PERCEPTIONS OF CAMPUS ADMINISTRATORS, TEACHERS, AND

STUDENTS ON USE OF INTERACTIVE VIDEOCONFERENCING

FOR THE DELIVERY OF HIGH SCHOOL ALGEBRA IN

SELECTED RURAL PUBLIC HIGH SCHOOLS

IN SOUTH TEXAS

A Dissertation

by

PATRICIA C. ABREGO

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

December 2009

Major Subject: Educational Administration

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ABSTRACT

Perceptions of Campus Administrators, Teachers, and Students on Use of Interactive

Videoconferencing for the Delivery of High School Algebra in Selected

Rural Public High Schools in South Texas. (December 2009)

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Campus administrators from rural public school districts are continuously looking for creative innovative ways to respond to the educational challenges placed upon them by federal and state-legislated accountability requirements. Advances in interactive videoconferencing (ITVC) technologies provide a way to address these challenges. However, these advancements sometimes lack needed resources to make a network of this magnitude work. The Mid-Rio Collaborative was established to share educational resources and knowledge between Texas A&M International University in Laredo, Texas, and surrounding rural public school districts in South Texas. The established collaborative provided the backdrop for the study while meeting the educational needs of this region.

The purpose of this study was to examine the use of interactive videoconferencing as a viable alternative for the delivery of high school Algebra. A mixed methods case study of four campuses explored the perceptions of administrators,

teachers, and students in the use of interactive videoconferencing. The sampled

population included 4 administrators, 4 teachers, 35 students (12 experimental and 23

control) from selected rural districts. Qualitative and quantitative research

methodologies were utilized in identifying perceptions of participating principals,

teachers, and students.

Major findings of this study included (a) campus administrators' values and

beliefs influence teacher use of interactive videoconferencing; (b) a difference exists in

experienced and novice teacher perceptions regarding the impact of ITVC, (c)

perceptions are dependent upon the Teacher Partner role in the teaching and learning

process; (d) increased interaction between students, teacher, content, other learners, and

technology exists with instruction delivered through ITVC; (e) perceptions of cognitive

and classroom conditions differed between students receiving instruction via face-to-face

and interactive videoconferencing; finally, (f) students receiving instruction through

ITVC did not demonstrate academic gains in state-mandated tests (TAKS). Study results

support the current body of research that contends there is no significant difference

between instruction delivered face-to-face and instruction being delivered via interactive

videoconferencing.

DEDICATION

My dissertation is dedicated to my three daughters: Miriam, Judith, and Lorena, who were still children when I began this journey and now are teenagers. You are my strength, my inspiration, and my truth. I will never really know of the many missed opportunities to talk, laugh, and cry with each of you, but I am certain I appreciate and treasure our moments together even more now.

It is also dedicated to my husband, Juan Manuel, for his undivided love, support, and understanding. Your efforts to compensate for my absence while I was away from home were great and not easy, but you were able to manage our home with a steady and loving hand. Your commitment to see me through was evident every step of the way. I am eternally indebted to you.

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This dissertation not only signifies the culmination of years of study but also represents the relationships with the many wonderful and inspiring people I have met since the beginning of my graduate studies. I have been blessed with their contributions to my development as a person and now as a scholar.

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May everyone's support be repaid tenfold and may God grant me the energy and wisdom to help others reach their educational goals as I enter this new phase in my professional career.

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CHAPTER I

INTRODUCTION

Leaders of rural public school districts are under tremendous pressure to find innovative and cost-effective solutions to respond to today's educational challenges. This is due to the ever-increasing demands of educational accountability and high-stakes testing. Accountability is driving administrators to seek alternatives to change current teaching and learning activities that are not yielding the desired results. Challenges such as the requirement from House Bill 1 that mandates that all students take four years of high school math combined with the shortage of highly qualified teachers in academic core subject areas force leaders of rural public school districts to search for cost-effective teaching strategies that produce results.

Over the past two decades, advances in distance education technologies and research on their effectiveness have provided school leaders with cost-effective viable solutions that have influenced the teaching and learning process. The introduction and availability of various exemplary programs have demonstrated that technology enhances the teaching and learning process by providing students with exciting and engaging learning experiences. Some examples of these programs are virtual fieldtrips, simulations, and virtual collaborations in which technology makes it possible for students in remote areas to experience new adventures and expand their horizons. The impact of technology in the educational process is not limited to one-time, isolated instances and experiences.

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The style for this dissertation follows that of *The Journal of Educational Research*.

A review of the literature indicates distance education to be beneficial in improving both student achievement and interest levels. Documented instances of improvement in mathematics education is frequently attributed to the use of distance education technologies (Barker, 1996; Gage, Nickson, & Beardon, 2002; Hughes, McLeod, Brown, Maeda, & Choi, 2007). A byproduct associated with distance education technologies is the ability to connect teachers with opportunities for professional development (Batey & Cowell, 1986; Green & Cifuentes, 2008; Martin, 2005; Schatzman, 1995).

The purpose of this study was to examine the use of interactive videoconferencing (ITVC) as a viable alternative for the delivery of high school Algebra as perceived by campus administrators, teachers, and students in selected public school districts in South Texas.

Since the enactment of the No Child Left Behind Act (NCLB) of 2001, there has been great demand placed upon all school districts to make sure all teachers of academic core subjects be highly qualified with the ultimate intent to increase students' academic performance across the curriculum. Staffing the nation's schools with well-qualified teachers is of particular concern in the areas of mathematics and science due to a historical decline in teacher certification rates in these two subject areas. The National Science Foundation (2006) in their report, *Science and Engineering Indicators, 2006*, found the percentage of public high school mathematics teachers with full certification in mathematics decreased from 90% in 1990 to 80% in 2002. Out of the 5,210 Texas public schools reporting vacancies in 2003-2004, a little over 20% or 1,083 vacancies

were in the area of mathematics (National Center for Education Statistics, 2008). Small rural school districts are particularly impacted by these statistics since they often find themselves competing with large urban areas in securing qualified teachers to fill their vacancies. In order to address the inequitable distribution of qualified teachers in areas of high need, both the Higher Education Act (HEA) and the No Child Left Behind Act (NCLB), are stimulating change in the method and manner in which teachers are prepared through a series of formula grants also known as Title II, Part A. In exchange for receiving funds, school districts are held accountable to taxpayers for improvements in academic achievement. Title II, Part A provides these school districts the flexibility to use these funds creatively to address challenges in teacher quality, whether they concern teacher preparation and qualifications of new teachers, recruitment and hiring, induction, professional development, and teacher retention.

A number of discretionary grant programs have also been established to fund partnerships between institutions of higher education and high-need school districts. These grant initiatives include the "Mathematics and Science Partnership Program" and the "Transition to Teaching Program," as well as the State Agency for Higher Education (SAHE), which link higher education resources with high-need school districts to address the professional development needs of their teaching faculty (U.S. Department of Education, 2005). The requirements of the No Child Left Behind legislature presents school leaders with great opportunities with the resulting concomitant challenges.

The Influence of the Campus Administrator

Campus administrators have generally been exhorted to assume the role of instructional leaders and implement solutions to general school issues but seldom asked to focus on particular subject areas. One of the challenges faced by rural school administrators is the improvement of student achievement in the area of mathematics. A modest research body of articles exists that examines student achievement in the area of mathematics in the rural context. A number of authors agree that in order to "fix" mathematics instruction in rural areas, certain practices must be in place. These practices include: (a) a challenging curriculum, (b) professional development efforts, (c) engaged use of distance learning technologies, and (d) local support.

Cauley and Seyfarth (1995) recommended ways for principals in rural communities to promote standards-based reform of mathematics education. They contend the first step toward successful implementation of any reform is to communicate the reasons for improving the mathematics curriculum and instruction. Second, principals need "to support the development of a high-level and technologically sophisticated core curriculum, encourage changes in teaching practice that enable students to focus on problem solving and reasoning, and seek improvements in assessment practices" (p. 18). This report also indicates campus leaders must assume a proactive role in any efforts toward the improvement of mathematics instruction. Batchelder (1999) reported that principals who encouraged meaningful collaboration and who organized teacher leaders to mentor other teachers showed significant success at implementing standards-based mathematics curriculum. As supported in the literature,

teacher collaboration and shared decision-making processes are key elements in stimulating and sustaining continuous improvement of any reform (Guarino, Santibanez, & Daley, 2006; Leithwood & Riehl, 2003; Warren & Peel, 1994).

Fullan (2001) in *The New Meaning of Educational Change* states that effective principals "are actively engaged as initiators or facilitators of continuous improvement in their schools" (p. 155). Fullan acknowledges that in light of the present accountability system, the role of the principal has been reduced to that of an instructional leader. He does not say this in a degrading manner but rather as a hindrance to deeper and more sustainable reform. To truly understand the change process, he contends, one must take into account the system and all its stakeholders. Instructional improvement is definitely important but it must go beyond the scope as presently perceived. Gibson (2001) states "The number one issue in the effective integration of educational technology into the learning environment is not the preparation of teachers for technology use, but the presence of informed and effective leadership" (p. 502). In this age of information, principals have to be able to integrate technology into the teaching and learning process where technology is as transparent as possible. Jacobsen (2001) contends "leaping into the knowledge age appears to be less about technology integration per se, and more about the fundamental changes to teaching and learning that are enabled and required by the new medium" (p. 6).

The review of the literature also stresses that a redesign of professional development should include partnerships between schools and university teacher education departments (Sealey & Robson, 1997, p. 79). Peel, Peel, and Baker (2002)

also support the importance of partnerships where schools and universities work together in a collaborative environment, with shared leadership, common vision, support of top leaders, respect and trust, open communication, flexibility, and adequate financial support.

Establishment of Partnerships Between Rural School Districts and Institutions of Higher Education

Leaders of rural public school districts often seek assistance from institutions of higher education to overcome their limited resources and restricted choices. One of these partnerships was established in 2006 between Texas A&M International University's College of Education and eight surrounding school districts: Zapata ISD, Pearsall ISD, Carrizo Springs ISD, Crystal City ISD, Cotulla ISD, Dilley ISD, Freer ISD, and Jim Hogg County ISD. The primary objective of this partnership was to utilize the Texas A&M International University's resources to support, coordinate, and enhance the delivery of quality instruction from an experienced teacher (Master Teacher) to those classrooms with a less experienced or novice teacher (Teacher Partner).

The establishment of these types of programs is familiar territory for the author who holds the position of Director of Instructional Technology at TAMIU and has been involved with distance learning technologies for over ten years, specifically, with the use of interactive videoconferencing (ITVC) the delivery of high school courses. This is, however, uncharted territory for the researcher in that never before have the perceptions of those involved been collected to generate a holistic picture of the use of interactive

videoconferencing. In these types of programs, emphasis is usually placed on how to make the technology work rather than on the learning experiences of those involved.

This study was conducted during the 2008 spring semester in four South Texas school districts. However, the researcher had been involved in the initial implementation of the videoconferencing network (or collaborative) since Spring 2007. As the Director of Instructional Technology of Texas A&M International University, the researcher was asked to be part of the initial meeting in March 2007 where superintendents and principals from eight surrounding school districts met to discuss the implementation of the upcoming House Bill 1 mandate. House Bill 1 dictates that school districts must offer four years of mathematics and four years of science as part of their curriculum. This mandate magnified the concern that small school districts were going to experience a shortage of experienced teachers in those content areas. The researcher's involvement in the meeting consisted of offering distance learning as a viable method for the delivery of instruction for these small school districts.

Superintendents and principals were asked to form a partnership, the Mid-Rio Collaborative, and to identify areas, specifically content areas, of concern. Algebra was uniformly selected as the number one area of concern. As an observer at this meeting, it was evident that all those present shared a common goal: to enhance the educational opportunities for their students. The Dean for the College of Education at Texas A&M International University began to work on the details of delivering an Algebra class through interactive videoconferencing.

Time was of essence since it was determined that the Algebra class was to be delivered sometime during the fall semester and continue throughout the academic year. It took several individuals to make this project a reality. My task as the individual responsible for distance education at the university was to (a) assess the current infrastructure of each school district and each participating high school, (b) develop a plan along with their technology director to procure a T-1 (high speed digital channel) line to the building where the transmission was to be delivered, (c) identify potential connectivity issues in the receiving classroom, (d) recommend and procure end-point hardware and software applications, and (e) develop a plan to train individuals involved in the actual delivery and maintenance of the equipment.

Assessing each individual school district's infrastructure proved to be easily manageable because this project was embraced by every high school principal or campus administrator. The researcher developed a form that was to be completed by the appropriate technical staff within each site. The campus administrators sought the cooperation of their technical staff for the completion of the form. The administrator also assigned a person to assist the receiving teacher with any technical difficulties before and during the actual transmission of the class. The technical staff also assisted during the actual testing of the equipment which, at times, took place before or after the school day.

The process of connecting each of the four high schools to the TTVN network took place between June and September 2007. This process was delayed due to the fact that one of the school districts hired an external contractor to maintain and support their

network. The contractor was located 150 miles from the school district and visits were sometimes difficult to schedule. The actual configuration of the T-1 line was done by the network group at Texas A&M International University with the assistance of the TTVN technical staff located in Texas A&M University in College Station. By September 2007, all four high schools were able to connect successfully.

It was determined that two of the four school districts lacked or had incomplete or inadequate end-point videoconferencing systems to receive instruction. Alternative sources of funding were located to equip these two school districts with adequate systems. Mobile videoconferencing units were purchased and delivered in September 2007 to these two high schools.

Finally, the plan for staff development included training teachers on the actual handling of the videoconferencing equipment, do's and don'ts of teaching at a distance, and how to use the university's Learning Management System to post class materials. The initial session took place in August of 2007 at Texas A&M International University with all participating teachers. Subsequent individual training sessions took place in each teacher's classroom in their respective site. Training sessions were held during the school day with funding allocated for travel and substitute coverage. A starting date was determined once all of the elements were in place and confirmed.

The opportunity to conduct such a study came in 2007 as three high schools identified Algebra I as an area of high need. The schools that signed up for the delivery of Algebra using ITVC were referred to as Campus A, Campus B, Campus C, and Campus D for purposes of confidentiality. The Master Teacher, identified and

recommended by the school principal, was located in Campus D. In this collaborative

partnership, the Master Teacher sent Algebra I instruction via ITVC to students in three

high schools. The seasoned teacher from Campus D had been teaching Algebra I for

over 20 years. At the receiving end, the principals from each high school (Campus A, B,

& C) identified teachers that would benefit from being paired with a Master Teacher.

The combination of historically low performance in math TAKS and the

difficulty in hiring qualified math teachers made the opportunity to pair a more

experienced teacher with a less experienced or novice teacher attractive to the principals

of the school districts. This opportunity motivated the principals to develop a uniform

master schedule and synchronize their calendars for the delivery of Algebra I using

ITVC was to be transmitted during second period (8:55 a.m.-9:45 a.m.) following a

Monday-Tuesday-Thursday pattern. Each campus also had an Algebra I class in third

period following the ITVC class. The official class starting date was October 2007.

Due to the geographical distance between the four participating school districts,

the use of distance learning technologies became an obvious choice. Multipoint-

interactive videoconferencing was chosen as the instructional delivery system.

Multipoint videoconferencing expands classroom videoconferencing to three or more

sites synchronously (Falco, Barbanella, Newman, & Silverman, 2007). Each remote site

had a different teaching console configuration due to limitations in space and physical

location of the Ethernet port. Complete classroom configuration diagrams are shown in

Appendix A. The different classroom configurations were not thought to have an impact

on the results obtained.

Mode of Delivery

Interactive videoconferencing that provides for synchronous communication was selected as the mode of delivery for this initiative. Even though all four districts had the capacity to support the bandwidth demands of a video/audio network, two of the four school districts lacked or had incomplete or inadequate end-user systems. This prompted the need to search for alternative sources of funding not only to purchase the appropriate end-user equipment but also to make the videoconferencing connections possible. The Texas A&M International University's College of Education combined a Mathematics and Science grant that provided the needed end-user equipment with a Rural Utilities Services (RUS) grant that set up T1 lines to each of the participating high schools. As a member of the Trans-Texas Video Network (TTVN), Texas A&M International University is able to extend its videoconferencing connections and essential multiway videoconferencing bridging, live streaming video, and expert technical assistance to surrounding communities. The Texas A&M Trans-Texas Video Network (TTVN) has been rated one of the most reliable networks with a 99.99% reliability access index (Zent, 2007). Part of TTVN's reliability is based on the fact that once the classes are programmed into the TTVN master schedule, the connection is made 30 minutes before the beginning of the class. This particular feature is instrumental in identifying technical and connectivity issues before the beginning of class as someone in the control room at TTVN immediately notifies the technical staff at that particular site.

The Importance of Distance Learning Technologies

Distance learning technologies have the potential to positively impact the teaching and learning process. Whether this influence is positive or negative depends on a number of factors as described by a variety of research articles. Although "distance learning is used primarily to increase access and to make limited subject expertise available to students in a wider area" (Bates, 2000, p. 22), the use of technology in the teaching and learning process should not only be intended to transmit information to the learner but to contribute to their learning experience as well (Gunawardena & Duphorne, 2001). The effects of distance learning on K-12 student outcomes have been reported by a meta-analysis conducted by Cavanaugh (1999) that showed that learning in a well-designed distance education environment is equivalent to that of well-designed traditional classroom instruction. Contributing factors to the effectiveness of teaching at a distance such as the design of the program, the demands of the content, the abilities and disabilities of the students, and the quality of the teacher were identified in her analysis (p. 18). Another meta-analysis conducted by Zhao, Lei, Yan, and Tan (2005), confirmed that the level of interactions, the presence of a "live instructor," and learner characteristics are additional factors that contribute to the effectiveness of a distance learning class. Zhao's findings also confirmed that the distance learning technologies utilized in those studies conducted before 1998 proved to be less effective than those conducted afterward. Regarding the quality and reliability of support systems Zhao's findings provide relevance to the fact that distance learning technologies have improved over the last decade.

There is a wide body of literature on the use of ITVC for course offerings at the post-secondary level. However, there is limited research that addresses courses being delivered via ITVC in the K-12 arena. The majority of the articles reviewed discuss sporadic instances of the use of ITVC for enrichment and one-time learning opportunities such as virtual field trips (Barack, 2005; Hasselbacher, 2007; Peat & Fernandez, 2000; Stearns, 2006). The Office of Educational Technology in the U.S. Department of Education on "Distance Education Courses for Public Elementary and Secondary School Students" gathered and analyzed survey data focused on technology-based distance education in public elementary and secondary school districts. The survey covered a 12-month period for the school year 2002-2003. Results from this survey revealed that approximately one-third of public school districts (36%) had students in the district enrolled in distance education courses. This represents an estimated 5,500 out of a total of 15,040 public school districts at the time the survey was conducted. Moreover, of the 5,500 districts with students enrolled in distance education courses, over 55% or 3,095 identified ITVC as the primary delivery mode. Sixty percent or 6,648 of small school districts with a population of less than 2,500 residents identified ITVC as the primary delivery mode (Setzer & Lewis, 2005).

The review of the literature identified six types of videoconferencing that are frequently found in K-12 educational settings: (a) point-to-point or provider-classroom videoconferencing; (b) collaborative-classroom videoconferencing; (c) multipoint videoconferencing; (d) mass audience or electronic field trips videoconferencing; (e) homebound videoconferencing; and (f) one-to-one videoconferencing (Falco et al.,

2007). Districts that reported offering distance education courses were asked which entities delivered distance education courses to students regularly enrolled in their district. Entities included

1. A cyber (i.e., online) charter school in the district;

2. Other schools in the district;

3. Their district (i.e., delivered centrally from the district);

4. Another local school district, or schools in another district, in their state;

5. Education service agencies within their state (e.g., Board of Cooperative Educational Services [BOCES], Council on Occupational Education [COE],

6. Intermediate Units [IU]), not including the state education agency or local school districts;

7. A state virtual school in their state (i.e., state-centralized K-12 courses available through Internet- or web-based methods);

8. A state virtual school in another state;

9. Districts or schools in other states (other than state virtual schools);

10. A postsecondary institution;

11. An independent vendor; and

12. Other entities. (Setzer & Lewis, 2005, p. 11)

Statement of Problem

School administrators from small rural school districts are motivated to look for cost-effective educational solutions to improve student achievement in several subject areas. One of these areas of need is high school Algebra. Interactive videoconferencing

is an effective and reliable mode of delivery that can be used to enhance the teaching and learning process in geographically-dispersed locations. Collaborations between rural school districts and institutions of higher education allow for the sharing of resources that can potentially improve teaching and learning processes.

Purpose of the Study

The purpose of this study was to examine ITVC as a viable alternative for the delivery of high school Algebra I as perceived by campus administrators, teachers, and students at selected rural public school districts in South Texas.

The perceptions of those involved were collected using a variety of methods. Information concerning cognitive, behavioral, and affective activities taking place throughout the duration of the class was collected using a Class Activities Questionnaire (CAQ). The underlying intention of the use of the CAQ was not to evaluate the use of ITVC in isolation, but as a contributing factor to the teaching and learning process. Responses from students involved in the ITVC were compared to the responses of students in classes not using technology as part of the delivery of instruction.

This study also collected data from the Teacher Partners involved at the receiving sites and compared it to students' responses. The Teacher Partners filled out the same Class Activities Questionnaire as the students. Comparison of the teacher and the students' responses in the questionnaires revealed similar perceptions of instructional practices that took place in the classroom receiving instruction via interactive videoconferencing. Comparison of the Master Teacher's responses to the Teacher Partners' responses revealed similar perceptions of intended outcomes. Finally, the

perceptions of the school administrators regarding their role in the overall process were also collected through semi-structured interviews.

Research Questions

This study was designed to address the following questions:

1. How do campus administrators' perceptions and beliefs shape the value or efficacy of ITVC in the delivery of high school Algebra?

2. In what ways does ITVC influence teacher instruction and student engagement?

3. How were cognitive, behavioral, and affective classroom activities perceived differently by students receiving instruction face-to-face and those receiving instruction through interactive videoconferencing?

4. In what ways does ITVC affect academic gains of students receiving Algebra I instruction in three school districts?

Definition of Terms

Affective activity: Classroom activities that focus on students' emotions such as motivation, stress, humor, enthusiasm, etc.

Affective domain: Relates to how individuals feel emotionally and physically while learning.

Asynchronous: Communication in which interaction between parties does not take place simultaneously (Touchstone, 1995).

Behavioral activity: Activities that deal with social conditions in the classroom such as norms and roles.

Class activities questionnaire (CAQ): An instrument to assess the instructional climate

by obtaining information concerning the cognitive, behavioral, and affective

domains taking place in the classroom.

Cognitive domain: Deals with the mental activities involved in the acquisition,

processing, organization, and use of knowledge and are collectively termed

cognition.

Cognitive activity: Learning activities that focus on the cognitive domain such as

selective attention, perception, discrimination, interpretation, classification,

recall, and recognition memory, evaluation, inference, and deduction

(*Encyclopedia Britannica*, 2009).

Distance education/learning: The acquisition of knowledge and skills through mediated

information and instruction, encompassing all technologies and other forms of

learning at a distance (U.S. Distance Learning Association, 2006).

Efficacy: Power or capacity to produce a desired effect; effectiveness.

Interactive videoconferencing (ITVC): A connection between people in separate

locations for the purpose of communication. It generally combines video, audio,

and often text and graphics (Texas State Library and Archives Commission,

n.d.).

Mixed methods study: A type of research where the researcher combines quantitative and

qualitative research techniques, methods, approaches, concepts or language into a

single study.

Multipoint videoconferencing: Expands classroom videoconferencing to three or more different sites asynchronously (Texas State Library and Archives Commission, n.d.).

Perception: Act of observing; awareness of the elements of environment through physical sensation (*Merriam-Webster Online Dictionary*, 2009).

