DAVID EDWARD HINGER

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Dedication

I dedicate this project to my beautiful and loving fiancé Chelsey. Her understanding, encouragement, and support have made completing this project possible.

To my parents who taught me the importance of education and instilled in me the ambition to peruse my dreams.

To my sister who has always been a voice of reason, encouragement, and understanding in my life.

Abstract

Educators are frequently looking for new ways to expand distance education opportunities to students in rural and remote locations. Videoconferencing is rapidly growing as a premier tool to minimize distance barriers and increase opportunities for continuing education. For more than a decade the Faculty of Education at the University of Lethbridge has offered blended learning courses through a cohort implementation strategy. While creating a cohort of students in one location facilitates the face-to-face component of the blended learning environment by allowing instructors to conduct classes occasionally during the semester by traveling to the remote location, the cost of travel for face-to-face visits to many rural and remote school districts, such as Peace River, adds another barrier to establishing life long learning opportunities.

In an effort to increase access throughout the province to graduate level programming the Faculty of Education is investigating the use of videoconferencing to replace some of the face-to-face site visits. In January 2005, the Faculty of Education at the University of Lethbridge enrolled a cohort of students from the Peace River School District in the University's first graduate level videoconferencing blended learning environment. These instructors, administrators, and students were the participants in this multi-methodological study to evaluate student and instructor perceptions of using videoconferencing in a blended learning environment, and establish best practices for future course offerings.

Acknowledgements

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Table of Contents

List of Tables

List of Figures

Introduction

In January 2005, the Faculty of Education at the University of Lethbridge initiated the use of videoconferencing (VC) to support a blended learning environment for graduate level courses to students in the Peace River School District. The first phase of this project was part of an Alberta Education initiative to increase rural access to postsecondary education through videoconferencing. Although observational data was collected and contributed to the phase I report, a broader examination on the effectiveness of videoconferencing at the graduate level was not undertaken.

The original observational data gathered in phase I will serve as a baseline for the design of the current study. The study explores the technological, pedagogical, and logistical issues involved with the implementation of videoconferencing in a blended learning environment. Qualitative and quantitative data will guide recommendations for future blended learning courses. This study consists of both a written formal research report and a video-paper (Appendix D). Video-papers are increasingly becoming a common component in many academic research studies. They provide a fast and reliable means of dissemination, and are helping educational researchers increase their influence on practice (Olivero, John & Southerland, 2004). This study will use the concept of a video-paper to provide an overview of the research study and highlight some of the key findings.

Statement of Purpose

This project aims to examine the effectiveness of videoconferencing as a strategy to enhance blended learning with distance Master of Education participants. The results of this study will include a summary of best practices to ensure effective design of

blended learning environments. The study will focus on both technology and pedagogy in an effort to identify keys to success. The objective of this project is to influence and assist future efforts to expand graduate level courses to rural and remote communities.

It is hoped the final research video-paper and written report will be published on the VcAlberta.ca website to promote share what was learned in this study to a wider audience. The major goal of this project is to increase the effective use of blended videoconference learning in the province of Alberta.

Background/Rationale

In 2001, the University of Lethbridge delivered its first videoconference course to Management students in Lethbridge and Edmonton. Aside from this single videoconference course, from 2001 through to 2005, the technology was used primarily for administrative meetings, guest speakers, job interviews, and research collaboration. This researcher is a member of an educational technology department at the University of Lethbridge (U of L), called the Curriculum Re-Development Centre (CRDC). The CRDC, in collaboration with the U of L's Department of Information Technology, has been involved in the majority of the U of L's videoconference initiatives over the years.

In the summer of 2003, the CRDC began developing the VcAlberta.ca website. The backbone of this website was a videoconferencing directory listing the various videoconference suites throughout the province of Alberta. The intention of the website was to create a professional community of videoconference users in the province. It was designed to share promising practices and innovative uses of the technology. The ultimate goal of the site is to help improve the quality of videoconferencing within the Alberta educational community.

In Fall 2003, the CRDC, in collaboration with Athabasca University, and the Galileo Educational Network, began researching the uses of videoconferencing in five kindergarten to grade twelve (k-12) schools in the province of Alberta (Anderson et al, 2005). The research looked at the use of videoconferencing for administrative meetings, classroom enhancement activities, professional development opportunities, and distance delivery.

