, the potential it offered for improving teaching and learning opportunities, as well as what types of organizational support they needed to make further progress in using the system. It may have been that the end-result was still too far away for responses on an instrument like the CBAM to reflect progress.

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[87] Researcher Notes and Comments. (November 7, 1997). Comments made following Focus Group Interviews, November 7, 1997.

In the focus groups, school team members spoke openly and freely about their understanding or involvement with the technologies associated with the regional network. The transcripts showed that schools were making progress implementing innovation. Participants stated what worked and didn't work for them; they shared their school division plans for application of distance education during the next stage of implementation of the network; they offered many suggestions for diffusing information about the network and engaging other groups in using the network. These actions demonstrated a level of confidence and self-efficacy that would not have been possible prior to staff development and on-site opportunities to work with the technologies.[88]

Conversations in the focus group interviews, as well as written comments on the Principal Narrative Reports, revealed that participants and schools were conducting dialogues about future use of the network. While participants recognized that there were still barriers to widespread implementation of distance education, they also were able to envision and relate to others how they could enhance communications and learning opportunities for students, teachers, and community residents throughout the region by utilizing some of the capacity of the telecommunications network.

> ***"We want to open it up to the community for classes and other learning opportunities"*** (Comment written on School E Principal Narrative Report, November 1997).
>
> ***"We would like to use this network for various club meetings...We are trying to provide access to our Vo-Tech office off this network"*** (Comment written on School I Principal Narrative Report, November, 1997).
>
> ***"Possible use...for meetings and communication"*** (Comment written on School G Principal Narrative Report, November, 1997).

11. Advocacy at the superintendent level was identified as a need for promoting and incorporating distance education into the culture of school communities.

Analysis of researcher's notes and recorded comments, document review, and transcripts of focus groups interviews revealed that participants felt that advocacy at the superintendent level was very important in promoting awareness and use of the regional network.

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[88] Researcher Notes. Researcher Comments. November 7, 1997.

Although Dr. Sheffield had sent the superintendents periodic summaries of progress of the Network and reviewed the status of the Network at the Superintendents' Meetings held in Fall 1996,[89] Spring 1997,[90] and Fall 1997,[91] superintendents did not appear to become involved in promoting the regional network in their communities. Superintendents appeared to be unaware of the training that had taken place for school telecommunications teams. Dr. Sheffield had made all arrangements for the staff development workshops directly with schools and the building principals.

> ***"I'm not sure the other superintendents understood this--or we would be doing this already"*** (Researcher Notes. Recorded comment of Superintendent (School H) regarding options available through SVCC-TN, April 29, 1997).
>
> ***"We're getting behind."*** (Superintendent #1)
> ***"If we don't get something going we'll be sitting there with all this equipment. I'd appreciate some leadership. I can't provide it"*** (Superintendent #2) (Researcher Notes, Recorded comments of superintendents on April 29, 1997 at the Superintendents' Meeting).

According to the comments made at their Spring 1997 meeting, superintendents did not appear to have understood, prior to this meeting, that each site could originate and receive programming and that multi-point to multi-point connections were possible. Several superintendents agreed to meet separately and discuss how they might become more involved in planning how their school divisions might use the network for distance education classes and for community groups. They asked to be informed regarding training for technical support staff.[92]

> ***"Please send information regarding scheduling software to superintendents and let them share the information with their technology staff at the school division level"*** (Researcher's Notes. Recorded comment made by superintendent at Superintendents' Meeting, April 29, 1997).
>
> ***"Other (superintendents) agree with above request"*** (Researcher's Notes, Researcher comment regarding above statement, April 29, 1997).

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89 Agenda: Superintendents' Meeting. (1996, September 23).
90 Agenda: Superintendents' Meeting. (1997, April 29).
91 Agenda: Superintendents' Meeting. (1997, October 29).
92 Researcher Notes. Researcher Comments. April 29, 1997.

Dr. Sheffield related that school teams were very concerned about scheduling, instructor compensations and fee schedule for students enrolled in distance education classes that involve instructors and students in different school divisions. "*These are areas where the superintendents need to be involved,*" [93] she told them.

When superintendents met at SVCC again in October 1997, there had been no resolution on these issues,[94] and Dr. Sheffield presented them again. She encouraged superintendents to become involved in using the network. She related that the (Virginia Legislature) "*Science and Technology Committee* (Virginia Legislature) *met last week at five sites via Net.Work.Virginia. Ted Bennett* (Member of Virginia House of Delegates [Halifax, VA], who represents the Southside Virginia region) *was impressed. He learned how to use the teleconferencing system*." [95]

> ***"If you have to have meetings, use it (the videoconferencing system)"*** (Researcher's Notes. Recorded comment made by Dr. L. Sheffield, October 29, 1997).

> ***"It is very important that they (superintendents) be involved because they set the standard and the speed for the whole division, but the superintendents are so busy. I know that (our superintendent) spent a lot of time working on the distance learning and seeing that it has happened. He's very interested in seeing that (it works). It is something that is on the upper midlevel list of his priorities, and he is real anxious for us to find ways for us to use the equipment now that it is here. So now I not only have what interests that we have here, I have (our superintendent) saying, 'What are you going to be doing? What are you going to be using? How are you going to be using it?'"*** (Focus Group Interview #3 Transcript, November 7, 1997, p. 9).

By the end of the superintendent's meeting, several of the superintendents began to recognize that their leadership was needed in promoting use of the Network. One member suggested *"Maybe it would be worthwhile for us to hold our next meeting via the Network"*[96]

In the focus group interviews, participants spoke about the need for superintendents to be involved. The question was raised whether superintendents had actually "*experienced using*

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[93] Researcher's notes. Recorded comment, April 29, 1997.
[94] Researcher's Notes, October 29, 1997.
[95] Researcher Notes. Recorded comment of L. Sheffield, October 29, 1997.
[96] Researcher's Notes. Recorded comment made by Superintendent, October 29, 1997.

the Network."[97] Another participant suggested that the superintendents *"go sit in classes where it's already working well to how it works--to see what the potential is."* [98]

> *"I'm wondering if you could put the superintendents in some sort of scenario like that at their next superintendents' meeting or the one after that where they're not in the same room, but they are in two separate places so that they can talk to one another within a room as well as across the network. I think that will be a big start."* [99]

Another participant suggested that superintendents accompany students to both satellite classes and classes using the videoteleconferencing system.

> *"If they sat in like a Latin or Japanese class with the facilitator from the electronic classroom and the students who took it electronically and could see the difference, I think those facilitators and children could give them a lot of feedback on why this is better than electronic classrooms"* [100].

Another participant responded, *"They need to go and see that."* [101] All of these statements supported the finding that participants felt advocacy of the superintendent was very important for promoting use of the network.

12. Participants considered active involvement and support of school principals to be important for implementation of distance education.

Analysis of data acquired in this study from questionnaires, document review, E-mail correspondence, my field notes and comments, and from focus group interview transcripts confirmed the "power of administrative control in school technology" described by Mecklenburger (1989, p. 7). In *Section I* (Attitude) on the questionnaire administered at the end of the study, "Item 17" that addressed administrator's role in staff development, received the most positive response, 4.40/5.00 (**Table 7**, p. 111). Participants strongly felt that administrators should be involved in the training regarding distance education.

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[97] Focus Group Interview #1 Transcript, November 6, 1997, p. 12.
[98] Focus Group Interview #1 Transcript, November 6, 1997, p. 12.
[99] Focus Group Interview Transcript #1, November 6, 1997, p. 13.
[100] Focus Group Interview Transcript #1, November 6, 1997, p. 13.
[101] Focus Group Interview Transcript #1, November 6, 1997, p. 13.

According to Mecklenburger (1989), "Administrators must understand both the capabilities and limitations of technology" (p. 7). The commitment of administrators involved in staff development in this study was shown by their responses to the final questionnaire. In this study, five (out of a possible nine) administrators attended the hands-on training (Attendance records: January 6, 7, 17, 24, and 31; February 7 and 21).[102] Four of those completed questionnaires at the end of the study; the fifth administrator had moved to another school district. No questionnaires were received from administrators who had not attended the hands-on training.

Research by Kirby (1995) showed that the climate at a school affects how comfortable students feel in participating in distance education classes that may begin or end prior to the school bell schedule. By their ability and willingness to compensate for the alterations that are necessary, schools, and indirectly principals, affect enrollment and attrition rates of distance education students. In Focus Groups #3, one participant commented on the importance of the building level administrators. *"The building level people, the administrators are important because anything that goes on in the building isn't going to work without their support."*[103]

An example in this study that revealed the importance of principals in promoting distance education classes involved the Dual Enrollment Biology course that was scheduled between Schools C and D; SVCC provided the instructor. The biology class began with 17 students.[104] But the beginning of October, about half had dropped. According to Dr. Sheffield, upon questioning the staff at both schools, it appeared that two factors were involved. Many students already were taking two or three other Dual Enrollment courses. Additionally the lab time for this course was established and managed by regular teachers at each school. The lab had been scheduled during Student Activity Period; students wanted to be able to participate in student activities.[105]

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[102] Attendance Records for Staff Development #2 Workshops.

[103] Focus Group Interview #3 Transcript, November 7, 1997, p. 9.

[104] Sheffield, L. (SVSHEFL@sv.cc.va.us). (1997, September 10). Re: SVTN. E-mail to J. McNeal (JMCNEAL@vais.net).

[105] Researcher Notes. Telephone conversation between L. Sheffield and J. McNeal, October 2, 1997.

Analysis of principal narrative reports and focus group transcripts showed that the telecommunication team members felt that distance education classes, as well as demonstrations, should be delayed until the technology was operating effectively. One basis for selection of telecommunication team members had been their interest in technology. Through their own use of the equipment, and through discussions during staff development, team members had developed awareness of the potential of distance education and the regional network. Since they understood the potential of the system, team members seemed to feel that they had a little more tolerance for dealing with the problems and delays associated with implementing new technology than the general public.[106]

> ***"From mine and Linda's experience we know one thing, you don't need to start until it's ready technically to go, because high school students can not handle a level of frustration that goes on from not picking up that program"*** (Speaker from School D).
>
> ***"Try college professors; they're even more temperamental, believe me. Students are very easy to work with in comparison"*** (Speaker from Longwood College).
>
> (Focus Group Interview #1 Transcript, November 6, 1997, pp. 37-38).

14. Participants (at schools where distance classes had been held during the fall) recommended additional staff development and time be provided to help teachers develop effective teaching strategies for delivering instruction via the teleconferencing system.

Analysis of focus group interview transcripts and responses to open-ended questions on the final questionnaire supported this statement. Several sites had been involved in delivery of distance education courses during the fall semester and representatives from those schools reflected upon the experience during the focus group interviews. They noted that teaching styles would need to be altered and that

> ***"I went to the lecture one night. Instructors need to tape and watch what the distance site receives. At times this instructor is difficult to understand and some examples do not come through clearly. This has really given me a new perspective on distance learning"*** (Written response to open-ended question on Final Questionnaire, November 1997).

[106] Researcher Notes. Researcher Comment, November 7, 1997.

additional time would be needed to prepare classes for delivery via distance technologies. Teachers who plan to deliver distance classes *"probably have to change (their) teaching style...and that takes time,"* noted one participant.[107]

> ***"It takes a lot more preparation time to be on television...to do it right....Well, if you don't do it right...that will run it right into the ground"*** (Focus group interview #1 transcript, November 6, 1997, pp. 32-33).

15. Team members recommended expanding staff development to reach a wider audience and accommodate mobility of staff and the changing interests of business and community members.

Analysis of focus group interview transcripts revealed participants wanted other groups to have staff development regarding application and use of distance education technologies.

> ***"We were given so much information that other people who didn't attend...that they didn't get and I feel a repeat of that sort for a different group--I don't need to do it again, but other people do"*** (Focus group interview #1 transcript, November 6, 1997 p. 3).

Changes in the administrative structure in schools meant that there would need to be some on-going staff development process. In June 1997, two new superintendents (there were eight school divisions in SVCC-TN) were installed.[108, 109] *"We did that several years ago (for superintendents), but it's a different group now...and it's a much better system now,"* noted Dr. Sheffield in response to comments about providing some training for superintendents.[110] She continued,

> *"At the superintendents' meeting last week we did begin to discuss this and I did make suggestions to the superintendents and their representative there that we do start setting up some demonstrations....I even suggested to a couple of the superintendents after the meeting that, you know, 'Why don't you try using this*

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[107] Focus Group Interview Transcript #1, November 6, 1997, pp. 31-31.
[108] 1996-97 List of Superintendents involved in SVCC-TN.
[109] 1997-98 List of superintendents involved in SVCC-TN.
[110] Focus Group Interview #1 Transcript, November 6, 1997, p. 6.

> *technology and just see how it works?' So I'm going to really follow through with them on setting up the demonstrations."* [111]

It is important to note that in one district where there were three new administrators, including the principal,[112] none of the members of the school telecommunications team returned a final questionnaire.[113] This situation provided additional evidence for the critical role of the principal in implementing change in the school environment. School leaders need to provide some form of on-going staff development to assure that current school staff (including teachers and administrators) maintain currency with the evolution of the regional telecommunications network and its potential for enhancing communications and educational opportunities for the local school and community.

16. Focus group participants identified a need for establishing a new organizational structure to promote cross-district utilization of the regional telecommunications network.

Southside Virginia Community College led the initial process of implementation of the regional telecommunications network.[114] Local schools had provided a classroom for the equipment and had identified staff and students for staff development. Analysis of my researcher notes at the Superintendents' Meetings and transcripts of focus group interviews showed that the nine high schools recognized that there needed to be some ownership and direction among the school divisions for developing a distance education program that served their needs. Schools wanted flexibility to try different approaches. In the focus group interviews, representatives related ideas that had been discussed at their schools for use of the Network. One school was exploring creation of cross-disciplinary projects that would be conducted via electronic communications with research scientists.[115] Another school had

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[111] Focus Group Interview #1 Transcript, November 6, 1997, pp. 13-14.

[112]. Researcher Notes. (1997, November 13). Telephone conversation with secretary at School D.

[113] Researcher Notes and Comments, December 1, 1997.

[114] L. G. Sheffield and R. W. Bratcher. Overview: Southside Virginia Community College Telecommunications System. Developing A High Performance Learning Community. December 1995.

[115] Focus Group Interview #1 Transcript. (1997, November 6). p. 11.

identified a couple of other schools and was working to set up some classes with those sites.[116] One participant stated that *"the principal should work with people...who have a genuine interest in being on camera, and are teaching something that would be something that other schools would want."*[117] Others preferred to wait and see what would be available.

Some superintendents recognized that they needed to exhibit leadership. *"We are going to have some programming. The principals expect us to make decisions."* [118]

The following are some thoughts that were shared during the focus group interview regarding future organizational structure for the regional network.

> ***"I think it's probably like a lot things, there will be people in several divisions but probably not all who are interested enough to pursue the technology, who won't sit and wait for things to come to them but will actually pursue usage, and I think that for those people the network will be used, not just the Internet access but the distance learning will be utilized more often and will become more familiar....I think (that if) you're going to have a group of the ten-something (schools),(there will be) some percentage that will participate, that will find ways to participate and others that will sit there until someone has the interest to do so"*** (Focus group interview #3, November 7, 1997, page 9).
>
> ***"The group physically that needs to be involved in the decision has to include the superintendent because it's financial. It (should) include the administrator or principal of that school. You need to include a guidance person for scheduling. It needs to include a technical person. So for us it's a four person group that would then meet with those four persons from the other divisions that would be) interested (in what we) would talk about...'We have a good program in this and you have a good program in that and we can merge and we can save some money, and we're not going to be doing it by adding people, we're going to be doing it by sharing resources'"*** (Focus group interview #1, November 6, 1997, p. 12).

17. Team members were enthusiastic regarding the potential of the videoconferencing medium and regional network for expanding communications and learning opportunities, but recommended distance classes initially be targeted to select groups.

Analysis of questionnaires administered at the start and close of the study showed that participants had positive attitudes towards distance education and benefits it would provide students in their schools. Data obtained from analysis of my notes recorded during staff

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[116]. Focus Group Interview #1 Transcript. (1997, November 6). p. 16.
[117] Focus Group Interview #1 Transcript. November 6, 1997. p. 4.

development workshops, written comments of school team members on open-ended surveys, focus group interview transcripts and principal narrative reports showed that schools had high interest at this point in time in using the network for enhancing communications and sharing of resources. They were interested in technology applications that included access to the Internet and creation of E-mail accounts for staff and teachers. Schools had plans to use the Network for a variety of meetings with groups located throughout Southside Virginia. Analysis of focus group transcripts showed that some schools already had plans or had conducted demonstrations for their staff, school boards and business and community leaders to showcase the technology--and the expertise of their staff (the telecommunications team members) in using the technology.

Principal Narrative Reports from schools A, E, H, and I, and analysis of focus group transcripts showed that the presence of the teleconferencing system had served as a catalyst for their schools to upgrade their own technology resources. One participant shared that *"We're working real hard on technologies, teacher confidences...and getting our staff up to our student level with technologies and computers."*[119]

> ***"Hopefully we'll be able to use it for some staff development....The Internet use really has been so far the greatest advantage for us because before we've been limited to a single machine dial-up connection...Now we've got the ability to connect as many as we wish....I intend to have a couple of computers installed in here and then folks will be able to...take courses (like Windows 95), or we could pull them in from another location if they're offered"*** (Focus Group Interview #2 Transcript, November 6, 1997, lines 166-170; lines 221-223).
>
> ***"With the completion of our LAN we will have many features for our faculty and staff....We hope to have Internet access in every classroom very soon"*** (Comment recorded on Principal Narrative Report. School A. November 1997).
>
> ***"I am in the process now of setting up a school-wide network"*** (Focus Group Interview #2 Transcript, November 6, 1997, line 211).
>
> ***"Once the school is wired for full access, students and teachers will use E-mail accounts. We currently use the Internet for library use, but hope to route to classrooms soon"*** (Comment recorded on Principal Narrative Report. School H. November 1997).

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[118] Researcher Notes. Recorded comment of one Superintendent, Superintendent's Meeting, April 29, 1997.

[119] Focus Group Interview #3 Transcript, November 7, 1997, p. 7

Students, teachers, and principals reported they were using the Network for Internet access. Schools had plans to provide students E-mail access from home via the Internet. And then, suggested one student, *"We could do some of our work at home and E-mail it to school!"*[120]

- ***"In Biology, we use it (the Internet) to look up what different chemicals do to different kinds of materials"*** (Student [School C] comment recorded during Focus Group Interview #3 Transcript. November 7, 1997, p. 11).

- ***"Our "econ" class has been playing the stock market game and they have been checking their stocks every morning (on the Internet) to buy and sell. In the past they had had to do this by the statistics in the newspaper. Now they're able to have the actual quotes in the morning. They're having a real good time being able to be that up-to-date in the buying and selling. Let's see what else have we been working on. We've had students working on careers through Virginia View and they do Internet searches on topics that have chosen from Virginia View. We've had an English class look at a variety of ...topics...A lot of Shakespeare research for British Lit."*** (Student comment recorded in Focus Group Interview #3 Transcript, School H, November 7, 1997, p. 11).

- ***"We are using the T-1 line for Internet access*** (Written comment on Principal's Narrative Report. School E. November 1997).

In their written response to Principal's Narrative Report, at the Scheduling Committee Meeting on June 18, 1997, and in the focus group interviews, many schools spoke about the interest of school staff in obtaining Staff Development courses via the Network.

"Staff development is one thing that I think will be very popular when courses become available....Courses, probably like the standards of education, curriculum specific courses, core courses like science and math....The staff doesn't like to travel. Perhaps if we could bring it here, perhaps we could have more people attend" (Focus group interview #2 transcript, November 6, 1997, lines 198-199, lines 202-206).

"We want to use the system for staff development, then for students" (Researcher's recorded comment made by School F representative, Scheduling Committee Meeting. June 18, 1997).

[120] Focus Group interview #3 transcript, November 7, 1997, p. 11.