Student engagement: "The extent to which students are actively involved in a variety of educational activities that are likely to lead to high quality learning" (Coates, 2005, p. 26).

Synchronous: Communication in which interaction between participants is simultaneous (Touchstone, 1995).

Teacher instruction: Teacher behaviors and practices that enhance the learning of all students.

Trans-Texas Video Network (TTVN): An interactive two-way multipoint multiplexed video and data network of T1 and T3 digital telecommunication circuits connecting the Texas A&M System universities, research organizations, extension agencies, public service agencies, and affiliate institutions. Multi-protocol routing devices are used to transmit data over dedicated circuits at rates of 56kbps to 1.5 Mbps (Zent, 2007).

Assumptions

For the purpose of this study, the following assumptions were made:

1. The researcher was impartial in collecting and analyzing the data.

2. The respondents surveyed understood the scope of the study and the language of the instrument, were competent in self-reporting, and responded objectively and honestly.

3. Interpretation of the data collected accurately reflected the intent of the respondents.

4. The methodology proposed and described here offered the most logical and appropriate design for this particular research study.

Limitations

The following limitations were identified by the researcher:

1. The scope of this study was limited to the information acquired from literature review and survey instruments.

2. The findings from this study were not generalized to any group other than the independent school districts involved in the study.

Significance of the Study

Campus administrators from rural public school districts are continuously looking for creative and innovative ways to respond to educational challenges placed upon them by federal legislation and state accountability requirements. Advances in ITVC technologies provide administrators an alternative; however, these advancements sometimes lack the resources needed to make a network of this magnitude work. Partnerships between schools and institutions of higher education offer an immediate solution to the dilemma by providing adequate infrastructure and the equipment needed to connect to TTVN. The findings of this study will be used to

identify the perceptions of all those directly involved in a class being delivered through ITVC and those that were not. The results of this study will provide teachers, campus administrators, and institutions of higher education with crucial information to further improve the implementation and design of similar programs being delivered through the use of interactive videoconferencing.

Organization of the Study

This study is divided into five major chapters. Chapter I includes an introduction, statement of the problem, purpose of the study, research questions, definitions, assumptions and limitations, and significance of the study. Chapter II includes the literature review. The literature review is divided into three sections. The first section presents an overview of distance education, its theoretical framework and its evolution throughout the years in the K-12 arena. This section also focuses on the advantages and disadvantages of distance education and describes programs and initiatives that have adopted ITVC as the mode of delivery. The second section discusses literature related to the role of the campus administrator as an instructional leader in the overall implementation of a distance education program. The third section reflects on the rural context and explores elements successful partnerships with institutions of higher education. Chapter III is a description of the methodology, including the sample population, procedure, instrumentation, and data analysis. Chapter IV contains the results of the analysis and comparisons of the data collected in the study. Finally, Chapter V is a summary of the findings from this study and conclusions and implications

from those findings. Recommendations for practice and directions for future research are

also addressed in this chapter.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

The purpose of the review of literature is to provide a context for inquiry into the use of ITVC as a viable, cost-effective solution for the delivery of high school Algebra and the role of the campus administrator in the overall implementation. The literature review is divided into three sections. The first section presents an overview of distance education, its theoretical framework, and its evolution throughout the years in the K-12 arena. This section focuses on the advantages and disadvantages of distance education and describes programs and initiatives that have adopted interactive videoconference as the mode of delivery. It also presents the apparent lack of research on the impact of ITVC on students' cognitive and affective outcomes. The second section discusses literature related to the role of the campus administrator as an instructional leader in the overall implementation of a distance education program. The third section reflects on the rural context and explores successful partnerships with institutions of higher education.

Overview of Distance Education

The definitions given to distance education in the literature reviewed by the researcher fall into two categories: one that views distance education as an environment conducive to learning processes and the other which views distance education as a mere vehicle of instruction (Casey, 2008).

Garrison and Shale (1990) realized the potential positive impacts of distance technologies on teaching and learning and proposed the following criteria to define distance education:

1. Distance education implies that the majority of educational communication between teacher and students occurs in separate locations;

2. Distance education must involve two-way communication between teacher and students for the purpose of facilitating the educational process; and

3. Distance education uses technology to mediate the necessary two-way communication. (p. 25)

Schlosser and Simonson (2006) agree with Garrison and Shale's criteria, but stress the point that interactive telecommunication must be available for students to interact with each other, the instructional materials, and the teacher. The inclusion of instructional environments that promote learning is of utmost concern in their definition of distance education. They contend that if distance education is to be successful, then: "its appropriate application should be based on the belief that the more similar the learning experience of the distant students is to that of the local student, the more similar will be the outcomes of the learning experience" (Simonson & Schlosser, 1995, p. 13).

Their definition is also based on the premise that distance education is a formal, institutionally based program where the students are geographically separated and both students and faculty are united by electronic, interactive means of communication.

Keegan's (1988) definition of distance education also mentions the involvement of an educational institution in the overall distance education program. According to Keegan, distance education must contain the following characteristics:

1. A quasi-permanent separation between teacher and student throughout the length of the learning process;

2. The influence of an educational organization in the planning, preparation of materials and the provision of student support services; and

3. The use of technical media: print, audio, video, or computer to unite teacher and learner to carry out the content of the course. (p. 10)

The role of distance education in the overall teaching and learning process is not shared by everyone. Clark (1983) in his article titled *"Reconsidering Research on Learning from Media"* relegates distance education as a mere vehicle of instruction and states:

The best current evidence is that media are mere vehicles that deliver instruction but does not influence student achievement any more than the truck that delivers our groceries causes changes in nutrition…only the content of the vehicle can influence achievement. (p. 445)

There are numerous definitions of distance education in the literature, some of which have been presented. A broad definition of distance education includes the separation of teacher and students, the use of interactive technologies to unite teacher, materials, and students, and the influence of an institution in the overall process. In order to obtain an insight into the field of distance education and its current practice, it is important to review its theoretical basis. Gunawardena and McIsaac (2004) contend that one of the

most critical challenges in the field of distance education is the need to adapt theories to understand the learning environments created by the latest technological developments. Holmberg (1986) recognized the need for theoretical considerations in the field of distance education:

> One consequence of such understanding and explanation will be that hypotheses can be developed and submitted to falsification attempts. This will lead to insights telling us what in distance education is to be expected under what conditions and circumstances this paving the way for corroborated practical methodological application. (p. 3)

The next section presents the theoretical framework of distance education and the main theories that have been developed around it. This framework will assist the researcher get a better understanding of the learning environments created by distance education.

Theoretical Framework of Distance Education

It is evident from the review of the literature that there is no general accepted theory for distance education. Garrison (2000) states, "the theoretical foundations of a field describe and inform practice and provide the primary means to guide future developments" (p. 3). Theory is "the summary and synthesis of what is known about a field…it is the reduction of our knowledge to the basic ideas, presented in a way that shows their underlying patterns and relationships" (Moore 1991, p. 2).

Keegan (1986) in his book, *The Foundations of Distance Education*, classified the most important theoretical positions into three groupings: (a) theories of autonomy

and independence, (b) theory of industrialization, and (c) theories of interaction and

communication.

Theory of Autonomy

Charles Wedemeyer and Michael G. Moore are the main proponents of the

theory of autonomy and independence. Their contributions come mainly from the late

1960's and early 1970's. According to Wedemeyer (as cited in Garrison, 2000), the

essence of distance education is the independence of the student as reflected in his

preference for the term "independent study" instead of distance education. He identified

the characteristics and advantages of independent study and described the learner as self-

directed and self-regulated. Garrison (2000) described Wedemeyer as a great "advocate

of freedom and choice for the learner" (p. 5). He believed the way of creating an

independent learner was through the adoption of technology. He avidly criticized the

way in which outdated methods of teaching and learning were still being employed and

modern distance education technologies were being underutilized (Keegan, 1986).

Moore's ideas on learner autonomy and independence are closely related to his

theory of transactional distance. Transactional distance contends that "distance education

is not simply a geographic separation of learners and teachers, but, more importantly, is

a pedagogical concept" (Moore, 1997, p. 20). According to Moore's theory, there is a

psychological and communications space (transactional distance) that needs to be

crossed in order to avoid misunderstandings between the instructor and the learner. In

his theory, distance is not a geographical concept but rather a concept described in the

relationship between structure and dialogue. An interpretation of Moore's theory done

by McIsaac and Gunawardena (1996) further clarifies that "education offers a continuum of transactions from less distant, where there is greater interaction and less structure, to more distant, where there may be less interaction and more structure" (p. 407). Moore's Transactional Theory was tested by Bischoff, Bisconer, Kooker, and Woods (1996) who confirmed Moore's three elements and their hypothesized interrelation. Heath and Holznagel (2003) define transaction as the interplay of individuals, the environment, and the patterns of behavior in a situation. As a consequence, the greater the transactional distance (less dialogue, more structure), the greater responsibility is placed on the learner (Garrison, 2000). In a later paper, Moore (1990) defines autonomy as "the extent to which the learner determines objectives, implementation procedures, and resources and evaluation" (p. 13).

Theory of Industrialization

Peters' work on a theory of industrialization in the 1960's proposes the notion to view the field of distance education as an industrialized form of teaching and learning. Peters concluded that in order for distance education to be effective, the principle of the division of labor is thus a constituent element of distance teaching. He stated that:

1. The development of distance study courses is just as important as the preparation process done before;

2. The effectiveness of the teaching process is dependent upon planning and organization;

3. Courses must be formalized and expectations from students standardized;

4. Distance study can only be economical with a concentration of the available resources and centralized administration. (Peters & Keegan, 1994, p. 124)

Theory of Communication

Holmberg's contribution to the theory of distance education lies on the concept of "guided didactic conversation," which refers to both real and simulated conversations. Holmberg's (1986) communication theory "seems to have explanatory value in relating teaching effectiveness to the impact of feelings of belonging and cooperation as well as to the actual exchange of questions, answers and arguments in mediated communication" (p. 123).

An analysis of the theories proposed over time to explain the complexities of distance education reveals two important facts: (a) there is not a universally accepted theory on distance education, and (b) those that have been proposed are impacted by the nature of the technologies being utilized. A brief history of distance education in the United States is presented in the next sections. Although an extensive review of the history of distance education is not deemed appropriate for this study, the researcher introduces the main developments in the field to get a general understanding of how current technologies and practices came about. Special attention will be given to ITVC since this study focuses on this mode of delivery.

History of Distance Education

The first college level distance learning program was delivered in 1892 by the University of Chicago when students far from campus would use the U. S. Postal Service to exchange assignments and lessons (Casey, 2008). In 1919, the University of

Wisconsin established the first non-commercial radio station (WHA). During the

following decade, universities around the United States combined correspondence

instruction with educational radio programming. Over 10% of all broadcast radio

stations were owned by educational institutions, which delivered educational

programming (Weinstein, 1997).

Television as an instructional medium began in 1934 when the University of

Iowa broadcasted courses by television. Television offered colleges and universities the

means to respond to the great numbers of military personnel returning from World War

II (Wolcott, 1994). After WWII, computer and telecommunications technologies were

integrated, and computer-communications networks were created that linked computers

among each other and to terminals. "Research in the field of telecommunications yielded

innovations such as satellites, modems, optical fibers and packet switching" (Hamelink,

1997, p. 8).

The Articulated Instructional Medium (AIM) Project, funded by the Carnegie

Corporation to study the best use of technology, was created in 1964. This project was of

particular importance because it was the first attempt to "identify, categorize, and

systemize distance learning practices on how to create and incorporate multimedia

practice for the benefit of the learner" (Casey, 2008, p. 47).

The availability of new technologies marked the beginning of a promising era for

distance education in the United States. According to Saba (2005), it was not until the

mid-1980s that the U.S. government decided to make the Internet available to civilian

organizations that distance education moved to the front lines of education. The next

three decades were characterized by improvements made to ITVC technologies and

broadband Internet access which this study will cover in a later section of this chapter.

Advantages of Distance Education

Distance education offers several advantages to both faculty and students.

Through the use of distance learning technologies, several students can be reached

simultaneously (Wheatley & Greer, 1995) and can collaborate in interdisciplinary

projects with the guidance of experts in different fields (Kober, 1990; Peat & Fernandez,

2000; Weinstein, 1997). Another advantage is the fact that participation is made possible

among widely dispersed learners (Furst-Bowe, 1997). Distance education has been

several times referred to as an alternative to traditional classrooms (Clark, 2001; Setzer

& Lewis, 2005) that also addresses the supplemental services component mandated by

the federal No Child Left Behind Act (U.S. Department of Education, 2004), and its

academic remediation goals.

Access is another advantage of distance learning. Distance learning allows

students in small, rural school districts to participate in advanced classes offered in a

larger school many miles away (Harms & Swernofsky, 2003). "Distance learning also

can help small districts spice up the regular curriculum with gravy offerings—short term

enrichment courses and live events that broaden the horizons of culturally-isolated

students" (Kober, 1990, p. 17).

Distance learning also presents educators with great benefits. Expanded

professional development and collaboration opportunities with colleagues in the same

field are the most prominent in the literature (Chancey, 1995; Kober, 1990; Martin,

2005; Sharp, 2001) as well as the sharing of common curricular components and expertise (Lundin, 1994) without the required time and money spent in traveling (Martin, 2005).

Disadvantages of Distance Education

Muilenburg and Berge (2001) identified 10 categories of barriers to distance education: These are:

1. Administrative structure, which requires partnerships within the organizations' units;

2. Organizational change due to the resistance to change within organizations;

3. Challenges associated with technical expertise, support, and infrastructure due to rapid technological advancements, limited instructors' computer skills, limited support for these instructors, and inadequate equipment;

4. Limited social interaction, which may result in isolation, concerns regarding program quality in relationship to testing and assessment of student outcomes;

5. Greater faculty time commitments but poor compensation and lack of grants for funding learning projects;

6. Threat of technology as it relates to the need for a reduced number of teachers;

7. Legal issues involving copyright, fair-use policies, piracy, intellectual property rights, and problems with hackers and viruses;

8. Evaluation relating to the lack of research supporting the value of distance education;

9. Access issues resulting from instructors' lack of equipment and students' lack of software and/or hardware, Internet inaccessibility, and issues related to equal access; and

10. Limited student support services such as advisement, library services, admissions, and financial aid. Other problems involve identity issues such as how to ascertain the student who registered for the course is the one completing the online examination and the assignments.

The most common barrier mentioned by faculty and administrators concerning participation in distance learning initiatives is the lack of technical support. This includes concerns about the lack of systems reliability and access to the online courseware as well as inadequate infrastructure, hardware, and software (Maguire, 2005).

Distance Education in PK-12

The National Center for Education Statistics (2008) reported that in the 2004-2005 school districts offering technology-based distance education courses used Internet-based or asynchronous technology (58%) as the main mode of instructional delivery (Table 1). Two-way ITVC or synchronous technology was used as a primary mode of instructional delivery by 47% of these districts. A closer look at these statistics revealed that small school districts offering technology-based distance education courses used two-way interactive video technology as the primary mode of delivery (Zandberg, 2008).

Table 1. Percent of Public School Districts Reporting the Mode of Delivery Used by Their Students for Any Technology-Based Distance Education Internet-Based and Two-Way Interactive Video

District Characteristics	2004-2005	
	Internet-based or Asynchronous Technology	Two-way Interactive Video
All public school districts offering technology-based distance education courses	58	47
District enrollment size		
Less than 2,500	53	53
2,500 to 9,999	71	31
10,000 or more	78	28

The Origins of Videoconferencing

The term "videoconferencing" can be traced back to the Latin terms "videre" and "confere," which mean "I see" and "bring together." Videoconferencing is further defined as the "exchange of digitized video images and sounds between conference participants at two or more separate sites (Wilcox, 2000, p. 1). Videoconferencing has also been referred to as "When interactive TV as a delivery system moves to two-way audio and two-way video….(it) provides the opportunity for multiple sites to be online all at the same time" (MacDonald & Caverly, 1997, p. 37). Holznagel (2003) summarized the general comments regarding ITVC at a national symposium of Regional Technology Education Consortia:

The IVC (interactive videoconferencing) technology itself does not teach, but properly implemented, is an effective avenue of delivering instruction and accessing learning. It is a tool for improving opportunities for learning, but there is no reason to expect test scores to rise as a result of using IVC any more than for any other tool. IVC needs to be valued for its capacity to provide access for

teachers and learners to more information and learning opportunities, and access

for teachers and administrators to greater collegial communication. (p. 6)

The Evolution of ITVC Technologies

ITVC technologies and broadband Internet access have been improving at a fast

pace over these past two decades. The first introduction of video was accomplished by

using one-way video and one-way audio. In this particular situation, the student could

see and hear the teacher, but since instruction was only pushed in one direction, it lacked

interactivity. In the mid-1980's, videoconferencing was used in education as compressed

video. Although interactivity was possible with compressed video, it required a

substantial investment from the part of the school district to operate and coordinate

(Smith, 2003). It was not until the mid-1990 when Internet Protocol or IP-based video

became very popular in the education arena because by then school districts had

improved significantly their Internet infrastructure (Weinstein, 1997).

Barker reported in 1988 that instructional television permitting two-way video

and two-way audio interaction between cooperating school districts is one of the fastest

growing distance learning alternatives available for schools. Technological advances

such as higher quality cameras, cost-effective IP connections, and increased bandwidth

have allowed for larger audiences to participate in ITVC experiences since the year

2000.

Advantages of Interactive Videoconferencing

ITVC has overcome some of the negative connotations of other distance learning technologies and has provided a suitable alternative to face-to-face traditional classroom instruction. ITVC provides for visual interaction between teacher and students that has been associated by several authors as having a higher degree of social presence than online, web-based courses (Biocca, Harms, & Burgoon, 2003) and can facilitate social and instructional interaction and reduce distance learners' perceptions of physical and psychological distances (Gilbert & Moore, 1998). Researchers of social presence suggest that a person's perception of social presence is greatly related to others' intimacy behaviors such as physical proximity, smiling, and eye contact. Communication media with the capability to deliver verbal and nonverbal cues will yield a higher perception of social presence (Gunawardena & Zittle, 1997) as in the case of interactive videoconferencing. Although there have been contradictory arguments regarding the role of communication media in the social presence paradigm (Lombard & Ditton, 1997), this study only mentions the relationship found between higher interaction and higher social presence and higher social presence and positive affective learning outcomes.

Disadvantages of Interactive Videoconferencing

Although ITVC technology lends itself to higher levels of interaction than other distance learning technologies, it still depends on the user's knowledge and skills to bring about interaction in an instructional context (Wagner, 1994). One of the most prevalent disadvantages listed in the literature regarding ITVC by teachers and faculty is the level of training and technical support that they have received on the use of the

equipment, on instructional principles and on the interaction process itself. Moore (1996)

on "Tips for the Manager on Setting Up a Distance Education Program" attributes the

success of a distance education program to its well-trained learner support system.

Types of Videoconferencing Systems

As far as the technology is concerned, mobile units with all components

integrated in a single system, allow for greater flexibility and access. These mobile units

or roll-abouts have undergone a transformation in that they used to be heavy and

cumbersome to move due to the fact that it was usually comprised of two (or one) big

TV monitors with a camera mounted on top of the monitors (Figure 1).

Figure 1. Typical Polycom dual-monitor videoconferencing system.

The introduction of liquid crystal display (LCD) projectors has eliminated the use

of bulky TV monitors and allowed greater flexibility and mobility (Figure 2). The

receiving sites are able to see and hear the sender in a bigger, clearer image, and

improved audio. Regardless of which unit is utilized, it is its mobility between rooms

that allow for further group interaction (Smith, 2003).

Figure 2. Tandberg's Media Place videoconferencing system.

Contributing Factors for the Effective Implementation of Videoconferencing Courses

Interactivity

A comparative meta-analysis of distance learning programs between 1985 and 2002 was conducted by Bernard et al. (2004) which revealed that interactivity is of pedagogical importance to the overall effectiveness of learning at a distance. Interactivity among learners occurs when technology is used as a communication device and learners are provided with appropriate collaborative activities and strategies to accentuate the process of learning together. The authors distinguish between "surface" interaction among learners, where superficial learning is promoted through efficient communication (e.g., seeking only the correct answer), and "deep" interaction among learners, wherein complex learning is promoted through effective communication (e.g., seeking an explanation). The teacher plays an important role by participating in establishing, maintaining, and guiding interactive communication."

This interactivity is further exemplified by the American Psychological Association in recommending the integration of concepts derived from cognitive

psychology, including sociocognitive and constructivist principles of learning into the design of interactive learning materials. In addition, learning materials and tasks must engage the learner in ways that promote meaningfulness, understanding, and transfer. Clarity, expressiveness, and feedback may help to ensure learner engagement and interactivity; multimedia learning materials may do likewise when they are linked to authentic learning activities (Bernard et al., 2004).

Interaction typically focuses on the learner and in particular what is taking place between the learner and the content, the learner and the instructor, and the learner with other learners (Moore & Thompson, 1989). A fourth interaction has been added just recently by Hillman, Willis, and Gunawardena (1994) and that is learner with technology. The literature recommends that course instructional designers keep these four types of interaction in mind when developing and producing high quality distance education courses.

Facilitator/Support Personnel

Common recommendations from other studies involving ITVC in the K-12 arena have revealed that the role of the facilitator at the receiving sites is critical to the success of the videoconferencing session (Joiner, Silverstein, & Clay, 1981). The role of the facilitator or Teacher Partner varies depending upon the capabilities of the individual. Classroom facilitators in secondary schools could either be a teacher certified in the subject area, teachers not certified in the subject area, a teacher's aide, or a permanent substitute. In most instances, this individual will be responsible for classroom management, administrative duties, document handling, and communication with the

campus administrator responsible for the program and the sending teacher. Moore (1995) identified five characteristics ("Five C's") as defining a good local coordinator (facilitator): communication, competence, continuity, control and confidence, and caring.

Other studies give the same level of importance to the technical support personnel at the receiving site. In some instances, the facilitator may also assume the role of technical support. The technical support staff makes sure that the technologies involved in the distance learning program are in working condition all throughout the videoconferencing session. This includes maintenance, troubleshooting, and keeping inventory of the equipment.

Interactive Videoconferencing in K-12

An extensive review of the literature confirmed that articles that have been written about the use of videoconferencing usually focused in postsecondary and professional settings and very few addressed the use of ITVC in the K-12 setting. It is very evident that literature on distance education and the effective use of interactive technologies in K-12 is scarce, and the few studies that are available consist mainly of case studies, opinions, and advice (Cavanaugh, 1999; Moore & Thompson, 1989). Two types of research can be found on the literature regarding distance learning technologies that also encompass ITVC research. Program-based research (Keegan, 1986) focuses on studies of programs and project-based research in various geographical locations and data-based studies (Saba & Shearer, 1994), which evaluate the results of those programs and/or projects and make conclusions in terms of student achievement.

Most of the literature in the K-12 arena relates to short-term programs/projects that have been incorporated into a face-to-face educational setting known as "electronic field trips" (Heath & Holznagel, 2002). An example of this type of project is the programming that links a government agency like NASA with 18 middle schools around the country. This project known as Mars Base allows students to design, plan, and create a prototype space colony in Mars. Each year the project begins with a teleconference presentation from experts in NASA and the Johnson Space Center in Houston that sets the parameters of the project and answers questions from participating students (Weinstein, 1997). Newman, Barnabell, and Falco (as cited in Newman, 2008) concluded that there are several benefits of these types of videoconferencing activities:

> They promote equal access to resources and increase the quality of educational opportunity for learners in remote or economically-disadvantaged schools; it allows access to subject matter experts and career role models for students across gender, ethnic, and racial divisions; it eliminates security issues related to travel; and it overcomes time and budgetary constraints typically associated with off-site field trips. (p. 2)

Cifuentes and Murphy (2000) conducted a year-long study between four classes of fourth grade students who transcended beyond the U.S./Mexico border. In this case study, Cifuentes and Murphy explored the possibilities of using telecommunications to share art and other artifacts. The four classes, two located in College Station, Texas, and two in Mexico City, were exposed to each other's culture with an understanding of their own cultural differences and similarities. Other examples of content providers for

electronic or virtual field trips include museums, zoos, and scientific or governmental organizations.