In spring 2005, an English 1900 class at the University of Lethbridge piloted the use of videoconferencing for undergraduate distance education. This course was delivered entirely on campus. A first year English class was divided into two groups, with a professor at one location and a teaching assistant at the other. Although plagued with technical difficulties, the research indicated potential for the use of videoconferencing in undergraduate distance education (Woods, 2005). In the Fall 2005 and Spring 2006, videoconferencing was used for distance delivery of undergraduate courses to students in the Crowsnest Pass area of Southern Alberta.

In Fall 2005, the CRDC completed an innovative practices video series on the uses of videoconferencing to support k-12 educators (Hinger, Mrazek, & Woods, 2005). These videos highlighted innovative practices in the use of pedagogical videoconferencing from around the province. Four videos were created to illustrate student engagement, classroom management, professional development, and videoconference etiquette.

In 2005, as part of an Alberta Education initiative, the Faculty of Education modified an existing graduate level program to the Peace River School District to include a blended learning model that specifically emphasized the use of videoconference

learning. The Faculty of Education has a long tradition of customizing ways to engage graduate learners in order to enhance their distance learning experiences. With the often-considerable physical distance between learners and instructors, videoconferencing was viewed as a potentially valuable tool to emulate face-to-face communication. This would not only save on travel time for faculty, but also provide opportunities for more frequent teacher-learner contact.

Although there have been a number of research projects that have examined the use of videoconferencing in Alberta educational contexts, very few have focused on the use of videoconferencing for blended course delivery or explored the benefits of this type of learning experience. This project will draw on current research regarding full course delivery, with the intent of expanding the community of knowledge through innovative uses of the technology. This research contends that videoconferencing increases access to courses at a distance, and improves student relationships/interactions in distance learning environments (Hinger, Mrazek & Woods, 2005). The Alberta Education SuperNet initiatives have increased the availability of videoconferencing throughout the province; research is necessary to ensure the effective pedagogical use of this technology.

The Videoconference Classroom Technology and Environment

This section describes the technological setup and room design of the videoconference systems used throughout the January 2005 through December 2006 implementation of this study.

Instructors used two styles of videoconference classrooms during the two-year period of this study. For classes with more than three local participants, lecture style videoconference facilities were used (Figure 1). In these rooms, the instructor was free to

sit as a member of the audience or as a presenter from a podium at the front of the room (Figure 2). The audio for these rooms consisted of wireless lapel microphones for the instructor, and desktop based bush button style microphones for the students (Figure 3).

Figure 1: Large VC Room

Figure 2: Large VC Room Podium

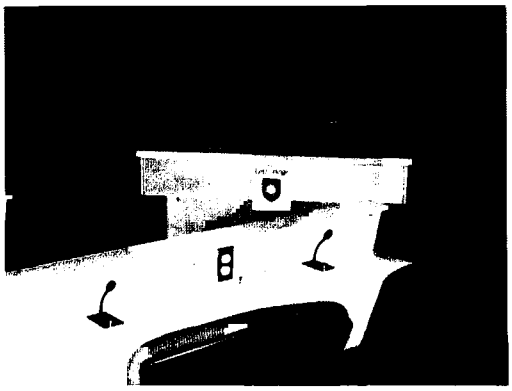
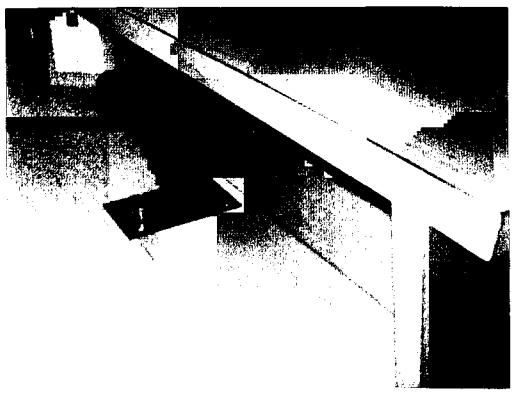
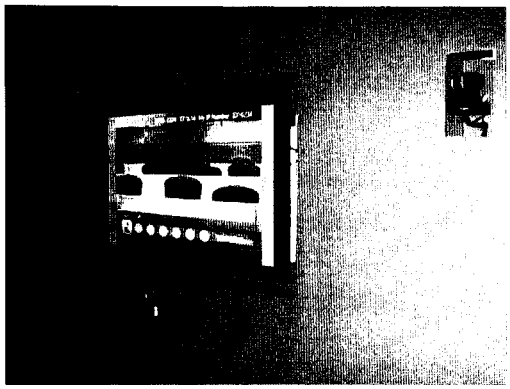


Figure 3: Push Button Microphone



When a participant pressed the desk button, the microphone was turned on, and a camera at the front of the room automatically turned on and focused in on them. These larger rooms combined several cameras for optimal flexibility, and coverage of all locations in the room (Figure 4).