All groups: administrators, teachers, and students expressed interest in using the regional network for meetings. One of the participants in a focus group related information regarding the Virginia judicial system use of a teleconferencing system. Some student suggestions for using the teleconferencing system included *"having a debate match or practice against another team, say if the weather is bad and we could not travel for a debate match....Quiz bowls...ACE teams or academic challenge."*[121]

> ***"I saw recently that ...some courts were using (the teleconferencing system) to hear pleas with criminals where the judge didn't have to go around the circuit and could stay in one place and teleconference to different sites to hear the cases"*** (Focus group interview #3 transcript, November 6, 1997, p. 14).

Teachers and administrators made these suggestions:

> ***"We're considering using it for a debate and also for the athletic directors. They travel so far to meet, but we're suggesting that they do that electronically"*** (Focus Group Interview #1 Transcript, November 6, 1997, p. 18).
>
> ***"I know many students in this area participate with Tri-Hi-Y and Model UN General Assembly and that requires students in the region to come togethe , culminating with the Model General Assembly in Richmond, and I see where it could be used with those student communicating ahead of the Model UN"*** (Focus group interview #1 transcript, November 6, 1997, p. 41).
>
> ***"Perhaps another would be in-service days, since Mecklenburg has two high schools, it would be nice for the social studies teachers on both ends of the counties to be able to meet together to see the direction of the county as ...instead of having to travel from one school to the other"*** (Focus group interview #1, November 6, 1997, p. 42).

[121] Focus group interview #3 transcript, November 7, 1997, p. 5.

> ***"My fear is we have all this wonderful equipment and we can't get together on scheduling...I want to gradually change over from the electronic classroom. With this we can use our teachers and let us see what we can do to use the system"*** (Researcher's recorded comments, Administrator from School D, Workshop #2. January 31, 1997).

Although scheduling and other administrative problems hampered inter-district planning for delivery of high school courses, as well as the Dual Enrollment courses offered through SVCC, schools identified several groups that would benefit greatly from delivery of instruction via the teleconferencing system. One group was composed of students already enrolled in distance courses through the satellite-based, one-way audio, two-way video Virginia Electronic Classroom (VEC) program. Focus group participants felt that the enhanced learning environment available to these students through the videoconferencing system would compensate for any "inconveniences." This feeling was supported by comments from both a Latin teacher and her student from Tazewell County during the videoteleconference (Workshop #3, April 18, 1997) who had experienced both modes of instruction. From the discussion, it was evident that "real bonding" had occurred between the two individuals who had never met face-to-face prior to this activity.[122]

> ***"We had students who called and asked if it would be possible to go to a summer school session with their location at (School D) tapping into SVCC, and these are students who graduated from (School D) two and three years ago. They wanted an AP math class this summer. They wanted to come to a summer school at (School D) using distance learning from this site. I know that we could run sort of a college summer school session in our local high school ...with students who graduated one, two years ago from that high school"*** (Focus Group Interview #1 Transcript, November 6, 1997, pp. 38-39).

Participants in focus group interviews were very enthusiastic about the opportunities being provided via the Network for adult education and for college-level summer school courses. These students, they felt, would most likely would be motivated students. A focus group participant who had had distance education classes at her school this fall notes that "*the motivated students that we've had thoroughly enjoyed being able to take Dual Enrollment classes at School D."*[123]

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[122] Researcher Notes. Researcher Comments. Workshop #3, April 18, 1997.

[123] Focus Group Interview #1 Transcript, p. 38, November 6, 1997.

Some schools hoped that eventually there would be some high school courses offered. A representative from one school suggested that they might consider offering creative writing. *"We have an excellent program, and we do think that would be something we could offer."* [124] Another representative described a student research program being considered at his school that would involve using the Network for collaborative programs between students and expert scientists--and might eventually involve students in several school divisions. Were that to happen, he said, *"then the next thing you know, somebody's going to say, 'Well, why don't we just have this as a class?'...and gradually (we could) build into it (using the teleconferencing system)."*[125]

> ***"We have a fairly good size adult education program going and I think...the equipment will allow us to expand our horizons a little bit and I think we'll be able to do more than we're able to now"*** (Focus Group Interview #2 Transcript, November 6, 1997, p. 7).

> ***"We would like to be involved with some other high schools (for high schools courses). Our students cannot afford the tuition for Dual Enrollment courses and our School Board will not pay tuition for the students"*** (Principal Narrative Report. School E. November 1997).
>
> ***"We plan to work with other schools to determine our needs and interests for high school courses"*** (Principal Narrative Report. School I. November 1997).

One member of the focus groups summarized feelings shared by many in the group with these words:

> ***"When you talked about Tazewell and how joining of those high schools created a sense of community, I think that has a high potential for this area. Because we are so variable and the connecting of the resources and the people we have from county to county in this area (offer) a real bonus for us to be able to pool our resources and to use this system to our benefit. I think that this (system) will also encourage the kind of use of other technologies that's not just this (videoconferencing system), it's the joining together of many other technologies in the course of using this. And so, as we become comfortable with this, I think it's going to do things far beyond anything that's done, you know, whether it's a class or seminar, or whatever it is--it's the rebound thing that's gong to be great"*** (Focus Group Interview #1 Transcript, November 6, 1997, p. 7).

[124] Focus group interview #1 transcript, November 6, 1997, p. 34.
[125] Focus Group Interview #1 Transcript, November 6, 1997, p. 12.

Summary of Results: Answers to Research Questions

Data emerging from this study from both qualitative and quantitative sources revealed that these rural Virginia schools found that their participation in a regional telecommunications network (Southside Virginia Community College Telecommunications Network, SVCC-TN) served as a catalyst for merging a collection of communication technologies into their school operations and for encouraging staff use of these technologies. Schools were redefining and expanding their initial interpretation of distance education from one of interactive classes taught via a 2-way audio, 2-way video VTEL system to a concept that included a wide range of communication systems that provided information and allowed participants to share and exchange resources. The data emerging from this study also validated previous research on critical attributes of staff development in promoting understanding and use of an innovation.

Analyses of quantitative and qualitative data provided the following answers to the research questions developed prior to the study and presented in Chapter 1.

1. How was the initial process of implementing distance education characterized in the local secondary institution?

This study showed that there is value-added benefit to high schools provided by participation in a regional network that includes institutions of higher education. Both SVCC and Longwood College provided access to a wide range of expertise and served as resources for delivering distance education courses to high schools participating in the Network.

Results of analysis of qualitative instruments supported the effectiveness of the strong, central leadership, enhanced by the high level of technical support provided throughout the study by Southside Virginia Community College (SVCC). This combination was instrumental in helping schools get connected to the ATM network, in promoting understanding of the technology, and in acquiring funding for the Network and access to some of the peripheral supporting technologies.

Research studies have shown that individuals who work with any innovation in its early stages can expect some initial difficulties, frustrations, and "implementation dips" (Fullan, 1992).

These occurred during the initial phase of this study, leading to changes in design of staff development, and eventually to changes in the initial use pattern of the regional network at the high school sites.

Due to the unexpected state-wide demand for installation of high speed communication channels, the telephone companies were unable to meet the original time lines for installing cabling. New engineering designs were needed to develop switches that could connect the broad-band T-1 telephone lines to the ATM network. Consequently, school hookups that originally were scheduled for January 1997 did not occur until late May or early summer. (As of November 1997, one school remained to be connected, and will not become operational until Winter 1998.) Equipment that was "new in the box" did not function. Further delays occurred as schools awaited assignment of Internet Domain names by Sprint. Then in Fall 1997 came the breakdown of the communications software program being used by the Virginia Community College System (VCCS) to connect their campuses and Net.Work.Virginia sites throughout the state of Virginia. Communications software that had been designed for a smaller number of users was incapable of meeting the demands being placed upon the system. This meant that students in some sites, including those associated with this Network, could not receive classes on a regular basis. Rewriting of code was needed--and was completed after classes had begun.

The delays due to problems associated with new technologies produced consequences that affected both the design and delivery of planned staff development, as well as student enrollment. Since the telecommunications network was not operational at local school sites, hands-on training (Workshop #2) using the Network occurred at the community college sites (which were operational in January 1997). The third staff development workshop, as originally scheduled, envisioned that participants would have an opportunity to deliver their own presentations via the network to other sites. Instead it became a demonstration teleconference in which users of distance education delivery system, representing K-12 and college audiences, presented information and shared experiences via the Virginia Community College Telecommunications Network with telecommunications team members located at one of the two SVCC campuses.

Staff development plans changed in other ways during the course of the study. Feedback from open-ended surveys following the first workshop indicated such a high level of anxiety among school team members that the network coordinator decided to modify the second workshop. Instead of medium-size group activities, each school received hands-on training for just their own school team members. During the Spring of 1997, without a fully functional network, it was difficult to create enthusiasm for students to enroll in distance courses that *might* be available in Fall 1997.

During the course of this study, schools changed their expectations regarding their initial use of the Network. Originally, it had been anticipated that the availability of a two-way audio and video teleconferencing system would lead immediately towards delivery of distance education classes to high school students in subjects that typically had low enrollment figures. Teachers on the school telecommunications teams expected to be serving in the role of classroom facilitators. While thirteen college-level courses were available via the Network to eight of the nine participating high school sites, few students enrolled in these classes. Consequently the role of teachers on the telecommunications teams became one of general facilitation of implementation of the regional network into their school setting.

According to comments made in focus group interviews and on principal narratives, schools felt that the most immediate gains to their instructional program from their participation in the Network lay not with distance education courses, but for enhanced communications and sharing of resources. Principal narratives and focus group interviews revealed strong interest in distance education course, but those that would be targeted towards (a) teachers for staff development and (b) specific high-interest student groups (in particular, towards high school students already taking distance classes via satellite through the two-way audio, one-way video Virginia Electronic Classroom [VEC] program).

2. What barriers did schools face as they addressed delivering instruction via regional telecommunications network?

In addition to technology issues, there were several other barriers to regional implementation of implementation of distance education, defined as "delivery of courses to high school students." Through their responses to both qualitative and quantitative data collection instruments, participants identified the following barriers. They included:

- scheduling conflicts, both within sites and across sites;
- communication patterns, both within sites and across sites;
- lack of cross-district policies that addressed financial issues such as fees for students enrolling in cross-district courses, instructor compensation, and incentives for developing a course for delivery over the Network; and
- local school organizational structures and issues, including genuine teacher concerns regarding use of technology and potential displacement through implementation of the network, and rigid time lines for scheduling and enrolling students in classes for the following year.

3. How did school telecommunications teams function in the staff development and implementation process?

Data emerging from this study confirmed that engaging students, teachers and administrators in working together in school telecommunications teams promoted the implementation process. During the staff development workshops, telecommunications teams had positive interactions that endured upon return to their buildings. During the workshops, the synergism created by involvement of individuals with differing positions in the school environment produced a wide range of suggestions for potential uses of the network and demonstrated the value of including both teachers and administrators on school telecommunications teams. One of the most positive responses on the closed-ended questionnaire administered at the close of the study (4.40/5.00) was that administrators should be involved in training.

Analysis of qualitative data validated the positive role of students on telecommunications teams. Student contributions were valued, not only by their team members, but also by

participants from schools that did not include students on their teams. The students were quick to learn how to use the equipment; they provided insight into what constituted good teaching; and they had unique ideas (not offered by administrators, teachers or high school staff) for expanded use of the Network.

The data supported the design of the study in which staff development was directed towards heterarchical school telecommunication teams (composed of students, teachers, and administrators), in the expectation that this non-traditional group would become promoters of the technology.

4. How did ongoing staff development, coupled with initial stages of implementation of the telecommunications network at the secondary school sites affect...

a. ...perceived attitudes towards the innovation?

Except for noting a small positive change (+0.31) in perceptions regarding ease of use (Complexity), analysis of data obtained from initial and closed-ended surveys (**Table 8**, p. 112) showed little change in any of the five attributes identified by Rogers (1962) as representative of categories associated with implementation of innovation. Data emerging from analysis of qualitative instruments provided much richer insight into changes in attitude that had occurred over time as individuals had become familiar with the concept, utilization and potential applications for distance education.

Participants in the study identified a relatively positive attitude at the start of the study towards the "Relative Advantage" (Category mean: 3.88/5.00) of distance education. This perception remained at this level throughout the study.

Throughout the study, responses by all individuals on all data collection instruments indicated that scheduling issues were their primary concern. Item 14 on the final questionnaire (**Table 7**, p. 111) that addressed "coordination with other schools," under the category "Compatibility," received the lowest score of any item (2.29/5.00).

The deepest insight into the two categories, "Trialability" and "Observability," came from analysis of qualitative data: (a) from written comments on open-ended surveys administered

following each of the staff development workshops, (b) from written comments on principal narrative reports obtained at the end of the study, (c) from written responses to the open-ended question placed at the end of the final questionnaire, and (d) from comments (recorded and transcribed) made at the three focus group interviews. Participants felt strongly that ***using*** the system was the most important factor in promoting acceptance and expanding the use of the teleconferencing system. Individuals reported that they became excited about the technology through using it during the staff development activities--and that, once they used it, they began to think of additional ways the telecommunications network could be employed to expand the opportunities available to their students, staff and community.

Participants in the study recommended repeating the staff development so as (a) to involve more people and new interest groups in thinking about applications associated with use of the network, and (b) to accommodate changes in school administration that occur over time. Participants felt that people must have opportunities to try the system in non-threatening situations--that they needed to observe situations where the videoconferencing system was being used.

The data indicated that schools were planning and developing their own (site-based) plans for using the capacity of the regional network. Several schools reported that they had delivered or were preparing demonstrations for various groups, including their school boards and Board of Supervisors and local business and community leaders.

Focus groups offered participants opportunities for sharing and exchanging information regarding the increasing visibility of the videoteleconferencing system throughout their region. Dr. Sheffield reported how one member of Virginia's Joint Commission on Science and Technology became so excited at the meeting held via the teleconferencing system, that "all at once he just reached over there and he started using it and he kept saying, 'This is unbelievable!'"

b. ...perceived Levels of Concern/Acceptance of the innovation?

Results of the Concerns-Based Adoption Model (CBAM) component (Section II) of the closed-ended questionnaire revealed little change in level of concern towards the implementation of distance education via a regional telecommunications network (**Tables 12-15,** pp. 120-123).

Except for a few respondents who identified concerns regarding "Collaboration" (Stage 5), almost all individuals identified their current concerns as issues involving SELF (Stages 0,1,2). These results confirmed those of Hall, George and Rutherford (1979/1986), who reported participants in early stages of implementation of an innovation select responses to the CBAM questionnaire that reflect Stages 0,1,2 and represent awareness of innovations and personal concerns towards the innovation.

c. ...perceived self-efficacy of participants towards the innovation?

All data, both quantitative and qualitative, obtained from the study confirmed the positive effect of staff development upon self-efficacy of participants. The data supported the emergence of a cadre of teacher leaders. Results of closed-end questionnaires at the end of the study revealed that category means for "Comfort" towards distance education technologies was 4.04/5.00 at the close of the study. The final questionnaire results (**Table 11**, p. 118) also showed that telecommunication team members had expanded their facility in use of the videoteleconferencing equipment (Change in category mean: +0.80/5.00) and accompanying technologies such as "E-mail" (Change in category mean: +0.61/5.00) and use of "Fax" equipment (Change in category mean: +0.60/5.00). Positive changes also were found for the perceptions participants had towards serving as a "Change Agent" for implementation of distance education (Change in category mean: +0.46/5.00). The final category means for "E-mail" and "Fax" were 4.10 and 4.45 (out of 5.00), respectively.

Analysis of the focus groups discussions demonstrated that participants felt their experiences provided increased insight into strategies that would enhance their local and regional use of the telecommunications network. They felt comfortable in sharing and exchanging information among each other. Individuals from sites that had had distance education classes suggested that instructors who plan to teach over the network would need to rethink their presentation and delivery strategies. Each focus group suggested ways to improve communications that included distribution of a newsletter, as well as by means of the Network, e.g. E-mail, a list-serv, or by creating a Web page.

Participants felt that leadership at the superintendent level was needed for increasing visibility of the network and for addressing issues regarding scheduling, student fees, and instructor assignments and incentives. One individual, supported by others, recommended that superintendents join students in both the electronic classroom and videoteleconferencing room--and listen to *their* comments regarding the differences in learning via the VTEL 2-way audio, 2-way video system.

5. In what ways did individuals and schools redefine, reorganize or reinvent the process of implementing distance education in order to optimize the implementation?

Implementation of the telecommunications began with strong central coordination and leadership provided by Southside Virginia Community College. However, by the end of the study, participants recognized that it was time for a new organizational structure to evolve and expressed these feelings during the focus group interviews. The focus groups provided a forum for exchanging ideas representative of different school divisions. Participants (teachers and administrators) agreed that there was value in allowing individual schools to develop plans that reflected site-based interests and constraints, rather than imposing a rigid organizational structure upon participants in the Network. They felt that the diversity represented among groups in the network could evoke long-term synergy, provided there were opportunities available to share and exchange information during the process. Participants suggested that some form of leadership structure that recognized both horizontal and vertical interest groups, within and across districts, would be most effective for the next stage in the life of SVCC-TN.

In the focus groups, participants spoke about the value of waiting until the technology is ready before involving other groups or offering classes. Even though these individuals felt that they (and highly motivated students) had the ability to weather delays and frustrations in early use of the technology, they felt that new users would not tolerate breakdowns due to the technology.

The original goal of the network was to provide students at high school sites an opportunity to enroll in select, high-level classes that could not be offered at their sites. During

the course of this study, this goal became a secondary objective, as schools began to recognize the opportunities for enhanced communications and sharing and exchanging of resources available through their connection to the network. Schools reported that the immediate value of having the Network was the opportunity to gain Internet connection and to provide E-mail accounts for staff and students. They identified improvements they were making to the communications networks at their sites in order to take advantage of opportunities provided by the network.

In the focus groups, participants suggested a variety of options for using the network that did not involve delivery of classes. They recommended using the network for meetings involving teachers, administrators, and students. They indicated support for "demonstration" activities, rather than long-term commitments, "demonstrations" that expanded the user group to include business and community leaders. They reported that their schools wanted to target distance education classes, initially, for select groups. Distance classes that they felt would be successful at this point in time included: staff development classes for teachers, summer school classes for college students, and Dual Enrollment classes for students who already had experienced distance education classes through participation in the Virginia Electronic Classroom program (VEC). Participants expressed feelings that, over time, interest eventually might grow to support a demand for specific distance education classes for high school students.

All data acquired at the end of study through analysis of focus group interviews supported the statement made by a participant in the second focus group interview:

> *"It's (SVCC-TN) become so much more that we thought it would. There are, I think, so many opportunities just beyond what we've been able to do so far and one day we'll be able to explore even more...I look forward to where we'll be in six months from now or a year from now. We've got the means, but we just don't have the method, so to speak, but I have the feeling that within a year we'll really start to see that this equipment was well worth the time and investment that we've put into it, and hopefully we'll see a return ten-fold of what we've seen so far"* (Focus Group Interview #2 Transcript, November 6, lines 113-115 and 447-452).

Chapter 6

Conclusions, Implications, Outcomes and Recommendations

Conclusions and Implications

Conclusions that emerge from the results of this case study are presented in this section. When appropriate, the significance and meaning of each conclusion are detailed. Critical supporting data from this study are summarized for each of the conclusions. Implications that are relevant for policies and practices in rural schools that plan to implement distance education or other programs requiring advanced electronic technologies are discussed.

1. Two distinct forms of leadership,

- **technical leadership and**
- **top-level institutional leadership**,

are needed within rural school divisions to support changes needed for full-scale implementation of a system involving advanced electronic technologies and a consortium of institutions.

Technical leadership is provided by individuals with an understanding of both the operation and potential of a variety of technologies. It can come from inside or outside the school system. School officials often recommend that district leaders should rely on specialists for technical advice (Trotter, 1997a, p. 31) when dealing with advanced electronic technologies. In large school districts, such capability may reside within the school system. Small rural school divisions, however, often do not have in-house expertise and probably will need to delegate responsibility for technical leadership to an external group or individual.