Few studies have documented the impact of the use of ITVC on students' cognitive and affective outcomes. The most common forms of measurement used to evaluate distance education courses are student satisfaction and student outcome (Daley, Spalla, Arndt, & Warnes, 2008; Furst-Bowe, 1997). There are other studies that provide limited evidence of support for inquiry-based learning and enrichment of resources (Freeman, 1998; Knipe & Lee, 2002; Newman, Du, Bose, & Bidjerano, 2006; Pachnowski, 2002).

One of the most impressive results found on the literature of cognitive and affective outcomes was that of a five-year longitudinal study called Project VIEW, a U.S. Department of Education's Technology Innovation Challenge Grant, which found that students who participated in videoconferencing had higher scores on cognitive indicators, were more motivated to learn the material, and were more interested in learning about the topics. As part of this study, 11 quasi-experimental comparative studies were conducted that compared the type of instruction (technology-supported ITVC with external providers versus traditional classroom coverage) using a teacher-developed standards-based scale as the assessment measure (Newman, 2005). Combined findings indicate, that in general, interactive videoconferencing had positive effects on student attitude and student achievement; students who received interactive videoconferencing had higher scores on classroom achievement post-tests than those without videoconferencing (Newman, 2008, p. 237).

Another study involving rural students in Colorado, explored the feasibility of providing remedial mathematics instruction to third and fourth grade eligible students with a teacher in the sending site and a facilitator at each of the receiving sites. The study concluded that (a) remedial mathematics instruction could be delivered successfully through the use of interactive videoconferencing; (b) video classes were at least as effective as traditional instructional delivery systems in producing student achievement; (c) interactive television was successful in engaging the students for the entire program; (d) since the equipment was already in place, the cost of running such a program was comparable to that of a face-to-face format; (e) the use of videoconferencing lends itself to the sharing of human and material resources and staff development through modeling; and (f) all those involved (teachers, facilitators, principals, superintendents, and parents) responded positively to evaluation surveys and questionnaires.

Cavanaugh (1999) conducted a meta-analysis on the effectiveness of videoconference or telecommunications. She quantitatively synthesized 19 previous distance education research studies in K-12 academic environments. Her studies examined student achievement in a total of 929 participants enrolled in content areas, such as science, social studies, language arts, foreign language, and mathematics. Cavanaugh's studies concluded that ITVC techniques are not more or less effective than traditional classroom instruction. Student achievement was not significantly different, except for foreign language when following the same course planning and design.

In the case of foreign language instruction, the students in videoconferencing settings performed lower than those in traditional classrooms. As far as the limitations and drawbacks of using ITVC in academic environments, the most salient are (a) the expense involved in administering the distance learning initiatives/activities; (b) the need for technical skill, and (c) the time that it takes to design meaningful learning experiences from a distance. Finally, her meta-analysis concluded that interactive distance education activities should be used in the classroom as a short-term supplement or to enhance or expand educational opportunities.

Other studies have revealed that videoconferencing students performed higher than those in traditional classrooms. Bruning, Landis, Hoffman, and Grosskopf (1993) reported on the results of a three-year program that transmitted Japanese language instruction to over 250 schools in 20 states via satellite. Because of the delivery mode, students in rural and small school districts were able to participate. Aside from learning Japanese, students were also exposed to Japanese culture through video clips. The interactivity component took place through audio bridge connections to native speakers each week. Satellite instruction was compared with traditional classroom instruction and revealed that the distance groups performed higher and had a positive attitude toward the experience.

Characteristics of ITVC for K-12 Implementation

Sullivan, Jolly, Foster, and Tompkins (1994) compiled certain characteristics that make ITVC appropriate for K-12 implementation:

1. Continuous interactivity– not restricted to any particular schedule; gives the participating sites flexibility promoting higher interaction between participants.

2. Relevance – interactive videoconference generally involves the grouping of students that have similar needs. For example, a foreign language class being delivered to exchange linguistics, idioms, and cultural experiences among participating foreign language classes.

3. Stimulating learning environments – the use of cameras with the ability to capture different angles; document cameras with the ability to display real-life objects; and speakers to further enhance the experience have the potential to engage students and appeal to different learning styles.

4. Flexibility – it has the flexibility to link with other schools or entities such as higher education institutions, regional service centers, schools, libraries and community resources.

5. Affordable cost – videoconferencing systems have become affordable and less expensive to maintain over the years. Grants and other federal and state initiatives have made it possible for school districts to acquire interactive equipment.

6. Cooperative arrangements and partnerships – small school districts often seek collaborative arrangements with institutions of higher education to reduce costs and increase resources.

7. Accesses to information – while connected in a videoconference, both teachers and students still have the capability to connect to the internet and bring in additional resources to the session.

8. School/community production center – the potential of ITVC goes beyond one-time experiences. Sessions can be recorded and published or distributed to reach other audiences besides the ones involved in the session. (p. 5)

Effective Teaching Practices Through Videoconferencing.

Researchers have also provided insights into what constitutes effective teaching practices through videoconferencing. Simonson, Smaldino, Albright, and Zvacek (2000, 2003) emphasize the importance that planning has in the whole implementation process and concluded that the instructor's personal teaching/learning philosophy influences the approach to teaching at a distance. Simonson et al. offers a practical guide to look at instructional planning:

1. Courses previously taught in a traditional classroom may need to be retooled. Focus on visual presentations, active learning experiences, and careful timing of lectures, demonstrations, and learning activities.

2. Consideration of using more than one delivery means to present instruction.

3. Plan interactive activities that engage learners from all sites.

4. Plan collaborative projects helping to support a positive social climate among and between distant sites.

5. Be prepared when technical problems occur. Have a back up plan. (p. 115)

Learning Environment Characteristics in K-12.

Another crucial aspect in the implementation of any ITVC program is learner engagement in tasks and activities that are authentic to the environment. Savery and Duffy (1995) proposed a link between constructivism as a theory of learning to the practice of instruction. Cognitive conflict is the stimulus for learning. This is the primary factor in determining what the learner attends to and what prior knowledge the learner brings to assist him in constructing new understanding or knowledge.

Hayden (1999) conducted a Delphi study of characteristics and critical strategies to support constructivist learning experiences in ITVC environments in K-12 populations. She identified seven characteristics:

1. Student-centered activities;

2. Active participation by students;

3. Deep understanding by student;

4. Access to primary sources of data;

5. Performance-based assessments;

6. Group situations/collaborative work; and

7. Teacher as facilitator. (p. 65)

In order to support the use of constructivist teaching strategies using interactive videoconferencing, she contended, educators must know characteristics for best uses of

this technology, and they must be exposed to professional development that supports new approaches to learning.

The Role of the Campus Administrator as Instructional Leader

The role of the campus administrator in the overall implementation of an instructional program is a crucial factor to this study. Literature regarding the campus administrator's role as an instructional leader is needed to understand their influence in their campus' teaching and learning process. Since this study involved four rural schools, special attention was given to the rural construct and its influence on the administrators' decisions to seek for solutions to increase student achievement in the area of mathematics. Distance learning technology offers a means by which institutions of higher learning can pool their resources and collaborate to deliver courses that require expertise that might be available statewide (Barker, 1992).

Critical to the collaborative nature of public school/university partnerships is the leadership component. Many initiatives have failed when the leadership was inadequate or non-existent. But it takes shared leadership to make this type of collaboration successful. Both school and university leaders must cooperate on the mutual benefit of the partnership for each organization (Warren & Peel, 1994).

There is no question, Fullan (2001) states, that the demands on the principalship have become even more intensified over the past 10 years, 5 years, 1 year. Since the enactment in 2002 of No Child Left Behind, the imposed demands have required that campus administrators devote countless hours and extra effort to look for ways to meet these demands with the ultimate goal to increase students' academic performance. This

legislation requires all states to establish annual reading and mathematics tests for all students in grades 3 through 8 and reading and mathematics tests in grades 10, 11, or 12. The specific assessments and tests are left up to the states following the same standards – all students must take the same tests in the same way regardless of locality. The law also mandates that every classroom in the country must have a "qualified teacher" (U.S. Department of Education, 2001).

Campus administrators must then strive to find a balance between their managerial, administrative duties and instructional leadership demands. Instructional leadership has been defined as "the set of roles and responsibilities designed to address the workplace needs of successful teachers and to foster improved achievement among students" (DiPaola & Tschannen-Moran, 2003, p. 44). Leithwood, Louis, Anderson, and Wahlstrom (2004) in their report to the Wallace Foundation supported the claim that "leadership is second only to classroom instruction among all school related factors that contribute to what students learn at school" (p. 5).

In *School Leadership That Works*, Marzano, Waters, and McNulty (2005) synthesized 69 studies conducted over 35 years that involved 2,802 schools, approximately 1.4 million students and 14,000 teachers, then calculated the correlation between principal leadership behavior and the average academic achievement of students. Their findings indicate that "a highly effective school leader can have a dramatic influence on the overall academic achievement of students" (p. 10). Marzano et al. (2005) also suggested that:

At no time in recent memory has the need for effective and inspired leadership

been more pressing than it is today. With the increasing needs in our society and

in the workplace for knowledgeable, skilled, and responsible citizens, the

pressure on schools intensifies. The expectations that no child be left behind in a

world and economy will require everyone's best is not likely to subside. (p. 123)

Leithwood and Riehl (2003) transmitted a cautionary note to all stakeholders in that

increased accountability assumes that principals are fully trained in instructional

leadership practices. This cautionary statement basically means that in these times of

heightened concern for student learning, educational leaders are being held accountable

not only for the structures and processes they establish, but also for the performance of

those under their command. This includes teachers as well as students. Ruebling, Stow,

Kayona, and Clarke (2004) further support the fact that school leaders must take

responsibility and be held accountable for poor results.

Accountability then urges campus leaders to spend time on leadership practices

that affect classroom instruction and to take an active role in the implementation of

instructional practices in specific subject areas that require attention.

The literature provides some clear examples of how principals still manage to

"actively engage as facilitators of continuous improvement in their schools," (Fullan,

2001, p. 155) act as facilitators and foster trust. A principal's fundamental role in a

school setting is to provide the needed resources for teachers to do their work. "A

facilitative and inclusive principal style, which actively seeks to involve teachers and

parents in the school, enhances the formation and sustenance of trust….good school management is central to trusting social relations" (Bryk & Schneider, 1996, p. 28).

Self-Efficacy

Another important element in effective and inspired leadership is the campus administrator's belief that he can organize, act, and implement actions in specific situations that may contain novel, unpredictable, and possibly stressful features. This is known as self-efficacy or expectancy efficacy (Bandura, 1977). "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). Some studies show that there exists a high correlation between reported self-efficacy and subsequent performance (Bandura, 1977; Bandura & Adams, 1977; Bandura, Adams, & Beyer, 1977).

Campus Leadership in a Rural Construct

Leaders of rural school districts are under tremendous pressure to find innovative ways to respond to today's educational challenges. This is due to the ever-increasing demands of educational accountability and high-stakes testing. Accountability is driving administrators to seek alternatives to current teaching and learning activities that are not yielding the desired results. Challenges such as the requirement from House Bill 1 that all students take four years of high school math combined with the shortage of highly qualified teachers in academic core subject areas force leaders of rural school districts to search for cost-effective teaching strategies that produce results. A survey of over 3,000 rural school superintendents in 2003 reported that mathematics and science are two of

the areas with significant teacher shortage in grades 7-12 (Schwartzbeck, Prince, Redfield, Morris, & Hammer, 2003).

According to Hill (1993), there are at least five basic characteristics that distinguish the rural principalship:

1. Rural principals generally do not have an assistant principal or other support staff;

2. Rural principals are often given other duties. These might be central office tasks, teaching, or even the principalship of another school;

3. Student discipline problems are less complex and less severe;

4. Community networks are more invasive and more powerful, just as the principal's role in the community is more visible; and

5. There is lack of organization or peer support with other administrators. (p. 80)

Directing resources toward enhancing the quality of education with the ultimate goal of improving student achievement can be very challenging for principals in any location, especially an isolated one where resources are limited or scarce (Howley, Chadwick, & Howley, 2002).

Some of the solutions that rural campus administrators have used to alleviate these limitations include pairing agreements, traveling teachers, correspondence study courses, and school consolidations. ITVC has proven to be an effective way to meet new state-mandated curriculum requirements, offer required courses for which a certified

teacher is not available, and to provide quality teacher inservice training that otherwise might not be available (Barker, 1988).

A project funded by Toyota USA Foundation in 1995 found that when implementing a distance learning program in rural communities, the following barriers may be present:

1. Lack of systematic links between mathematics and science teachers to share resources, curriculum units, and strategies.

2. Lack of equipment in place

3. Unstructured professional development opportunities. (Schatzman, 1995, p. 5)

Rural Administrators and Achievement in Mathematics

National movements toward the improvement of teaching mathematics in U.S. schools represent a particular challenge for rural administrators. To begin with, national and state leaders set standards for all schools. These standards are intended to represent what is necessary to build a mathematical literate workforce and a strong national economic infrastructure. Rural teachers and administrators must comply with these standards and also to the uniqueness of their communities. Rural teachers and administrators are cognizant of the fact that their communities may regard these standards as less important. Local rural communities exert a powerful influence on schools that places communities over other distant national priorities (Kannapel & De Young, 1999). Rural communities perceive schools to be their own (Herzog & Pitman, 1995). Traditional values like hard work, discipline, and relationships are of great

importance to rural families. Rural residents tend to select low paying jobs close to family and friends over high paying jobs in distant localities (Seal & Harmon, 1995). Rural adolescents are often undecided about career choices, especially if these aspirations will take them away from the community (Campbell & Silver, 1999).

In order to bring these conflicting national standards to a workable agenda, the Annenberg Rural Challenge (1999) issued a policy statement regarding educational standards in rural areas. This statement advocates that :"(a) rural schools must set high academic standards for their students, (b) academic standards should originate with communities, and (c) academic standards should address context and learning conditions along with subject matter content" (p. 61).

Historically, rural schooling has been viewed as deficient (Herzog & Pittman, 1995). However, there is evidence that suggests just the opposite. Rural researchers (Fan & Chen, 1999; Haller, Monk, & Tien, 1993; Howley & Gunn, 2003) contend that achievement in mathematics in the rural context is comparable to its urban and suburban counterparts. Howley and Gunn (2003) analyzed data from different sources including the National Assessment of Educational Progress that assemble consistent information on the contemporary mathematics achievement of rural students since 1978. They concluded that there is no mathematics achievement gap between rural vs. nonrural. These conclusions disprove common assumptions about rural deficiency in mathematics achievement.

A study conducted by Lee and McIntire (2000) investigated state-level variability in rural versus non rural mathematic achievement as well as the influence of six

schooling conditions in the overall process. Results varied a great deal at the state level. In some instances, the nonrural population performed better or worse than the rural population. Such state differences can be attributed, according to Lee and McIntire (2000), to any of six conditions of schooling:

1. Structural features if the educational system such as class size, school size, district size;

2. Equity of local resources such as income distribution of the community, parity of instructional resources among schools, patterns of assignment of the best teachers among district's schools;

3. Local culture of schooling such as the extent to which the school is embedded in the community;

4. Intentions of teachers and administrators such as school climate, collegiality, etc;

5. Adequacy of resources such as school funding in view of challenges, tax effort;

6. Degree of collective purpose such as student-centered focus, extent of tracking, equity of educational outcomes. (p. 170)

This study concluded the fact that there is a significant relationship between academic gains and schooling conditions. These schooling conditions include not only traditional inputs (instructional resources, teacher quality and course offerings) but also schooling practices and context (progressive instruction, safe and orderly climate, and collective support).

Under the traditional inputs, teacher quality is an issue of great concern. A survey of 896 rural school district superintendents revealed that small school districts employed fewer teachers who met the "highly qualified" criteria and had greater difficulty attracting and retaining teachers (Schwartzbeck et al., 2003). NCLB defines a "highly qualified" teacher as someone who meets the following specific requirements: hold a bachelor's degree, have full state teacher certification, and demonstrated subject-area competency. A teacher demonstrates subject-area competency by passing a state content assessment, or by holding an undergraduate major in the subject, or by having a graduate degree in the subject taught (secondary teachers only) (U.S. Department of Education, 2005). Studies have shown a direct correlation between the teacher having a major or a minor in mathematics and student achievement in that content area (Hawk, Coble, & Swanson, 1985). Hawk et al. (1985) concluded that

> Student achievement, for general mathematics as well as Algebra, is greater for students who are taught by teachers certified in mathematics than is the achievement of students taught by teachers certified in some other content area (out-of-field teachers, neither possessing a major nor a minor in mathematics). (p. 15)

Stigler and Hiebert (1999) argue that "if we hope to improve the practice of the teaching profession, it is the standard, common practice that must improve" (p. 175). Improvement of common practice requires building teacher capacity to promote student learning to high standards. One way of promoting teacher capacity building is through professional development activities. The National Staff Development Council has

defined effective professional development as long term, sustained collaboration with colleagues, and integrated into their daily teaching. Rural schools often lack the resources to provide effective professional development that supports teacher capacity building (Khattri, Riley, & Kane, 1997).

Rural campus administrators need to assess and prioritize their broad range of schooling conditions and consider strategies that address those needs. One of those strategies is to seek cost-effective alternatives to either complement or improve their diverse local needs. Successful collaboration with institutions of higher education has proven to be an effective venue to address the needs of rural schools.

Collaboration with Institutions of Higher Education

There is evidence in a number of studies that collaboration can indeed increase all of the aspects of capacity, form stronger relationships, and generate collaborative learning (Harris, & Thompson, 2006; Williams & Pennington, 2002). Collaboration has been described by a number of authors as a positive strategy to initiate school improvement (Peel et al., 2002). According to the Institute for Regional and Rural Studies in Education, there is a renewed interest in collaboration between rural school districts and post-secondary institutions. This renewed interest is being awakened by the latest accountability pressures that exhort campus administrators from small and rural school districts to seek alternatives to build capacity (Stephens, 1994). Partnerships between universities and schools enable individuals and institutions to accomplish more together than they could alone (Prins, 2006).

Another critical component to a successful collaboration between rural school districts and universities is trust. Teachers, faculty, and administrators must feel comfortable in voicing their opinions, disagreeing with each other, and being honest about their experiences, perspectives, and feelings. Once a sense of trust is established, the collaboration is ready to move forward (Warren & Peel, 1994).

Summary

Leaders of rural school districts are under tremendous pressure to find innovative ways to respond to today's educational challenges. This is due to the ever-increasing demands of educational accountability and high-stakes testing. Accountability is driving administrators to seek alternatives to change current teaching and learning activities that are not yielding the desired results. A review of the literature revealed that, over the past two decades, advances in distance education technologies and research on effectiveness of these technologies have provided school leaders with viable solutions that have the capability to influence the teaching and learning process. This chapter presented an overview of distance education, its theoretical framework, and its evolution throughout the years in the K-12 arena. There are a vast number of studies on the successful implementation of ITVC programs/projects in the K-12 arena, but most of these relate to few instances of interactivity between the sender and the receiving site. Most of these deal with enrichment activities such as virtual field trips. Longitudinal research on the actual delivery of specific high school subjects was found to be scarce.

The review of the literature also revealed the importance of the role of the campus administrator as an instructional leader and a provider of needed instructional

resources. Research done by Leithwood and his colleagues (2004) stress the fact that "leadership is second only to classroom instruction among all school related factors that contribute to what students learn at school" (p. 3). Moreover, it is the campus administrator's self-efficacy or belief that he can organize, act, and implement actions in specific situations that may contain novel, unpredictable, and possibly stressful features that will bring about change (Bandura, 1977). Directing resources toward enhancing the quality of education with the ultimate goal of improving student achievement can be very challenging for principals in any location, especially an isolated one where resources are limited or scarce (Howley et al., 2002).

Finally, collaboration will inevitably prove to be mutually beneficial to both rural school districts and institutions of higher education as found in the multiple articles that exemplify collaborations of this type. Warren and Peel (1994) ascertain the fact that once shared leadership and trust are present, the collaboration among entities is then ready to move forward.

The next chapter presents a discussion of the methodology used for this study and the mixed methods design employed to capture the perceptions of participating administrators, teachers, and students.

CHAPTER III

RESEARCH DESIGN AND METHODOLOGY

Introduction

This chapter provides an explanation of the methods and procedures that were used in conducting the study. This study was designed to explore the process of using ITVC as a viable solution for rural school administrators in the delivery of high school courses. The course that was delivered through ITVC in this case study was Algebra I. The ITVC process was investigated using a case study approach supported by mixed methods data collection. The perceptions of everyone involved in the process of delivering Algebra I through ITVC were measured using a combination of instruments that provided a better understanding of the implementation process. Additionally, this study sought to determine if the learning activities taking place in the classroom were perceived to be different by type of instruction delivery.

The research questions that guided this study were:

1. How do campus administrators' perceptions and beliefs shape the value or efficacy of ITVC in the delivery of high school Algebra?

2. In what ways does ITVC influence teacher instruction and student engagement?

3. How were cognitive, behavioral, and affective classroom activities perceived differently by students receiving instruction face-to-face and those receiving instruction through interactive videoconferencing?

4. In what ways does ITVC affect academic gains of students receiving Algebra I instruction in three school districts?

Background

In order to better understand the current academic status of each participating campus, it was deemed significant to look at their historical performance in the Texas Assessment of Knowledge and Skills (TAKS) (see Appendix B). Assessment of previous academic status of each campus was performed through a historical look at the math TAKS test performance. Performance in mathematics as measured in the TAKS test by both current and previous years showed historically below the state average.

Only Campus A showed its ninth graders scoring higher than the state standard. Campuses B and C had scored 20 or more points below the state standard during the 2006-2007 school year. Campus A Algebra teacher had over 28 years of teaching experience. Campus B hired a first-time teacher to teach Algebra, and Campus C assigned a permanent substitute due to the lack of applicants for the teaching position.

The combination of historically low performance in math TAKS and the difficulty in hiring qualified math teachers made the opportunity to pair a more experienced teacher with a less experienced or novice teacher attractive to the principals of the school districts. This opportunity motivated the principals to develop a uniform master schedule and synchronize their calendars for the delivery of Algebra I using ITVC to be transmitted during second period (8:55 a.m.-9:45 a.m.) following a Monday-Tuesday-Thursday pattern. Each campus also had an Algebra I class in third period following the ITVC class. The official class starting date was October 2007.

Research Design

The study of the impact of ITVC as an instructional delivery method is a complex task. Its complexity lies in the numerous variables that come into play and influence the delivery process. There are multiple factors that must be examined in order to ascertain these variables impact in the learning process. It was this complexity that determined that a mixed methods design was appropriate for this study. Mixed methods research includes a quantitative phase and a qualitative phase in the overall research study. "The goal of mixed methods research is not to replace either of these approaches but rather to draw from the strengths and minimize the weaknesses of both in single research studies and across studies" (Johnson & Onwuegbuzie, 2004, p. 15). The rationale for choosing mixed methods research is based on the fact that all research methods have limitations, and the researcher felt that "biases inherent in any single method could neutralize or cancel the biases of other methods" (Creswell, 2003, p. 15).