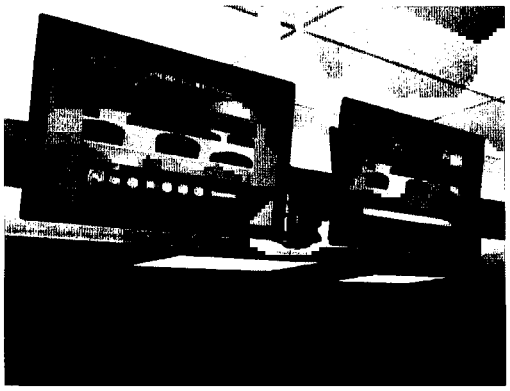
Figure 4: Large VC Room Cameras



The larger videoconference suits consisted of large data projections at the front of the room for the audience (Figure 5), and plasma displays for the instructor when the podium was used (Figure 6).

Figure 5: SMARTBOARD

Figure 6: Instructor Plasma Displays



When the local participants consisted of fewer than four students, a smaller conference room was used. In this location, the instructor would sit with the students at a desk facing a single videoconference monitor system (Figure 8). The audio for this smaller room consisted of one area boundary microphone that could pick up the audio from all participants (Figure 9).

Figure 8: Small VC Room

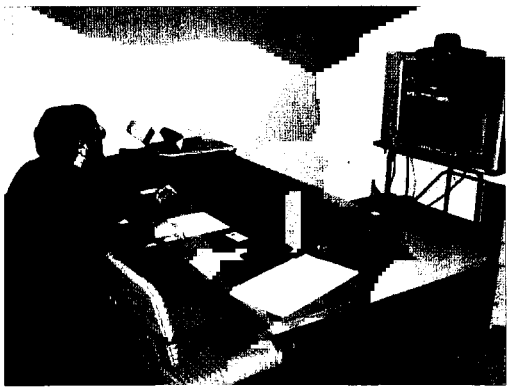
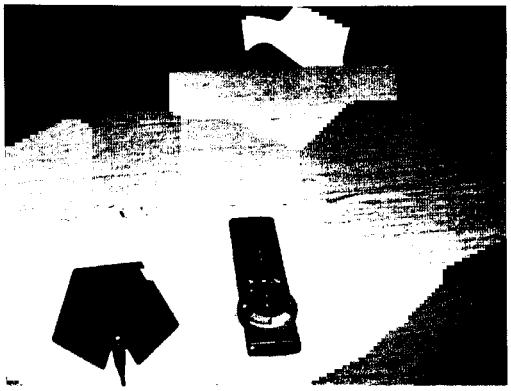


Figure 9: Area Boundary Microphone



The videoconference suites used for remote students consisted of two room styles. Early courses used boardroom type setups with oval tables. Two television displays located at the end of the table would act as monitors for the videoconference. In later courses, students were able to attend using videoconference classrooms located in schools. These rooms were usually set up in rows with a combination of televisions and large data projectors. All of these rooms used area boundary microphones to capture participant audio.

Research Question

Main Question:

In what ways does the use of videoconferencing impact graduate student learning in a blended learning environment?

Nested Questions:

- What are the relationships between the pedagogical tools used in a graduate class, as they relate student satisfaction in the course?
- What relationship exists between the use of technology in a graduate course and students' perceptions and satisfaction?
- What are the student perceptions of using videoconferencing in a blended learning environment?
- What are instructor perceptions of using videoconferencing in a blended learning environment?
- What supportive technologies are needed to support videoconferencing in distance learning?

Glossary of Terms

The following is a glossary of terms defined as they are used throughout this paper.

Bridgit – An electronic desktop sharing and collaboration application. Bridgit is a registered trademark of SMART Technologies.

IP – Internet protocol: A method by which information is sent over a network between two computers.

ISDN – Integrated services digital network: A telecommunications service through which digital data is transmitted.

SMART Board – An interactive electronic white board. SMART Board is a registered trademark of SMART Technologies.

SuperNet – A high speed IP based network connecting government office, schools, universities, colleges, health-care facilities, and libraries throughout Alberta.

Technical – Referring to the physical digital technology and its uses.

Technological – Refers to the pedagogical implementation of technology.

Videoconference – Synchronous video and audio communication between two or more individuals at a distance.