In this study, the technical leadership came from outside the school divisions. Central coordination and technical support were provided by Dr. Linda Sheffield and the technology staff at Southside Virginia Community College. This technical leadership greatly facilitated the installation of the network. School team members spoke very positively regarding the level of support they received in arranging for installation and initial operation of the network.

In rural schools, in the absence of a cadre of technology specialists within the system, it is the top-level school leadership--the superintendents and principals--who must provide support

and direction to teachers charged with implementing advanced electronic technologies in their classrooms and with coordinating new ways of teaching and learning that involve students and staff from other institutions. Current instructional demands and organizational policies and practices consume and, some may say, overwhelm teachers. In order to get this critical group to implement changes associated with use of distance education and other advanced technological innovations, the highest level of school leaders must become technically aware of the potential of the innovations and must be personally and directly involved in the introduction and implementation of them. Without their leadership, as this case clearly showed, teachers are unlikely to make large changes in their own practices.

In this study, superintendents generally were supportive of the concept of distance education and introduction of technology to implement it, but failed to provide a sufficient level of leadership during the initial stages to achieve wide-spread utilization of the regional network once it was operative. Superintendents delegated responsibility for network installation to an external provider and responsibility for on-site implementation to principals. Principals then selected a small group at their local (school telecommunications teams) to explore use of distance education technologies. Some principals were actively involved in this process, and others were not.

Data in this study showed that telecommunications team members welcomed and embraced the implementation of the regional telecommunications network; they were convinced of its potential and relevance for enhancing teaching and learning opportunities for themselves and their students. Yet, by the end of the study and in the absence of top-level direction and support, they had made only minimal changes in their teaching strategies and had made limited use of the new technology, employing it only for access to the Internet and e-mail.

Actual utilization by high school sites for delivery of distance high school or college-level classes--an original goal for the development of the regional network was minimal (**Table 5**, p. 108). There were no high school level courses offered during Fall 1997. Only four sites had students enrolled in distance classes. Three of these had high school students enrolled in college level distance classes; the fourth site offered adult education distance classes.

A major factor in the delay of wide-spread implementation was the failure of superintendents to resolve issues that required their leadership and involvement, and thereby to provide adequate support for those involved in working with the new technologies. Unresolved issues included:

- scheduling--the high schools and SVCC had very different yearly and daily schedules;
- recognition of the time and training needed to adequately prepare teachers to teach and incorporate the potential for expanded learning experiences available through use of the Network;
- awareness of the need to create a school culture to support technology and associated demands for continual learning necessitated by use of technology;
- direction for school use of distance education among the different sites;
- redefinition of roles and responsibilities of individuals involved in distance delivery of courses; and
- tuition for students enrolled in cross-district, cross-institutional level distance courses.

Additionally, superintendents failed to provide the institutional support and cross-divisional connections needed to effect integration of the technology beyond the localized efforts made by the initial group of committed pioneers who made up the school telecommunications teams. Instead the superintendents relied upon the external coordinator to coordinate all efforts associated with the installation of the equipment and training of staff, and most did not begin planning for using the system until six months after the installation was complete.

During the course of this study, none of the superintendents became users of the regional network. By April 1997 they realized that they needed to get more involved. When this study ended in November 1997, data showed that superintendents had begun to demonstrate leadership in promoting and supporting the Network. "We should hold our next meeting via the Network," stated one superintendent at the Superintendents' Meeting held on October 29, 1997. Two superintendents reported at this time that they were developing demonstrations showcasing the videoteleconferencing system for their local business and community leaders in the expectation

that these individuals would become part of a wider community of users. Another superintendent had begun to assume some leadership for use of the network, not only for his own high school, but for the group of superintendents. This individual had provided funds for upgrading computer infrastructure within his high school, had arranged for staff training (from an external provider) for use of Internet and communication materials, and by the end of 1997, had initiated discussions with the other superintendents in the region regarding resolution of scheduling issues (L. Sheffield, personal communication, January 1998).

Principals, as well as superintendents, influence how teachers spend time and what programs receive support in a school. Data in this study showed that principals who were involved in training exhibited more commitment to implementation of distance education at their local sites than those who were not.

Only five principals out of the nine in this study attended the hands-on training with their school teams. One moved to another school division during Summer 1997. The remaining four individuals were the only principals who returned questionnaires at the close of the study. Three of those four principals had distance education classes at their school site during Fall 1997; the fourth was planning for staff development to be delivered via the Network in Spring 1998. None of the four principals who had not attended the hands-on training returned a questionnaire. None of these had on-site distance classes during Fall 1997.

At one of the two high schools that had a college level biology class delivered via the network by SVCC staff, enrollment dropped dramatically after the first few weeks. An inquiry revealed that student interests had not been considered in scheduling the laboratory class at the local site; it had been scheduled during Student Activity period. Moreover, it was learned that the entire administrative staff at this site was new in Fall 1997; none had been involved in planning or training for use of the compressed video technology, and none appeared to have understood the total implications of their scheduling decision upon successful delivery of distance education classes to high school students.

Two implications for rural schools that plan to implement distance education follow from the above conclusion stating the importance of top-level leadership:

(a) A way must be found to involve top-level leadership in schools in understanding:

(i) what sophisticated advanced electronic technologies can offer their rural schools and communities in assisting them accomplish their own goals,

(ii) what teachers need to do and learn in order to utilize the new technologies for enhancing teaching and learning opportunities for students, and

(iii) what kinds of technical support and incentives they need to provide to teachers to motivate them to engage in working with these technologies.

(b) New pathways for communication beyond traditional bureaucratic hierarchical procedures will be needed to facilitate exchange of information and expertise among newly trained school-based "experts" and top-level school decisionmakers, both within and among participating school divisions.

Superintendents and principals will need to find the time to be involved in hands-on experiences and training for use of these new technologies.

Key school-level people who are interested in distance education and technology, who have demonstrated their commitment by participating in initial staff development activities, and who will be affected by changes resulting from implementation of distance education will need to become involved in school division planning for use of this innovation. By participating in a forum that involves front-line teaching staff, top-level school administrators can maintain currency in understanding what policies and practices involving staffing, school organization and structure most effectively will support and promote teachers' acceptance and involvement in a technological innovation such as distance education.

One way to provide for sharing and exchange of information regarding distance education would be to establish local distance education advisory boards composed of administrators, teachers, students, and parents. Once initial implementation of distance education has occurred, this new group might become responsible for maintaining this new learning environment. Tasks for this advisory group might include: (i) establishing goals for use of the regional network, (ii) providing for training, (iii) diffusing information regarding the network throughout the school community, (iv) developing school polices related to distance education, and (e) interacting with similar boards from other schools participating in a regional network. Working in such an

environment will demand a new complex of leadership and collaborative team-building skills in order to produce a unified set of goals and policies.

2. A multi-role, collaborative, heteroarchical team approach to staff development is an effective strategy to use to train and empower individuals in rural school communities in the use of advanced technologies.

In this case study, the above approach to staff development was implemented. Data collected in the study showed that it provided a mechanism for:

- developing expertise and self-efficacy in operating equipment and working with new technologies,
- generating enthusiasm and vision for incorporating advanced electronic technologies (distance education) into the life of the school and community,
- fostering peer interactions within/among school divisions,
- enhancing opportunities for communication within/among school divisions, and
- developing a cadre of school-based technology leaders capable of expanding technology leadership within/among schools.

Data showed that the presence of students on the school teams also enhanced the capacity and expertise of the teams. Student contributions included:

- providing insight on the characteristics they valued in a teacher, and what they thought would be needed to be a good distance teacher;
- preparing and presenting (at the second staff development workshop) very professional looking multi-media materials that showcased their school;
- offering (in focus group interviews) valued suggestions, not considered by teachers and administrators, on ways to diffuse the innovation; and
- demonstrating facility in operating the videoconferencing equipment.

Team members became empowered as they gained knowledge, skills, and experience in working with the new technologies. One implication of this conclusion is that individuals who gain self-efficacy working with new technologies will undergo a behavioral change in their attitude and approach towards the existing organizational structure in schools. As they develop greater skill and self-efficacy in working with their new knowledge and skills, these individuals will begin to envision new ways of "doing things." and will make suggestions for changes in policies and practices, formerly the domain of top-level leadership, that would enhance their performance. The vehicle for this behavioral change appears to be technology; it is becoming a force that may lead to "reculturing" and "restructuring" the traditional operation of educational institutions.

In this study, there was spirited discussion at the focus groups. Participants made a number of specific suggestions for actions they felt the superintendent should take to support and promote implementation of distance education at their local sites and throughout the region. It appeared that schools and telecommunications teams really felt that their opinions had value in terms of helping decide the future of the regional network. Based on the fact that all nine high schools provided some form of feedback at the end of this study, it can be interpreted that the schools and telecommunications teams really felt that their opinions had value in terms of helping decide the future of the network.

3. Attainment of the desired end-result for the telecommunications network, the routine delivery of college or high school courses to high school students, is a process that requires establishment of a series of intermediate steps with clearly defined goals.

This study demonstrated that delivery of a technology system to schools that have had little experience with sharing and exchanging resources, or with applications of technology as a vehicle for delivering distance education classes to high school students, is a complex process. Having the technology, along with a goal for its full implementation, does not lead to successful implementation of a telecommunications system. Instead the process needs to move through a series of intermediate steps.

The policy implications of this conclusion are far-reaching. Schools cannot assume that having hardware means that they instantaneously have solved all their perceived instructional problems. Should schools fail to take the time and effort to engage in a series of planning efforts and develop policies and practices that foster and support strategies for delivering instruction and enhancing learning opportunities via the new medium, they may find that their financial investment in technology has produced no measurable or apparent improvement in educational outcomes.

One example of an intermediate goal that schools could consider is creation of an expanded group of users beyond involvement of an initial group of "pioneers." In this study, telecommunication team members (the pioneers) were selected for their enthusiasm towards exploring applications of technology to teaching and learning. Throughout the study they exhibited great tolerance for delays and "implementation dips" that are common to all projects that involve working with emerging technologies.

However, all potential users will not share this enthusiasm for technology and change, and are not likely to have the same tolerance for delays. Scaling up an initial effort to provide universal access and involvement of all staff in the use of advanced electronic technologies poses a dramatic challenge for schools. Such changes, some researchers (Dede, 1997; Meltzer and Sherman, 1997) feel should only be attempted in conjunction with greater emphasis on learner-centered pedagogical strategies, and within the larger context of system reform.

In the focus groups conducted at the close this case study, participants spoke of the importance of cultivating a larger community of users beyond those on the initial school telecommunications teams. A number of them stated that their schools were setting up demonstrations for school boards, for PTA's, and for their superintendents, and in response to student suggestions, planned to include demonstrations targeted to students..

A second example of an intermediate goal is the creation of a set of policies and practices that would support the efforts of teachers who are learning to use the technology. Bossert (1996) believed that "much of the resistance in our educational institutions to technological change, as well as to change of any sort, is due to inter-connected structural elements of

organizations that remain for the most part invisible to us in our planning and implementation efforts" (p. 11).

The participants in this study recognized the potential for inquiry and enhanced learning experiences provided through utilization of the network. But in order to make further progress and expand their numbers, they realized that they needed administrative acknowledgment of the time, training, and money required to change teaching and learning practices, as well as institutional procedures and mechanisms for communicating and interacting within and among school divisions.

A third example of an intermediate goal is for schools to take inventory of current technologies and establish priorities and funding for acquiring additional hardware and software that may be needed. Generating a wider group of users beyond the initial set of pioneers implies that schools will need to consider strategies and allocate funding for providing staff development to create a school-wide technology culture and transform a traditional institution into a learning organization.

Schools that participated in this study reported that they found the presence of the regional network acted as a catalyst for them to upgrade their school technology capacity. For some schools this meant acquiring new computers and servers. For others, this meant networking computers in their building, upgrading memory, and training teachers to use the Internet and e-mail.

4. Some commonality of institutional organizational practices needs to be established before rural schools can proceed with full-scale implementation of a regional telecommunications network.

Most schools assume that participation in a regional telecommunications network is beneficial for their students and communities. However, in order to obtain these benefits, there needs to be some basis and opportunity for interaction. There are other issues to consider, but without common time practices, it becomes nearly impossible to schedule regular classroom instruction.

In this study scheduling was identified on every data collection instrument as the organizational practice that posed the major barrier to implementation of distance education at high school sites. The item that received the most negative response (2.29/5.00) on the questionnaire administered at the close of the study was the one that addressed coordination of schedules with other schools (**Table 7**, Item 14, p. 111). The differing formats used by schools and SVCC to schedule classes meant that there was little opportunity to establish a region-wide (or even an exchange of courses among several sites) schedule for distance classes that would benefit students in each of the participating institutions.

Academic schedules varied among school divisions and the community college. Start and end dates differed. SVCC follows a two-semester calendar, with the fall semester starting in August and ending in mid-December, and the second semester running from mid-January to May. The high schools have a September to June schedule. Schools involved in this regional network used varied formats to distribute time within the school day. Starting and ending times varied. The community college generally offered day classes three times a week for a fifty-five minute period. High schools had a variety of schedules: several different forms of "block," and others with a 6 or 7-period day. Some schools in the regional network operated on a 4 x 4 block, allowing students to complete a year of study within a semester. Even the two high schools in the same school division had different schedules for students.

Registration practices differed among institutions. In the rural high schools that were part of this study, student schedules are developed in the early spring for the following year. The multiple technical problems associated with this Network delayed its installation until May 1997. Consequently, without an operational Network, it was difficult to plan distance courses and to schedule students for these classes. Moreover, schedules for college courses offered by SVCC were not available until the end of April, long after scheduling had been completed for high school students.

Two implications emerges from the conclusion regarding the need for some commonality of organizational practice among schools participating in regional networks. The first is that, based upon data in this study, schools contemplating using the network to deliver classes to high

school students will need to consider adopting a common schedule prior to starting the distance education program and work towards coherence in other organizational practices that affect operations of a regional telecommunications network.

The second implication is that the individuals who are responsible for student scheduling will need to be involved in training and planning for a regional telecommunications network. High school organizational practices generally accord responsibility to guidance counselors for advising students regarding course selections and for developing student schedules. Therefore, guidance counselors need to be aware of course opportunities available to students (especially higher level science, math, and foreign language) via the compressed video system that originate from other institutions participating in the regional network, as well as the challenges associated with learning via this new environment.

5. Only with hands-on experience and actual use can a full appreciation and understanding of the potential of technological innovations, such as the compressed video system, be developed among targeted end-users.

A vast conceptual gap exists in individuals who lack experience in contextual applications of technology in their understanding of the ways electronic technologies can expand teaching and learning experiences that can only be overcome by actually using the equipment. In this study, when people saw the technology and actually used it, they were captivated by it and amazed at how easy it was to operate. Participants repeatedly stated that using the compressed video system and associated electronic technologies had created an understanding of its potential for them. In the focus group interviews, team members reported that they and others changed their thinking about the technology once they had used it.

In this case study, one staff development session was devoted entirely to a menu of hands-on activities that revealed the full range of options available through use of the compressed video system and peripheral electronic equipment. This became a four-hour situated learning environment, with individual sessions being provided for each school team. Team members gave this session the highest satisfaction rating of any activity in this study.

This conclusion poses major implications for the way in which future staff development involving technology is delivered to teachers. This conclusion suggests that traditional methods of teacher training involving reading and telling strategies are totally inappropriate for getting teachers to gain understanding of the use of technology for enhancing and expanding institutional practices. This conclusions implies that "One-shot" approaches to staff development will not work for applications involving technology. It implies that every step in the process of implementing the advanced technologies associated with the regional telecommunications network should involve teachers and other members of the school community who are engaged in using the technology in ever expanding ways.

As a consequence, teachers will need more extensive training and on-going support than is traditionally offered in staff development programs, both for use of the equipment and for development of appropriate materials and teaching strategies that match their specific teaching assignments. Teachers will need the kind of skill development opportunities that can be acquired through practicums and continuing education--formats used by other professionals like counselors who need to upgrade and practice skills (Kearsley, 1996). They also need time to try out new methods of teaching and time to reflect upon ways to change their delivery of the curriculum to incorporate new methods.

Large amounts of money are certain to be expended on the introduction of technology for distance education during the next decade. This case study clearly shows that major changes in the attitudes and operations of top-level school leadership are going to be needed, along with significant changes in teacher training, to reap the expected benefits of this investment. This view is shared by other researchers who have noted the significance of adequate support structures for implementation of innovations (Fullan, 1994) and for implementation of technology (as the innovation) into schools (Ritchie, 1996; Merkley, Bozik, and Oakland 1997).

Outcomes

As a result of their participation in a regional telecommunications network, the rural schools that were part of this study are enhancing their own computer and network capacities

and capabilities in order to take advantage of the opportunities available to them through the regional network. They are expanding memory of current computer inventories; they are purchasing new computers and servers with expanded memory and capabilities; students in some schools are building these computers and servers; they are networking current computers. It is possible to network the computer associated with the VTEL equipment so that programs can be received at several sites within the building (2-way video capability is available only in the videoconferencing room). Staff at schools are pursuing additional technical training (often at their own time and expense). Although initial interests appear to be focused on use of the Internet and establishment of e-mail accounts for staff and students, other outcomes associated with the implementation of SVCC included:

1. Plans of superintendents to hold one of their next regional meetings via the Network.
2. Decision by School A to move from a 7-period day schedule to a block schedule that reflects the current pre-dominant schedule employed by other secondary schools who participant in SVCC-TN.
3. Plans of Longwood College for delivery of three staff development courses (tied to the Virginia Standards of Learning [SOL's]) via the regional network during Spring 1997.
4. Decision of SVCC to offer Dual Enrollment Introductory Japanese (college credit course) via the Network in Spring 1998. The class will originate at Site H and involve high school students at that site and college students at Longwood College.
5. Active planning by many sites to prepare and deliver demonstrations showcasing the network for local school boards and various business and community leaders.
6. Identification by schools connected to the Network of a technical contact (all schools: 8/8) and a distance education coordinator (7/8).
7. Addition of another school division to SVCC-TN (Funding was provided by Bell-Atlantic.) in January 1998.
8. Provision (October 1997) of full-time technical staff position by SVCC to provide on-going training and support to high schools participating in the Network. The cost of this position is

shared with Old Dominion University which needs this level of technical support for their Teletechnet distance education program that is available for college students at SVCC.

Recommendations

These recommendations have evolved as a result of the findings in this case study. This section is divided into three sections. The first section includes recommendations designed to improve operational practices in the field. In the second section, a set of cautionary items for schools to consider when implementing a system involving advanced electronic technologies is presented. In the third section, additional research that would expand theory and knowledge regarding use of telecommunication technologies for supporting new research-based models of teaching, learning and assessment is identified.

Recommendations to Improve Program Practices

1. Develop a school division plan for using the regional network that is coherent with school goals. This plan should be part of a wider school division technology plan.

2. Through the use of "top-down," "bottom-up," and "inside-out" strategies, create a body of supporters and users inside and outside the school that includes parents, as well as business and community leaders. Showcase the capability of the technology (when fully operational) by organizing and conducting a variety of demonstrations to a wide range of potential users. Provide organized opportunities for horizontal and vertical interest groups to collectively improve their technology skills and to share and exchange successful strategies and applications within their own region and among other groups at state and national levels with similar interests. Dedicate some portion of school technology budget to support these efforts.

3. Acquire strong advocacy and support for a regional telecommunications network from school division superintendents and building principals. They should become users themselves and publicly demonstrate their support by using the system for a variety of activities and

communications and by inviting media attention to the benefits available to schools and the community through use of a regional network at local high school sites.

4. Customize staff development to meet the current and extended needs of particular groups of learners. Include plans and processes to provide on-going training for successive groups of users.