One of the major benefits for using mixed methods research is the triangulation that results in the convergence and corroboration of the results obtained from the different methods employed in studying the same phenomenon (Johnson & Onwuegbuzie, 2004). Moreover, collecting diverse types of data is what best provides an understanding of the research problem. The manner in which the data are collected in a mixed methods research is also critical. According to Creswell (2003), a mixed methods sequential explanatory research design consists of collecting the quantitative data first and the qualitative data second. The rationale for this type of approach comes from the idea that the quantitative data provide a general understanding of the research problem,

while the qualitative data help refine and explain the quantitative results by exploring

participants' views in depth (Creswell & Plano-Clark, 2007).

This study implemented the sequential approach by first administering the CAQ.

Responses to the open-ended questions from the CAQ were further explored through a

face-to-face interview conducted by the researcher for the qualitative portion of the

study. The researcher opted for a case study approach to improve understanding of a

specific phenomenon like the use of ITVC on the delivery of Algebra I. According to

Stake (2000), case study "facilitates the conveying of experience of actors and

stakeholders as well as the experience of studying the case" (p. 454). Case study

research provides opportunities to explore, describe, and analyze a program, an event, an

activity, or individual in depth. Case studies can be descriptive or evaluative. Merriam

(1998) indicates that case studies, regardless of topic, can be classified as descriptive or

evaluative studies in which a detailed account of the phenomenon is presented, where

"descriptive data are used to develop conceptual categories or to illustrate, support, or

challenge theoretical assumptions held prior to the data gathering" (p. 19). Evaluative

studies provide judgments about the worth of a given program. Gall, Gall, and Borg

(2003) rationalized four characteristics of case study research. They are: (a) focusing on

specific instances through the study phenomenon, (b) observing each case in-depth, (c)

examining the natural context of the phenomenon, and (d) studying the participants'

perspectives.

Lincoln and Guba (1985) presented 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 the 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 content as they do from themselves" (p. 189). A case study design is one strategy for obtaining insight into the natural environment (Stake, 1994).

Furthermore, Yin (1994) felt that a variety of data collection techniques are appropriate for case studies. These data collection techniques include: (a) interviews, (b) direct observations, (c) review of existing documents, and (d) other artifacts, including survey data and participant observations. The researcher made use of all of these techniques while exploring the process of implementing of ITVC to deliver instruction in a rural high school setting in South Texas

Qualitative Methodology

A qualitative research approach was used to answer research question #1 (RQ1): *How do campus administrators' perceptions and beliefs shape the value or efficacy of ITVC in the delivery of high school Algebra?* There were a total of four school administrators who agreed to participate in the study. Campus administrators' perceptions and beliefs were captured using semi-structured interviews. All interviews were conducted in May 2008.

The investigator used a combination of qualitative and quantitative research design techniques to answer research question #2 (RQ2): *In what ways does ITVC*

influence teacher instruction and student engagement? The sequential data collection approach was employed by first asking the teachers to fill out the CAQ quantitative instrument. A week later, the qualitative data were obtained by face-to-face interviews with the teachers. The interview expanded on their responses given to the three open-ended questions from the CAQ.

In order to answer the second part of research question #2 (RQ2) regarding student engagement, the researcher extracted information from both students' and teachers' responses given to three related items in the CAQ (Items 5, 15, & 19). Further information about student engagement was obtained by analyzing the teachers' interview transcripts. Finally, teachers' responses to the interview questions related to student engagement were also analyzed and presented using descriptive statistics.

Quantitative Methodology

A quantitative research design was used to answer research question #3 (RQ3): *How were cognitive, behavioral, and affective classroom activities perceived differently by students receiving instruction face-to-face and those receiving instruction through interactive videoconferencing?*

A quasi-experimental post-test only design with comparison group was used to determine the effects of the independent variable, mode of delivery, on the dependent variables, cognitive, behavioral, and affective classroom activities. Neither random selection nor random assignment was possible since the groups were already assigned to a particular class at the beginning of the school year. Table 2 illustrates the design.

Table 2. Quantitative Research Design

	Condition Beginning October 2007	Post-test (CAQ) May 2008
ITVC Group (2nd period) – October 2007	ITVC	O1, O2, O3
Comparison Group (3rd period) – October 2007	Face-to-face	O1, O2, O3

Note. O1=cognitive; O2=behavioral; O3=classroom conditions.

Variables

Table 3 lists the variables analyzed for research question #3 (RQ3) and research

question #4 (RQ4) by type and category/range.

Table 3. List of Variables by Type and Category/Range

Variable	Type	Categories/Range
Mode of Delivery (IV)	Categorical	ITVC(Experimental) Face-to-face (Comparison)
CAQ – DV – Cognitive (Memory, Translation, Interpretation, Application, Analysis, Synthesis, Evaluation - paired items)	Continuous	1.00 – 4.00
CAQ – DV – Affective – (Discussion, Test Grade/Stress, Lecture – paired items)	Continuous	1:00 - 4:00
CAQ – DV – Affective – (Enthusiasm, Independence, Divergence, Humor – single items)	Continuous	1:00 - 4:00
CAQ – DV Affective – (Teacher Talk)	Categorical	10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%
CAQ – DV Affective – (Homework)	Categorical	0 1/2hr. 1hr. 11/2hr. 2hrs. 3hrs. 4hrs. 5hrs more
TAKS scores - Indicator Variable	Continuous	1298-2830 (Scaled score)

A quantitative research design was used to answer research question #4 (RQ4)*: In what ways does ITVC affect academic gains of students receiving Algebra I instruction in three school districts?* Descriptive statistics and an analysis of variance (ANOVA) procedure were used in order to determine whether the groups changed significantly from the pre-test to the post-test (within groups), whether there was an overall significant difference in scores between the two treatment groups (between groups), and whether there was a significant difference between the two groups with regard to the amount of change in scores from the pre-test to the post-test. Scores on the Eighth Grade Math Release Test (May 2007) were used for baseline assessment of mathematics ability. Scores of the Ninth Grade of the students' performance on the TAKS test (May 2008) were used to indicate the level of achievement after completion of the Ninth Grade Algebra I class.

Research Setting

Four small rural public high schools in South Texas participated in this study. Figure 3 depicts the general location of the four sites involved in this study. Due to the geographical distance between these four school districts, the use of distance learning technologies became an obvious cost-effective choice. Multipoint interactive videoconferencing was chosen as the instructional delivery method. Multipoint interactive videoconferencing expands classroom videoconferencing to three or more sites synchronously (Falco et al., 2007).
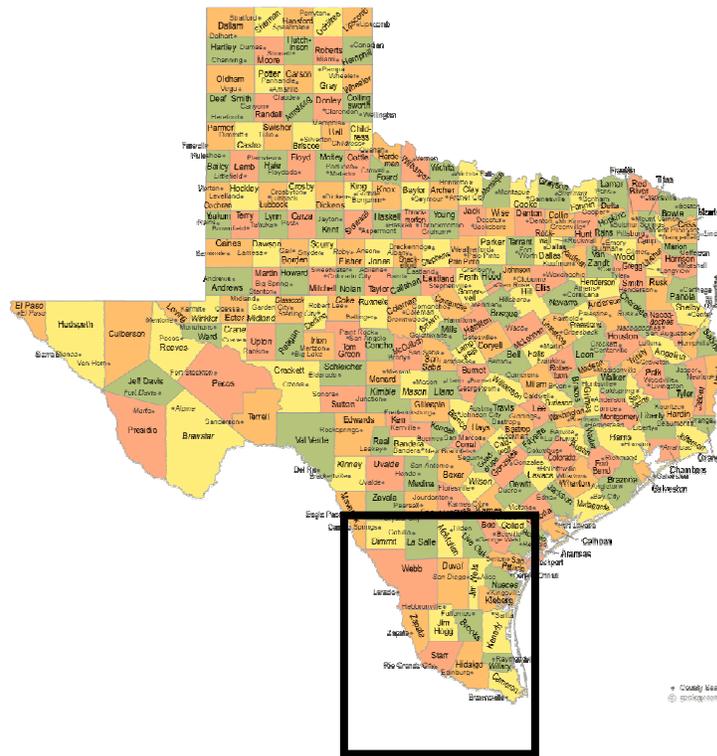
Figure 3. Map outlining the general location of the four sites involved in this project.

All high schools participating in this program form part of a collaborative initiated by Texas A&M International University located in Laredo, Texas. This collaborative was established in 2006 between Texas A&M International University's College of Education and eight surrounding small rural school districts. The primary objective of this partnership was to utilize Texas A&M International University's resources to support, coordinate, and enhance the delivery of cost-effective quality instruction from an experienced teacher (Master Teacher) to those classrooms with a less experienced or novice teacher (Teacher Partner).

Funding for purchase and installation of equipment, stipends, training, and travel was procured through different grants awarded by the Rural Utilities Service (RUS), sponsored by the U.S. Department of Agriculture, the Mathematics and Science Partnership Program, and the State Agency for Higher Education (SAHE). Individual schools were responsible for providing their own interactive videoconferencing equipment. They were also responsible for providing other computer peripherals such as printers, document cameras, telephones, and access to a fax machine.

Selection of Subjects

This study examined an Algebra I course taught year long using multipoint interactive videoconferencing delivered to three high schools. High school campus administrators submitted their requests to have Algebra I delivered via multipoint interactive videoconferencing. Campus administrators had the overall responsibility for the implementation of this program in their campus. They were also responsible for identifying the participating classes. This study relied on purposive sampling that was used for both the selection of the research sites and for the selection of participants. The experimental group was comprised of a total of 12 ninth grade high school students enrolled in Algebra I during second period (8:55 a.m.-9:40 a.m.) at the receiving sites (Campuses A, B, & C). The experimental group received instruction from a Master Teacher located at Campus D (sending site) at least two to three times per week on a M-T-TH pattern. The rest of the week, all students were receiving instruction face-to-face from the Teacher Partner. A control group from each participating group was selected and was comprised of students taking the same class with the same teacher in the period

immediately following the experimental group at each participating school. A total of 23 ninth grade high school students were part of the control group. The sending site (Campus D) had a total of 13 students enrolled who were not evaluated for this study. These students received face-to-face instruction from the Master Teacher. None of the student participants in either group had ever taken courses delivered using ITVC.

There were a total of four teachers involved in this study: the sending teacher (Master Teacher) and three receiving teachers (Teacher Partners). The Teacher Partners at the three receiving sites were selected by their campus principal. The teacher from Campus A had over 28 years experience teaching Algebra. The teacher from Campus B was in her first year of teaching and had no experience teaching Algebra I. The teacher from Campus C was a permanent substitute with no teaching experience. The Teacher Partners were the sole teachers of Algebra I at each of the participating high schools. One of the Teacher Partners had taken courses via ITVC as part of her undergraduate course work. The Master Teacher had over 20 years' experience teaching Algebra I. This teacher was also the sole Algebra I teacher in her high school. The Master Teacher had no previous exposure to ITVC.

The student population of each participating school along with its ethnic composition is depicted in Table 4. According to the Academic Excellence Indicator System (AEIS) (Texas Education Agency, 2007) report, the majority of the students at all three high schools were Hispanic and economically disadvantaged.

Table 4. Enrollment, Ethnic Distribution, Economically Disadvantaged, and Mobility Figures at All Three Campuses, 2002-2007

| Year | Population | Ethnic Distribution | | | | Economically Disadvantaged | Mobility |
		Hispanic	White	Asian	African-American		
Campus A							
2006-2007	319	290	28	0	0	214	60
2005-2006	320	285	34	0	1	195	73
2004-2005	332	295	34	2	1	200	70
2003-2004	348	299	47	2	0	256	55
2002-2003	341	288	50	2	1	248	67
Campus B							
2006-2007	212	186	24	0	2	140	63
2005-2006	207	173	32	0	2	140	50
2004-2005	210	163	45	0	2	130	60
2003-2004	203	157	44	0	2	114	49
2002-2003	234	181	52	0	1	113	61
Campus C							
2006-2007	713	624	77	3	9	580	196
2005-2006	704	611	76	1	14	549	200
2004-2005	684	609	68	1	6	514	189
2003-2004	697	619	63	5	10	306	130
2002-2003	725	637	70	5	12	498	106

Research Instruments

The instruments for this mixed methods case study included the CAQ (RQ3) and TAKS scores (RQ4) for the initial collection of quantitative data. Following the sequential collection approach, the qualitative portion of the CAQ was collected a week later which contained three open-ended questions for further explication of the phenomenon (RQ2). Qualitative data were collected by means of semi-structured interviews of the administrators (RQ1). This constituted the mixed methods research strategy.

Class Activities Questionnaire

The CAQ (Steele, 1969) was developed to obtain information concerning cognitive and affective activities that teachers and students perceived occurring in the classroom. The two domains that were explored in this analysis to capture students' perceptions of the instructional climate in the control and experimental classes were:

1. The Cognitive Doman – levels of thinking called for in class.

2. The Affective Domain – social and emotional conditions that exist in the classroom.

Cognitive Domain

According to Bloom and his colleagues, there are only a limited number of thinking operations believed to exist by theorists in the psychology of intelligence (Steele, 1969). Different thinking operations are required by various kinds of class activities. Therefore, cognitive levels stressed in a particular class can be inferred by identifying the activities emphasized in the class (Steele, 1969). Bloom's system of classification has been simplified and developed into the CAQ.

The taxonomy as adapted for this evaluative instrument contains seven levels of thinking operations. These are arranged in order of increasing complexity. They are divided into lower and higher thought processes. The difference between the lower and the higher levels is one of complexity. The taxonomy is hierarchical in nature. The use of all the lower levels is involved at each higher level of thinking.

Affective Domain

Aside from the cognitive activities taking place during class instruction, the affective domain assesses the social and emotional conditions that exist in the classroom. Many factors contribute to the classroom climate, and they can influence it either positively or negatively. One thing is certain: all of these factors affect the students' motivation and attitude toward learning.

The classroom focus dimension assesses the role of the teacher as information-giver where students assume a passive role or whether the teacher acts as a facilitator while the students are actively collaborators in the class discussion. The classroom climate dimension basically assesses how open and relaxed is the class.

Validity of the Instrument

The CAQ instrument has been validated by multiple populations and programs over four decades. Extensive field testing was conducted in developing the 25 choice items. For purposes of this study, some minor changes to the wording were made to facilitate understanding (i.e., teacher talk was substituted with lecture) of the statement being made. After numerous students' interviews, it was determined that this instrument would be appropriate for populations above the sixth grade.

Reliability of the rating scale was estimated using split-half correlation of matched pairs of items. In at least 88 classes that participated during the field testing process of this instrument, the cognitive dimension showed reliability coefficients of .60 and above in 65% of the classes. For classroom conditions, 61% of the classes showed coefficients of .60 or above. The CAQ has been used to find clear-cut variations among

instructional programs in both cognitive and non-cognitive domains both within and across instructional groups.

The CAQ is a 30-item instrument administered to both teachers and students. The first 27 items are statements describing general kinds of activities that are strongly emphasized in the classroom (see Appendix C for a copy of the instrument). These activities are classified according to Bloom's taxonomy, which contains seven levels of thinking operations. These are arranged in order of increasing complexity. They are divided into lower and higher thought processes. The difference between the lower and the higher levels is one of complexity. The taxonomy is hierarchical in nature. The use of all the lower levels is involved at each higher level of thinking. The seven cognitive operations and a brief description of activities that represent them are shown in Table 5. along with the statements that address each activity.

Table 5. Seven Cognitive Operations

Cognitive Operations		Descriptions
Lower Thought Processes	1. Memory	Activities calling for recall or recognition of information presented**. Items 1& 10**
	2. Translation	Activities calling for paraphrasing or expressing information in a different symbolic form**. Items 9 & 21**
	3. Interpretation	Activities calling for recognition of relationships and seeing implications of information. **Items 6 & 16**
Higher Thought Processes	4. Application	Activities calling for selection of appropriate methods and performance of operations required by problem situations. **Items 3 & 13**
	5. Analysis	Activities calling for recognition of the structure of material, including the conditions that affect the way it fit together**. Items 7 & 12**
	6. Synthesis	Activities calling for the generation of new ideas and solutions. **Items 11 & 23**
	7. Evaluation	Activities calling for development and application of a set of standards for judging worth**. Items 2 & 20**

Affective Domain

The nine factors that address the affective domain in the Class Activities

Questionnaire are presented in Table 6.

Table 6. Nine Factors Addressed in the Class Activities Questionnaire Along With the
Statements That Address Each Factor

Affective		Description
Classroom Focus	Discussion	Student opportunity for and involvement in class discussion. **Items 5 & 15**
	Test/grade stress	High pressure to produce teacher-selected answers for a grade**. Items 8 & 22**
	Lecture	Teacher role is information-giver with a passive listening role for students**. Items 4 & 26**
Classroom Climate	Enthusiasm	Student excitement and involvement in class activities. **Item 19**
	Independence	Tolerance for and encouragement of student initiative. **Item 14**
	Divergence	Tolerance for and encouragement of many solutions to problems. **Item 17**
	Humor	Allowance for joking and laughter in the classroom. **Item 25**
	Teacher talk	Proportion of class time consumed by teacher talk. **Item 26**
	Homework	Weekly amount of outside preparation for class. **Item 27**

The first 27 items are scored 1 Strongly Agree to 4 Strongly Disagree. The last

three items on the CAQ call for open-ended responses on the best things about the class

and things needing to be changed from the rater's point of views.

Data Collection

Quantitative Data Collection

Responses given to the 30 items in the CAQ were collected from participating

teachers and students during May 2008. Also, for comparisons of student achievement

gains, the Texas Assessment of Knowledge and Skills (TAKS) results were evaluated.

Scores on the Eighth Grade Math TAKS Test (Spring 2007) were used for baseline

assessment of mathematics ability. Scores of the Ninth Grade of the students'

performance on the TAKS test (Spring 2008) were used to indicate the level of

achievement after completion of the Ninth Grade Algebra I class. Students enrolled in

the ITVC class are part of the pool, and therefore, scores were used as a general

indication of achievement but not an absolute measure of the results of the study. This

study did not make judgments on the academic achievement of the students participating

in this program; instead, it focused on the actual learning activities taking place during

the class being delivered via interactive videoconferencing.

Ethical Considerations

Approval to conduct this study was obtained from the Institutional Review Board

at the Texas A&M International University located in Laredo, Texas, and from the

Institutional Review Board at the Texas A&M University located in College Station,

Texas. All institutional requirements regarding the collection, processing, and storage of

data were followed. The subjects for this study were ninth grade high school students

who required parental consent for participation.

Parental consent forms were distributed only after the researcher introduced

herself, explained the research activity, and the purpose of the study. Parental consent

forms were collected during the same week they were distributed to prevent students

from forgetting to return the forms. After parental consent forms were collected, student

assent forms were distributed to all those students who had returned the parental consent

forms. The researcher once again explained the purpose of the study and the importance of their participation. After the researcher obtained assent from the students, the researcher distributed and collected the questionnaires. Those students who did not return their parental consent forms remained in the classroom working on a sponge activity provided by the teacher. Students' questionnaires were coded for confidentiality. Campus administrators and teachers who responded to the CAQ were given a letter code during the presentation of the data. A letter of informed consent was obtained providing written assurances of rights and protections.

Subjectivity

The researcher bias, or one's own subjectivity, is a threat to validity. In a qualitative study, the researcher is the primary instrument of data collection and analysis which leads directly to the subjectivity of the researcher. The researcher's subjectivity in the study is shaped by experiences as a Director of Instructional Technology, university instructor, and high school teacher. She has been further influenced by information gathered from the literature review for this study.

The researcher embarked on this study with preconceived notions of the barriers that teachers would encounter in their experience with ITVC. The researcher also acknowledges that her position as a university instructor greatly influences her commitment and interest in this area of research. The literature review has also shaped the inquiry of the researcher, including the theoretical framework of distance education, known barriers for implementation, and technical/technology threats. Each of these constructs shaped the lens through which the researcher views instruction through ITVC.

The researcher recognized that this lens is only one way to approach observing teacher practice.

The researcher's subjectivity also shaped the nature of the study and the content of the semi-structured interviews with administrators. The researcher's own awareness of the importance of the role of the campus leader greatly influenced the researcher's focus on an examination of the administrator's own role in the implementation process. The researcher's role as a director of instructional technology provides the opportunity to be informed of any technical problems as teachers prepare to teach or receive instruction through ITVC and to act accordingly. The results from this study aim to support campus administrators and teachers with information regarding strategies and resources needed to create and teach via interactive videoconferencing.

Member checks used throughout data collection as the researcher took interview transcripts back to administrators and teachers for their review along with weekly peer review meeting with members of the curriculum team to confirm the researcher's results, and enhance the validity of the study.

Qualitative Data Collection

Open-Ended Responses

The open-ended section of the Class Activities Questionnaire asked respondents to list the three best things about the class from their point of view. A second question asked what three things they would change about the class if they could. Finally, respondents were given an opportunity to make additional comments regarding any other

aspect of the class. For purposes of this study, responses collected from this section were only used to formulate interview questions for Teacher Partners.

Interview –Teacher Partner

The researcher asked Teacher Partners to expand on their answers to the open-ended questions through a semi-structured interview. The questions were adequately designed based on the teachers' responses to the open-ended questions in the Class Activities Questionnaire. The purpose for further insight into the teachers' responses on likes and dislikes was to derive themes and categories that established commonalities. All three Teacher Partners were interviewed during their conference periods to avoid interruptions and distractions.

Interview – Master Teacher

The Master Teacher was asked to fill out the Class Activities Questionnaire. The purpose of the interview was to find out if there was a correlation between the Master Teacher's perceptions of the intended class activities and the perceptions of the students and the Teacher Partners at the receiving sites.

Interview – Campus Administrator

The administrators' perceived roles in the overall implementation of this initiative was collected through semi-structured interviews. There were three essential lead questions:

1. How do you feel regarding the effectiveness of instruction via interactive videoconferencing?

2. What are some of the factors that you perceive affect teacher's use of interactive videoconferencing?

3. What is your perception of your role in addressing those factors?

A total of four campus administrators were interviewed by the researcher: three from each receiving site and one from the sending site. Three out of the four campus administrators were the school's principal and one was an assistant principal. The main reason the assistant principal (Campus C) was interviewed instead of the principal was the fact that the assistant principal was assigned to oversee the overall implementation of the program from the beginning of the school year. Also, the assistant principal was responsible for the math department at the time of this research. The researcher met with the principal of each participating high school to explain the purpose of the study, examine the research instruments, and delineate a schedule for the distribution and collection of the instruments.

All interviews took place in the school premises. Three took place in the administrator's office and one outside the counselor's office. The place, date, and time for the interview had been previously selected by the campus administrator via email or by phone. All but one interview had to be re-scheduled twice due to the unavailability of the principal.

The interviews were audio-taped and transcribed verbatim with administrators' consent based on the questions as detailed in Appendix D. The interviews were reviewed for emerging themes. The same system was used to create codes and categories for the emerging themes so that a case study could be developed based on the campus

administrators' perceptions of their role in the overall implementation of ITVC in their campus. The researcher met once again with the campus administrator to review the transcript of their interviews to see if they were an accurate representation of their comments. Once the campus administrator had approved the transcript, he was asked to initial the transcript. There was an average of four personal visits to each of the high school sites.

Collection of Additional Qualitative Data

Observations, field notes, and email communications were employed to obtain a picture of the activities taken place during the class and even beyond class times. As an active participant of the implementation process, the researcher frequently attended and recorded notes during meetings and conference calls between the university coordinating team and campus personnel.

The researcher observed three of the four installations of end-point interactive videoconferencing systems in their respective sites. The researcher was also present during every testing session with each of the four sites that generally lasted around 90 minutes. In addition to notes taken as an observer, the researcher also wrote down some "lessons learned" field notes with ideas about possible relationships to previously collected notes. These notes provided the researcher with a context for the observed relationships.