Literature Review

Educational technology increases our capacity to create new learning opportunities for students in remote and distant locations. Broadening knowledge through increased access to information is a key role of education (Hilton, 2006). In an effort to meet the demands of a changing society, educators are evaluating strategies to increase access to quality, accessible, and affordable education. The increased availability, reliability, and reduced cost of technology make it the logical solution for expanding access to education.

Appropriate use of technology is not the solution to all of the problems facing distance education. It is a tool invented to assist us in everyday life (Tapscott, 1998; Blacker, 1994). Adapting teaching strategies to take full advantage of the potential of this tool to meet the educational needs of students is one of many challenges facing educators today. It is important to align educational strategies with appropriate technologies to meet the specific needs of the course curriculum (Matthews & Reiss, 1995).

Educators must learn to incorporate a variety of educational technological tools available to create an engaging learning environment. One of the responsibilities of educators today is to develop pedagogical strategies to empower this new learning environment. The key to success will be to evolve current teaching strategies to keep the emphasis focused on interactive learning environments, where technology is used to maintain and stimulate teacher-student and student-student interaction (Watts, 2003).

This literature review focuses on identifying several key pedagogical concepts that have been successful in online, videoconference, and blended learning environments. Researchers have been publishing key findings on the impact of technology for several

years. It is the responsibility of researchers to focus on identifying innovative practices in an effort to continue moving forward toward the goal of creating effective learning environments.

Online Learning

The increased use of technology in education is leading toward a more learner-centered approach (Levine, 2005). Online learning environments are ideal for creating student-tailored educational experiences. Easily customizable online tools allow students to work at their own pace, and to personalize their learning experience. The tools incorporated into distance learning allow flexibility to meet the specific needs of students (Cavanaugh, 1999).

Online learning environments have shown great potential in their ability to create communities of practice (Menlove, Hansford & Lingnugaris-Kraft, 2000). Using asynchronous tools, students are able to share ideas and collaborate on common learning objectives. The diverse knowledge that students bring to these learning communities creates increased learning opportunities (Overbaugh & Lin, 2006). Student-student interaction is easily encouraged through sharing of coursework, collaborative projects, and interactive assignments. Collaborative peer response exercises have been successful in online learning environments in their ability to increase interaction and student satisfaction (Ge & Er, 2005). Atkinson (1999) suggests, through studying the physical and psychological barriers that distance education learning environments create, educators can begin to develop strategies to increase communication.

Evaluating and designing new instructional models is vital to establishing effective interaction in a distance-learning environment (Mortera-Gutierrez & Murphy,

2000). Evolving to meet the needs of a post-industrial or postmodern student population will involve creating new instructional models (Davies, 2000). Universities are finding it necessary to adapt to this new population and find ways to continue the life-long learning process. Distance education initiatives offer adults increased access to a variety of learning opportunities that can be tailored to work around family and career commitments (Menlove, Hansford & Lingnugaris-Kraft, 2000). Finding ways to enhance these distance learning environments will be important as educators continue efforts to evolve education in ways that meet the changing needs of today's students.

Videoconferencing

Videoconferencing has been identified in recent years as a new distance educational tool capable of meeting the needs of a technologically diverse student population. It can eliminate barriers created by distance, and provide extended access to content experts for students in remote locations. Videoconferencing has been utilized as a communication and training tool in the business world for years (Badenhorst & Axmann, 2002). It provides a fiduciary benefit to large corporations in its ability to cut down on costs and eliminate travel time.

Historically, videoconferencing required a substantial investment in human resources and infrastructure. The high costs associated with establishing videoconference facilities limited its use in the business world to large multi-national corporations, although many telecom companies offered the use of videoconference facilitates to companies for hourly rental fees. These early videoconference adopters relied heavily on expensive ISDN (Integrated Services Digital Network) data phone lines to carry the high bandwidth required for a two-way synchronous interaction. ISDN lines provide

guaranteed dedicated bandwidth, however, the long distance and service charges associated with them are substantial (Wikipdedia, 2007). As the availability of high bandwidth network access is becoming more prevalent throughout North America, many companies are abandoning ISDN based videoconferencing for IP-based communication. (GigaOM, 2006; Gusnowski, 2006).

The high cost of videoconferencing equipment and required dedicated bandwidth has also limited the use of videoconferencing as an educational tool. Nevertheless, educational videoconferencing has been implemented and researched for a number of years. Australia was one of the early adopters of videoconferencing, and has been experimenting with the educational uses of the technology for many years. However, the slow connection speeds, high costs, and poor reliability of the technology have been limiting factors in most of the early educational videoconference courses (Mitchell & Schiller, 1993).