5. Explore and implement a variety of strategies to improve communications within and among schools and communities in rural areas. Utilize the capacity of the network to deliver and promote sharing of information related to the network and to other issues of regional concern.

6. Examine the rich body of research devoted to school change and study of innovations to gather insight into strategies for managing change associated with new electronic technologies. Explore case studies related to implementation of technology into educational organizations.

7. Create a different and flexible organizational structure that involves shared leadership among school divisions for promoting and enhancing applications of a regional telecommunications network to school educational programs. Develop a collective vision for the network that reflects broad-based interests in the community.

Once the equipment is operative, re-examine the leadership structure and determine what form of leadership would be appropriate to support, sustain, and promote the "Vision" for the Network during successive stages of implementation. This group should address items of regional concern that include school schedules, fees for student enrollment in distance education courses, instructor incentives and compensation, strategies for improving and expanding communications, and the type of forums and vehicles to establish for sharing and exchange of information among participants in the network. There should be opportunities for both vertical and horizontal interest groups to participate in planning for use of the network, and in exchanging and sharing of information. A regional coordinator may be needed who is responsible solely to school divisions and has the authority to make decisions and commit financial resources to the

program. Additional funding beyond local school budgets may be needed to support innovative school and teacher efforts in utilizing the Network.

8. Consider the development of a student-based group to serve as a source for additional technology support at the school level. In this study, two schools reported their students were enrolled in a class that built computers for school use as part of their instructional program (Researcher Notes: Interview with Dr. Paul Stapleton, May 16, 1997; Focus Group Transcript #2, November 6, 1997, p. 9). There might be justification to develop an electronics course (that could be offered via the Network, with site facilitators being school technology personnel) that would train students how to maintain computers, work with the local network and operate the teleconferencing system. As a result of this type of program, students might be able to provide building-level support for teachers' applications of the technology. Additionally, the program might help students develop skills that are valued in the workplace, leading perhaps to school and local internships. Moreover, this type of program might expand students horizons to include further study and consider possible future employment in technology fields.

9. Create a state-wide technology leadership training program to support the users of Net.Work.Virginia. A well-designed technology leadership program could demonstrate the advantages to be derived from Net.Work.Virginia applications and could serve as a forum for sharing strategies that support faculty involvement and innovation, mobilize parent and community participation, provide information regarding maintenance and enhancement of the technology, and establish collaborative relationships among state educational institutions.

This program should involve a *leadership* component. It should not just be *instructional technology*. It is important that participants understand that schools are representative of organizational *systems,* and that delivery of distance education programs also involves an organizational *system.* For both schools and distance education programs to work effectively, a number of interrelated factors are operative. For distance education, the nature of the design of the program or course, "the communications technology used for delivery, and the interaction

depends on the sources of knowledge, the student needs, and the learning environment" (Moore and Kearsley, 1996, p. 13). Course content; instructor, facilitator and institutional support capabilities; and nature of learners influence the learning environment. School policies, management structure and budgets affect composition of distance education programs. Changes in one component has immediate effects on all other components. Effective school technology leaders need to understand not only technology, but also how different applications of technology affect the overall school program and can serve varied interests and needs of their communities.

Cautionary Points for Rural Schools to Consider When Planning to Implement a Regional Telecommunications Network

1. Total reliance on an external provider (the process used in this study), while efficient in organizing network installations, may actually lead to delays in implementation and utilization of a telecommunication network. External providers lack authority to make decisions involving school use of the technology. In this study real planning at the school level did not appear to begin until several months following installation. In a worst case scenario, funds provided for infusion of distance learning technology into schools may be inefficiently used and even wasted.

2. Postponing school-based planning efforts until technology installations are complete (whether or not internal or external technical support is employed) may seem to be expedient, but may actually lead to delays in implementation and utilization of the network. Mecklenburger (1989) stated, "When it comes to integrating technology into the classroom, change is primarily a people process, not a technological one" (p. 6). This statement is very significant for school-level leaders who have the responsibility to create a "technology culture" within their learning environment. As data in this study showed, technology posses a threat to teachers who are comfortable with their traditional role as instructional leader in the classroom.

Fullan (1996) stated that educational change is "inherently, endemically, and ineluctably non-linear (sic), (and) that the most sophisticated plan imaginable will unfold in a nonlinear,

broken-front, back-and-forth manner" (p. 421). If school leaders accept this premise, they may be less hesitant to start planning how their schools might use the capacity of a regional telecommunications network as soon as the decision has been made to participate in these efforts.

Although school leaders may not know the exact best strategies to use to promote a shared school culture for technology and diffuse awareness of the forthcoming innovation, they do have wide experience in using bureaucratic procedures for diffusing policies and practices among staff and students. This type of bureaucratic involvement can promote change along as long as it is not accompanied and orchestrated by a set of rigid rules and mandates.

3. Schools should carefully consider if they can commit to the total costs of a program involving introduction of new technology. Unless the implementation of this technology is accompanied by an extensive staff development program for teachers that shows them how different forms of pedagogy, coupled with the new technology, can be integrated into their teaching practices and can enhance the learning environment for students, implementation efforts may fail. The time and money associated with the implementation costs will be wasted, and education will have one more innovation that fails. Money to support the added staff development demands associated with new technology most likely will need to be provided by reappropriation of current funds. As a consequence school divisions will need to debate the relative priority of all budget items and determine their relative value.

4. Schools should be wary of the claims of technology vendors regarding the benefits to be made to instructional programs as a result of the purchase of their latest and best equipment. To gain insight into what they challenges they face, schools should capitalize upon the experiences of other school divisions that have been involved in similar situations. Schools can identify some of these sites by contacting state educational agencies and professional organizations, and others by employing research techniques to access both print and on-line case study literature involving implementation of technology. In some cases, vendors may supply names of school divisions that are using their products. Schools that consider implementation of a sophisticated electronic

telecommunications network should be certain that the benefits acquired from participating in such a venture will overcome the barriers to learning associated with lack of face-to-face contact between the instructor and students, as well as the loss of autonomy that may result due to compromises in their school organizational practices that may need to be made for effective operation of the network.

In this study, the school telecommunications teams found the four-way interactive videoteleconference with teachers from Tazewell County Public Schools and Northern Virginia Community College a very satisfying and valued way to learn about some of the challenges and benefits of delivering distance education via electronic technologies.

Recommendations for Further Research Study

1. Research studies should be conducted to determine what variables and combinations of variables (including district policies, school leadership patterns, and student profiles), serve as predictors for successful implementation of these programs in secondary schools.

2. Research should be conducted to identify effective strategies and interactions that assist varied learner groups with acquiring skills and knowledge that they need to be successful in courses that are delivered via synchronous and asynchronous electronic transmissions, and that require them to work independently or as members of virtual teams. This might include research on cognitive and affective attributes that address how individuals learn.

3. Follow-up case studies should be done to determine if the findings from this study generalize to other rural secondary schools who are considering implementing a distance education program.

4. Research should be conducted to gain a greater understanding of the benefits of adopting a systems approach to delivery of distance education in rural secondary schools.

5. Further research should be conducted to determine and develop criteria to measure what role, if any, different applications of technology can serve in improving performance, in providing support, in increasing motivation, and in developing higher-order thinking processes of all categories of student-learner groups.

Final Observations

Although this issue was not directly addressed in this study, my observations during the course of this case study confirmed that utilization of advanced electronic technologies (acquired through participation in a regional telecommunications network) accelerates progress towards accomplishing the network goal of meeting the needs of rural communities. A network that involves a number of institutions with differing levels of programs, such as K-12, 2-yr and 4-yr college, can provide:

- increased educational opportunities for high school students;
- increased availability of educational opportunities and staff development for teachers; and
- increased access to national and global resources and communications for students, teachers, and local business and community leaders.

High technology systems require a high degree of sophisticated technology support to become and to remain operational. Total implementation costs must include the cost for that support as well as capital outlays for hardware and software. Additional amounts need to be calculated to account for the time and efforts required for training, diffusing awareness and knowledge of the network throughout the school community, and sustaining that effort. There presently is no magic recipe that lists how to accomplish large-scale educational reforms.

For rural schools, the cost of isolation are very great. The lack of access to high speed communications has wide-reaching implications for teachers, students and business and community members. In the region described in this study, prisons and tobacco farming form the major economic base of the area. In this study (based upon statements made at the focus groups), even though implementation was in the initial stages, a number of collaborative, localized

efforts currently were being considered or already were underway to begin utilizing some of the capacity provided by the regional telecommunications network. They included:

(a) high school courses for students already enrolled in the state distance education program efforts delivered via satellite;
(b) academic summer school programs for local high school and college students;
(c) staff development for teachers to assist them in meeting the new state Standards of Learning;
(d) adult education courses for business and community members;
(e) telementoring projects; and
(e) enrichment programs and enhanced communication options for students, teachers, staff, and business and community leaders.

Throughout this study, telecommunication team members were strongly supportive of distance education and the opportunities it offered their students and communities. Despite the problems identified during initial implementation efforts, the statement receiving the most positive response on both the initial and final questionnaire (**Table 7**, Item 1, Mean: 4.52/5.00 [final questionnaire], p. 111) was the one that stated, *"Distance education is a valuable addition to the programs my district offers."*

References

Anderson, R. (1994, November 14). State technology activities related to teachers. Office of Technology Assessment Contractor Report.

Appalachia Educational Laboratory. (1997, November). *AEL* [Homepage of Appalachia Educational Laboratory], [Online]. Available: http://www.ael.org/ [1998, January 4].

Arends, J. H., Schmuck, R. A., & Arends, R. I. (1980). Students as organizational participants. In M. M. Milstein (Ed.), Schools, conflict, and change (pp. 96-113). New York: Teachers College Press.

Armstrong, D., Davis, R., & Young, G. (1996). Technology integration at the middle and high school levels: A model for staff development. NASSP Bulletin, 80(582), 81-88.

Asher, J. J. (1967). Inservice education: Psychological perspectives. Seattle, WA: Far West Laboratory for Educational Research and Development. (Eric Document Reproduction Service No. ED 013 371)

Ashton, P. T., & Webb, R. B. (1986). Making a difference: Teachers' sense of efficacy and student achievement. New York: Longman.

Association for Educational Communications and Technology. (1977). The definition of educational technology. Washington, DC: author.

A technology-ready state. (1993). Electronic Learning, 13(2), 58.

Avolio, B. J., & Bass, B. M. (1988). Transformational leadership, charisma, and beyond. In J. Hunt, B. R. Baliga, H. P. Dachter, & C. A. Schriesheim (Eds.), Emerging Leadership Vistas (pp. 29-49). Toronto: Lexington Books.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavior change. Psychological Review, 84, 191-215.

Bandura, A. (1981). Self-referent thought: A developmental analysis of self-efficacy. In J. H. Flavell & L. Ross (Eds.), Social cognitive development: Frontiers and possible futures (pp. 200-239). Cambridge: Cambridge University.

Bandura, A. (1982). Self-efficacy mechanism in human agency. American Psychologist, 37, 122-147.

Bandura, A., & Adams, N. E. (1977). Analysis of self-efficacy theory of behavioral change. Cognitive Therapy and Research, 1(4), 287-310.

Bandura, A., Adams, N .E., & Beyer, J. C. (1977). Cognitive processes mediating behavioral change. Journal of Personality and Social Psychology, 35, 125-139.

Barker, B. O., & Dickson, W. M. (1996a). Distance learning technologies in K-12 schools: Past, present and future practice. Tech Trends, 41(6), 19-22.

Barker, B. O., & Dickson, M. W. (1996b). Factors determining rural school readiness to use distance learning. Rural Educator, 17(3), 14-18.

Barker, B., & Taylor, D. (1993, July). An overview of distance learning and telecommunications in rural schools. Paper presented at the annual meeting of the National Association of Counties, Chicago, July 16-20. (ERIC Document Reproduction Service No. ED 365 502)

Barron, A., & Orwig, G. (1993). New technologies for education. Englewood, CO: Libraries Unlimited.

Bem, D. J. (1970). Beliefs, attitudes, and human affairs. Belmont, CA: Brooks-Cole.

Bennett, C. K. (1996). Schools, technology, and educational leadership: A framework for change, NAASP Bulletin, 80(577), 57-65.

Berman, P. (1981). Educational change: An implementation paradigm. In R. Lehming & M. Kane (Eds.), Improving schools: Using what we know (pp. 253-286). Beverly Hills, CA: Sage.

Berman, P., & McLaughlin, M. (1978). Federal programs supporting educational change, Vol. VIII: Implementing and sustaining innovations. Santa Monica, CA: The Rand Corporation.

Berman, P., & McLaughlin, M. W. (1980). Factors affecting the process of change. In M. Milstein (Ed.), Schools, Conflict, and Change (pp. 57-71). New York: Teachers College, Columbia University.

Berry, W. (1990). What are people for? San Francisco: North Point Press.

Blumberg, A., and Greenfield, W. (1980). The effective principal: Perspectives on school leadership. Boston: Allyn & Bacon.

Blumhardt, J. H., & Cross, L. R. (1996). Making the jump(s) into cyberspace. ED, Education at a distance, 10(1), 13-21.

Bogdan, R. C., & Biklen, S. K. (1992). Qualitative research for education: An introduction to theory and methods (2nd ed.). Boston: Allyn and Bacon.

Bossert, P. J. (1996). Understanding the technologies of our learning environments, NASSP Bulletin, 80 (582), 11-20.

Bossert, S. T., Dwyer, D. C., Rowan, B., & Lee, G. V. (1982). The instructional management role of the principal. Educational Administration Quarterly, 18(3), 34-64.

Bozeman, W. C., Raucher, S. M., & Spuck, D. W. (1991). Application of computer technology to educational administration in the United States. Journal of Research on Computing in Education, 1, 62-77

Branstad, T. (1996). Technology in Iowa schools: Linking classrooms and making opportunities accessible. NASSP Bulletin 80(582), 21-25.

Bredo, E. (1994). Reconstructing educational psychology: Situated cognition and Deweyan pragmatism. Educational Psychologist, 29(1), 23-25.

Bretz, R. G. (1995, May). Telecommunications for rural America: Lessons from Nebraska. Presentation at the Annual Conference on Rural Datafication (3rd, Indianapolis, IN). (ERIC Document Reproduction Service No. ED 399 097)

Brophy, J. (1979). Teacher behavior and its effects. Journal of Educational Psychology, 71, 735-750.

Brown, B., & Brown, Y. (1994). Distance education around the world. In B. Willis, (Ed.), Distance education: Strategies and tools (pp. 1-39). Englewood Cliffs, NJ: Educational Technology Publications.

Bruce, M. A., & Shade, R. A. (1995). Effective teaching and learning strategies using compresed video. TechTrends 40(4), 18-22.

Burge, E. J. (1990, November). Marrow bone thinking: A plea for strengthened qualitative research in distance education. Paper presented at a Conference on Research in Distance Education, Caracas, Venezuela. (ERIC Document Reproduction Service No. ED 328 228)

Butler, M. (1991, Spring). Rural population growth slows during 1980-90. Rural Conditions and Trends. Washington, DC: U.S. Department of Agriculture, Economic Research Service.

Carlson, R. B. (1994). A case study of the impact of a state-level policy designed to improve rural schools in the state of Vermont (Occasional Paper No. 36). Charleston, WV: Appalachian Educational Laboratory. (Eric Document Reproduction Service No ED 368 531)

Cawelti, G. (1995). High school restructuring: What are the critical elements? NASSP Bulletin, 79(569), 1-15.

Clark, D. L., & Astuto, T. A. (1994). Redirecting reform: Challenges to popular assumptions about teachers and students. Phi Delta Kappan, 75(7), 512-530.

Clark, R. E. (1994). Media will never influence learning. Educational Technology Research and Development, 42(2), 21-29.

"Community Development Efforts." (1997, Spring). The Link., 16(1). [on-line]. Available: http://www.ael.org/link/ [1998, April 7].

Cox, P. L. (1983). Complementary roles in successful change. Educational Leadership, 41(3), 10-13.

Creswell, J. W. (1994). Research design: Qualitative & quantitative approaches. Thousand Oaks, CA: Sage.

Crilly, A. (1996). Asia: Going for distance. ED, Education at a Distance, 10(3), 17-20.

Crowder, J. (1997). Net.Work.Virginia in an extended campus environment: A university putting knowledge to work. Unpublished manuscript, Virginia Tech, Blacksburg, VA.

Cuban, L. (1982). Persistent instruction: The high school classroom, 1900-1980. Phi Delta Kappan, 64(3), 113-118.

Cuban, L. (1986). Teachers and machines: Classroom use of technology since 1920. New York: Teachers College Press.

Cuban, L. (1990). Reforming again, again, and again. Educational Researcher, 19(1), 3-13.

Cyrs, T. E., & Smith, F .A. (1990). Teleclass teaching: A resource guide. Las Cruces, NM: New Mexico State University Center for Educational Development.

Cziko, G. A. (1990). Unpredictability and indeterminism in human behaviour: Arguments and implications for educational research. Educational Researcher, 18(3), 17-25.

Daggett, W. R. (1992). Job Skills of 90s requires new educational model for ALL students. Liaison Bulletin, 18(5). (ERIC Document Reproduction No. ED 301 531)

Darling-Hammond, L., & Berry, B. (1988). The evolution of teacher policy. Washington, DC: Center for Policy Research in Education, The Rand Corporation.

Deal, T. E. (1986). New images of organizations and leadership. Peabody Journal of Education, 63(3), 1-6.

Dean, R. S., Biner, P. M., & Coenen, M. E. (1996). Distance education effectiveness: A systems approach to assessing the effectiveness of distance education. ED, Ed at a distance, Ed Journal 10(3), J-1-J-4.

Dede, C. (1993). Leadership without followers. The Computing Teacher, 20(6), 9-11.

Dede, C. (1994). The technologies driving the National Information Infrastructure: Policy implications for distance education. Paper commissioned by the Southwest Regional Laboratory (SWRL) in connection with the U.S. Department of Education's evaluation of Star Schools.

Dede, C. (1996). Distance learning→Distributed learning: Making the transformation. Learning and Leading with Technology, 23(7), 25-30.

Dede, C. (1997). Rethinking how to invest in technology. Educational Leadership, 55(3), 12-19.

DeFrank, J. S. (1993). Teacher empowerment in a rural Pennsylvania school district: A case study of change. (Doctoral dissertation, Temple University, 1990). Dissertation Abstracts International, 54(2-A), 385.

Delcourt, M. A. B., & Kinzie, M. B. (1993). Computer technologies in teacher education: The measurement of attitudes and self-efficacy. Journal of Research and Development in Education, 27(1), 35-41.

De Young, A. J., & Lawrence, B. K. (1995). On Hoosiers, Yankees, and mountaineers. Phi Delta Kappan, 77(2), 105-112.

Dillehay, B. H. (1997). Foundation for change: Building a technology infrastructure in Virginia. ED Journal, 11(4), J-13-J-16.

Drops, G. (1996, July). Interactive strategies for two-way video courses. Workshop presented at the 12th Annual Conference on Distance Teaching & Learning, Madison, WI.

Dwyer, D. (1994). Apple classrooms of tomorrow: What we've learned. Educational Leadership, 51(7), 4-10.

Eisenhower National Clearinghouse for Mathematics and Science Education. (1995). Guidebook to excellence in mathematics and science education (Contract No. R392126001). Washington, DC: Office of Educational Research and Improvement.

Eric Clearinghouse on Rural Education and Small Schools (ERIC/CRESS). (1997) *Rural Education* [Homepage of ERIC/CRESS], [Online]. Available: http://www.ael.org/eric/rural.htm [1998, January 4].

Erlandson, D. A., & Bifano, S. L. (1987). Teacher empowerment: What research says to the principal. NASSP Bulletin, 71(503), 31-36.

Explosive growth in distance education, (1997, October). Distance Education Report 1(6), 1-3.

Ferber, R., Sheatsley, P., Turner, A., & Waksberg, J. (1980). What is a survey? Washington, DC: American Statistical Association, Subcommittee of the Section on Survey Research Methods.