Throughout the duration of the study, the researcher had the opportunity to visit with other Mid-Rio project personnel responsible for leading the curriculum development process who provided an insight into their own observation notes and email

communication between the Master Teacher and Teacher Partners. The researcher also remained in constant communication with the Mid-Rio Project Director. Frequent meetings were scheduled either face-to-face and by phone and exchanged emails throughout this study. The Mid-Rio Director was instrumental in providing insight into the historical aspects of the different communities. This insight facilitated the researcher's access to every location. Finally, the researcher had access to records involving connectivity and troubleshooting tickets filed with the telecommunication network that provided pertinent data on reliability and elimination of hardware/system errors.

Procedures

The study took place during the last four weeks of the academic year. Initially, participants in the experimental group totaled N=26 and in the control group N=32. However, participants who did not return the parental permission form were excluded from the analysis. This yielded an N=12 for the experimental group and an N=23 for the control group. The return rate for the experimental group resulted in a 46.1% and 71.8% return rate for the control group.

Administration of Questionnaires

The researcher met with the administrator of each participating high school to explain the purpose of the study, allow the administrator to examine the research instruments, and delineate a schedule for the distribution and collection of the instruments. All parental consent forms were provided in English as well as in Spanish for any English as a Second Language (ESL) or Limited English Proficient (LEP)

Spanish-speaking parents. The researcher then met with each participating teacher and presented detailed information about the study. Teachers were asked to provide the researcher with prospective dates for (a) distribution of the consent forms, (b) collection of consent forms, (c) administration and collection of questionnaires, and (d) the teacher interview.

Campus administrators were interviewed at a later date to further explore their perspectives on the integration of interactive videoconferencing. In order to obtain the campus administrators' perspectives, the researcher conducted an open-ended semi-structured interview. Qualitative data collected from the campus administrators and teachers' interviews revealed common themes and patterns. The use of multiple methods to collect data can enhance the validity of the case study findings by the process of triangulation (Gall et al., 2003).

Data Analysis

Data collected from participants' interviews were analyzed and evolving patterns recognized through category construction (Merriam, 1991). Categories emerged through constant comparison of incidents in participants' remarks. It was through analysis that patterns were found related to the overall implementation of the program. The researcher analyzed data for emerging patterns during the case study and continuously constructed meaning by chunking key phrases together around themes or patterns. For example, it was evident that administrators recognized the factors affecting teacher use of ITVC from the early stages of the program. The researcher then felt it was needed to probe

their level of efficacy in addressing those issues. It was this type of probing and clarification that deepens understanding.

Descriptive statistics enabled the researcher to summarize, organize, and present data in a meaningful and effective format. The researcher used mean scores, standard deviations, frequencies, and correlation as part of the descriptive analysis. Multiple displays, such as charts and tables, were used to present findings. Analysis of the quantitative data was performed through the use of the Statistical Package for the Social Sciences (SPSS) version 16 in order to answer RQ3 and RQ4 of this study. For research question #3, a weighted point system from which mean student scores are computed was used in this analysis. The items were weighted under the assumption that students who indicated strong responses to items should be differentiated from those whose responses were more moderate. The weights also differentiate those items to which students react more extremely. Values of 1-4 were assigned to the scale positions Strongly Agree to Strongly Disagree.

A series of descriptive statistics were used to compare group differences by location based on the responses given to the Class Activities Questionnaire on cognitive factors. Means and Standard Errors were used to find degree of emphasis of activities taking place in the classroom at the time the ITVC class was being delivered. An independent t-test was used to statistically compare means. Chi-square analyses were used to analyze responses given to the CAQ classroom conditions factors pertaining to preparation time (homework) and teacher talk (lecture) due to the categorical nature of the variables.

In addition to the descriptive statistics, the researcher conducted a mixed analysis of variance (ANOVA) procedure to compare results from the Eight Grade Mathematics TAKS test to the Ninth Grade Mathematics TAKS test students took in 2007 and 2008, respectively. A comparison of the overall scale scores between control and experimental by location was then made. Scores on the Eighth Grade Math Release Test (May 2007) were used for baseline assessment of mathematics ability. Scores of the Ninth Grade of the students' performance on the TAKS test (May 2008) were used to indicate the level of achievement after completion of the Ninth Grade Algebra I class. The results of these analyses are presented and discussed in detail in Chapter IV.

CHAPTER IV

RESULTS

The primary purpose of this study was to identify if ITVC could serve as a viable solution to the delivery of high school Algebra in rural areas where qualified secondary mathematics teachers are scarce. The secondary purpose of this study was to gain an understanding of the learning activities taking place in the classroom as perceived by the participating students and Teacher Partners.

Chapter IV provides the results of the data collected from the selected populations through the Class Activities Questionnaire and semi-structured interviews administered to campus administrators and Teacher Partners. Analysis of the questionnaire results examined similarities and differences in the cognitive, behavioral, and affective activities the teacher intended and students perceived actually occurring in the classroom from the control and experimental groups.

Four research questions anchored the inquiry into the perceptions of all those involved in this case study:

1. How do campus administrators' perceptions and beliefs shape the value or efficacy of ITVC in the delivery of high school Algebra?

2. In what ways does ITVC influence teacher instruction and student engagement?

3. How were cognitive, behavioral, and affective classroom activities perceived differently by students receiving instruction face-to-face and those receiving instruction through interactive videoconferencing?

4. In what ways does ITVC affect academic gains of students receiving Algebra
    I instruction in three school districts?

The Algebra I class was identified as an area of need by three rural public school districts located in South Texas. The schools that signed up for this initiative are referred to as Campus A, Campus B, and Campus C (receiving) for purposes of confidentiality. Figure 3 shows the distance between the participating districts. The Master Teacher is located in Campus D (sending) and has been teaching Algebra I for over 20 years. The Master Teacher was identified and recommended by her school principal. She eagerly assumed the challenge of teaching Algebra at a distance, and she spent more time and energy in developing course content materials for delivery in this format than she would have done in a face-to-face format. At the receiving end, the principals from each high school (Campuses A, B, & C) identified persons teaching math that could benefit from being paired with a Master Teacher in a cooperative distance learning setting.

The following section provides the results of the study organized according to the research questions. The findings include both qualitative and quantitative analysis of the mixed methods design.

Research Question #1

How do campus administrators' perceptions and beliefs shape the value or efficacy of ITVC in the delivery of high school Algebra?

Administrators' Perceptions of the Effectiveness of Interactive Videoconferencing

A qualitative method was employed for this particular research question. The researcher used a semi-structured interview that provided the opportunity to gain insight into the administrator's perceptions of their role in the implementation process.

Question

How do you feel regarding the effectiveness of instruction via videoconferencing?

Participants' responses suggested that the overall use of videoconferencing is beneficial for the district, teachers, and students. One participant reported that

> The use of ITVC is effective because the students are seeing something different. Not only that, but in this 21st century, it [videoconferencing] fits with the district initiatives. You know 21st century initiatives. A lot of students look for something different and need something different. [AA]

The same participant stated that

> The traditional way of a classroom is not getting the job done for the most part. I know the students are enjoying the class. I call it change in the sense that it [the class] was different from the traditional classroom, traditional way of the teaching and with a very solid with the technology being used. The teacher embraced it [technology] and took it on and bridged the gap for those students in the program. [AA]

Another participant sees videoconferencing as "a tool for our teachers and students to learn in this case, Algebra objectives" [AB].

The participants also seem to value the interaction among participating schools as a benefit to the overall program. One participant stated

I think the program through ITVC is a good addition and great benefit for the students. The exposure to a different region or a different part of Texas where the instruction is coming from gives our students the opportunity to possibly meet and discuss topics with the students from the remote area. [AC]

Table 7 summarizes the campus administrators' perceived benefits and limitations of the use of ITVC in relation to participating students and Teacher Partners.

Table 7. Administrators' Perceived Benefits and Limitations

Administrator	Students	
	Benefits	Limitations
Campus A	*Exposed to a nontraditional way of instruction *Embrace the connection taking place between the teachers from different schools. *Are really engaged	*None
Campus B	*Learn Algebra objectives *Dialogue with students from other communities.	*Lack the level of maturity needed in handling the level of structure of the Algebra class
Campus C	*Exposed to students from a different region *Opportunity to discuss topics with students from remote areas	*Don't pay attention to this type of instruction *Don't follow directions

Administrator	Teachers+	
	Benefits	Limitations
Campus A	*Welcomes the collaboration with the Master Teacher	*None
Campus B	*Use this as an opportunity for professional development *Communicate with other practicing teachers	*None
Campus C	*Learn teaching strategies since she is a permanent substitute	*None

+Sending site (D) not included.

All four administrators mentioned collaboration as a perceived benefit. One administrator's response suggests that the collaboration between the university (TAMIU) and the school districts is invaluable. The same administrator sees this type of collaboration as a platform for teachers to "learn from educational dialogue and learn from the members of the university on ways of improving their teaching" [AB]. Another administrator finds the role of the university as key in providing the tools needed to make this type of program successful: "the university provided us with the equipment, training, support, and materials. Their role was to help us give our students the best instruction possible using the latest technology" [AD].

The perceived value of the collaboration that took place during this program is evident in the administrators' responses. One administrator sees the university as the bond that keeps all of the components connected. "Their [university's] support, their connections, their collaboration, and the communication with all those involved is critical. All of these are important factors" [AA].

Question

What are the factors that affect teachers' use of interactive videoconferencing?

The administrators' responses to the perceived factors affecting teachers' use of interactive videoconference were consistent with those found in the literature reviewed (Joiner et al., 1981; Moore, 1995). The factors mentioned by the administrators clustered around the six major themes: (a) common curriculum, (b) synchronized class schedule, (c) communication, (d) training, (e) technology, and (f) technology support.

Common Curriculum

Administrators expressed that having a common curriculum along with the timely availability of instructional materials is one of the most important factors. It was very evident that all four administrators were committed to the process of aligning their Algebra curriculum to the state standards:

The curriculum is the biggest factor because you must have the Master Teacher on the same page with the other teachers. The sustainability of this collaboration is not going to be effective if everybody is not on the same page curriculum-wise. [AA]

My teacher was working on the same page as far as the scope and sequence is concerned; you know, trying to keep everything in line with the same objectives, lessons, and activities. I know there were times when we fell behind and the other sites were ahead of us, but the teachers had to adjust a little bit. For the most part, they were sequenced and on the same page. [AB]

One of the main factors is not having the materials available ahead of time...it will be a great idea if the sending teacher sends any instructional materials a couple of weeks ahead of time allowing the receiving end to make copies for the students with plenty of time. [AC]

One administrator also referenced the human element associated with the availability of a common curriculum as "being a small school, we don't have a curriculum specialist that larger districts have. That's where the university comes in and assumes the place of a curriculum specialist" [AD].

The administrators' concerns regarding the need for a common curriculum as the foundation for the delivery of Algebra was addressed in the initial stages of the program by the coordinating team at Texas A&M International University. A curriculum writing team was formed and the Master Teacher (sending site) was included as of one of three curriculum writers. The other two writers were teachers selected from a local school district with a proven high passing rate on the state TAKS test. A common scope and sequence was developed and shared among all participating schools. The scope and sequence was developed before the first day of class. Another component that facilitated the alignment process was the fact that all participating sites had the same textbook adoption.

Although steps were taken to provide Teacher Partners with the needed instructional materials, there were instances of frustration. As one of the administrators indicated in the interview:

> I know there were a couple of times in which they (students) were waiting for a fax to come with the assignment or quiz they were supposed to work on that day. I think it will be a great idea if the sending teacher sends any instructional materials a couple of weeks ahead of time allowing the receiving end to make copies for the students with plenty of time. [AC]

Synchronized Class Schedule

The majority of the administrators indicated that a synchronized class schedule was another factor that influenced the delivery of instruction via interactive

videoconference. A comparison of school schedules showed a difference of up to 15 minutes.

It was evident that the conflict with the class schedule between the sending and receiving schools was a major factor perceived by the administrators. As one of the administrators points out "The main concern with the distance class was the start time, how our teacher had to wait anywhere between 10-20 minutes because of the conflicting time between schedules between us and the hosting school" [AC].

Communication

The majority of the administrators took an active role in overseeing the implementation of this program. They visited classrooms, talked to participating teachers, and communicated with the coordinating team at the university on a regular basis. Teacher collaboration is an area of concern as indicated by the majority of the administrators. One administrator expressed his concern with the level of involvement his teacher had with the Master Teacher. He now realizes that he found himself "looking at what the teacher involved in the program was doing. How are they planning? How is the management of the class?" [AA]. Another administrator indicated that she realized the need for collaboration since the beginning of the semester and suggested more meetings between the Master Teacher and the Teacher Partners throughout the duration of the semester [AD].

Response from another administrator suggested that he was very pleased with the collaboration between his teacher and the Master Teacher. As he indicates, "the fact that our permanent substitute was observing someone who is certified and experienced was

beneficial in that she was able to observe how the math concepts were taught and various methods were used [AC].

The analysis of emails received from the Master Teacher regarding the consistency of meetings reveals that out of the four meetings planned, only one materialized due to conflicts with the teachers' schedules.

Training

In an environment where technology is the mode by which teachers and students communicate, the level of training on the manipulation of the equipment becomes an essential skill. Prior to this program, only one of the participating teachers had been exposed to interactive videoconferencing. The importance of training was captured in one of the administrator's statements:

> Another big piece is the training for the teachers that are involved with the program to implement distance learning because there are factors that they may have not seen until they are involved with it. They need training in using the videoconferencing equipment. [AA]

This point was shared by another administrator who indicated that "we need to make sure they [teachers] feel capable of handling the equipment" [AB].

Logs kept by the Trans-Texas Video Network (TTVN) indicate that teachers' lack of training on the basic use and manipulation of the videoconferencing system contributed to transmission downtime in a few instances. An example is a phone conversation between one of the receiving teachers and the TTVN technician where the camera was facing the wall instead of the students. The teacher had to seek technical

assistance from her district technician to move the camera in the right direction since the teacher did not know how to rotate the camera using the remote control. Audio level adjustment was also reported as a common reason for downtime during the transmission of the class.

One administrator perceived this class as an opportunity for staff development for his teacher. He indicated that

the opportunity that TAMIU provides our teachers in the area of staff development is great. The fact that we have a difficult time attracting new teachers into teaching, especially in the areas of math and science makes their role very critical. [AB]

In reference to staff development, another administrator requested that there should be "some in-service days with those teachers involved so that they can increase their knowledge….best practices…this program [allows] for both teachers and students to get the best of both worlds" [AA].

Technology and Technology Support

Technology and technical support were also mentioned as factors influencing teachers' use of interactive videoconferencing. As supported by the literature review, due to the nature of the class, both technology and technology support were mentioned as key elements. These two factors were emphasized by all four administrators. Here are some of the comments regarding technology and the availability of proper infrastructure to send/receive instruction: "We must make sure we have the right technology, you know, [such as] the rotating cameras" [AA]. "The fact that the technology was not

working at the beginning of the program was a concern. We had problems with the technology that were eventually resolved" [AB]. "I think one of the main factors is probably having the technology available to the receiving end. Also, having the infrastructure available to send or receive instruction is important" [AC]. "We were at zero. The university provided a mobile unit and a document camera for our teacher" [AD].

As far as technology support is concerned, the administrators expressed mixed opinions: **"**In our case, the classroom was located about 40 feet from the campus technology facilitator. Their offices are right next door. This was a guarantee that the support was going to be there every time the class met" [AA]. "As per our request, the university provided timely technology support to assist the teacher involved in the program" [AD].

The other two administrators provide rather different perspectives in relation to technology support: "There is only one technician that works throughout the district not only on our campus. It would help to have one onsite to assist the teacher with any technical difficulties that she may encounter" [AB]. "Technology support was an area of some concern with our campus, but this issue was resolved. The university provided a facilitator to be there at the time of the class to troubleshoot the technical problems" [AC].

In response to administrators' concerns regarding lack of support at the different sites, it offered to hire a facilitator to assist the teacher with the technical aspects

throughout the transmission. Two of the four administrators decided not to seek additional technical support.

Collaboration and Support From Institutions of Higher Education

As a final point and in line with the numerous articles reviewed (Barker, 1992; Prins, 2006; Stephens, 1994; Warren & Peel, 1994), the majority of the administrators acknowledged that collaboration with an institution of higher education is an important influencing factor in the overall implementation of this type of initiative. This assumption was further supported by comments made. One administrator pointed out:

A big piece [in the overall implementation] is the support of the organization [Texas A&M International University] that is promoting this program. Their support, their connection, their collaboration, and the communication with all those involved are critical. All of these are important factors. [AA]

Another administrator requested future collaborations of this type by commenting that "We need more programs like this....the university personnel coming to our school is awesome. I never felt like this program was pushed on us; it always felt like a collaborative effort. I feel we pulled together and improved instruction." Finally, the administrator from the sending campus summarizes the experience by stating that "the training and support that we received from the university greatly affected teacher's use of the interactive videoconferencing. The university helped us with the equipment and training, materials and supplies" [AD].

Question

What is your perception of your role in addressing those issues and in the overall

implementation of the program?

The main objective for leading the campus administrator to verbalize his/her

perceptions of the factors that affect or influence teachers' use of ITVC in the delivery of

Algebra is to bring about his level of self-efficacy beliefs in addressing those factors.

Self-efficacy is the campus administrator's belief that he can organize, act, and

implement actions in specific situations that may contain novel, predictable, and possible

stressful features (Bandura, 1977).

During the implementation process, it was evident that the majority of the

campus administrators believed that they were capable of producing a high level of

performance over the factors that influenced teacher's use of interactive

videoconferencing. They recognized that this process was going to involve change, but

that they believed in their ability to intervene if things were not going in the right

direction. As the principal from the sending site recognized in the following statement:

"like anything else that is new, you might have a little fear on the part of the teacher,

maybe a little resistance because you're changing into something new" [AD]. Yet

another administrator ascertained "as with any program, there are going to be changes,

and you have to accept, facilitate, and turn tough situations into positive situations"

[AA].

Table 8 displays factors mentioned by campus administrators that affected

teachers' use of interactive videoconferencing and how each of these factors were

addressed by the campus administrator. The number in parenthesis represents the

frequency of their responses.

Table 8. Common Indicators Regarding the Role of the Administrator in Addressing
Factors That Affect Teachers' Use of Interactive Videoconferencing

Factors	Campus Administrator – Self-Efficacy Indicators (frequency)
Common Curriculum	-seek collaborations (4)
Class Time	-facilitate (3)
Staff Development	-communicate with university personnel (3)
Training	-provide support & resources to the teacher (3)
Technology	- accept change (2)
Collaboration with	-be flexible (1)
university	-be positive (1)

The reviews of available literature relevant to the role of the school administrator

reveal solutions that rural campus administrators used to address the factors that affect or

influence teachers' use of interactive videoconference. One of these solutions is their

ability to seek collaboration agreements with other school districts and institutions of

higher education. Once the agreement is in place, the lines of communication must

remain open throughout the collaboration period. Every administrator interviewed refers

to this activity. As one administrator emphatically indicated: "As a campus principal, I

believe that my role is that of opening lines for educators from this community and of

the region" [AB]

Another administrator sees communication as a logical derivative of a successful

collaboration. The campus administrator from School A simply states, "I must

communicate with the directors of the program (higher institutions) making sure they know you know exactly what's going on with the program and that I am accessible."

As far as teachers collaborating with teachers from a different region, the administrator from School B believes in the notion of team teaching as he rationalizes that "teachers learn from each other, for example, one might have a better way of teaching a certain objective."

In this same line of thought, another administrator recognized the real challenge he was facing at the beginning of the school year when he could not fill the vacancy for an Algebra teacher:

I think videoconferencing is a good concept for areas such as ours. In our case, we were not able to have a certified math teacher, so having someone who is friendly, who is certified, at a distance helps out instead of having a non-certified person or a substitute teacher. [AC]

Three of the four administrators were conscientious of their role as facilitators in the overall implementation of the program. Some were more actively involved and took immediate measures to provide needed resources to teacher and students participating in the Algebra class. Others waited until they got feedback from the coordinating team at the university to address those needs.

Administrator A recognized his role as a facilitator from the planning stages of the program. As he commented:

As soon as I determined that this program was good for the school and the kids, I had to ensure that the teacher assigned to the program had my support and

everything that he needs to work. Whether it is training, supplies, materials, you

know whatever is needed to make this program work. [AA]

Administrators B and D verbalized their own perception of their role as

facilitators as follows: "My role is to facilitate opportunities for our students and our

staff" [AB].

My role is to support the students and to offer the best [instruction] that we can.

We got into this collaborative and got the equipment that we needed not only for

the Algebra class but for other classes…..my role is merely to support and be

there…I may not be the expert but the liaison between the teacher and the

university. [AD]

Summary

Findings from administrators' responses suggest that they believe in the overall

effectiveness of ITVC in the delivery of instruction. Some of the administrators

perceived a few limitations primarily pertaining to the students and none to the teachers.

Students' level of maturity was perceived as the main limitation.

The administrators' responses to the perceived factors affecting teachers' use of

interactive videoconference were consistent with those found in the literature reviewed.

The factors mentioned by the administrators clustered around the six major themes: (a)

common curriculum, (b) synchronized class schedule, (c) communication, (d) training,

(e) technology, and (f) technology support. It was evident that the majority of the

campus administrators believed that they were capable of producing a high level of

performance over these factors by establishing collaborations with other districts and institutions of higher education and acting as facilitators and providers of resources.

Research Question #2

In what ways does ITVC influence teacher instruction and student engagement?

Existing research on videoconferencing points to the benefits (Cavanaugh, 1999; Gunawaradena & Duphorne, 2001) of this mode of delivery for participating teachers and students, but it also sends a word of caution regarding a teachers' expectations of higher student outcomes as a result of its integration into the teaching and learning process (Daley et al., 2008; Furst-Bowe, 1997). ITVC is a "tool for improving opportunities for learning, but there is no reason to expect test scores to rise as a result of using IVC any more than for any other tool. ITVC needs to be valued for its capacity to provide access for teachers and learners to more information and learning opportunities and access for teachers and administrators to greater collegial communication" (Holznagel, 2003, p. 6).

The four teachers involved in this program provided detailed accounts of their perceptions of the influence of ITVC on teacher instruction and student engagement. Interviews were conducted in May 2008. The sending teacher or Master Teacher (Campus D) and the three receiving teachers (Campuses A, B, and C) were informed of the purpose of the study. The participants' comments are noted as TA for teacher in school Site A, TB for teacher in school Site B, TC for teacher in school Site C, and TD for teacher in school Campus D (sending site).

Teacher Instruction

The role of the Teacher Partners in each of the receiving sites was meant to be different than a facilitator. Traditionally, the facilitator is responsible for administrative and managerial duties only. Classroom facilitators in secondary schools are responsible for classroom management, administrative duties, document handling, and maintaining constant communication with the sending institution. In this particular program, the Teacher Partners' role in the overall teaching and learning process included the underlying notion that they would also serve as partners in the teaching and learning process. This intention was clearly stated in the first organizational meeting with the coordinating team at the university (Field note, AGENDA, September 2007). One of the benefits found in the literature regarding pairing an experienced teacher (Master Teacher) with a less experienced one (Teacher Partner) is the opportunity for professional growth.

Teacher Partner A, the only Teacher Partner with previous experience teaching Algebra, acknowledges how his participation in the class has impacted his teaching:

The fact that I got to see some of the strategies that the Master Teacher used helped me see a different way to teach a particular objective. Some of them [strategies] I had already used in the past, but since it was too long ago, I had forgotten about them. [TA]

When asked if he was using these strategies with his other Algebra classes, he answered "absolutely!" Since school A was not using the same adoption book as the other two schools, the teacher had access to a variety of materials. "The fact that we had

different adoptions [textbooks] meant we had to follow the Master Teacher's lessons, and after the system [videoconference] was disconnected, we would continue using ours…. I found myself using these handouts in my other classes as supplemental materials" [TA].