The increased availability of high bandwidth IP-based network infrastructure is increasing the availability of videoconferencing as an educational tool. Specifically in Alberta, the completion of SuperNet in September 2005 has enabled k-12 and post secondary institutions throughout the province access to the quality network infrastructure required to support videoconference initiatives (Alberta Education, 2006). A number of videoconference research projects have been published on the use of IP-based videoconferencing in the province of Alberta (VcAlberta, 2007), and initial research has shown great potential for the use of the technology in post-secondary distance education (Odell, Francis, Eaton, Reynolds & Mason, 2002; Woods, 2005).

Anderson et al (2003) completed a comprehensive videoconference literature review which is available for download from the VcAlberta.ca website. This literature review is part of a larger videoconference research paper (*videoconference research community of practice*, 2005), also available on VcAlberta.ca. This initial literature review suggests that there are several factors necessary to insure a successful videoconference learning environment. The videoconference portion of this literature review will focus expand on Anderson's literature review by focusing on defining the technological and pedagogical strategies most successful in ensuing a successful videoconference experience.

Technical

The technical setup, reliability, and performance of videoconference facilities are essential factors in the success of a videoconference learning environment (Sanderson, 1992). If not configured properly, the technology can limit student engagement and quickly interfere with active learning (Atkinson, 1999; Woods, 2005). Student acceptance of the technology is directly correlated with reliability of the technology (Selim, 2005). Poor audio, video, and technical difficulties can interfere with the learning process (Badenhorst & Axmann, 2002). Designing a successful videoconference learning environment involves multiple aspects of network configuration, audio/video production techniques, and integration of supportive technologies (Sonnenwald, Solomon & Hara, 2003).

Network Configuration. Network reliability is key to the success of the videoconference environment. High-dedicated uninterrupted bandwidth is necessary when implementing any synchronous communication technology such as

videoconferencing (VIDe, 2006). H.323 videoconferencing is a standards based protocol that can be setup to traverse firewalls and work on a variety of network configurations. More recent technologies, such as gatekeepers and boarder controllers, are enabling a more seamless integration of the technology into existing network infrastructure (Packetizer, 1999).

Videoconferencing in the Alberta Education system runs on the provincially funded SuperNet infrastructure. The SuperNet network incorporates a Quality of Service (QoS) protocol, which increases performance and reliability for real-time synchronous communication technologies such as videoconferencing (Axia, 2006). QoS allows network facilitators to "tag" network packets in an effort to set priority for them during network traversal. E-mail for example, does not need dedicated bandwidth, so it can run at high or low speeds of connectivity. For these types of non-critical asynchronous applications the QoS would be set at a low priority. Videoconferencing needs constant bandwidth; therefore it would be tagged as high priority in QoS. A simple way to think of this is to think of the carpool lane on a freeway; applications such as videoconferencing are given priority over other traffic on the network.

Audio Quality. Audio is the most important aspect of any videoconference environment. It is far easier for a videoconference participant to adapt to poor video; however, communication is nearly impossible if they cannot hear the remote site (Woods, Hinger, Cambell, 2005). The best way to ensure a successful videoconference experience is to guarantee the quality and reliability of the audio. In a videoconference environment there are generally two main sources of audio: participant audio resulting from communication between students and instructors, and supportive technology audio.

Woods (2005) concludes the best method for achieving the highest quality of audio from instructors is through the use of a dedicated wired or wireless lapel microphone.

Audience or student participant audio is a more complicated issue to resolve. Large area boundary microphones can cause excess background noise. For this reason many videoconference facilities implement "push-button" microphones for individual participants (Woods, 2005). Fuchs and Varhagen (2004) conclude the push-button microphones impede classroom interaction, and an always-on microphone model can greatly increase the speed and frequency of classroom interaction.

Video Quality. Increased audio communication and quality is essential to creating a successful videoconferencing learning environment. If audio is the most important aspect, then why is there such emphasis on combining video into the experience? Why not simplify the technology and concentrate on audio-graphics communication?

Human beings communicate more than 93% of their feelings non-verbally (Marwijk, 2005). Mehrahian and Ferris (1967) conclude that only 45% of all communication is contributed through verbal communication, the other 55% of human communication is through body language. Increased communication in a learning environment is essential to increasing a successful learning outcome. The ability to communicate through body language and facial expressions can increase student participation (Atkinson, 1999). Similarly Darn, Lebury & White (2004) emphasize the importance of eye contact on classroom participation and engagement. Proper camera placement, and room design can help to facilitate eye contact, and create a more interactive and natural learning environment (Woods, 2005).