Festinger, L. (1957). A theory of cognitive dissonance. Stanford, CA: Stanford University.

Festinger, L. (1964). Behavioral support for opinion change. Public Opinion Quarterly, 28, 404-412.

Fetterman, D. M. (1989). Ethnography: Step by step. Newbury Park, CA: Sage.

Fisher, C., Dwyer, D., & Yocam, K. (Eds.). (1996). Education & technology: Reflections on computing classrooms. San Francisco: Jossey-Baas.

Floden, R. E., Goertz, M. E., & O'Day, J. (1995). Capacity building in systemic reform. Phi Delta Kappan, 77(1), 19-21.

Fowler, F. J., Jr. (1993). Survey research methods (2nd ed.). Newbury Park, CA: Sage.

Fullan, M. (1981). School district and school personnel in knowledge utilization. In R. Lehming & M. Kane (Eds.), Improving schools: Using what we know (pp. 212-254). Beverly Hills, CA: Sage.

Fullan, M. (1982). The meaning of educational change. New York: Teachers College Press.

Fullan, M. (1985). Change processes and strategies at the local level. The Elementary School Journal, 85(3), 390-419.

Fullan, M. G. (1992). Successful school improvement. Bristol, PA: Open University Press.

Fullan, M. G.(1993). Change forces: Probing the depths of educational reform. Bristol, PA: Falmer Press.

Fullan, M. G. (1994). Coordinating top-down and bottom-up strategies. In R. F. Elmore & S. H. Fuhrman (Eds.), The governance of curriculum (pp 186-202). Alexandria, VA: Association for Curriculum and Development.

Fullan, M. G. (1996). Turning systemic thinking on its head. Phi Delta Kappan, 77(6), 420-423.

Fullan, M., Bennett, B., & Rolheiser-Bennett, C. (1990). Linking the classroom and school improvement. Educational Leadership, 47(8), 13-19.

Fullan, M. G., & Stiegelbauer, S. (1991). The new meaning of educational change. New York: Teachers College Press.

Gable, R. K. (1986). Instrument development in the affective domain. Boston: Khuwer-Hijhoff Publishing.

Gagne, R. M. (1985). The conditions of learning and theory of instruction (4th Ed.). New York: CBS College Publishing.

Gant, L. P. (1996). Lessons in developing distance learning. Performance and Instruction, 35(2), 22-25.

Garrison, D. R. (1989). Understanding distance learning: A framework for the future. New York: Routledge.

Granger, D., & Benke, M. (1995). Supporting students at a distance. Adult Learning, 7(1), 22-23.

Greene, J. C., Caracelli, V. J., & Graham, W. F. (1989). Toward a conceptual framework for mixed-method evaluation designs. Educational Evaluation and Policy Analysis, 11(3), 255-274.

Greenwald, A. G. (1965). Behavior change following a persuasive communication. Journal of Personality, 33, 370-391.

Grossman, B. (1994). Distance learning community organizing strategy. In Pacific Mountain Network (Producers), A guide to the Far View video series on distance learning. Denver: Pacific Mountain Network.

Guskey, T. R. (1979). Inservice education, classroom results, and teacher change (Unpublished doctoral dissertation, University of Chicago). Dissertation Abstracts International, 40(6), 3241A. (University Microfilms No. T27430)

Guskey, T. R. (1985). Staff development and teacher change. Educational Leadership, 42(7), 57-60.

Guskey, T. R. (1986). Staff development and the process of teacher change. Educational Researcher, 15(5), 5-12.

Haas, T., & Lambert, R. (1995). To establish the bonds of common purpose and mutual enjoyment. Phi Delta Kappan, 77(2), 136-142.

Hall, G. E., George, A. A., & Rutherford, W. L. (1979/1986). Measuring stages of concern about the innovation: A manual for use of the SoC Questionnaire (R & D Report No. 3032). Austin, TX: University of Texas at Austin, Research and Development Center for Teacher Education. (Republished and Distributed by Southwest Educational Development Laboratory [SEDL], Austin, TX)

Hall, G. E., & Hord, S. M. (1984). Change in schools: Facilitating the process. Albany, NY: Albany State University Press.

Hall, G. E., Loucks, S. F., Rutherford, W. L. & Newlove, B. W. (1975). Levels of use of the innovation: A framework for analyzing innovation adoption. Journal of Teacher Education, 26(11), 52-56.

Hall, G. E., Wallace, R. D., Jr., & Dossett, W. A. (1973). A developmental conceptualization of the adoption process within educational institutions. Austin: Research and Development Center for Teacher Education, The University of Texas.

Hall, J. (1990). Open university: Closing the distance to learning. Change, 4(3), 48-50.

Hammer, P. C. (1996). Rural educational directory: Organizations and resources. Charleston, WV: ERIC Clearinghouse on Rural Education and Small Schools.

Hannafin, R. D., & Savenye, W. (1993). Technology in the classroom: The teacher's new role and resistance to it. Educational Technology, 33(6), 26-31.

Hanrahan, L. A. (1995). Planning for a K-12 distance learning sytem: A case study (Doctoral dissertation, Syracuse University, 1995). Dissertation Abstracts International, 57-04A, 1415.

.

Hanson, G. P. (1995). Instructional telecommunications: A resource and planning guide (Bulletin No. 95171). Madison, WI: Wisconsin Department of Public Instruction.

Hanson, D., Maushak, N. J., Schlosser, C. A., Anderson, M. L., Sorensen, C., & Simonson, M. (1996). Distance education: Review of the literature (2nd Ed.). Ames, IA: Research Institute for Studies in Education, College of Education.

Harrington-Lueker, D. (1996). Coming to grips with staff development. Electronic Learning, 16(1), 33-43.

Heider, F. (1946). Attitudes and cognitive organization. Journal of Psychology, 21, 107-112.

Herrenan-Cabrara, P. (1994). From there to there with K-12 distance learning. In P.S. Portway & C. Lane (Eds.), Guide to teleconferencing and distance learning (pp. 320-343). San Ramon, CA: Applied Business Telecommunications.

Hersey, P., & Blanchard, K. H. (1982). Management of organizational behavior (4th ed.). Englewood Cliffs, NJ: Prentice Hall.

Herzog, M. J., & Pittman, R. B. (1995). Home, family, and community: Ingredients in the rural education equation. Phi Delta Kappan, 77(2), 113-118.

Hill, T., Smith, N. D., & Mann, M. F. (1987). Role of efficacy expectations in predicting the decision to use advanced technologies: The case of computers. Journal of Applied Psychology, 72(2), 307-313.

Hinnant, E. C. (1994). Distance learning using digital fiber optics: A study of student achievement and student perception of delivery system quality (Doctoral dissertation, Mississippi State University, 1994). Dissertation Abstracts International, 55-10A, 3164.

Holden, D. C. (1991). Student and facilitator attitudes towards TI-IN's approach to distance learning (Doctoral dissertation, University of Toledo, 1991). Dissertation Abstracts International, 52-07A, 2511.

Holmberg, B. (1985). The feasibility of a theory of teaching for distance education and a proposed theory (ZIFF Papiere 60). Hagen (West Germany): Fern Universitat, Zentrales Institute fur Fernstudienforschung Arbeitsbereich. (ERIC Document Reproduction Service No. ED 290 013)

Holmberg, B. (1986). Growth and structure of distance education. London: Croom Helm.

Holmberg, B. (1989). Theory and practice of distance education. London: Routledge.

Holzberg, C. S. (1997). Teaching your teachers well: Successful strategies for staff development. Technology & Learning, 17(6), 34-38.

Hord, S. M., Rutherford, W. L., Huling-Austin, L., & Hall, G. E. (1987). Taking charge of change. Alexandria, VA: Association for Supervision and Development.

Howley, C. B., & Howley, A. (1995). The power of babble: Technology and rural education. Phi Delta Kappan, 77(2), 126-131.

Huberman, A. M. (1983). School improvement strategies that work: Some scenarios. Educational Leadership, 41(3), 23-27.

Huberman, M. (1988). Teacher careers and school improvement. Journal of Curriculum Studies, 20(2), 119-132.

Information Infrastructure Task Force. (1994, September). The Information Infrastructure: Reaching society's goals. A report of the Information Infrastructure Task Force Committee on Applications and Technology (NIST-S-Pub-868). Gaithersburg, MD: National Institute of Standards and Technology.

"Inside AEL: Interdisciplinary Teamed Instruction." (1996, Summer). The Link, 15(2). [on-line]. Available: http://www.ael.org/link/ [1998, April 7].

Interactive Educational Systems Design. (1996). Report on the Effectiveness of Technology in Schools, '95-'96. Washington, DC: Software Publishers Association.

Iowa Distance Education Alliance (Producers). (1996). The Iowa Distance Education Series (Video). (Available from AECT, 1025 Vermont Avenue, NW, Suite 820, Washington, DC 20005)

Itzel, W. J. (1996). Distance learning through wide area networking. Media & Methods, 32(4), 6.

Ivanovic, G. (1995). Iowa communications network enhancing education in Iowa. ED, Education at a distance, 9(5), 6-7.

Jackson, P. W. (1990. The functions of educational research. Educational Researcher, 19(7), 3-9.

Jacobs, R. W. (1994). Real Time Strategic Change. San Francisco: Berrett-Koehler.

Johnson, C. F. (1996). Distance education: Factors that affect implementation in secondary schools (Doctoral dissertation, University of Wisconsin--Madison). Dissertation Abstracts International, 57-04A, 1550.

Jonassen, D., Davidson, M., Collins, M., Campbell, J., & Haag, B. B. (1995). Constructivism and computer-mediated communication in distance education. The American Journal of Distance Education, 9(2), 7-26.

Joyce, B. R. (1991). The doors to school improvement. Educational Leadership, 48(8), 59-62.

Joyce, B., & Showers, B. (1980). Improving inservice training: The messages of research. Educational Leadership, 37(5), 379-385.

Joyce, B. R., & Showers, B. (1981). Transfer of training: The contribution of "coaching." Journal of Education, 163(2), 163-172.

Joyce, B., & Showers, B. (1982). The coaching of teaching. Educational Leadership, 40(1), 4-10.

Kearsley, G. (1996). Education as usual: Comments on Chris Dede's article. American Journal of Distance Education, 10(2), 55-60.

Keegan, D. (1986). The foundations of distance education. London: Croom Helm.

Keegan, D. (1990). A theory for distance education. In M. Moore (Ed.), Contemporary issues in American distance education (pp. 327-332). New York: Pergamon.

Kember, D., & Harper, G. (1987). Approaches to studying research and its implications for the quality of learning from distance education. Journal of Distance Education, 2(2), 15-30.

Kember, D., Lai, T., Murphy, D., Shaw, I., Wong, J., & Yuen, K. S. (1990). Naturalistic evaluation of distance learning courses. Journal of Distance Education, 5(1), 38-52.

Kentucky Board of Education (1995). 1996 Update to the master plan for educational technology. [on-line]. Available: http://www.kde.state.ky.us/ [1996, October 15].

Kinzie, M., Delcourt, A. B., & Powers, S. M. (1994). Computer technologies: Attitudes and self-efficacy across undergraduate disciplines. Research in Higher Education, 35(6), 745-768.

Kirby, J. (1995). Facilitator and student roles and performance in a high school distance education system (Doctoral Dissertation, The Florida State Unitersity, 1995). Dissertation Abstracts International, 56-12A, 4736.

Knowles, M. (1975). Self-directed learning: A guide for learners and teachers. New York: Cambridge.

Knowles, M. (1984). Androgogy in action. Applying modern principles of adult learning. San Francisco: Jossey-Bass.

Krumholz, S. F., & Johnstone, M. (1988). A practical application to training instructional television faculty and students. Lifelong Learning: An Omnibus of Practice and Research, 11(8), 115-116.

Kuhn, T. S. (1962). The Structure of Scientific Revolutions (2nd ed.). Chicago: University of Chicago.

Lambert, R. P. (1991, March). Broad policies, local schools: Re-thinking rural education in an age of reform. In Conference Proceedings, Rural Education Symposium (Nashville, TN). (ERIC Document Reproduction Service No. ED 342 533)

Lawerence, G. (1974). Patterns of effective inservice education: A state of the art summary of research on materials and procedures for changing teacher behaviors in inservice education. Tallahassee, FL: Department of Education.

Lehman, R. (1996). The essential compressed video guide: 7 keys to success. Madison, WI: University of Wisconsin-Extension.

Leithwood, K. A. (1992). The move toward transformational leadership. Educational Leadership, 49(5), 8-12.

Leithwood, K. (1994). Leadership for school restructuring. Educational Administration Quarterly, 30(4), 498-518.

Leithwood, K. A., & Jantzi, D. (1991). Transformational leadership: How principals can help reform school cultures. School Effectiveness and School Improvement, 1(3), 249-281.

Lightfoot, S. L. (1983). The Good High School. New York: Basic Books.

Lightfoot S. L. (1986). On goodness of schools: Themes of empowerment. Peabody Journal of Education, 63(3), 9-28.

Lincoln, Y. S., & Guba, E. G. (1985). Naturalistic inquiry. Newbury Park, CA: Sage.

Little, J. W. (1984). Making sure: Contributions and requirements of good evaluation. Journal of Staff Development, 3(1), 25-47.

Loucks, S .F., Newlove, B. W., & Hall, G. E. (1975). Measuring levels of use of the innovation: A manual for trainers, interviewers, and raters. Austin, Texas: Southwest Educational Development Laboratory.

Loucks, S. F., & Zacchei, D. A. (1983). Applying our findings to today's innovtions. Educational Leadership, 41(3), 28-31.

Loucks-Horsley, S. (Speaker). (1988). What we know about change in schools. (Cassette interview). Alexandria, VA: Association for Supervision and Curriculum Development.

Louis, K. S., Kruse, S., & Raywid, M. A. (1996). Putting teachers at the center of reform: Learning schools and professional communities. NAASP Bulletin, 80(580), 9-21.

Lucas, M. H. (1995). The relationship between Connecticut school superintendents' knowledge of and attitudes toward distance education (Doctoral dissertation, The University of Connecticut, 1995). Dissertation Abstracts International, 56-10A, 3925.

Madsen, J. M., & Sebastiani, L. A. (1987). The effect of computer literacy instruction on teachers' knowledge of and attitudes toward microcomputers. Journal of Computer-Based Instruction, 15, 68-72.

Maeroff, G. I. (1988). A blueprint for empowering teachers. Phi Delta Kappan, 69(7), 472-477.

Market Data Retrieval. (1993). Education and technology, 1993: A survey of the K-12 market. Shelton, CT: Author.

Marshall, S. P. (1995). The vision, meaning and language of educational transformation. The School Administrator, 52(11), 8-15.

Martin, C. M. (1993). Oklahoma's Star Schools: Equipment use and benefits two years after grant's end. The American Journal of Distance Education, 7(3), 51-60.

McClelland, W. A. (1968). The process of effecting change. Alexandria, VA: George Washington University, Human Resources Research Office. (ERIC Document Reproduction Services ED 025 038)

Means, B., & Olson, K. (1995a). Technology's role in education reform: Findings from a national study of innovating schools (SRI Project 2882, ED Contract No. RR 91-1720-10). Prepared for U.S. Department of Education, Office of Educational Research and Improvement.

Means, B., & Olson, K. (1995b, April). Technology's role within constructivist classrooms. Paper presented at the annual meeting of the American Educational Research Association, San Francisco. (ERIC Document Reproduction Service No. ED 383 283)

Mecklenburger, J. A. (1989). Technology in the 1990s: Ten secrets for success. Principal, 2, 6-8.

Mehlinger, H. (1996a). School reform in the information age, Phi Delta Kappan, 77(6), 400-407.

Mehlinger, H. (1996b). School reform in the information age. Bloomington, IN: Indiana University. Center for Excellence in Education (CEE).

Meltzer, J., & Sherman, T. M. (1997). Ten commandments for succesful technology implementation and staff development. NASSP Bulletin, 81(585), 23-32.

Merkeley, D. J., Bozik, M., & Oakland, K. (1997). Investigating support for teachers using distance learning in education: A case study. *DEOSNEWS* [Online], *7*(11). Available: http://www.cde.psu.edu/ACSDE/ [1997, December 8].

Mertens, S., & Yarger, S. J. (1988). Teaching as a profession: Leadership, empowerment, and involvement. Journal of Teacher Education, 39(1), 32-37.

Miles, M. B. (1980). School innovation from the ground up: Some dilemmas. New York University Education Quarterly, 11(2), 2-9.

Miles, M. B. (1983). Unraveling the mystery of institutionalization. Educational Leadership, 41(3), 14-19.

Miles, M. B., & Huberman, A. H. (1994). Qualitative data analysis: A sourcebook of new methods. Beverly Hills, CA: Sage.

Milone, M. (1996). Beyond bells and whistles: How to use technology to improve student learning. Washington, DC: American Association of School Administrators.

Mitchell, D. E., & Tucker, S. (1992). Leadership as a way of thinking. Educational Leadership, 49(5), 30-35.

Monk, D. (1989). Using technology to improve the curriculum of small rural schools. ERIC Digest. Charleston, WV: ERIC Clearinghouse on Rural Education and Small Schools. (Eric Document Reproduction Service No. ED 308 056)

Moore, D. M., Burton, J. K., & Dodl, N. R. (1991). The role of facilitators in Virginia's electronic classroom project. American Journal of Distance Education, 5(3), 29-39.

Moore, M. G. (1990a). The effects of distance learning; A summary of the literature (Research Monograph Number Two). (ERIC Document Reproduction Service No. ED 330 321)

Moore, M. G. (1990b). Introduction. In M. Moore (Ed.), Contemporary issues in American distance education (pp. xii-xxvi). New York: Pergamon.

Moore, M. G. (1993). Is teaching like flying? A total systems view of distance education. American Journal of Distance Education, 7(1), 1-10.

Moore, M. G. (1995). The five Cs of the local coordinator. The American Journal of Distance Education, 9(1), 1-5.

Moore, M. G., & Kearsley, G. (1996). Distance education: A systems view. Belmont, CA: Wadsworth.

Morgan, A. (1991). Case-study research in distance education. (ERIC Document Reproduction Service No. ED 342 361)

Muffoletto, R. (1994). Technology and restructuring education: Constructing a context. Educational Technology, 34(2), 24-28.

Myers, D., & Stonehill, R. (1993). School-based management (Report No. EDD00036). Washington, DC: Office of Educational Research and Improvement (OERI) Educational Research Comsumer Guide. Number 4. (ERIC Document Reproduction Service No. ED 353 688)

National Commission on Excellence in Education. (1983). A nation at risk: The imperative for educational reform (Report No. 06-000-00177-2). Washington, DC: U. S. Government Printing Office.

National Commission on Teaching & America's Future. (1996). What matter most: Teaching for America's future. Woodbridge, VA: Author.

National Commission on Time and Learning. (1994). Prisoners of time: Report of the National Educational Commission on Time and Learning. Washington, DC: U. S. Government Printing Office.

National Institute for Science Education (NISE). (1996, May). Principles of effective professional development for mathematics and science education: A synthesis of standards. Madison, WI: Author.

National Staff Development Council. (1996). Standards for staff development (Middle Level and Secondary Level). Oxford, OH: Author.

Net.Work.Virginia. (1997, August 18). *What is Net.Work.Virginia?* [Online]. Available: http://www.networkvirginia.net [1998, Jan. 5].

Net.Work.Virginia. (1997, Sept. 26). *Sites by type and bandwidth.* [Online]. Available: http://www.networkvirginia.net/images/NWV_key_9-26.htm/ [1998, Jan. 5].

Newlove, B. W., & Hall, G. E. (1976). A manual for assessing open-ended statements of concern about an innovation. Austin: Research and Development Center for Teacher Education, University of Texas at Austin.

North Central Regional Educational Laboratory. (1995). Pulling together: R&D resources for rural schools. Oak Brook, IL: author.

Orlich, D. C. (1989). Staff development: Enhancing human potential. Boston: Allyn and Bacon.