In the same teacher's opinion, his role in the overall program was that of a Teacher Partner since he felt he was a contributor in the teaching process.

I felt as a partner in this whole process, when the system was disconnected, I would take over and, if we still had some problems, we would go over them; if not, I would review the material that was covered during that particular period. [TA]

The other two Teacher Partners offered different perspectives in relation to their participation and their role in the class. Teacher B felt that this class had no significant impact on her teaching and that it had actually impaired her own teaching. As she explains:

Compared to my other classes, we were already in a different chapter, and I had already covered the material that the Master Teacher was covering via distance learning. My students were mainly reviewing the content; we were just reviewing the content. [TB]

When the researcher asked her if she had communicated this to the Master Teacher, she replied:

We set a schedule for our meetings, but we were never able to commit to meet so we never communicated via videoconference only by email or phone. Finally, I

brought the issue to my principal, and we decided to stop receiving instruction

since our students were falling behind in the curriculum. [TB]

Analysis of emails sent to university staff reveals that Site B requested to

discontinue participation in the Algebra class two months before the scheduled final date

(M. Rosales, personal communication, February, 7, 2008). Teacher C also concurred

with Teacher B in that this class had no significant impact on her teaching. She did

acknowledge that the Master Teacher was "good" and that she had used some of the

strategies in her other classes. In this teacher's opinion, her role in the overall program

was that of a facilitator:

I would basically sit in the back of the class and let them [students] do

everything. They [students] had control of the remote and, if she [Master

Teacher] had a question, they would answer. If they didn't know, I would try to

help them get to the answer she was looking for. [TC]

This teacher also mentioned the fact that there were efforts made to meet with the

Master Teacher either face-to-face or through videoconferencing, but due to conflicts

with their schedules, these meetings never materialized. During her interview, the

Master Teacher cited two main concerns that had impacted her teaching. One was the

amount of attention that she gave the students at her site and the other was classroom

management at the distant sites. The below paragraphs give a detailed account of her

experience.

Teacher D, Master Teacher, indicated that one of her main concerns throughout

the delivery of instruction was the fact that she had a class of 13 students in front of her.

Once the program was fully implemented, this meant that she had one group in front of

her and three others at a distance for a total of 51 students. In her opinion, this situation

impacted the amount of attention she could give to the any of the classes. She

commented that "it would have been a lot easier without having those kids in front of

me…it was manageable but it was hard…spreading your time between three groups"

[TD].

> In reference to the role that the teachers at the other sites assumed, she answered:
>
> They were in the classroom but they were not visible...I asked them to be, you
>
> know walk around and look at what the kids were doing, but they didn't…and of
>
> course I am not their principal, so I did not feel that telling them what to do was
>
> my job. That was a hard thing because they were not focusing on what I was
>
> doing…they kind of just let me teach and they were not involved in the lesson.
>
> [TD]

Classroom management was another area that in this teacher's opinion negatively

affected the delivery of instruction. The Master Teacher addressed these issues with her

principal and with the coordinating team at the university (M. Rosales, personal

communication, March 27, 2008).

> There is no way that I on this end can take care of discipline at the other end. Of
>
> course, I can say things, try things, but ultimately, it is the responsibility of that
>
> teacher at the other end…they have a say so on how that class is going to behave,
>
> how they are going to perceive me [the sending teacher], how they are going to

behave with me, how they are going to receive the instruction that the sending teacher is giving. [AD]

The Master Teacher acknowledged failed attempts she made to meet with the Teacher Partners at the other end. She feels that there were several conflicts between her school calendar and those of the receiving sites that made meetings as a group problematic. "We did it [meet] a couple of times...individually with the teachers...we couldn't connect because they were benchmarking, or I was benchmarking or we had different holidays, different Spring Breaks, etc." [TD].

In summary, interactive videoconferencing influenced teachers' instruction at all four schools. Out of the three Teacher Partners, only one reported a positive learning experience. The other two Teacher Partners perceived the experience as negative and did not feel that this class helped them grow professionally. One of the Teacher Partners felt that her participation in this class even impaired her teaching since her students had already covered the material.

The Master Teacher also felt that this type of delivery impacted her teaching negatively but attributed this to a certain degree to the number of students overall and to the lack of classroom management at the other sites. All participating teachers acknowledged that they tried to schedule meetings throughout the semester to address these and other issues but were able to meet only once due to conflicts in their schedules.

Finally, only one of the three teachers at the receiving sites perceived his role as a "Teacher Partner" and, as such, he was actively involved in the teaching and learning

process. Accounts from the other two teachers revealed that they perceived their role as primarily administrative in nature.

Student Engagement

Student engagement is of pedagogical importance in any learning environment regardless of the way in which instruction is delivered. The review of the literature revealed that learning materials and tasks must engage the learner in ways that promote meaningfulness, understanding, and transfer (Bernard et al., 2004). In a distance learning environment, interaction focuses on the activity taking place between the learner and the content, the learner and the instructor, the learner and other learners (Moore, 1989) and the learner with technology (Hillman et al., 1994).

The researcher approached this second part of these questions by extracting information from the responses given to the following items in the Class Activities Questionnaire:

Item #5. The class actively participates in discussions.

Item #15. There is little opportunity for student participation in discussions.

Item #19. Students are excited and involved with student activities.

The researcher also deemed important to capture the perceptions of the participating teachers' accounts on the level of student engagement and student interaction. Their responses to the same three items were also extracted from the Class Activities Questionnaire as well as their interview transcripts.

Table 9 shows how many students rated each factor as Strongly Agree, Agree, Disagree, and Strongly Disagree. As can be seen from the students' responses to Item #5

in Table 9: "The class actively participates in discussions," 9 out of 12 students or 75%,

reported active participation in discussions as evidenced by their selecting Agree or

Strongly Agree for this factor. Seventy-five percent of the students also Agree or

Strongly Agree with Item #15: "There is little opportunity for student participation in

discussions" (reverse coded). When asked about their excitement and involvement with

student activities, 83% or 10 students, Agree or Strongly Agree with this statement.

Table 9. Student Responses to Items Related to Student Engagement in CAQ (N=12)

Question	Strongly Agree (SA)	Agree (A)	Disagree (D)	Strongly Disagree (SD)
Item 5. The class actively participates in discussions	1 (8%)	8 (67%)	3 (25%)	
Item 15. There is little opportunity for student participation in discussions**	1 (8%)	8 (67%)	3 (25%)	
Item 19. Students are excited and involved with student activities	3 (25%)	7 (58%)	2 (17%)	

**Reverse coding used for comparison purposes.

Table 10 shows how the Teacher Partners' perceived the students either actively

participating or excited and involved with student activities. They rated each sentence as

Strongly Agree, Agree, Disagree, and Strongly Disagree. The teachers' responses to

these three statements showed rather different scores. Two out of three teachers either

strongly agreed or agreed with the statement, "The class actively participates in

discussions," only one teacher agreed with the other two statements and two disagreed. It

is difficult to conclude from this data whether the students were referring to their

interaction with the content, the instructor, other learners, or the technology.

Table 10. Teacher Partner Responses to Items Related to Student Engagement in CAQ (N=3)

Question	Strongly Agree (SA)	Agree (A)	Disagree (D)	Strongly Disagree (SD)
Factor 5. The class actively participates in discussions	1 (33%)	1 (33%)	1 (33%)	
Factor 15. There is little opportunity for student participation in discussions**		1 (33 %)	2 (67%)	
Factor 19. Students are excited and involved with student activities		1 (33%)	2 (67%)	

**Reverse coding used for comparison purposes.

In order to get a better understanding of the type of student engagement taking place during the class, the researcher analyzed the teacher responses to the interview questions. The teacher interviews were conducted after they had completed the Class Activities Questionnaire. Two concerns emerged from this analysis: student's lack of interaction with the content and with the learners at the distant sites.

During their interview, two of the Teacher Partners related the lack of student motivation to the fact that the content was not challenging enough to keep them engaged. One teacher explained: "They [students] had already done some of the stuff she [Master Teacher] was teaching so they already had it in their notes…they didn't have to recopy it so that contributed to their [disruptive] behavior" [TB].

> They [students] were like...oh, we saw that last week…so they already knew the answers. They still participated since their level of interest was high since they had already been exposed to that material with me previously. There were also

times when they [students] were a little lost especially when it was something that the other sites had already covered. [TC]

The Master Teacher [sending teacher] attributed their lack of interest to the fact that the Teacher Partners' were not "actively involved in the lesson" as she recalled:

Sometimes I would say something, and I thought it would be obvious to the teacher on the other end and evidently it wasn't. I would say things like "so, what do you all think about this one" and "so what about you," and they wouldn't face anybody. Sometimes I would get the teacher's attention and she would ask them to pay attention but most of the time no. [TD]

Even though there were four sites connected, students could not see the other students through the projection screen unless they unmuted their microphone and made some noise. The camera settings were set to display only the site that was "talking." This situation was mentioned by the following teachers. "My students interacted a lot with the teacher, and she would ask questions and most of the time, the students would answer. As far as the other towns, we didn't interact with any of them" [TA]. "Some of them [students] did enjoy interacting with the teacher" [TC].

I would've liked to see, not just to see the last one to speak, you know the voice. That was the only one I could see, and I would have like to see, I would have to talk to them so that they would respond to me. I would've like to see not only both schools at the same time, but I would've like to see them both on the screen at the same time. [TD]

In summary, there is evidence to suggest that there was interaction taking place in this Algebra class being delivered over interactive videoconferencing. Data extracted from responses given to items related to student engagement in the Class Activities Questionnaire revealed that over 75% of the students perceived themselves as actively participating and/or given the opportunity to participate. An even higher percentage, 83%, strongly agrees or agrees in that they were excited with the activities given by the Master Teacher. Two of the participating teachers disagreed with the statement that the students were given the opportunity to participate or that they were excited with the activities. A closer analysis to the teacher responses in their individual interviews revealed that the students were not likely interacting with the content since they had already covered the lessons presented, but that they were interacting with the Master Teacher.

Research Question #3

How were cognitive, behavioral, and affective classroom activities perceived differently by students receiving instruction face-to-face and those receiving instruction through interactive videoconferencing?

Cognitive Domain

There are seven cognitive factors of the CAQ that describe possible cognitive activities. Students respond in terms of how well each sentence describes what is stressed in the class. Table 11 contains the mean scores for both groups receiving Algebra instruction via ITVC and face-to-face. Mean scores approaching 1.00 indicate student positive attitudes or perceived greater emphasis toward the statements. The mean

scores for statements dealing with analysis, application, memory, evaluation, synthesis, and translation are between 1.00-2.25 in the positive zone. Similarly, the mean scores approaching 4.00 indicate student negative attitudes toward the statements or perceived de-emphasis. As can be seen in Table 11, none of the factors fell in this zone. The mean score that fall between 2.25 and 2.75 is said to be in the neutral zone. Only statements dealing with translation fell in this zone.

Table 11. Means and Standard Deviations for CAQ Cognitive Factors (N=35)

Cognitive Factors	N	Minimum	Maximum	M	SD
Memory	35	1.00	3.00	1.94	.52
Translation	35	1.00	3.00	2.20	.53
Interpretation	35	1.00	3.00	2.05	.52
Application	35	1.00	3.50	1.81	.59
Analysis	35	1.00	3.00	1.61	.50
Synthesis	35	1.00	3.50	2.02	.69
Evaluation	35	1.00	2.50	1.98	.42

Table 12 contains the student means by group (ITVC and face-to-face). This table shows that both groups perceived emphasis on all seven cognitive conditions in class activities. The only mean score that fell in the "neutral zone" (2.29) was in the translation domain. The fact that the mean score is approaching 2.50 is interpreted to indicate that students perceived class activities in the Translation domain received little emphasis during the class or were not as important as the rest of the activities. Translation is described as any activities calling for paraphrasing or expressing information in a different symbolic form. The little emphasis is attributed to the fact that

by the time students take Algebra, they have already transitioned from concrete to

abstract analysis.

Table 12. Means and Standard Errors for CAQ Cognitive Factors by Group (N=35)

Cognitive Factors		N	M	SD	SE
Memory	Control	23	2.00	.52	.10
	Experimental	12	1.83	.53	.15
	Total	35	1.94	.52	.08
Translation	Control	23	2.15	.59	.12
	Experimental	12	2.29	.39	.11
	Total	35	2.20	.53	.08
Interpretation	Control	23	2.04	.61	.12
	Experimental	12	2.08	.28	.08
	Total	35	2.05	.52	.08
Application	Control	23	1.86	.64	.13
	Experimental	12	1.70	.49	.14
	Total	35	1.81	.59	.10
Analysis	Control	23	1.58	.49	.10
	Experimental	12	1.66	.53	.15
	Total	35	1.61	.51	.08
Synthesis	Control	23	2.04	.73	.15
	Experimental	12	2.00	.63	.18
	Total	35	2.02	.69	.11
Evaluation	Control	23	1.89	.45	.09
	Experimental	12	2.16	.32	.09
	Total	35	1.98	.42	.07

Figure 4 shows a comparison between scores given to each cognitive domain and

the different zones of emphasis. This comparison provides a measure of strength of

students' responses and facilitates comparison between the two groups.
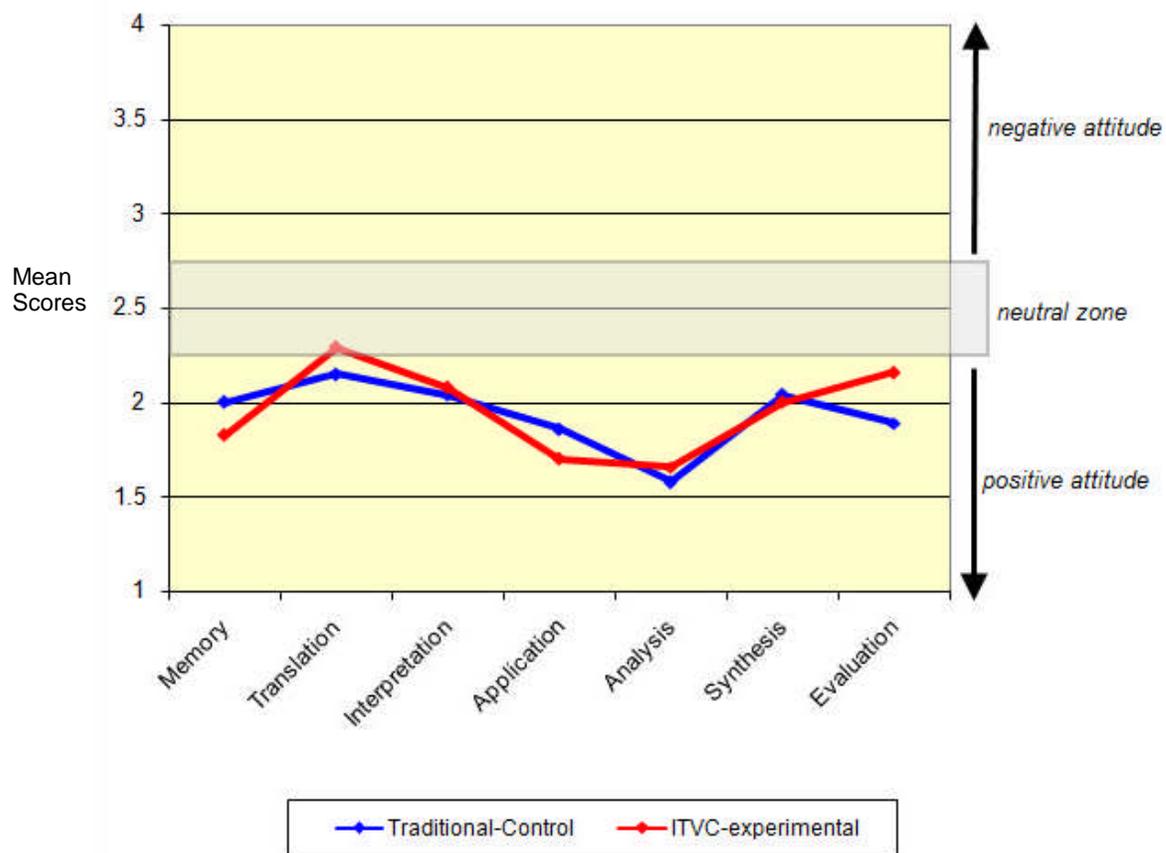
Figure 4. Mean scores by group.

In order to statistically test significance of the difference, a t-test was used. The results of the independent sample t-test are presented in Table 13. Homogeneity of variance between groups was confirmed by Levene's Test for Homogeneity of Variances. Since the Levene's Test for Homogeneity showed that factor "interpretation" $F=5.703$ was significant sig=.023, therefore, the "Equal Variances not Assumed" row was used for the t-test.

Table 13. Independent Samples t-test Cognitive Indicators for Both Groups

| | Cognitive Indicators | Levene's Test for Equality of Variances | | | | |
		F	Sig.	t	df	Sig. (2-tailed)
Memory	Equal variances assumed	.224	.639	.888	33	.381
	Equal variances not assumed			.880	21.888	.388
Translation	Equal variances assumed	1.504	.229	-.732	33	.469
	Equal variances not assumed			-.828	30.710	.414
Interpretation	Equal variances assumed	5.703	.023	-.210	33	.835
	Equal variances not assumed			-.259	32.767	.797
Application	Equal variances assumed	.323	.574	.756	33	.455
	Equal variances not assumed			.820	27.913	.419
Analysis	Equal variances assumed	.004	.951	-.441	33	.662
	Equal variances not assumed			-.429	20.771	.672
Synthesis	Equal variances assumed	1.020	.320	.173	33	.864
	Equal variances not assumed			.181	25.426	.858
Evaluation	Equal variances assumed	.984	.328	-1.870	33	.070
	Equal variances not assumed			-2.070	29.347	.047

An independent t-test was used to compare students' perceptions of cognitive indicators present in the Algebra class. There was no significant difference in the memory indicator (t=.88, df=33, p=.38); translation indicator (t=-.73, df=33, p=.46); interpretation indicator (t=-.25, df=32., p=.41); application indicator (t=.75, df=33, p=.45); analysis indicator (t=-.44, df=33, p=.66); synthesis indicator (t=.17, df=33, p=.86), and evaluation indicator (t=.888, df=33, p=.38).

Summary of Cognitive Emphasis

A summary of cognitive emphasis is essential in this study to determine if the

students in the control and experimental groups perceived that the activities taking place

in their Algebra class required lower thought processes or higher thought processes.

Lower cognitive factors are memory, translation, and interpretation. Higher thought

processes are defined by the remaining four levels: (a) application, (b) analysis, (c)

synthesis, and (d) evaluation. Table 14 contains a summary of cognitive emphasis

between the traditional face-to-face classes and the ITVC classes. Both control and

experimental groups show some emphasis on both lower level thinking abilities and

greater emphasis on higher level thinking abilities.

Table 14. Differences in Cognitive Levels in Control and Experimental Classes

Dimensions of the CAQ	Traditional- Control N=23	ITVC-Experimental N=12
Lower Level Thinking Abilities	2.06* Some Emphasis	2.06 Some Emphasis
Higher Level Thinking Abilities	1.84 Greater Emphasis	1.88 Greater Emphasis

*The value shown in each cell is the mean score for the group. A mean under 2.25 indicates some emphasis and under 2.00 much emphasis on the dimension.

The Teacher Partners were also asked to complete the CAQ to evaluate their

perceptions of classroom activities. Table 15 contains the teachers' perceptions of the

thought processes taking place in the videoconferencing class (ITVC). Mean scores

showed that Teacher Partners perceived both low (M=1.94) and high (M=1.70) thinking

level skills as being given "greater emphasis" in class activities.

Table 15. Teacher Partners' Perceptions of the Cognitive Levels Taking Place in the Experimental Class

Dimensions of the CAQ	ITVC-Experimental N=12
Lower Level Thinking Abilities	1.94 Greater Emphasis
Higher Level Thinking Abilities	1.70 Greater Emphasis

Affective Domain

Another domain that allows comparisons between groups is the affective domain. The affective domain deals with the social and emotional conditions that exist in the classroom. These conditions could contribute to either a positive classroom climate or to a detrimental experience. Some of these factors are administrative in nature, such as group norms, teaching strategies, and the roles everyone plays in the teaching and learning process. Other factors deal with individual and group attitudes and feelings, such as trust and cooperation, enthusiasm, acceptance, and involvement. All of these factors affect the student's motivation and attitude toward learning.

Table 16 displays the factors that address classroom conditions. These items were paired and averaged according to the CAQ manual.

Table 16. Classroom Conditions Factors

Factors	CAQ Items
Discussion/opportunity	5, 15
Test/grade stress	8, 22
Lecture / listening	4
Divergence	17
Enthusiasm	19
Independence	14
Humor	25
Teacher Talk (categorical)	26
Homework (categorical)	27

The data collected in the second part of the CAQ concerned factors dealing with the affective domain. Mean scores approaching 1.00 showed positive attitude toward the statement being made about classroom conditions. The descriptive statistics of the classroom conditions factors are shown in Table 17.

Table17. Descriptive Statistics of the Classroom Conditions Factors: Means and Standard Deviations for CAQ Classroom Conditions Factors (N=35)

Classroom Conditions Factor	N	Minimum	Maximum	M	SD
Discussion/opportunity	35	1.00	3.50	2.38	.60
Test/grade stress	35	1.00	3.00	1.68	.64
Lecture/listening	35	1.00	4.00	2.54	.85
Divergence	35	1.00	3.00	1.85	.73
Enthusiasm	35	1.00	4.00	2.05	.87
Independence	35	1.00	3.00	1.82	.66
Humor	35	1.00	4.00	2.71	.98

Table 18 contains the score means by group (control and experimental). This table shows the level of emphasis of classroom conditions in the classroom. Score means

from both groups show greater emphasis was given to test grades (M=1.67 and M=1.70)

and independence (M=1.78 and 1.91).