Orlich, D. C., & Ezell, J. R. (1975). Evaluating the efficacy of an elementary science in-service education program, Science Education, 59(1) 59-71.

Pacific Mountain Network. (1994). Far View I-IV (Videotape series). Denver: Pacific Mountain Network.

Parker, E. W., & Griffin, T. H. (1979/1986). A quick scoring device for the Stages of Concern questionnaire (R & D Report No. 3079). Austin: Research and Development Center for Teacher Education, The University of Texas. (Printed and Distributed by Southwest Educational Development Laboratory (SEDL), Austin, TX)

Perraton, H. (1982). Alternative routes to formal education. Baltimore: Johns Hopkins University.

Peters, O. (1988). Distance teaching and industrial production: A comparative interpretation in outline. In D. Sewart, D. Keegan , & B. Holmberg (Eds.), Distance education: International perspectives (pp. 95-113). New York: Routledge.

Portway, P. S., & Lane, C. (Eds). (1994). Guide to teleconferencing & distance learning. San Ramon, CA: Applied Busines Telecommunications.

Postman, N. (1992). Technopoly: The surrender of culture to technology. New York: Alfred A. Knopf, Inc.

Postman, N. (1995). The end of education: Redefining the value of school. New York: Alfred A. Knopf, Inc.

Rhodes, L. A. (1995). Technology-driven systemic changes. Learning and Leading with Technology, 23(3), 35-37.

Rhodes, L. A. (1996a). Seeking new connections: Learning, technology, and systemic change. Learning and Leading with Technology, 23(6), 45-56.

Rhodes, L. A. (1996b). Looking through a different lens: Snapshots of three school districts. Learning and Leading With Technology, 23(7), 35-39.

Rhodes, L. A. (1996c). Seeking new connections: Learning, technology and systemic change. Learning and Leading With Technology, 23(8), 45-48.

Ritchie, D. (1996). The administrative role in the integration of technology. NASSP Bulletin, 80(582), 42-52.

Roberts, J., & Dungan, S. (1993, April). Tabula rasa: Case studies of teacher voice. Paper presented at the annual meeting of the American Educational Research Association, Atlanta, GA. (Eric Document Reproduction Service No. ED 360 742)

Rogers, E. M. (1962). Diffusion of innovations. New York: Free Press

Rogers, E. M. (1983). Diffusion of innovations (3rd ed.). New York: Free Press.

Rogers, E. M. (1997, February). Diffusion of innovations. Paper presented at the 1997 meeting of the Association for Educational Communications and Technology Conference, Albuquerque, NM.

Rogers, E., & Shoemaker, F. (1971). Communication of innovations, (2nd ed.). New York: The Free Press.

Rosenblum, S., & Louis, K. (1979). Stability and change: Innovation in an educational context. Cambridge, MA: ABT Assoc.

Russell, F. K. (1992, February) Receive-site facilitator practices and student performance in satellite-delivered instruction. In M. R. Simonson and K. A. Jurasek (Eds.), Proceedings of Selected Research and Development Presentations at the Convention of the Association for

Educational Communications and Technology and Sponsored by the Research and Theory Division (14th, Washington, DC, pp. 759-772). (ERIC Document Reproduction Service No. ED 334 969)

Sarason, S. B. (1982). The culture of the school and the problem of change. Boston: Allyn and Bacon.

Sarason, S. B. (1990. The predictable failure of educational reform. San Francisco: Jossey-Baas.

Schamber, L. (1988). Delivery systems for distance education. ERIC Digest. Syracuse, NY: ERIC Clearinghouse on Information Resources. (ERIC Document Reproduction Service No. ED 304 111)

Schauer, G. H. (1993, November). Memo to participants at Southside Fiber Optics Task Force Meeting. Unpublished.

Schatz, L. (1996). Michigan takes major steps toward developing a statewide telecommunications network. ED, Education at a distance, 10(5), 6-7.

Schlosser, C. A., & Anderson, M. L. (1994). Distance education: Review of the literature. Washington, DC: Association for Educational Communications and Technology.

Schoenfelder, K. R. (1995). Student involvement in the distance education classroom: Teacher and student perceptions of effective instructional methods. In C. Sorensen, C. Schlosser, M. Anderson, and M. Simonson, Encyclopedia of distance educational research in Iowa (Rev. ed. [pp. 79-86]). Ames, IA: Research Institute for Studies in Education.

Schramm, W. (1971, December). Notes on case studies of instructional media projects. Working paper for the Academy for Educational Development, Washington, DC.

Schrum, L. (1996). Teaching at a distance: Strategies for successful planning and development. Learning and Leading with Technology 23(6), 30-33.

Schunk, D. H. (1984). Self-efficacy perspective on achievement behavior. Educational Psychologist, 19(1), 48-58.

Schwandt, T. A. (1994). Constructivist, interpretivist approaches to human inquiry. In N. K. Denzin & Y. S. Lincoln (Eds.), Handbook of qualitative research (pp. 118-137). Thousand Oaks, CA: Sage.

Seal, K. R., & Harmon, H. L. (1995). Realities of rural school reform. Phi Delta Kappan, 77(2), 119-124.

Seller, W., & Hannay, L. (1988). The influence of school climate on peer coaching. Paper presented at the annual meeting of the American Education Research Association, New Orleans.

Senge, P. M. (1990). The Fifth Discipline. New York: Doubleday.

Sergiovanni, T. (1987). The theoretical basis for cultural leadership. In L. T. Sheive & M. B. Schoenheit (Eds.), Leadership: Examining the Elusive (pp. 116-129). Alexandria, VA: Association for Supervision and Curriculum Development.

Sergiovanni, T. J. (1989). Value-added leadership: How to get extraordinary performance in schools. New York: Harcourt Brace Jovanovich.

Sergiovanni, T. J. (1996). Leadership for the schoolhouse. San Francisco: Jossey-Bass.

Shale, D. (1990). Toward a reconceptualization of distance education. In M. Moore (Ed.), Contemporary issues in American distance education (pp. 333-343). New York: Pergamon.

Shanker, A. (1990). The end of the traditional model of schooling--A proposal for using incentives to restructure our public schools. Phi Delta Kappan, 71(5), 345-357.

Shaw, E. (1995). The training-waste conspiracy. Training, 31(4), 59-65.

Sheingold, K. (1991). Restructuring for learning with technology: The potential for synergy. Phi Delta Kappan, 73(1), 17-27.

Sher, J. P. (1995). The battle for the soul of rural school reform: Can the Annenberg Rural Challenge turn the tide? Phi Delta Kappan, 77(2), 143-148.

Sherry, L. (1995). Issues in Distance Learning. International Journal of Distance Education, 1(4), 337-365.

Showers, B. (1985). Teachers coaching teachers. Educational Leadership, 42(7), 43-48.

Simonson, M. (1995). Does anyone really want to learn...(sic) at a distance? TechTrends, 40(5), 12.

Simonson, M., & Schlosser, C. (1995). More than fiber: Distance education in Iowa. TechTrends, 40(3), 13-15.

Smith, B. J. (1993). Implementation of satellite distance learning in Illinois rural secondary schools: A descriptive study (Doctoral dissertation, Southern Illinois University, 1993). Dissertation Abstracts International, 54-08A, 2995.

Solomon, G., & Solomon, S. (1995). Technology and professional development: 10 Tips to make it better. Learning and Leading with Technology, 23(3), 38-39.

SouthEastern Regional Vision for Education (SERVE). (1995). Overcoming barriers to school reform in the Southeast. Greensboro, NC: Author, Affiliated with the School of Education, University of North Carolina at Greensboro.

Southside Virginia Community College. (1994, October). Minutes of Meeting of superintendents, representatives from GTE and Sprint, SVCC personnel. Unpublished.

Southwestern Educational Development Laboratory (SEDL). (1995). Local Heroes: Bringing telecommunications to rural, small schools (Video). (Available from SEDL, 211 E. 7th St., Austin, TX 78701)

Sparks, D. (1996, April). How do we ensure sustained on-the-job learning? The Developer, 2-4.

Sparks, G. J. (1983). Synthesis of research on staff development for effective teaching. Educational Leadership, 41(3), 65-72.

Stake, R. E. (1994). Case studies. In N. K. Denzin & Y. S. Lincoln (Eds.), Handbook of qualitative research (pp. 236-247). Thousand Oaks, CA: Sage.

Stake, R. E. (1995). The art of case study research. Thousand Oaks, CA: Sage.

Steinberger, E. D. (1995). Margaret Wheatley on leadership for change. The School Administrator, 52(1), 16-20.

Stern, J. D. (Ed.) (1994). The condition of education in rural schools (PIP 94-1106). Washington, DC: U.S. Department of Education.

Stewart, D. W., & Shamdasani, P. N. (1990). Focus groups: Theory and practice. Newbury Park, CA: Sage.

Stewart, W. J. (1990). Secondary school imperatives for the ‘90s: Strategies to achieve reform. NASSP Bulletin, 74(524), 70-74.

Strauss, A., & Corbin, J. (1990). Basics of qualitative research: Grounded theory procedures and techniques. Newbury Park, CA: Sage.

Sullivan, M., Jolly, D., Foster, D., & Tompkins, R. 1994. Local heroes: Bringing telecommunications to rural, small schools, Austin, TX: Southwest Educational Development Laboratory.

Talab, R. S., & Newhouse, B. (1993, January). Self-efficacy, performance variables and distance learning facilitator technology adoption: Support for the teacher needs hierarchy. Proceedings of Selected Research and Development Presentations at the Convention of the Association for Educational Communications and Technology Sponsored by the Research and Theory Division. (15th, New Orleans, LA). (ERIC Document Reproduction Service No. ED 362 207)

Tanner, B., Canady, R. L., & Rettig, M. D. (1995). Scheduling time to maximize staff development opportunities. Journal of Staff Development, 16(4), 14-19.

Telecommunications network brings region together. (1996, Fall). Southside Virginia Community College Schedule, 2.

Texas Staff Development Council. (1996). Staff Development Practices. Mesquite, Texas: Author.

Thach, E. C., & Murphy, K. L. (1995). Competencies for Distance Education Professionals. Educational Technology Research and Development, 43(1), 57-79.

Theobald, P., & Mills, E. (1995) Accountability and the struggle over what counts. Phi Delta Kappan. 76(6), 462-466.

Theobald, P., & Nachtigal, P. (1995). Culture, community and the promise of rural education. Phi Delta Kappan, 77(2), 132-135.

Tiffin, J., & Rajasingham, L. (1995). In search of the virtual class; Education in an information society. New York: Routledge.

Triandis, H. C. (1971). Attitude and attitude change. New York: John Wiley & Sons.

Trotter, A. (1997a, November 10). A test of leadership. Education Week, 17(11), 30-33.

Trotter, A. (1997b, November 10). Taking technology's measure. Education Week, 17 (11), 6-10.

Turner, C. M. (1994). A Study of change: How did a network of instructional design teams influence implementation of an innovation? (Doctoral dissertation, Virginia Polytechnic Institute and State University, 1994). Dissertation Abstracts International, 56-02A, 0427.

U.S. Congress, Office of Technology Assessment (OTA). (1989). Linking for learning: A new course for education (OTA-SET-430). Washington, DC: U.S. Government Printing Office.

U.S. Congress, Office of Technology Assessment (OTA). (1995). Teachers & technology: Making the connection (OTA-EHR-616). Washington, DC: U.S. Government Printing Office. [database online]. Available at: http://www.wws.princeton.edu/~ota/ [1998, January 4].

U.S. Congress, Senate Committee on Labor and Human Resources (1987). Star Schools Program Assistance Act (Report 100-44 [OTA-SET-430]). Washington, DC: U.S. Government Printing Office.

U.S. Department of Education, Office of Educational Research and Improvement (OERI). (1991, March). An agenda for research and development on rural education (RC028222). Washington, DC: Author. (ERIC Document Reproduction Service No. ED 331657)

U.S. Department of Education. (1997, November 27). *What is the Star Schools Program*, [Online]. Available: http://www.ed.gov/prog_info/StarSchools/ [1998, January 4].

Virginia Department of Education. (1996). 1995 Fall membership reports (Superintendents Memo No. 18, January 26). Richmond: Author.

Virginia Education Association. (1995, June). Virginia's educational disparities. Richmond: Author.

Wager, W. (1979). Instructional design and attitude learning. Educational Technology 19(2), 51-53.

Wagner, E. D. (1993). Variables affecting distance educational program success. Educational Technology, 33(4), 28-32.

Walsh, J., & Reese, B. (1995). Distance learning's growing reach. T. H. E. Journal, 22(11), 58-62.

West, P. (1996, February 7). Distance-learning network to be developed. Education Week, 15(20), 8.

Wheatley, M. (1992). Leadership and the new science: Learning about organization from an orderly universe. San Francisco: Barrett-Koehler.

White, K. (1997, November 10). A matter of policy. Education Week, 17(11), 13-18.

White, Paula A. (1992). Teacher empowerment under "ideal" school-site autonomy. Educational Evaluation and Policy Analysis, 14(1), 69-82.

Willis, B. (1991). From a distance. Distance education: Here today, gone tomorrow? Educational Technology, 31(2), 32-33.

Willis, B. (1992). From a distance: Making distance learning effective: Key roles and responsibilities. Educational Technology, 32(6), 35-37.

Wilson, B. G. and others. (1994). Technology making a difference: The Peakview Elementary School Study. (ERIC Document Reproduction Service No. 381 149)

Wilson, S. M. (1993). The self-empowerment index: A measure of internally and externally expressed teacher autonomy. Educational and Psychological Measurement, 53, 727-737.

Wood, F. H., & Thompson, S. R. (1980). Guidelines for better staff development. Educational Leadership, 37(5), 374-378.

Wood, F. H., McQuarrie, F. O., Jr., & Thompson, S .R. (1982). Practitioners and professors agree on effective staff development practices. Educational Leadership, 40(1), 28-31.

Wu, P.C. (1988). Enacting change: Why is change difficult? Lessons for staff development. Journal of Staff Development, 9(2), 17-21.

Wurster, S. L. (1997) Instructional Resources: Distance Education. Trends and Issues Alerts. TechTrends, 42(6), 18-19.

Yin, R. K. (1984). Case study research: Design and methods. Beverly Hills, CA: Sage.

Zimbardo, P., & Ebbesen, E. B. (1969). Influencing attitudes and changing behavior. Reading, MA: Addison-Wesley.

Appendices

Appendix A

Operational definitions

1. **ATM: Asynchronous Transfer Mode:** ATM switching protocol can rapidly handle all types of traffic--voice, data, image, and video. It is a packet switching technique that uses packets, or cells, of fixed length to transmit multiple types of information. Speeds vary from the 1.5Mbps to 622Mbps and above.

2. **Analog-to-Digital--A/D Conversion:** The conversion of an analog signal into a digital equivalent. An A/D converter measures or samples an input voltage and outputs a digitally encoded number corresponding to that voltage. Two opposite kinds of communication signals can thus be interconnected. An analog signal transmits information by modulating a continuous signal, such as a radio wave, while a digital signal is based on a binary code in which information is sent as a series of "on" an "off" signals. It is less subject to interference than an analog signal (Hinnant, 1994; Hanson, 1995).

3. **Asynchronous:** The capability of a communications technology to store and record programming for later playback or use. Another term sometimes used to refer to a technology that has this capability is "time-independent" (Hanson, 1995).

4. **Attitude:** A relatively enduring organization of an individual's beliefs about an object that predisposes his actions (Rogers and Shoemaker, 1971). Attitude may be influenced by experiences.

5. **Bandwidth:** The amount of the electromagnetic spectrum that a given signal occupies. Usually expressed in kilohertz (thousands of hertz, or Khz), megahertz (millions of hertz, or Mhz), or bits-per-second. A full page of English text is about 16,000 bits. A fast modem can move about 15,000 bits in one second. Full-motion, full-screen video requires about 10,000,000 bits-per-second, depending upon compression.

6. **Bridge:** A device that connects three or more telecommunications channels, such as telephone lines.

7. **Codec:** A COder-DECoder device that converts analog audio or video into digit code and vice versa. Upon reception a second codec re-converts the signals in analog form. It may provide full-motion video or it may incorporate a compression technique to reduce data rate.

8. **Change Agent:** A person who acts to encourage or persuade people to adopt an innovation and use it.

9. **Compressed Video:** A system that can process video images (i.e., frames) to reduce spatial redundancy (within a frame) and temporal redundancy (between frames). Video compression reduces bandwidth and hence the cost to transmit video signals is reduced. For this study, compressed video will be T-1 (1.5Mbps) at 15 frames per second refresh rate. In compressed video only the changes in moving frames are captured and transmitted, not the full motion video signal. The reconstituted image exhibits some motion and, depending on the available bandwidth and capacity of the transmitters and receivers, the motion may appear somewhat irregular.

10. **DS3:** Digital signal level 3; a telephone term describing the 45Mbps signal carried on a T3 facility. It is most often associated with broadcast video transmission. Although the broadcast "purist" will rightfully point out that as a digital signal it is not a true broadcast quality RS-250B standard signal, it is the nearest approximation to a broadcast signal in a digital environment. (Portway and Lane, 1994, p. 415). A DS3 line can carry 28 T-1 channels. SVCC received a DS3 signal.

11. **Distance education/distance learning:** Instruction that takes place in a setting which the teacher is in contact with the student through correspondence or telecommunication technologies.

12. **ELMO:** Document camera used to display overheads and graphics.

13. **E-mail:** (Electronic Mail). Messages, usually text, sent from one person to another via computer. E-mail can also be sent automatically to a large number of addresses.

14. **Innovation:** A deliberate, novel, or specific change which is thought to be an effective in accomplishing the goals of a project or of a system.

15. **ISDN:** Integrated Services Digital Network. This network signaling and transmission concept utilizes standardized digital signaling methods and equipment to enable voice, data, and video information to be transferred simultaneously among users (Hanson, 1995, p. 131). It can

provide speed about 128,000 bits-per-second over regular phone lines. ISDN is basically a way to move more data over existing regular phone lines than is possible using the conventional format.

16. **Rural**: A designation that has many meanings according to the frame of reference being used (Stern, 1994). The Census Bureau defines "rural" as a residual category of places "outside urbanized areas in open country, or in communities with less than 2,500 inhabitants," or where the population density is "less than 1,000 inhabitants per square mile" (Stern, 1994, p. 4). The area in this study has an average population density of 36 person per square mile.

17. **Site facilitator:** The traditional definition of a site facilitator pertains to the role of an individual who supports the instructional process in an adult educational program. For the purpose of this study involving secondary schools, there are two categories of site facilitators. Both are essential to the successful implementation of distance education in this setting. For clarification purposes, one group is called the school facilitator and is usually the building principal. The other group is composed of individuals who manage the receiving site classroom; they are identified as classroom facilitators.

18. **T-1** (DS-1 Channel): A general term for a digital carrier that is available for high-volume voice or data traffic; often used for compressed video teleconferencing networks. A video codec operating at the T-1 rate uses the equivalent of 24 voice channels and operates at the speed of 1.5 megabits-per-second.

19. **Technology:** The totality of the means employed to provide objects or services necessary or desirable for human sustenance or comfort.

20. **Telecommunications**: A term that pertains to communications that occur over a distance. Wire, radio, optical or other electromagnetic channels are used to transmit or receive signals for voice, video and data communications.

21. **Video(tele)conferencing:** Use of video and audio signals to link participants at different locations for a specific purpose. Video conferencing is a form of teleconferencing in which multiple sites separated by distance are linked together for communication. Among the types of

information exchanged can be voice, video, and data. When only voice links are used, the meeting is an audio conference.

22. **VTEL**: A proprietary system for compressed video teleconferencing. It is the system being used in this study. It is a complete videoconferencing package contained in a wheeled cabinet. Usually one or two monitors sit atop the cabinet along with at least one camera mounted on a pan/tilt head, the audio system, the control system and the codec are inside the cabinet.

Appendix B

SOUTHSIDE VIRGINIA TELECOMMUNICATIONS NETWORK
School Needs Assessment

SCHOOL _____

PRINCIPAL _____

Address _____

_____

Telephone number _____

School Fax Number _____

Equipment available for telecommunications classes

Designated classroom _Y / N_____

Telephone Y / N Number_____

FAX _Y / N_____Number_____

Computer with modem __Y / N_____

IBM/MAC _____

Model and speed of modem _____

Wordprocessing software _____

Videoplayer _Y / N_____

Document Camera _Y / N_____

Other equipment _____

What curriculum needs would you like to see addressed with telecommunications system? State level: college/high school

Do you have teachers who would like to offer a course using the compressed video format? Please give name and course.

Appendix C

Guidelines for School Telecommunications Team

SOUTHSIDE VIRGINIA TELECOMMUNICATIONS NETWORK
SCHOOL _____
PRINCIPAL _____

Research has shown that the key to successful implementation of a distance learning program in high schools lies with the site facilitators: the principal and individual classroom facilitators.

We hope to help you develop an enthusiastic and successful Telecommunications Team for your school.

We recommend that your initial team consist of the following members:

Principal
2-4 individuals who will serve as classroom facilitators
1 individual who will be the contact person for technical support. This individual should have expertise in one or more of the following areas:
multimedia
library--media specialist
computers--business teacher
electronics
2 students--individuals who are enthusiastic about telecommunications program/have some computer expertise

TRAINING

3 general training sessions with the entire team will be held

1 policy meeting will be held: principal and classroom facilitators should attend.

Please complete an information sheet for your school
Identify each member of your team, as well as characteristics and specific examples of behaviors that led you to select these individuals to serve on your team

SOUTHSIDE VIRGINIA TELECOMMUNICATIONS NETWORK
SCHOOL TELECOMMUNICATIONS TEAM

SCHOOL _____

(Reduced form)

Role	Name	Position	Personal character-istics that led to selection	Professional character-istics that led to selection	Professional experiences that support selection	Computer expertise (If applicable>
Principal						
Classroom facilitator #1						
Classroom facilitator #2-4						
Technical support personnel						
Student #1						
Student #2-4						

Appendix D

Southside Virginia Telecommunications Network

Pre-Assessment Questionnaire

Distance education is an innovation that will have an impact on the ways in which students and teachers interact with information, with each other, and with other individuals who share their interests, but are separated in time and space. You are pioneers in developing new ways of communication.

*The purpose of this questionnaire is to determine how you feel about distance education delivered via compressed video--this is called the "**innovation"** in this questionnaire. The same questionnaire will again be administered following the training and a period of experimentation. Innovations commonly take three to five years before adoption and full integration, so you should not expect to become an expert in the time period between the "before" and "after" questionnaires.*

*There are four parts to this questionnaire. Part I includes questions about **attitude.** Part II represents questions that address the **progress of the innovation.** Part III covers your feelings of **self-efficacy**--how you rate your ability to work with the new types of equipment as well as the entire process of delivering instruction via distance education. Part IV contains questions regarding **demographic issues.***

Results should provide useful information to schools for future planning of network use. Additionally, the responses will be used as part of my research for my dissertation that involves a study of the process of implementing distance education into rural schools. Your opinions are confidential. No attempt will be made to report the identity of the individual or the school. The overall results will be shared with you and with the Project Director of the Southside Virginia Telecommunications Network. We all are committed to providing you with the best information and materials we can to assist you in implementing distance education in you school.

Thank you for your support.

****

(The following information is for tracking purposes only)

Please record the last four digits of your social security number: ___ ___ ___ ___

Please record a check mark beside the name of your high school.

_____(1) Bluestone _____(2) Brunswick _____(3) Central of Lunenburg

_____(4) Greensville _____(5) Halifax _____(6) Park View

_____(7) Prince Edward County _____(8) Randolph-Henry

_____(9) Buckingham ____(10) Other

Section 1 Attitude towards Distance Education *(The questions in this section have been adapted from those developed by Lucas (1995) and have been reproduced with permission of the author).*

Please use the following rating scale to indicate your current attitude towards distance education and check the appropriate circle.

STRONGLY DISAGREE	DISAGREE	UNDECIDED	AGREE	STRONGLY AGREE
1	2	3	4	5

1. Distance education can be a valuable addition to the programs my district offers.	**1**. 1 2 3 4 5
2. It is not necessary to have a trial period before purchasing distance education equipment.	**2.** 1 2 3 4 5
3. Distance education can motivate teachers to use a variety of resources in the classroom to address different learning styles.	**3.** 1 2 3 4 5
4. Distance education is a current fad.	**4.** 1 2 3 4 5
5. Distance education is not difficult to understand.	**5.** 1 2 3 4 5
6. Costs outweigh the potential benefits of distance education.	**6.** 1 2 3 4 5
7. Distance education should be tried on a small scale first in our district.	**7.** 1 2 3 4 5
8. Distance education can show parents how schools can utilize technology effectively to aid learning.	**8.** 1 2 3 4 5
9. Distance education can provide valuable enrichment programs for my district.	**9.** 1 2 3 4 5
10. It is very difficult to find non-technical articles or reports about distance education technology.	**10.** 1 2 3 4 5
11. Distance education will expand and enhance our curricular offerings.	**11.** 1 2 3 4 5
12. If distance education programs are unsuccessful, there should be a way to terminate them within a short period of time.	**12.** 1 2 3 4 5
13. Distance education will not lead to increased student interest in classroom learning.	**13.** 1 2 3 4 5
14. Distance education programs are hard to coordinate when they involve more than one school system.	**14.** 1 2 3 4 5
15. It is difficult to know where to begin when you want to start a distance education program.	**15**. 1 2 3 4 5

STRONGLY DISAGREE	DISAGREE	UNDECIDED	AGREE	STRONGLY AGREE
1	2	3	4	5

16. Distance education can do little to supplement and enhance my district's course offerings.	**16.** 1 2 3 4 5
17. It is not necessary to involve school administrators in distance education in-service programs.	**17.** 1 2 3 4 5
18. I do not believe that I will see more interaction between teacher and student when distance education is used in the classroom.	**18.** 1 2 3 4 5
19. Distance education technology is compatible with the goal of maximizing learning for each individual student.	**19.** 1 2 3 4 5
20. Distance education stresses technology more than educational principles.	**20.** 1 2 3 4 5
21. Distance education can help provide equity for our school district.	**21.** 1 2 3 4 5
22. Distance education programs belong more in developing countries than in the United States.	**22.** 1 2 3 4 5
23. I will expect to see both students and teachers using distance education in the classroom.	**23.** 1 2 3 4 5
24. The public is in favor of distance education programs being initiated in my district.	**24.** 1 2 3 4 5
25. I feel comfortable with distance education technology.	**25.** 1 2 3 4 5
26. Distance education is effective in preparing students for learning in the "information age".	**26.** 1 2 3 4 5
27. Distance education is too hard to institute without a trial period.	**27.** 1 2 3 4 5
28. I do not feel that teachers will respond positively to distance education in the classroom.	**28.** 1 2 3 4 5
29. I am often confused by the technical terms in distance education.	**29.** 1 2 3 4 5
30. I do not feel that teachers will view distance education as a threat to their job security.	**30.** 1 2 3 4 5
31. Distance education can assist students in becoming more effective learners.	**31.** 1 2 3 4 5

This concludes Section I. Please turn the page to start Section II.

SECTION II. Stages of Concern

The questions in this section form part of ***Concerns Based Adoption Model,*** *developed by Hall, Robertson and Dossett and have been reproduced with permission of the authors. The items in this section were developed from typical responses of school and college teachers who were involved in all stages of adoption of innovative practices in their respective schools. For the purpose of this questionnaire, the* ***innovation*** *is defined as* ***implementation of distance education using compressed video.***

A good portion of this questionnaire may appear to be of little relevance or irrelevant to you at this time. For the completely irrelevant items, please mark the circle "0" on the scale. Other items will represent those concerns you ***do*** *have, in varying degrees of intensity and should be marked* ***higher*** *on the scale.*

Example

a. This statement is very true of me at this time	***a.*** 0 1 2 3 4 5 6 7
b. This statement is somewhat true of me now.	**b.** 0 1 2 3 4 5 6 7
c. This statement is not at all true of me at this time.	**c.** 0 1 2 3 4 5 6 7
d. This statement seems irrelevant to me.	**d.** 0 1 2 3 4 5 6 7

Please respond to the items in terms of your present concerns, or how you feel about your involvement or potential involvement with ***distance education.*** We do not hold to any one definition of this program, so please think of it in terms of your own perceptions of what it involves. Remember to respond to each item in terms of your present concerns.

IRRELEVANT	NOT TRUE OF ME NOW		SOMEWHAT TRUE OF ME NOW			VERY TRUE OF ME NOW	
0	1	2	3	4	5	6	7

1. I am concerned about students' attitudes towards this innovation.	**1.** 0 1 2 3 4 5 6 7
2. I now know of some other approaches that might work better.	**2.** 0 1 2 3 4 5 6 7
3. I don't even know what the innovations is.	**3.** 0 1 2 3 4 5 6 7
4. I am concerned about not having enough time to organize myself each day.	**4.** 0 1 2 3 4 5 6 7
5. I would like to help other faculty in their use of the innovation.	**5.** 0 1 2 3 4 5 6 7
6. I have a very limited knowledge about the innovation..	**6.** 0 1 2 3 4 5 6 7
7. I would like to know the effect of the innovation on my professional status.	**7.** 0 1 2 3 4 5 6 7

IRRELEVANT	NOT TRUE OF ME NOW		SOMEWHAT TRUE OF ME NOW			VERY TRUE OF ME NOW	
0	1	2	3	4	5	6	7

.

8. I am concerned about conflict between my interests and my responsibilities..	**8.** 0 1 2 3 4 5 6 7
9. I am concerned about revising my use of the innovation.	**9.** 0 1 2 3 4 5 6 7
10. I would like to develop working relationships with both our faculty and outside faculty using this innovation.	**10.** 0 1 2 3 4 5 6 7
11. I am concerned about how the innovation affects students..	**11.** 0 1 2 3 4 5 6 7
12. I am not concerned about this innovation.	**12.** 0 1 2 3 4 5 6 7
13. I would like to know who will make the decisions in this new system.	**13.** 0 1 2 3 4 5 6 7
14. I would like to discuss the possibility of using the innovation.	**14.** 0 1 2 3 4 5 6 7
15. I would like to know what resources are available if we decide to adopt this innovation.	**15.** 0 1 2 3 4 5 6 7
16. I am concerned about my inability to manage all the innovation requires.	**16.** 0 1 2 3 4 5 6 7
17. I would like to know how my teaching or administration is supposed to change.	**17.** 0 1 2 3 4 5 6 7
18. I would like to familiarize other departments or persons with the progress of this new approach.	**18.** 0 1 2 3 4 5 6 7
19. I am concerned about evaluating my impact on students.	**19.** 0 1 2 3 4 5 6 7
20. I would like to revise the innovation's instructional approach.	**20.** 0 1 2 3 4 5 6 7
21. I am completely occupied with other things.	**21.** 0 1 2 3 4 5 6 7
22. I would like to modify our use of the innovation based on the experiences of our students.	**22.** 0 1 2 3 4 5 6 7
23. Although I don't know about this innovation, I am concerned about things in the area.	**23.** 0 1 2 3 4 5 6 7
24. I would like to excite my students about their part in this approach.	**24.** 0 1 2 3 4 5 6 7
25. I am concerned about time spent working with nonacademic problems related to this innovation.	**25.** 0 1 2 3 4 5 6 7
26. I would like to know what the use of the innovation will require in the immediate future.	**26.** 0 1 2 3 4 5 6 7

IRRELEVANT	NOT TRUE OF ME NOW		SOMEWHAT TRUE OF ME NOW			VERY TRUE OF ME NOW	
0	1	2	3	4	5	6	7

27. I would like to coordinate my effort with others to maximize the innovation's effects.	**27.** 0 1 2 3 4 5 6 7
28. I would like to have more information on time and energy commitments required by this innovation.	**28.** 0 1 2 3 4 5 6 7
29. I would like to know what other faculty are doing in this area.	**29.** 0 1 2 3 4 5 6 7
30. At this time, I am not interested in learning about this innovation.	**30.** 0 1 2 3 4 5 6 7
31. I would like to determine how to supplement, enhance, or replace the innovation.	**31.** 0 1 2 3 4 5 6 7
32. I would like to use feedback from students to change the program.	**32.** 0 1 2 3 4 5 6 7
33. I would like to know how my role will change when I am using the innovation.	**33.** 0 1 2 3 4 5 6 7
34. Coordination of tasks and people is taking too much of my time.	**34.** 0 1 2 3 4 5 6 7
35. I would like to know how this innovation is better than what we have now.	**35.** 0 1 2 3 4 5 6 7

This ends Section II. Please proceed to Section III.

Section III. Self-Efficacy *(Please answer questions using the following scale.)*

STRONGLY DISAGREE	DISAGREE	UNDECIDED	AGREE	STRONGLY AGREE
1	2	3	4	5

Comfort/anxiety

1. I feel at ease learning about distance education technologies.	**1.** 0 1 2 3 4 5
2. The thought of using distance education technologies frightens me.	**2.** 0 1 2 3 4 5
3. I am not the type to do well with electronic technologies such as compressed video.	**3.** 0 1 2 3 4 5
4. I feel comfortable about my ability to work with distance education technologies.	**4.** 0 1 2 3 4 5
5. Distance education technologies are confusing to me.	**5.** 0 1 2 3 4 5
6. I am anxious about using distance education technologies because I don't know what to do if something goes wrong.	**6.** 0 1 2 3 4 5

Electronic Mail ***I feel confident...***

7. ....logging on to e-mail.	**7.** 0 1 2 3 4 5
8. ....reading mail messages on e-mail.	**8.** 0 1 2 3 4 5
9. ....responding to mail messages on e-mail.	**9.** 0 1 2 3 4 5
10. ....deleting messages received on e-mail.	**10.** 0 1 2 3 4 5
11. ....sending mail messages on e-mail.	**11.** 0 1 2 3 4 5
12. ....sending the same mail message to more than one person on e-mail.	**12.** 0 1 2 3 4 5
13. ....logging off of e-mail.	**13.** 0 1 2 3 4 5

Fax Machine ***I feel confident...***

14. .... connecting to number at receiving site.	**14.** 0 1 2 3 4 5
15. ....faxing a one-page document.	**15.** 0 1 2 3 4 5
16. ....faxing a multiple page document.	**16.** 0 1 2 3 4 5

STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE
1	2	3	4	5

Videoteleconferencing ***I feel confident...***

17.	....dialing remote sites.	**17.** 0 1 2 3 4 5
18.	....adjusting camera for receiving site.	**18.** 0 1 2 3 4 5
19.	....adjusting camera for viewing remote sites.	**19.** 0 1 2 3 4 5
20.	using the microphones appropriately to speak to remote sites.	**20.** 0 1 2 3 4 5
21.	....recording sessions using the integrated VCR.	**21.** 0 1 2 3 4 5
22.	....operating the Elmo projector appropriately.	**22.** 0 1 2 3 4 5

Serving as a "change agent" ***I feel confident...***

23.	....helping students learn using distance education technologies.	**23.** 0 1 2 3 4 5
24.	....conducting a discussion session or collaborative activities using materials provided by the distance learning instructor.	**24.** 0 1 2 3 4 5
25.	....helping students communicate with the instructor and students at other remote sites using the videoconferencing system.	**25.** 0 1 2 3 4 5
26.	....managing a distance education course as a receiving site.	**26.** 0 1 2 3 4 5
27.	....helping to implement distance education in my school.	**27.** 0 1 2 3 4 5
28.	....in using the distance education system to deliver programming to a community audience.	**28.** 0 1 2 3 4 5

Please turn the page to complete Section IV.

Section IV. Demographic Information *(Please circle your answers)*

1. What is your role in this project? 1. Classroom facilitator 2. HS Principal 3. HS Assistant Principal 4. Tech support 5. Other_____	2. What is your sex? 1. Male 2. Female
3. What is your status in this project? 1. Paid assistant; not a certificated teacher. 2. Volunteer: not a certificated teacher 3. Certificated teacher; facilitator assignment is part of regular teaching load 4. Administrator 5. Tech support 6. Other _____	4. How many years have you been employed in an academic setting? 1. 0-2 2. 3-6 3. 7-12 4. 13-20 5. 21-30 6. Over 30
5. How many years have you been in your current position? 1. 0-2 2. 3-6 3. 7-12 4. 13-20 5. 21-30 6. Over 30	6. What is your highest level of education? 1. HS 2. BA/BS 3. MA/MS 4. MA/MS plus 30 5. Doctorate 6. Other
7. Are you certified in the subject area of course that you facilitate? 1. Yes 2. No 3. Not applicable	8. Have you taken any graduate course work in the last 3 years? 1. Yes 2. No

******Open-ended question added to Final Questionnaire**

Do you have comments/suggestions regarding
the Southside Virginia Community College Telecommunications Network
additional staff development for use of VTEL equipment/Internet?
teaching/learning using compressed video
professional staff development using compressed video
other?

Please use the attached sheet to indicate your comments. All responses are confidential.

Thank you again for your time and interest in completing this survey.

Appendix E

Open-ended Survey

SOUTHSIDE VIRGINIA TELECOMMUNICATIONS NETWORK

*The following information is for tracking responses and is for **Research** purposes only. No attempt will be made to report either the identity of the individual or the school.*

Please give the last four digits of your social security number ___ ___ ___ ___

Please check the appropriate response for your high school

___ (1) Bluestone ___(2) Brunswick _____ (3) Central of Lunenburg

___ (4) Greensville ___ (5) Halifax _____ (6) Park View

___(7) Prince Edward County _____(8) Randolph-Henry

___(9) Buckingham _____(10) Other

We value your opinions and need your support in order to provide you with the best information and materials we can to assist you in implementing distance education in your school

Please check the appropriate staff development session

_____#1. Distance education:History, theory and instructional format
_____#2. Videoconferencing and other equipment: Instructions and practice
_____#3. Sample lesson:

1. What was positive about your experiences today?

2. What was negative about your experiences today?

3. What was interesting about your experiences today?

4. What concerns do you have?

5. What suggestions do you have for improvement?

Appendix F

FACILITATOR CONSENT FORM

The 21st Century is coming! Through the Southside Virginia Telecommunications Network, students in seven public school divisions, the two sites of Southside Virginia Community College and the two sites of Longwood College will be able to share resources. Through this system that involves compressed video technologies, students will have greater access to information, will be able to enroll in courses that their schools may not be able to offer due to limited enrollment, and will be able to communicate via e-mail with individuals who share similar interests. Future plans for the network include involvement of local governmental and medical organizations.

I, _____(name), agree to participate in the research project on the study of site facilitation of distance education in rural secondary schools that is being conducted by Jean McNeal, a doctoral student in the College of Human Resources and Education, Department of Educational Leadership and Policy Studies, at Virginia Polytechnic Institute. This research will contribute qualitative insight into the process of change that occurs as distance education is implemented in the secondary school environment, and in particular, into the effect of distance education upon individuals who serve as building and classroom facilitators toward distance education. Facilitators will be asked respond to written questionnaires, administered before and after training, allowing for a period of experimentation, regarding their attitude towards distance education, their personal stage of implementation, and feelings of self-efficacy regarding this innovation. Short surveys will be administered following each training session, and after initial distance education programming so that the network administrator and distance education instructor can respond to any perceived problems. In late spring, facilitators will be asked to participate in a two-hour focus group in which they will be asked to provide personal commentary on the operation of distance education in their schools, their concerns, needs, and future plans for the network at their school.