Table 18. Means and Standard Errors for CAQ Classroom Conditions Factors by Group
(N=35)

Classroom Conditions Factor		N	M	SD	SE
Discussion/opportunity	Control	23	2.04	.58	.12
	Experimental	12	2.16	.32	.9
	Total	35	2.08	.50	.8
Test/grade stress	Control	23	1.67	.66	.14
	Experimental	12	1.70	.62	.17
	Total	35	1.68	.64	.10
Lecture/listening	Control	23	2.47	.94	.19
	Experimental	12	2.66	.65	.18
	Total	35	2.54	.85	.14
Divergence	Control	23	1.69	.70	.14
	Experimental	12	2.16	.71	.20
	Total	35	1.85	.73	.12
Enthusiasm	Control	23	2.13	.96	.20
	Experimental	12	1.91	.66	.19
	Total	35	2.05	.87	.14
Independence	Control	23	1.78	.67	.14
	Experimental	12	1.91	.66	.19
	Total	35	1.82	.66	.11
Humor	Control	23	2.65	1.07	.22
	Experimental	12	2.83	.83	.24
	Total	35	2.71	.98	.16

Figure 5 presents the mean scores of the two groups. It shows that both groups

perceived some emphasis (mean <2.25) on opportunities for discussion and

participation. The mean scores show mixed results to divergence and enthusiasm. The control group rated the level of divergence as having greater emphasis (mean=1.69) in class activities and the experimental group as some emphasis (mean=2.16). Students in the control group perceived they were given more opportunities to discover as many solutions to problems as possible (divergence) than the students in the experimental group. Divergence, Enthusiasm, and Independence are single items in that there is only one question in the CAQ instrument that addresses each condition.
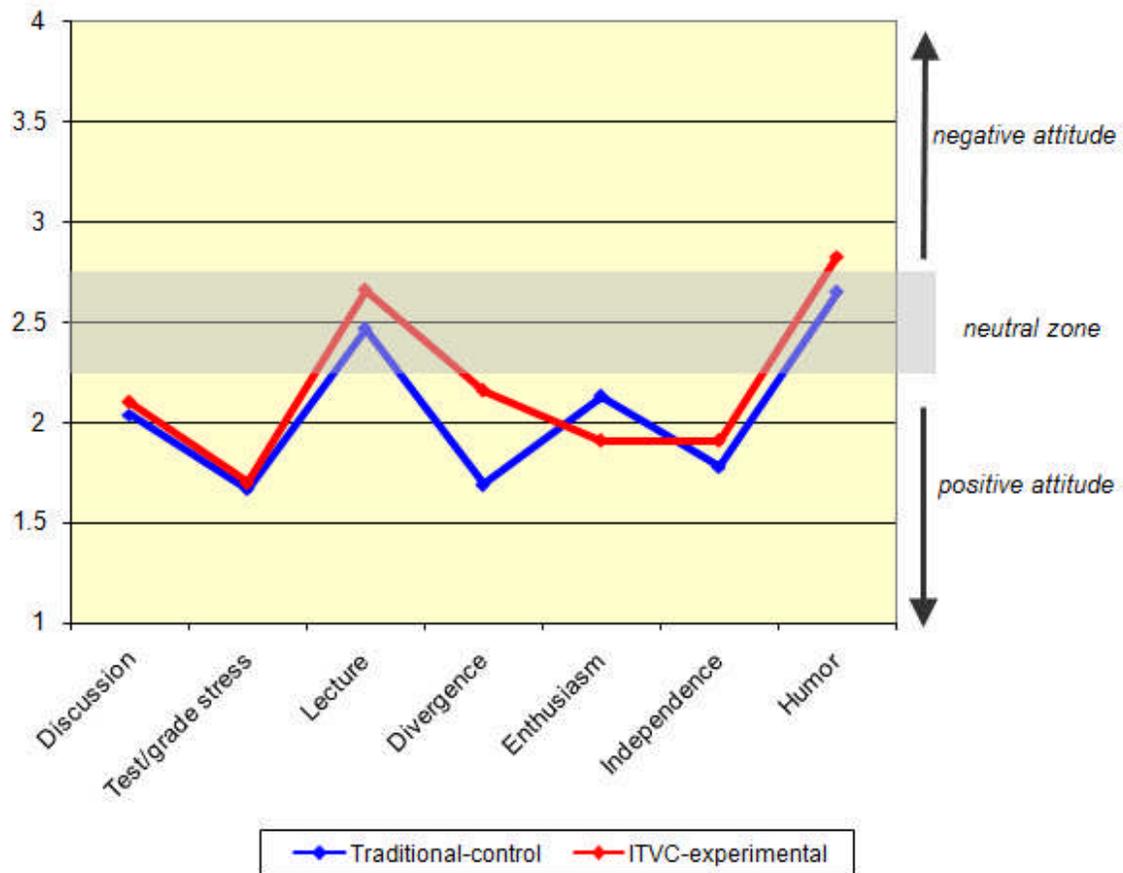

Figure 5. Mean scores by group on classroom conditions.

Students in the experimental group rated enthusiasm as having greater emphasis (mean=1.91) and the control group rated enthusiasm as having some emphasis (mean=2.13) in class activities. Both groups agreed that they were encouraged to independently explore and begin new activities and that there was great emphasis placed on test grades (mean<2.00).

Joe M. Steele, developer of CAQ, recommends that the researcher interpret each of the classroom conditions according to the nature of the class being assessed. The instrument's factor analysis conducted by Steele (1969) suggests that the thought processes are not independent from classroom conditions. In considering these relationships, it is prudent to look at patterns between these two analyses and determine their relationships. For example, students in the Algebra class perceived much emphasis in both memorizing information and test grades/stress. Also, both classes showed that application and independence received emphasis in class activities. This relationship is expected from an Algebra class where students utilize abstraction in concrete situations, selecting and applying methods to solve a specific problem usually with minimum direction from the part of the teacher.

Students in both groups responded negatively to the statement "there is evidence of laughing or joking in class" (reverse coding). Both groups scored this factor as having a mean > 2.50 (control mean=2.65, experimental mean=2.83) suggesting that this activity was deemphasized or discouraged in class. Finally, in order to determine how much listening was actually taking place, students were asked "most class time is spent doing other things than listening" (reverse coding). Students rated this activity as above

2.50 but below 2.75, which means that this activity (listening) received little emphasis. Students were also asked to measure the amount of time the teacher spent lecturing to get a better idea of the amount of time the teacher was talking.

Based on the students' responses to the amount of time the teacher spent lecturing (teacher talk), it can be inferred that 91.7% in the experimental group perceived that the teacher was lecturing 25% of the total class time. A wider range of responses was obtained from the control group. Fifty-four percent of the students in the control group perceived that the teacher lectured 40 or more percent of the time. The Pearson Chi-Square analysis revealed a significant difference between the two groups related to the amount of time the teacher lectures. A comparison by group is displayed in Table 19.

Table 19. Cross Tabs for Teacher Talk by Group (N=34)

Group		On average the teacher talks how much of the time						
		90%	75%	60%	40%	25%	10%	Total
Control	Count	1	3	4	4	3	7	22
	% within group	4.5%	13.6%	18.2%	18.2%	13.6%	31.8%	100.0%
	% of Total	2.9%	8.8%	11.8%	11.8%	8.8%	20.6%	64.7%
Experimental	Count	0	0	1	0	11	0	12
	% within group	.0%	.0%	8.3%	.0%	91.7%	.0%	100.0%
	% of Total	.0%	.0%	2.9%	.0%	32.4%	.0%	35.3%
Total	Count	1	3	5	4	14	7	34
	% within group	2.9%	8.8%	14.7%	11.8%	41.2%	20.6%	100.0%
	% of Total	2.9%	8.8%	14.7%	11.8%	41.2%	20.6%	100.0%

Chi-square for Teacher Talk by Group (N =34)

	Value	df	Sig. (2-sided)
Pearson Chi-Square	20.176	5	.001

The percentage of time consumed by the teacher speaking is in itself a revealing index of positive classroom conditions. The more the teacher talks, the more the students are passive. A relationship can be drawn between application-independence-teacher talk resulting in the notion that students spent most of the time applying concepts independently. This signifies the presence of an open climate with much student participation and involvement.

Preparation for class was also a factor investigated in this study. Students were asked to estimate the amount of time each week they spent preparing for class. Some of these estimates may include "voluntary" preparation and not necessarily assigned homework. Nevertheless, it was important to compare the amount of preparation between the two groups. Table 20 displays frequencies and percentages.

Table 20. Frequencies and Percentages for Class Preparation/Homework (N=34)

Homework	Frequency	Percent
0 hours	1	2.9
1 hour	1	2.9
1 and 1/2 hours	1	2.9
2 hours	3	8.8
2 and 1/2 hours	2	5.9
3 hours	2	5.9
3 and 1/2 hours	2	5.9
4 hours	9	26.5
4 and 1/2 hours	13	38.2
Total	34	100.0

As shown in Table 21, over 75% of the students spent from 3 to 41/2 hours per week doing homework. This is, in some instances, somewhat less than one half hour each evening. To find out if there was any variation between the two groups, Table 19 shows the results of comparisons.

Table 21. Cross Tabs for Class Preparation Group (N=34)

Group		0 hrs	1 hr	1.5 hrs	2 hrs	2.5 hrs	3 hrs	3.5 hrs	4 hrs	4.5 hrs	Total
		How much time spent preparing for class each week									
Control	Count	1	1	0	1	1	1	1	5	12	23
	% within group	4.3	4.3	.0	4.3	4.3	4.3	4.3	21.7	52.2	100
	% of Total	2.9	2.9	.0	2.9	2.9	2.9	2.9	14.7	35.3	67
Experimental	Count	0	0	1	2	1	1	1	4	1	11
	% within group	.0	.0	9.1	18.2	9.1	9.1	9.1	36.4	9.1	100
	% of Total	.0	.0	2.9	5.9	2.9	2.9	2.9	11.8	2.9	32
	Count	1	1	1	3	2	2	2	9	13	34
	% within group	2.9	2.9	2.9	8.8	5.9	5.9	5.9	26.5	38.2	100
	% of Total	2.9	2.9	2.9	8.8	5.9	5.9	5.9	26.5	38.2	100

Chi-square for Homework by Group (N =34)

	Value	df	Sig. (2-sided)
Pearson Chi-Square	9.729	8	.285

The Pearson Chi-Square found no significant difference between the amount of time preparation for class or homework between the two groups.

Open-Ended Questions

The last three items on the CAQ call for open-ended responses on the best things about the class and things that needed to changed. This section of the CAQ (students only) is not reported in this study.

Summary

The Class Activities Questionnaire was used to identify behavior of emphasis and reveal variations between two groups of students. Specific profiles of emphasis in thought processes and classroom conditions were found across the two groups. Some factors were less strongly emphasized than others, but patterns are exhibited by both groups. Students in the Algebra class showed consistent patterns of emphasis characteristic of the content area in the factors of translation and independence. The only significant difference between the two groups was found in the teacher talk factor. The teacher sending the instruction via ITVC was perceived as lecturing only 25% of class by students in the experimental group. The analysis of student judgments appears to disclose an accurate and meaningful description of the instructional climate of the classroom.

Research Question #4

In what ways does ITVC affect academic gains of students receiving Algebra I instruction in three school districts?

Striving for a higher academic performance in Algebra was undoubtedly one of the forces that prompted school administrators to seek collaboration with surrounding districts and institutions of higher education. Findings in the literature revealed that

student satisfaction and student outcomes are the two most used measures to evaluate the effectiveness of a class delivered through distance learning technologies (Daley et al., 2008; Furst-Bowe, 1997).

For comparisons of student academic gains, the Texas Assessment of Knowledge and Skills (TAKS) results were evaluated. Scores on the Eighth Grade Math Release Test (Spring 2007) were used for baseline assessment of mathematics ability. Scores of the Ninth Grade of the students' performance on the TAKS test (Spring 2008) were used to indicate the level of achievement after completion of the Ninth Grade Algebra I class. The researcher compared both state tests and determined that although they both have a strong focus on Algebra with linear equations, the 9th grade TAKS test has more objectives (9 versus 6) than the Eighth Grade Math TAKS Test. Finally, a comparison of means by treatment represented by their TAKS results was made.

School districts released the scale scores for ALL students in both the experimental and the control groups. Due to confidentiality concerns, they would not release only the scores of the students participating in this study. There were a total of 26 (N=26) students in the experimental group and 32 (N=32) in the control group. The frequencies and percentages of the demographic variables are presented in Table 22. One half of the sample consisted of females (48.3%). Slightly more than half belonged to the control group (55.2%); less than half was assigned to the treatment (44.8%).

Table 22. Frequencies and Percentages of Demographic Variables (N=58)

Variable	*N*	Percentage
Gender		
Female	28	48.3
Male	30	51.7
Condition		
Control	32	55.2
Experimental	26	44.8
School		
A	25	43.1
B	10	17.2
C	23	39.7

It was hypothesized that the treatment (use of interactive videoconferencing) would result in an increase in TAKS scores. It was also hypothesized that gender would be related to the increase in TAKS scores. In addition to the descriptive statistics, a mixed analysis of variance (ANOVA) procedure was used in order to determine whether the groups changed significantly from the Eighth Grade TAKS test (within groups), whether there was an overall significant difference in scores between the two treatment groups (between groups), and whether the there was a significant difference between the two groups with regard to the amount of change in scores from the Eighth Grade TAKS test to the Ninth Grade TAKS test. The within-subjects variable was time (Eighth TAKS scores versus Ninth Grade TAKS scores). The between-subjects variables were treatment and gender. Statistical significance was determined based on an alpha level of $p \leq .05$ for group and gender contrasts on the test scores.

The means and standard errors of the TAKS scores across time are displayed in Table 23. The mixed ANOVA findings are presented in Table 24.

Table 23. Means and Standard Errors for TAKS Scores

Group	Pre-treatment TAKS		Post-treatment TAKS	
	M	*SE*	*M*	*SE*
Comparison				
Female	2073.56	40.02	1985.63	35.91
Male	2075.38	40.02	1959.56	35.91
Treatment				
Female	2069.83	46.21	1992.25	41.47
Male	2045.36	42.79	1927.50	38.39
TAKS Score Mean	2066.33		1966.23	

The findings in Table 24 indicate that the mean pre-treatment TAKS score ($M = 2066.03$) was significantly higher than the mean post-treatment TAKS score ($M = 1966.23$; $F(1, 54) = 22.08$, $p < .001$). The decrease in TAKS scores, however, did not vary significantly across treatment conditions ($F(1, 54) = .01$, $p < 1.00$). Thus, the first hypothesis was not supported. Similarly, the decrease in TAKS scores did not differ significantly across gender ($F(1, 54) = .64$, $p < .50$). The second hypothesis was also not supported.

A comparison of means by treatment by school of the TAKS 2008 results was made and is displayed in Figure 6. This figure shows how the control groups in Campus A and Campus B performed higher than the experimental groups. The experimental group in Campus C performed higher than the comparison group. The passing scale score state standard is 2100 for the TAKS 2008 test.

Table 24. ANOVA Results for TAKS Scores Across Time (N=58)

| Source	df	MS	F	Sig.
Between groups				
Condition	1	6260.34	.67	.667
Gender	1	23013.94	.41	.410
Condition x gender	1	7545.53	.64	.636
Error	54	33367.65		
Within groups	1	284801.17	22.08	.000
Time	1	123.41	.01	.922
Time x condition	1	8300.38	.64	.426
Time x gender	1	274.75	.02	.884
Time x condition x gender	54	12896.13		
Error				
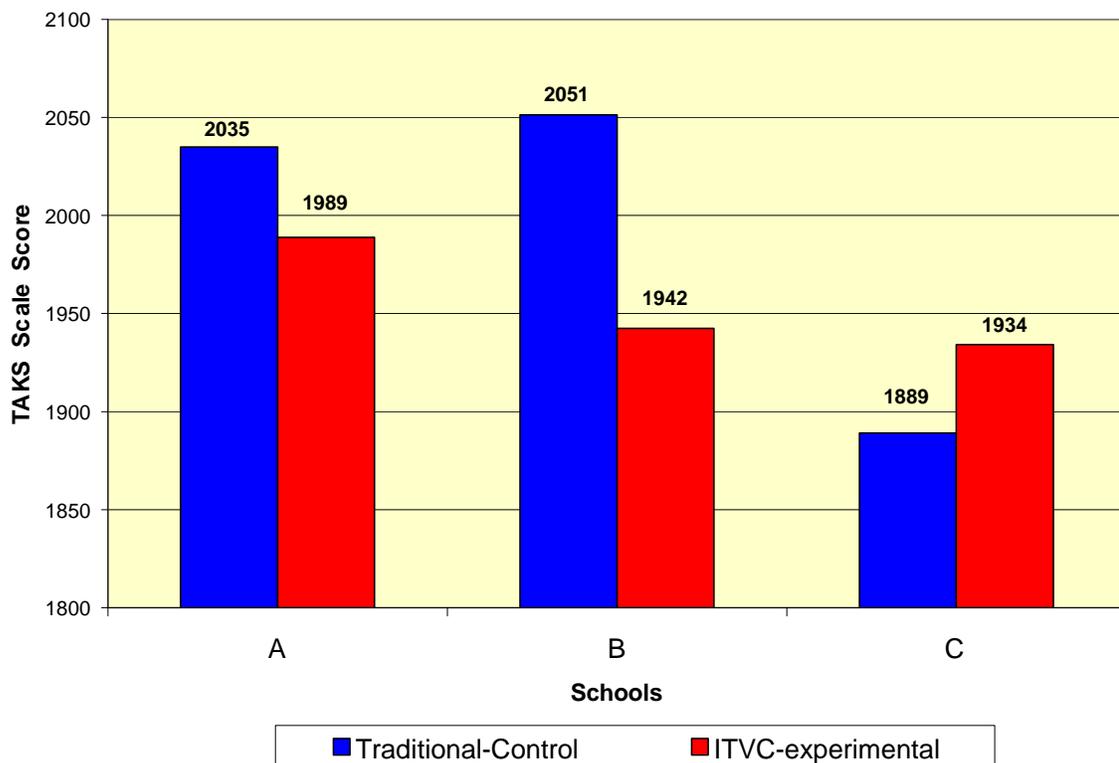
Figure 6. Comparison of means by treatment by school.

Summary

Students receiving instruction in Campus C through ITVC scored higher on the Ninth Grade TAKS test than the traditional group. Campus C's experimental group scored significantly higher than its comparison group (Traditional-Scale Score=1889; ITVC Scale Score=1934). A corroboration between the quantitative results obtained to answer RQ4 and the qualitative results obtained from the Teacher Partners' interview can be drawn to further explicate this occurrence. Corroboration can then be drawn between TAKS results and ITVC's influence on teacher instruction. The Teacher Partner in Campus C was a permanent substitute teacher who acknowledged during her interview, her role as that of a facilitator in the entire process and allowed the Master Teacher to teach:

> I would basically sit in the back of the class and let them [students] do
> everything. They [students] had control of the remote and, if she [Master
> Teacher] had a question, they would answer. If they didn't know, I would try to
> help them get to the answer she was looking for. [TC]

The same Teacher Partner recognized that exposure to the Master Teachers' lecturing through ITVC did not have an impact on her teaching. It is then reasonable to infer that scores were a result of the quality of teaching regardless of the medium used to deliver it. Scores were a result of the quality of teaching received through ITVC.

Teacher Partner from Campus A felt like a partner in the teaching process and acknowledged during his interview that he was using some of the strategies used by the Master Teacher in his traditional face-to-face classes. The scores in the TAKS test

indicate that the comparison group scored higher (Scale Score=2035) than the experimental group (Scale Score=1989). We can then infer that the use of the new teaching strategies learned while observing the Master Teacher proved to be effective for students in the comparison group. Scores were a result of the quality of the instruction through ITVC and the use of strategies learned.

Finally, Teacher Partner B felt that her involvement in the ITVC class had impacted her teaching in a negative way since she felt the students had already covered the material by the time it was presented by the Master Teacher. She acknowledged the fact that she was not following the Scope and Sequence since she introduced the material ahead of the Master Teacher. She asked her principal to stop receiving the class through ITVC two months before the official end of the program. Scores were a result of her inability to continue instruction where the ITVC class left off. The scores in the TAKS test indicated that the comparison group scored higher (Scale Score=2051) than the experimental group (Scale Score=1942) at Campus B.

Conclusion

The research questions addressed in this chapter revealed the perceptions of campus administrators, teachers, and students involved in the delivery of Algebra through the use of interactive videoconferencing. The research questions provided an insight into the learning activities taking place during class. The next chapter provides a summary of the themes of the research study and discusses their relevance to the literature. In addition, Chapter V will place those themes in the context of the findings, conclusions, and suggestions for policy, practice, and future research.

CHAPTER V

SUMMARY OF THE FINDINGS, CONCLUSIONS, AND

RECOMMENDATIONS FOR FURTHER STUDY

This chapter will review the purpose of the study and the methodology used and will present a summary of the findings and a discussion of the results. The delivery of Algebra I instruction through ITVC to rural high school ninth graders was a complex task that depended upon a multiplicity of factors. Aside from the technology and the infrastructure needed to deliver instruction, there were human and logistics factors that came into play, some of which will be further discussed in this chapter. This study provides valuable insights gained from the perceptions of all those involved in delivering the Algebra I class through interactive videoconferencing. These insights have potential implications for school district administrators looking at ITVC as a solution to supplement their instructional programs and as an aid to future research on the essential factors that must be present in courses delivered using this model of course instruction. Accordingly, the chapter concludes with suggested topics for future research, along with recommendations and implications for the refinement of current practices in the area of distance education.

Review of the Research Study

The purpose of this mixed methods case study research was to identify if ITVC could serve as a viable solution to the delivery of high school Algebra in rural areas where qualified secondary mathematics teachers are scarce. The secondary purpose of

this case study was to gain an understanding of the learning activities taking place in the classroom as perceived by the participating students and Teacher Partners.

The researcher opted for a case study approach to improve our understanding of a specific phenomenon, in this case, the use of ITVC on the delivery of a specific content area: Algebra I, in a specific setting: rural ninth grade classrooms in South Texas. According to Stake (2000), case study "facilitates the conveying of experience of actors and stakeholders as well as the experience of studying the case" (p. 454). Case study research provides opportunities to explore, describe, and analyze a program, an event, an activity, or individual in depth. The results presented here reflect this particular situation/set of variables, and generalization beyond this case should be undertaken cautiously (Lincoln & Guba, 1985).

The results of the study are presented according to the order of the research questions. The findings include both qualitative and quantitative analysis of the mixed methods design. A mixed methods design combines the strengths of both types of analysis and provides a better understanding of the phenomena under investigation.

The manner in which the data were collected in this mixed methods research was also critical. In the case of the teachers, a mixed methods sequential explanatory research design was selected and consisted of collecting the quantitative data first and the qualitative data second. The rationale for this type of approach comes from the understanding that the quantitative data provide a general understanding of the research problem, while the qualitative data will help refine and explain the results obtained from

the quantitative data by exploring participants' views in depth (Creswell & Plano-Clark, 2007).

This study involved four different rural high schools located in South Texas. All of the participating schools were part of a collaborative known as the Mid-Rio Collaborative. Due to the geographical location of the high schools, it was determined that ITVC would be the mode of delivery for the Algebra course taught from October 2007 through April 2008.

Purposive sampling was used for both the selection of research sites and participants within those sites, due to the characteristics of the population being studied. Participants for this study were high school ninth graders enrolled in Algebra I during second period (8:55 a.m.-9:40 a.m.) at each of the receiving sites. Aside from the experimental class receiving the treatment, a control class at each site was composed of students in the class immediately following the experimental group. Participating Algebra teachers were selected by their campus principals.

Review of the Findings and Links to Current Literature

Campus Administrators' Perceptions

How do campus administrators' perceptions and beliefs shape the value or efficacy of ITVC in the delivery of high school Algebra? Pertinent data obtained from interview transcripts and field notes revealed detailed accounts of the administrators' experiences regarding their perceptions and beliefs of their role in the overall implementation of ITVC on their campus.

It was the administrators' determination that prompted the collaboration with other school districts and an institution of higher education. From the early stages of the Mid-Rio Collaborative, it was evident that campus leaders were under a lot of pressure due to the demands of educational accountability and high-stakes testing. According to the literature, these pressures are even greater for campus administrators in isolated locations where resources are limited or scarce (Howley et al., 2002). Rural high school campus administrators must seek solutions to alleviate their limitations including pairing agreements such as the one addressed in this study. One of the solutions mentioned in the literature review is the use of ITVC as an effective way to meet new state-mandated curriculum requirements and to deliver required courses for which a certified teacher is not available (Barker, 1988). In this study, only one of the sites, Campus A, had an experienced teacher. The other two sites, B & C, had a first-year teacher and a permanent substitute, respectively.

Campus administrators' responses to the interview questions revealed a firm belief that the overall use of ITVC is beneficial for the district, teachers, and students. The idea that the students were exposed to a Master Teacher and students from different communities was very appealing to the administrators. Appealing and promising. It was promising in the sense that their teacher would be a partner in the teaching and learning process and would communicate and collaborate with the Master Teacher throughout the duration of the class. There was an underlying belief that this collaboration would provide professional growth opportunities for the Teacher Partners.

Although administrators firmly believed in the value of ITVC to deliver instruction, they were also aware of its benefits and limitations. As far as students are concerned, the perceived benefits included collaboration and communication with students from other parts of the region. Lack of students' maturity was the only perceived limitation. This lack of maturity is attributed to the age range of the students (14-16 years old) and to the novelty of being in front of a camera.

As with any new program implementation, campus administrators expected the appearance of factors that would influence their teachers' use of interactive videoconferencing. The factors mentioned by administrators are in line with those mentioned in the literature review. The six factors that emerged from this study were: (a) common curriculum, (b) synchronized class schedule, (c) communication, (d) training, (e) technology, and (f) technology support. This study found that the majority of the campus administrators believed they were capable of producing a high level of performance over the factors by acting as facilitators and taking immediate measures to provide needed resources to teachers and students. The belief that the campus administrator can organize, act, and implement actions in specific situations that may contain novel, unpredictable, and possibly stressful features is supported by the literature and is defined as self-efficacy (Bandura, 1977).

All of the campus administrators who participated in this program acknowledged it was the collaboration with an institution of higher education that made this program possible.

Teacher Instruction and Student Engagement

In what ways does ITVC influence teacher instruction and student engagement? Participating teachers provided detailed accounts of their perceptions of how ITVC influenced teacher instruction and student engagement.

Teacher Instruction

Teachers agreed interactive videoconferencing influenced teachers' instruction at all four schools. However, only one Teacher Partner reported a positive learning experience, Teacher Partner A. The other Teacher Partners perceived the experience as negative and felt that this class did not help them grow professionally. One of the Teacher Partners felt that her participation in this class had not impacted her teaching in any way and had even impaired her teaching since her students had already covered the material. The two Teacher Partners who reported a bad experience had from 0-1 year of teaching experience. It appears that the Teacher Partner who had experience teaching Algebra is the only one who benefited from this program.

The Master Teacher, on the other hand, felt that this type of delivery impacted her teaching negatively but attributed this to a certain degree to the number of students overall and to the lack of classroom management at the receiving sites. All participating teachers acknowledged that they tried to schedule meetings throughout the semester to address these and other issues but were able to meet only once due to conflicts in their schedules.

Finally, only one of the three teachers at the receiving sites perceived their role as a "Teacher Partner" (Teacher Partner A) and, as such, he was actively involved in the

teaching and learning process. Accounts from the other two teachers revealed that they perceived their role as primarily administrative and supervisory in nature.

Studies found in the literature review of ITVC in the K-12 arena revealed that the role of the facilitator at the receiving sites is critical to the success of the ITVC session. The role of the facilitator varies depending upon the capabilities of the individual (Joiner et al., 1981). Not addressed in the literature is the fact that the role of a site facilitator must vary according to the instructional nature of the content being delivered. In this study, the role of the Teacher Partner was intended to go beyond classroom management, administrative duties, or document handler to being an involved and active partner, coach, and facilitator of student learning as guided by the Master Teacher.

Student Engagement

This study included students' perceptions of their level of engagement in the Algebra class delivered through interactive videoconferencing. The review of the literature emphatically points at interactivity as being of pedagogical importance to the overall effectiveness of learning at a distance (Bernard et al., 2004). This study found evidence to suggest that there was a deep interaction taking place in the Algebra class. Data extracted from responses given to items related to student engagement in the Class Activities Questionnaire revealed that over 75% of the students perceived themselves as actively participating and/or given the opportunity to participate. An even higher percentage, 83%, Strongly Agrees or Agrees in that they were excited with the activities presented by the Master Teacher. Analysis of the teacher responses in their individual interviews revealed that the students were interacting throughout the semester even when

they had already covered the material presented by the Master Teacher. Research on interaction and distance learning environments has identified four different types of interaction: (a) learner and content, (b) learner and the instructor, (c) learner with other learners (Moore & Thompson, 1989), and (d) learner with technology (Hillman et al., 1994). It is evident by the high scores given to CAQ factors #'s 5, 15, and 19 by teachers and students that all of these types of interactions were taking place in the Algebra class delivered through interactive videoconferencing. It is also important to note that over 90% of the students in the ITVC class perceived the teacher lecturing only 25% of the time.

Student's Cognitive and Affective Outcomes

How were cognitive, behavioral, and affective classroom activities perceived differently by students receiving instruction face-to-face and those receiving instruction through interactive videoconferencing? An extensive literature review supports the fact that few studies have documented the impact of the use of ITVC on student's cognitive and affective outcomes. Traditionally, the most common forms of measurement used to evaluate courses delivered at a distance are student satisfaction and student outcome (Daley et al., 2008; Furst-Bowe, 1997). Few studies have found that students who participated in videoconferencing activities had higher scores on cognitive indicators, were motivated to learn the material, and were more interested in learning about the topics (Newman, 2005).

A summary of cognitive emphasis was essential in this study to determine if the students in the control and experimental groups perceived that the activities taking place

in their Algebra class required lower thought processes or higher thought processes. Both control and experimental groups showed higher emphasis on higher level thinking abilities. Teacher Partners' perceptions showed higher emphasis on both lower and higher level thinking abilities Teacher Partners were only asked to rate the class being delivered through interactive videoconferencing.

Some factors were less strongly emphasized than others, but patterns were exhibited by both groups. Students in the Algebra class showed consistent patterns of emphasis characteristic of the content area in the factors of translation and independence. Translation is indicative of activities calling for paraphrasing or expressing information in a different symbolic form. Students felt that this domain received little emphasis during class or was not as important as the rest of the activities. Translation is categorized as a lower thought process.

The only significant difference found was in the teacher talk factor. The teacher sending the instruction via ITVC was perceived as lecturing only 25% of class time. The percentage of time consumed by the teacher speaking is considered an index of positive classroom conditions. The more the teacher talks, the more the students are passive. A relationship can be drawn between application-independence-teacher talk resulting in the notion that students spent most of the time applying concepts independently. This signifies the presence of an open climate with much student participation and involvement.

The analysis of cognitive emphasis from both teachers' and students' perspectives revealed that the activities taking place in the classroom at the time

instruction was delivered through ITVC had a greater emphasis on higher thinking

processes. This result was similar in both control and experimental groups.

Academic Gains of Students

In what ways does ITVC affect academic gains of students receiving Algebra I

instruction in three school districts? As previously noted, the review of the literature

points at student outcome as the most frequent measures of the success of a class

delivered through ITVC (Daley et al., 2008; Furst-Bowe, 1997). The researcher

conducted a careful analysis of the data and concluded that the use of ITVC did not

result in an increase in student academic gains as measured by the 8th grade TAKS pre-

test and the 9th grade TAKS post-test. A significant change in the scale scores from the

pre-test to the post-test was evident in both the control and experimental groups, but it

was attributed to differences in the basic composition of the test. Finally, a comparison

between the mean scale scores on the TAKS test for 2008 and scores by the groups in

this study revealed that two of the three control groups performed higher than those

students in the experimental groups, while one of the control groups performed higher.

Conclusions and Limitations of the Study

The review of the findings from both qualitative and quantitative instruments

show that (a) campus administrators' values and beliefs influence teacher use of

interactive videoconferencing; (b) ITVC impact on teacher instruction is perceived

differently by experienced and novice teachers and is dependent upon the role assumed

by the Teacher Partner in the overall teaching and learning process; (c) the class being

delivered through ITVC has interaction taking place between students and the teacher,

the content, other learners, and the technology; (d) cognitive and classroom conditions were not perceived differently by students receiving instruction face-to-face and those receiving instruction through interactive videoconferencing; and (e) students receiving instruction through ITVC did not show academic gains in the state-mandated test (TAKS).

The results, findings, and conclusions must be viewed in light of the limitations of the study, which are:

1. Small sample size

2. Students' perceptions were utilized to determine cognitive and classroom conditions which may be subjective to a certain extent, and

3. The pre- and post-test used to determine academic gain was a standardized state test that varies in the number of objectives measuring math knowledge and skills and the type of math assessed from one grade to the next.

Given these limitations, it is important to note that the results and findings may not be generalized to other groups.

Recommendations and Summary

The quality of instruction is for the most part dependent upon the design of that instruction, not the medium. Any results reported here are functions of the design of the instruction provided to the students. The results of this study may have implications for the field of distance education, in particular, the use of ITVC as a vehicle to deliver instruction. The following recommendations for further studies derive from the current investigation:

1. The number of students enrolled in an ITVC class should be kept small and at a distance. In this study, the Master Teacher perceived that she would have done a better job if she did not have a "live" class in front of her.

2. Administrator involvement is essential to the successful implementation of any program and as such it is recommended that they are actively involved throughout the process. Field notes revealed that campus administrators were actively involved in the planning stages of the implementation and not as involved as the program progressed during the sequential months.

3. Teachers involved in the class need to be included in all stages of the process. A sense of ownership and shared responsibility from the outset of the program is essential. The role the Teacher Partner assumed throughout the delivery of the class is indicative of his/her own perception of his/her role in the whole process. This perception became very clear during their interviews and in the results of the TAKS data. One of the reasons Campus A did so well in the state test was the fact that the Teacher Partner was actively involved in the teaching process. He assisted the students during class and after the system disconnected. The role of the facilitator (Teacher Partner) in the teaching and learning process has been documented in the literature by Moore (1995).

4. Planned meetings between all stakeholders, either face-to-face or via distance learning, before, during, and after the semester is over, need to be scheduled and agreed to in advance. As part of the formative evaluation, meetings should take place to find out if the needs of all those involved in the program are being met and corrective action taken promptly.

5.   Lessons and activities should be developed before, not during, the actual delivery of the course. It is recommended that a mechanism be in place to use a learning management system (LMS) in conjunction with the ITVC technology. All instructional materials could be uploaded to the LMS and readily available to Teacher Partners. This suggestion is based on the administrators' perceived factors (or barriers) affecting teachers' use of interactive videoconferencing. The majority of the administrators mentioned the untimely availability of the instructional materials before class with some materials being delivered the same day they were going to be covered in class.

6.   A technology support staff should be provided at each receiving site. Technology support at each receiving site was mentioned as a barrier for the effective delivery of the course. In small school districts, the number of technical staff at each site is limited, and they may not be based at the high school but at the district's office. Having someone to turn on/off the equipment alleviates stress on the Teacher Partner.

In summary, this study presented data concerning the perceptions of rural campus administrators, teachers, and students regarding the use of ITVC in the delivery of high school Algebra I in South Texas. Advances in interactive technologies with high-speed transmission capabilities have innumerable possibilities for course delivery to geographically isolated school districts. Although this study concentrated only one content area, research has shown that there is no significant difference between instruction delivered face-to-face and instruction being delivered via interactive videoconferencing. The results obtained in this study from group comparisons in the cognitive and affective domains support that body of research.

This study revealed areas that warrant further investigation in order to have a maximally successful interactive video conference implementation with (novice) teachers in rural school districts. Special consideration should be given to (a) experience of the receiving teachers; (b) delineation of the role of the all of those teachers involved; (c) additional preparatory time for participating teachers; and (d) formative evaluation in the areas of collaboration, timely availability of instructional material, and empowerment of the Teacher Partners.

Administrators of rural and geographically isolated areas are under tremendous pressure to find cost-effective solutions to meet federal mandates for the provision of highly qualified teachers in specialized content areas such as Algebra. No doubt, ITVC will be seen as a solution to meet this and other mandates. In addition to the literature on the elements of a successful collaboration, this study has shed some light on the challenges in implementing a program using ITVC as the vehicle to deliver instruction.

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APPENDIX A

CLASS DIAGRAMS

Configuration Diagrams

Site A.

This classroom was equipped with a 32-inch CRT monitor, a desktop computer and a multifunction printer. The monitor was located in the back of the room and the teacher had to ask the students to turn their desks around before the beginning of each class in order to be able to see the instructor at the distant site. Below is a diagram depicting the classroom arrangement.
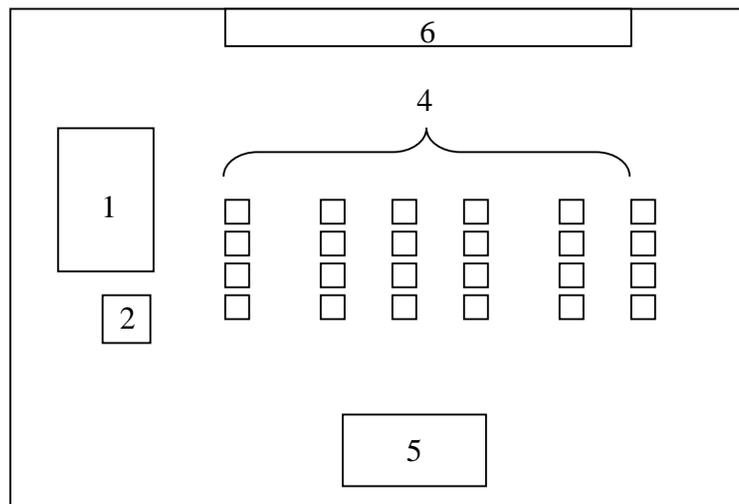

Figure: Remote site A room layout

1. Teacher desk

2. Multi-function printer

3. Desktop computer

4. Student desks

5. Monitor

6. blackboard

Site B.

Due to space limitations, this classroom was equipped with a mobile videoconferencing unit that was placed in the middle of the room. The videoconferencing unit was provided by Texas A&M International University in September 2007. The teacher partner had to move the unit to the middle of the room right before the beginning of each class. The unit stayed connected to the Ethernet port in one of the classroom's corner to facilitate the process. The teacher partner had access to a desktop computer and a printer.

Below is the diagram depicting the room arrangement.
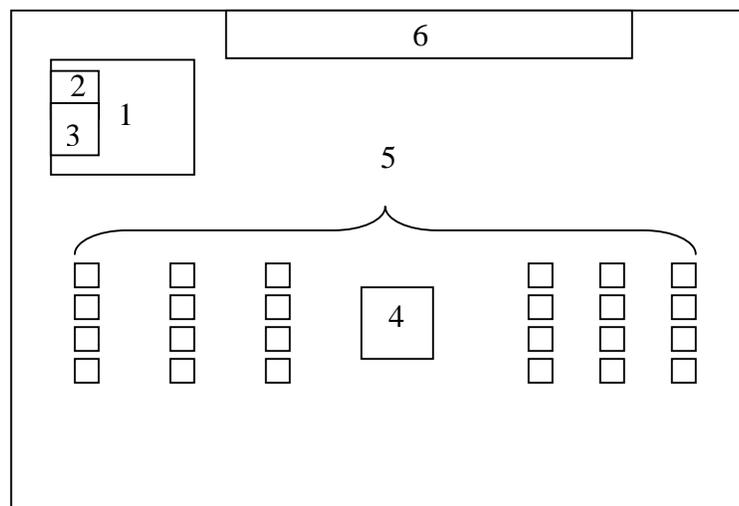
1. Teacher desk

2. Desktop computer

3. Printer

4. Videoconferencing unit with projector

5. Student desks

6. Projection screen

Site C:

This classroom was equipped with a V-Tel 32-inch CRT monitor, a desktop computer and a multifunction printer. The monitor was located in the one side of the room right by the entrance door next to the teacher's desk. The location of the system was dependent upon the location of the Ethernet port jack. Below is a diagram depicting the classroom arrangement.
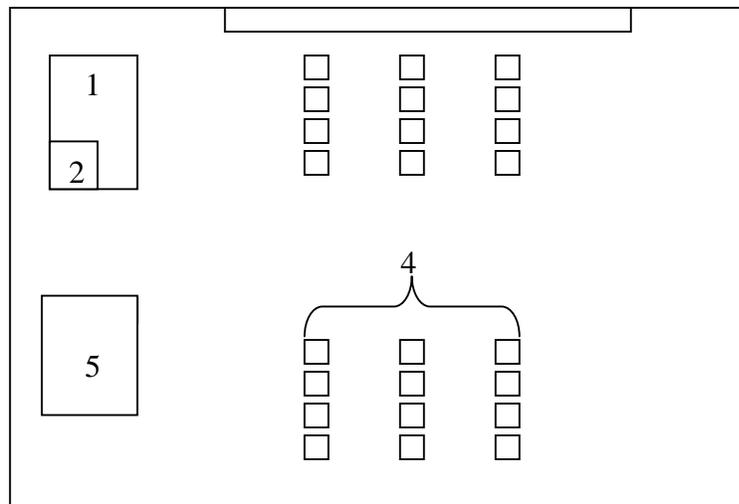
1. Teacher's desk

2. Desktop computer

3. Printer

4. Students' desks

5. Video conferencing unit

APPENDIX B

TAKS MATHEMATICS PERFORMANCE GRADES 9 & 10, 2002-2007

Mathematics TAKS Performance Grades 9 & 10, 2002-2007

	Grade 9		Grade 10	
Campus A				
	math state	math campus	math state	math campus
Year				
2006-2007	61	**65**	65	**49**
2005-2006	58	**30**	62	**43**
2004-2005	58	**24**	59	**38**
2003-2004	61	**34**	64	**45**
2002-2003	65	**47**	74	**47**

	Grade 9		Grade 10	
Campus B				
	math state	math campus	math state	math campus
Year				
2006-2007	61	**40**	65	**52**
2005-2006	58	**17**	62	**36**
2004-2005	58	**31**	59	**29**
2003-2004	61	**27**	64	**52**
2002-2003	65	**46**	74	**67**

	Grade 9		Grade 10	
Campus C				
	math state	math campus	math state	math campus
Year				
2006-2007	61	**38**	65	**48**
2005-2006	58	**33**	62	**46**
2004-2005	58	**39**	59	**37**
2003-2004	61	**30**	64	**47**
2002-2003	65	**58**	74	**69**

APPENDIX C

CLASS ACTIVITIES QUESTIONNAIRE

(STUDENTS AND TEACHERS)

CLASS ACTIVITIES QUESTIONNAIRE
(STUDENTS)

Instructions:

For each sentence below, circle the letters which show the extent to which you AGREE or DISAGREE.

Base your answer on how well each sentence describes what is stressed in your class—what your teacher has you do.

Circle SA	If you STRONGLY AGREE with the sentence.
Circle A	If you agree MODERATELY with the sentence.
Circle D	If you DISAGREE moderately with the sentence.
Circle SD	If you STRONGLY DISAGREE with the sentence.

1. Remembering or recognizing information is my main task   SA   A   D   SD

2. A common class activity is to make judgments of good/bad, right/wrong, and explain why.   SA   A   D   SD

3. I can actively put methods and ideas to use in new situations.   SA   A   D   SD

4. Most class time is spent doing other things than listening.   SA   A   D   SD

5. The class actively participates in discussions.   SA   A   D   SD

6. I am expected to go beyond the information given to see what is implied.   SA   A   D   SD

7. Great importance is placed on logical reasoning and analysis.   SA   A   D   SD

8. My job is to know the one best answer to each problem.   SA   A   D   SD

9. Restating ideas in my own words is a central concern.   SA   A   D   SD

10. Great emphasis is placed on memorizing.   SA   A   D   SD

11. I'm encouraged to build onto what I have learned to produce something brand-new.   SA   A   D   SD

12. Using logic and reasoning processes to think through   SA   A   D   SD
complicated problems (and prove the answer) is a
major activity.

13. A common concern is practicing methods in life-like   SA   A   D   SD
situations to develop skill in solving problems.

14. I am encouraged to independently explore and begin   SA   A   D   SD
new activities.

15. There is little opportunity for student participation in   SA   A   D   SD
discussions.

16. Students are expected to read between the lines to find   SA   A   D   SD
trends and consequences in what is presented.

17. Students are encouraged to discover as many solutions   SA   A   D   SD
to problems as possible.

18. Detailed examination of ideas and conclusions is a   SA   A   D   SD
major class activity.

19. Students are excited and involved with class activities.   SA   A   D   SD

20. My major task is to make judgments about the value   SA   A   D   SD
of issues and ideas.

21. Great importance is placed on explaining and summarizing   SA   A   D   SD
what is presented.

22. There is a great concern for grades in this class.   SA   A   D   SD

23. Inventing, designing, composing, and creating are   SA   A   D   SD
major class activities.

24. Students mainly compare ideas to find likeness and   SA   A   D   SD
differences.

25. There is very little joking or laughing in this class.   SA   A   D   SD

Did you circle an answer for each question?

26. On the average, the teacher lectures how much of the time: 90% 75% 60% 40% 25% 10%

27. On the average, how much time do you spend preparing for this class each <u>week</u>?
(circle the time spent)

0   ½ hr   1 hr.   1 ½ hr   2 hrs   2 ½ hrs   3 hrs   3 ½ hrs   4 hrs.   5 hrs   more

28. List three things that you like best about this class.
1)_____

2)_____

3)_____

29.   If you could change three things about the class, what would they be?

1)_____

2)_____

3)_____

COMMENTS: If you have any comments, please write them on the space below.

CLASS ACTIVITIES QUESTIONNAIRE
(TEACHERS)

Instructions:

For each sentence below, circle the letters which show the extent to which you AGREE or DISAGREE.

Base your answer on how well each sentence describes what is stressed in your class.

Circle SA	If you STRONGLY AGREE with the sentence.
Circle A	If you agree MODERATELY with the sentence.
Circle D	If you DISAGREE moderately with the sentence.
Circle SD	If you STRONGLY DISAGREE with the sentence.

1. Remembering or recognizing information is the student's main job.   SA   A   D   SD

2. A common class activity is to make judgments of good/bad, right/wrong, and explain why.   SA   A   D   SD

3. Students can actively put methods and ideas to use in new situations.   SA   A   D   SD

4. Most class time is spent doing other things than listening.   SA   A   D   SD

5. The class actively participates in discussions.   SA   A   D   SD

6. Students are expected to go beyond the information given to see what is implied.   SA   A   D   SD

7. Great importance is placed on logical reasoning and analysis.   SA   A   D   SD

8. The student's job is to know the one best answer to each problem.   SA   A   D   SD

9. Restating ideas in the student's own words is a central concern.   SA   A   D   SD

10.	Great emphasis is placed on memorizing.	SA	A	D	SD
11.	Students are encouraged to build onto what they have learned to produce something brand-new.	SA	A	D	SD
12.	Using logic and reasoning processes to think through complicated problems (and prove the answer) is a major activity.	SA	A	D	SD
13.	A common concern is practicing methods in life-like situations to develop skill in solving problems.	SA	A	D	SD
14.	Students are encouraged to independently explore and begin new activities.	SA	A	D	SD
15.	There is little opportunity for student participation in discussions.	SA	A	D	SD
16.	Students are expected to read between the lines to find trends and consequences in what is presented.	SA	A	D	SD
17.	Students are encouraged to discover as many solutions to problems as possible.	SA	A	D	SD
18.	Detailed examination of ideas and conclusions is a major class activity.	SA	A	D	SD
19.	Students are excited and involved with class activities.	SA	A	D	SD
20.	The student's major task is to make judgments about the value of issues and ideas.	SA	A	D	SD
21.	Great importance is placed on explaining and summarizing what is presented.	SA	A	D	SD
22.	There is a great concern for grades in this class.	SA	A	D	SD
23.	Inventing, designing, composing, and creating are major class activities.	SA	A	D	SD
24.	Students mainly compare ideas to find likeness and differences.	SA	A	D	SD
25.	There is very little joking or laughing in this class.	SA	A	D	SD

Did you circle an answer for each question?

26. On the average, I lecture how much of the time: 90% 75% 60% 40% 25% 10%

27. On the average, how much time do you spend preparing for this class each <u>week</u>?
(circle the time spent)

0   ½ hr   1 hr.   1 ½ hr   2 hrs   2 ½ hrs   3 hrs   3 ½ hrs   4 hrs. 5 hrs more

28.   List three things that you like best about this class.

1)_____

2) _____

3)_____

29.   If you could change three things about the class, what would they be?

1)_____

2)_____

3)_____

COMMENTS: If you have any comments, please write them on the space below.

APPENDIX D

INTERVIEW LEAD QUESTIONS

LEAD QUESTIONS

1. How do you feel regarding the effectiveness of instruction via interactive videoconferencing?

2. What are some of the factors that you perceive affect teacher's use of interactive videoconferencing?

3. What is your perception of your role in addressing those factors?

VITA

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