I understand that this participation is entirely voluntary, and that the project will be carried out as described below:

The researcher (Jean McNeal will, with permission, audiotape training sessions and focus groups. In order to protect anonymity of participants, the tapes will be transcribed immediately after taping, with all identifying information excluded from the transcriptions. The audiotapes will then be erased. However, if I prefer not to be audiotaped, data will be gathered without taping and with the same protection of privacy.
The researcher will also observe several distance educational programs. Once again, all identifying information about individuals or schools will either be directly excluded or disguised (e.g. by substituting pseudonyms or ID codes) which will be known only to the researcher. Note that no finding will be reported by individual names so that at no time will anyone be able to identify me by my responses to questions or comments made in the training.

Responses to written questionnaires will be completely anonymous. However, for purposes of tracking data sets, I will enter the last four digits of my Social Security number on my answer sheets. Any other identifying information will be used only for tracking and can not be linked to my individual name.

The researcher, Jean McNeal, will answer any questions about this research, now or during the course of the project (Phone: 703-759-9456; e-mail: jmcneal@vais.net) A copy of the

dissertation will be provided to the project director, Linda Sheffield, at Southside Virginia Community College.

I have read and understand this consent form, and as noted above, am willing to participate in this research.

_____ _____

Facilitator Signature Date

_____ _____

Researcher Signature Date

(Please sign both copies. Keep one for your records and return one to the researcher.)

FORM APPROVED BY HUMAN SUBJECT COMMITTEE FOR USE UNTIL December 1997.

Appendix G

PARENT CONSENT FORM

Dear Parent/Guardian:

As you know your child is a member of the college-credit Biology course at ***xxxx*** or ***yyyy*** School that is being delivered via the Southside Virginia Community College Telecommunications Network (SVCC-TN).

Dr. Linda Sheffield, Assistant to the President of SVCC is coordinator for the network. Jean McNeal is a doctoral student in Educational Leadership and Policy Studies at Virginia Tech whose doctoral research involve the study of the process of implementing distance education in a secondary school setting. The purpose of this letter is to advise you that we will be observing the biology class in early November and conducting a discussion group with students regarding their opinions and attitudes towards taking a class via distance education. We are requesting your permission to have your student participate in this study. A permission form is attached to this letter and we would appreciate your signing it and having your student return it to his/her teacher or classroom facilitator.

During the classroom observation, we will not interfere with any ongoing activities; our presence will not cause discomfort for any student. We would like to audiotape the discussion group. Questions to students would seek their opinions about the distance ed course; how it works; what is hard, easy; suggestions for improvement, etc. The names of all the students, the facilitators and the school will be kept confidential and the tape will be erased within one year from the date of the visit (no later than November 1998). Pseudonyms will be used in any report of the visit and discussion.

If you have any questions about the research, please feel free to contact Dr. Sheffield at the address or phone number listed above; Jean McNeal can be reached at (703)759-9456 , 342 Chesapeake Drive, Great Falls, VA 22066. We will be happy to answer any questions you may have.

Sincerely,

Dr. Linda Sheffield Jean McNeal

I have read the above information and my student _____
(name)

(check one of the following)

___ may participate in the research study.

___ may not participate in the discussion group, but may be present while the observers are present in class, provided that no comments made by my student are transcribed or reported

___ may not participate in the research study.

_____ _____

Signature Date

FORM APPROVED BY HUMAN SUBJECT COMMITTEE FOR USE UNTIL _____

Please return by November 1, 1997

APPENDIX H

Letters Regarding Distribution of Final Questionnaire.

#1: "Alert" Letter to Principals

October 11, 1997

«Title» «FirstName» «LastName», «JobTitle»
«Company»
«Address1»
«City», «State» «PostalCode»

Dear «Title» «LastName»,

It has been almost one year since I first met you through our association with the Southside Virginia Community College Telecommunications Network (SVCC-TN). As you may remember, I am engaged in a doctoral program at Virginia Tech, with research involving the study of the process of implementing distance education into K-12 schools. This process will take several years to reach optimum performance. However, my involvement will be ending in November 1997, with the focus interviews that Dr. Sheffield is arranging with participating schools.

At the start of the staff development activities, I administered a survey to adult members of the school telecommunication teams. It would be most helpful to me if these individuals (Their names are listed on the accompanying sheet.), as well as any other staff at your school that currently are associated with distance education, including use of the Internet, could complete the same survey. I hope you can help me by distributing these materials to the appropriate staff members. This note is just to alert you to expect a package within the next couple of week containing the surveys, along with envelopes, stamped and addressed to me for individuals to return the completed surveys to me.

The information from the surveys will provide information on attitudes and concerns towards distance education, and level of self-efficacy towards the new technologies associated with implementing distance education at this point in time, as well as a comparison with original results. Responses of individuals are confidential. Pseudonyms will be used to refer to schools and individual survey responses in all reports. Overall results will be shared with schools and Dr. Sheffield, project coordinator, and will enable effective planning and continued training for implementation of the full capacity of the system. The state of Virginia, and K-12 schools throughout the United States look to experiences of schools in Southside Virginia to help them determine how distance education programming might suit their needs and can best be implemented.

Should you have any questions you can reach me by telephone at (703) 759-9456 or by e-mail at: jmcneal@vais.net. Thank you for your support.

Sincerely,

Jean P. McNeal

#2. Letter to Principals Accompanying Questionnaires

October 20, 1997

«Title» «FirstName» «LastName», «JobTitle»
«Company»
«Address1»
«Address2»
«City», «State» «PostalCode»

Dear «Title» «LastName»,

This package contains a set of surveys for individuals associated with current and future plans for education activities that are part of the Southside Virginia Community College Telecommunications Network (SVCC-TN). These would include meetings, courses (staff development, high school and Dual Enrollment), use of the Internet, etc.

At the start of any staff development activities, as part of my doctoral research at VA Tech, I administered a survey to adult members of the school telecommunication teams to determine their perceived attitudes, concerns, and self-efficacy towards distance education technologies. It would be most helpful to me if these individuals could complete the same survey, along with other individuals who currently are associated with the Network.. The information from both surveys will provide information on attitudes and concerns towards distance education, and level of self-efficacy towards the new technologies associated with implementing distance education at this point in time, as well as a comparison with original results. Responses of individuals are confidential. Pseudonyms will be used to refer to schools and individual survey responses in any reports associated with a study of SVCC-TN. However, overall results will be shared with schools and Dr. Sheffield and will enable effective planning and continued training for implementation of the full capacity of the system.

According to my records, the individuals listed on the accompanying sheet served on your school telecommunications team. For tracking purposes, I have included the last four digits of the Social Security Numbers that were written on the surveys. I do not know which numbers match with specific individuals.

I would appreciate it if you would circulate the enclosed envelopes to the individuals listed, and ask that they select the appropriate envelope, complete the survey, and mail it to me. Each envelope contains an explanatory note, a survey, a small token of my appreciation, and a stamped-addressed envelope. I am hoping for 100% response. Additional envelopes are provided for individuals who have joined your school's distance education delivery and support team during the past year. I especially welcome the responses of the school administrative team.

Thank you for your support. I would like to have all questionnaires returned to me by **November 3.**

Sincerely,

Jean McNeal

#3. Letter to Facilitators with Questionnaires

October 21, 1997

Dear Colleagues,

My doctoral research project at VA Tech involves following the progress of distance education in the K-12 schools that are part of the Southside Virginia Community College Telecommunications Network (SVCC-TN). I met many of you last year through activities associated with the Network.

A lot of progress has been made. Staff development activities have been conducted with SVCC staff. The Network is up and running; K-12 schools have Internet access and many are actively taking advantage of this opportunity; 13 distance education classes are operational at the college level, some with high school students; two high schools are conducting a biology course for their students; meetings and conferences are using the telecommunications system. The future holds many more opportunities for both SVCC-TN and K-12 schools.

I welcomed the willingness of those of you who completed an initial survey last December involving your attitudes and concerns regarding distance education at your school site. Once again I would truly appreciate those of you who completed the first questionnaire to respond to the same survey at this point in time, as well as those who may have become involved with distance education over the past year. Your involvement in implementing distance delivery of education within the high school environment is critical, and these two surveys allow a comparison of individuals' attitudes concerns, and level of comfort to be made regarding the technology over time and help identify areas that need to be addressed before further progress can be made. Innovations like distance education take from three to five years to fully implement, so you should not feel threatened that you have not attained complete comfort or use of this innovation in the curriculum. Dr. Sheffield is scheduling some focus groups at schools in early November that will offer participants an additional opportunity to have an open discussion about the successes and challenges of using the telecommunications delivery system in your school. I will be with Dr. Sheffield and hope to see you at that time.

Please accept the enclosed pencils as a small compensation for your time. I have enclosed a stamped, addressed enveloped for you to use to send me your completed survey. The coding on the first page is for tracking purposes only. All responses are confidential . Please try to return your questionnaire by to me by **November 3.**

Thank you for your support in helping me to complete my research.

Sincerely yours,

Jean McNeal

Letter #4. 1st Follow-up Letter to Principals

November 2, 1997

«Title» «FirstName» «LastName», «JobTitle»
«Company»
«Address1»
«City», «State» «PostalCode»

Dear «Title» «LastName» ,

Several weeks ago I mailed you a set of questionnaires pertaining to the Southside Virginia Community College Telecommunications Network (SVCC-TN). I requested that you distribute them to members of your 1996-7 school telecommunications team. Responses to the questionnaires, along with information obtained through open-ended questionnaires that followed each of the three workshops conducted by SVCC last winter and spring, and from focus groups that Dr. Sheffield is hosting during the first week of November, will be of great help in implementing and improving the program. I am conducting a case study of the implementation process for distance education into K-12 schools, and this study will be much improved if I have as many responses as possible from the original participants in the training.

The names of the original members of your 1996-7 school telecommunications team, along with the last four digits of the Social Security Numbers of individuals on the team who have, as of November 2, returned the questionnaires to me, are listed below. Since responses are confidential, I do know the names that are associated with these SSN's. I would appreciate your cooperation in asking those who have not responded to please to do. Each package contains a stamped, self-addressed envelope for returning the survey.

Names of Individuals on 1996-7 Team

SSN's (last 4 digits) of Questionnaires Received (as of 11/2/97) from 1996 Team Members

I also would appreciate knowing how your school is using, or plans to use the telecommunications network (videoteleconferencing and/or Internet) in the future. This information will be very valuable to the project, and to other schools in Virginia and in the U.S. who plan to incorporate distance education courses into their curriculum. I have enclosed form and a stamped addressed envelope for your response.

Thank you for your support.

Sincerely,

Jean McNeal

Letter #5. 2nd Follow-up Letter to Principal

November 15, 1997

«Title» «FirstName» «LastName», «JobTitle»
«Company»
«Address1»
«City», «State» «PostalCode»

Dear «Title» «LastName» ,

Several weeks ago I mailed you a set of questionnaires pertaining to the Southside Virginia Community College Telecommunications Network (SVCC-TN) and requested that you distribute them to members of your 1996-7 school telecommunications team. As of this date, I have not received any responses. Through a follow-up call, I spoke with your secretary who indicated that team members has misplaced these and requested that I end additional forms. These are enclosed.

Responses to the questionnaires, along with information obtained through open-ended questionnaires that followed each of the three workshops conducted by SVCC last winter and spring, and from focus groups that Dr. Sheffield hosted with me during the first week of November, will be of great help in implementing and improving the program. I am conducting a case study of the implementation process for distance education into K-12 schools, and this study will be much improved if I have as many responses as possible from the original participants in the training.

The names of the original members of your 1996-7 school telecommunications team are listed below. I would appreciate your cooperation in asking these individuals to complete the survey. Each package contains a stamped, self-addressed envelope for its return to me.

Names of Individuals on 1996-7 Team

Should you have any questions you can reach me at (703) 759-9456 or through my e-mail address: jmcneal@vais.net.

Thank you for your support.

Sincerely,

Jean P. McNeal

Appendix I

Principal's Narrative Report

Southside Virginia Community College
Telecommunications Network (SVCC-TN)
"A-I" High School

1. How is your school currently using the telecommunications network?

2. What future plans do you have for the network at your school? Please be as specific as possible.

--for Dual Enrollment courses?

--for high school courses?

--for Internet use?

--for electronic mail?

--for staff development?

--other uses (co-curricular, community, etc.)?

3. What comments/concerns do you have regarding the network?

November 1997

Appendix J

Focus Group Interview Questions
November 6 & 7, 1997

Domains	***Questions***
Value/effect of the 3 workshops	1. What do you feel about the value of the 3 workshops held this part year by SVCC regarding the network and use of the VTEL equipment? 2. How has your participation in the workshops affected your understanding of distance education? 3. How has your participation in the workshops affected your skill/ability to work with the technology associated with distance education? 4. How has the school telecommunications team functioned throughout this period?
Current status of Network equipment at school site	1. How is the Network functioning at your school? 2. How did you find the support provided by SVCC in establishing operability of the Network?
Development of school and community awareness of the Network	1. How have you and your school district developed awareness of the SVCC-TN among your staff, students, parents, community, school boards, etc.? 2. What future *public relations* plans do you have for creating awareness of the Network and its potential as a resource for rural schools and communities?
Plans for future use of the network	1. What plans does your school have for future use of the Network? 2. What kind of incentives do you think would promote use of the network by teachers and students? 3. How might the Network serve to help schools in becoming community centers for technology ?
	4. How are your schools addressing the disparity of technology that may exist in the homes of some of your students?

Domains	***Questions***
Current utilization of the Network	1. How is the telecommunications Network currently being utilized in your school?
Thought on future organizational structure for the Network	1. What kind of organizational structure do you think should be developed to: manage the Network establish protocols for courses and other uses of the Network provide a forum to discuss and exchange ideas regarding use and operation of the network?

Appendix K

Goals and Objectives for Staff Development Workshops

Goals for Workshops

1. Introduce school telecommunications teams to the use of compressed video in delivering distance educational instructional programs

2. Develop an understanding among members of the school telecommunications team of the changes in society brought about by developments in the realm of technology

3. Create an awareness of the vision, goals, evolution and operation of the Southside Virginia Telecommunications Network

4. Model and communicate effective strategies for teaching and learning that employ technology

5. Develop interdependence among all members of school telecommunications and among school teams that are part of the Southside Virginia Telecommunications Network

6. Create an understanding among participants that the focus of all changes in education involving technology needs to be its value to the learner.

7. Foster an understanding that *change is a process, not an event.*

8. Create a "critical mass" of "mentors" at each of your schools who will be able to:
   - articulate the opportunities available to students at through the Southside Virginia Telecommunications Network
   - demonstrate operation of the network for interactive communication and learning experiences
   - exhibit leadership in promoting distance education

OBJECTIVES for Workshops

After completing these workshops, you will be able to.....

1. Define distance education and articulate the unique characteristics of this mode of education.

2. Define technology and identify some of the impact it has had on varied segments of our society,

3. Identify current instructional technologies that involve education at a distance.

4. Describe the evolution of distance education since the 19th century.

5. Discuss the impetus for restructuring of schools in the '80s and '90s.

6. Articulate various instructional strategies which use electronic technologies that can be employed to engage all categories of learners in study of new material.

7. Engage in group discussions regarding:
   - definitions of quality instruction and effective teaching practices,
   - role of facilitators in distance education programs, and
   - ways to promote awareness of distance education in schools.

8. Develop "learning guides" for organization of information....

9. Design and deliver, using compressed video, a 5-minute visual presentation showcasing your school. Your presentation should combine two or more technologies.

10. Identify school support structures--classroom, administrative, community--for students enrolled in distance education programs.

11. Develop strategies for using technology to facilitate instruction.

12. Engage in learning environments in which sample "mini-lessons" that are delivered using compressed video.

13. Observe examples of successful distance learning practices (video).

14. Operate equipment typically used by teachers and facilitators in classroom that are connected by compressed video technologies.

15. Prepare a set of guidelines for students enrolled in distance education classes.

16. Communicate via electronic mail.

Appendix L
Agenda

Southside Virginia Telecommunications Network
Training Session #1. December 2 & 3, 1996

Meeting Educational Challenges through Technology

Time	Event
9-9:30 a.m.	Facilitators: Questionnaire Students/teachers: Get acquainted activity
9:30 a.m.	Welcome Goals/objectives Format: Ways of learning and interacting with information ISG-partial notes
9:50 a.m.	What is technology? (Video) Small Group Discussion: Changes in government, business, medicine and education due to technology. School restructuring ...CHANGE
10:15-30 a.m.	Break/Refreshments
10:30 a.m.	Distance Education Definition Requirements Model Interactions History Star Schools (video) Delivery; objective determines system Advantages/disadvantages/opportunities Compressed video--what is it? (video)
11:15 a.m.	Southside Virginia Telecommunications Network Vision; membership; goals; funding; architecture Introductions here Good Teaching (Video) and Small Group Discussion

12:00 noon-	Lunch
12:45 p.m.	How do learners learn? Learning styles; varied modes Role of instructor
	Use of technology in learning. DE classrooms
	Roles for facilitators:
	Summary; homework; preview
	Evaluation: WHAT do you evaluate?
1:30 p.m.	Adjourn

Appendix M

External Resource Materials

The following individuals or groups gave me permission to distribute their materials to individuals and schools participating in SVCC-TN:

- Southwest Educational Development Laboratory (SEDL), for permission to copy and distribute the 1994 book and video, Local Heroes: Bringing Telecommunications to Rural, Small Schools, by M. Sullivan, D. Jolly, D. Foster, and R. Tompkins, published and distributed by SEDL.

- Dr. Michael Simonson, College of Education, University of Iowa, for permission to copy and distribute the 9-volume Iowa Distance Education (Video) Series, produced 1996.

- Professors Mary Alice Bruce and Richard A. Shade, University of Wyoming, for permission to copy and distribute their September 1995 article, "Effective Teaching and Learning Strategies Using Compressed Video," published in TechTrends.

- Dr. Judy Garcia, of Fairfax County Public Schools (FCPS), for providing the researcher with copies of FCPS videos to use in the workshops and print material relevant to distance learning to distribute to participants in SVCC-TN.

- Pacific Mountain Network for donating copies to the researcher of their four videos in the 1994 Far View Series on Distance Learning and permitting their use in training.

- Professor Lynne Schrum, University of Georgia, for permission to copy and distribute her March 1996 article, "Teaching at a Distance: Strategies for Successful Planning Development," published in Learning and Leading With Technology.

- Pacific Mountain Video (Denver, CO) for donating four videotapes from their "Far View" series.

VITA

Jean Pulis McNeal

Education

A.B. cum laude. Radcliffe College/Harvard University. (1959). Biochemical Sciences.
M.A. Columbia University. (1961). Chemistry

Employment

1996-97: Graduate Assistant. College of Human Resources and Education, VA Tech.
Researcher/participant/trainer in telecommunications project involving 13 rural high school sites..
Developed web site for two graduate courses. Assisted in delivery of research methods course at VA Tech.

1992-96. Teacher. Fairfax County Public Schools (Science and Math).
Explored applications of technology and problem-based learning to chemistry and math.
Piloted constructivist-based algebra course.
Administrator: Middle School and High School Summer Schools

1988-92. Science Curriculum Specialist. Fairfax County Public Schools (Area IV). Designed, developed and delivered staff development activities for diverse groups on topics associated with K-12 science program that included materials, methods, use of information technology, and assessment criteria.
Co-chair: Fairfax County Regional Science Fairs.

1982-88. Teacher. Fairfax County Public Schools (Science and Math).
Explored applications of technology to teaching and learning in chemistry.

1969-81. Assistant Professor, Chemistry and Physical Science. UCLA and. Community Colleges in California, Maryland, Virginia.

1959-68: Researcher chemist/biochemist.
Sloan Kettering Institute, New York, NY.
Merck, Sharpe and Dohme Research Laboratories, Rahway, NJ.
Polaroid Corporation, Cambridge, MA.
University of California, Los Angeles, Departments of Zoology and Chemistry.

Activities

Author of ten educational and four scientific publications.
Presenter: NSTA National Conventions and Virginia State Science Conference.
Member: NSTA High School Science Committee. Editorial Board for The Science Teacher.

Member of volunteer community-based organizations that include AAUW and programs for Girls Exploring Math and Science (GEMS). Former “I Have a Dream” program planner and tutor.