Room Design

The success of pedagogical videoconferencing is heavily dependant upon the technology and the environmental setup (Schiller & Mitchell, 1993; Selim, 2005). Videoconference environments are often conducive to the technological requirements. Although it is recommended to sacrifice local interaction for remote interaction (Woods, 2005), it is also important to incorporate videoconference technology into a natural learning environment (Mrazek, Woods, & Hinger, 2006).

Supportive Technologies

The success of a videoconferencing environment depends not only on the technological setup of the videoconference room, but also the addition of supportive synchronous technologies that support interaction and engagement (Mrazek, Woods, & Hinger, 2006). Research has shown that videoconferencing alone is not enough to create an effective learning environment (Hinger, Mrazek, & Woods, 2005). It is important in any learning environment to identify the combination of technologies that is best suited to support the learning outcomes (Mathews & Reiss, 1995).

Woods (2005) describes the use of a document camera in which the instructor was able to duplicate a teaching exercise that had proven effective in face-to-face classes. Anderson et al (2005) describes increased student engagement through the use of document cameras, DVD players, and interactive white board technologies. Mrazek, Woods, and Hinger (2006) identify the ability to increase student engagement through the combination of videoconferencing and interactive white board exercises. The use of visual and supportive technologies can increase the student interaction and act as an additional method to connect the students with the course content (Atkinson, 1999).

Supportive technologies are easily incorporated into the videoconference environment and in many cases can provide added interactivity to the learner experience (Flynn, 2005). The key is identifying the appropriate technologies and designing our learning materials to meet the technological environment in which they are being used.

Engagement

There seems to be little doubt of the direct correlation between student engagement and student satisfaction and achievement (Kuh, 2004; Marks, 2000; Shea, Swan, Fredericksen & Pickett, 2001). Jones and Klopfenstein (1997) describe the difficulty in a videoconference class of keeping students at remote locations engaged in learning activities. Increasing student engagement is essential to the success of pedagogical videoconferencing. Increased student interaction can increase students' interest and perceptions in a course (Moreta-Gutierrez & Murphy, 2000). Students' perceptions of the technology are important to the success of the videoconference classroom (Selim, 2005).

Atkinson (1999) concludes that student interaction is highest when the videoconference is organized into relevant discussion sessions. Relating the content to the student's personal experience, calling on the students by name, limiting lecture times to 15 minute sessions, increasing discussion visuals, and utilizing interactive teaching strategies can greatly increase student engagement (Thoms, 1997).

Videoconferencing is unlikely to replace the face-to-face learning environment. The psychological implication of presence that characterizes a traditional classroom is difficult to replicate in a virtual space. However, the use of videoconferencing is a suitable substitute when face-to-face meetings are not viable (Homfray, 2007). The

technology can create opportunities for increased instructor-student and student-student communication in a distance education course. Increased communication can increase student motivation (Ehrmann, 1996).

Blended Learning

Understanding the individual learner can help identify the best teaching strategies to maximize communication at a distance (Mathews & Reiss, 1995). Identifying the individual needs and learning styles of students can help implement the appropriate blend of technologies to best suit their learning needs. The use of blended learning environments increases the ability to apply the appropriate technologies to specific tasks throughout the learning process.

Donnelly (2006) describes traditional blended learning as the combination of face-to-face classroom interaction with an online learning environment. The increased use of this term in education is expanding the definition of blended learning to include a multitude of learning environments. In undergraduate classes, educators often combine a blend of technologies to support the classroom learning experience. This new definition of blended learning is often associated with explicit reference to the blend of different learning strategies and tools into a learning environment (Vignare, 2006).

Blended learning has pedagogical implications for this new mode of delivery that involves the incorporation or a mix mode of technologies in an effort to supplement and compliment existing curriculum (Driscoll, ND). Dede (1996) notes that emergent technologies have the practical means of enriching the learning experience. Combining asynchronous and synchronous communications educators can begin to design new models of engagement (Rossett, Douglis & Frazee, 2003).

Blended learning environments have proven to be more efficient and effective than online-only distance courses (Singh, 2003). The blended learning environment encourages active learning, while maintaining a degree of self-directive learning (Derntl & Motsching-Pitrik, 2003). This mixed modality-learning environment encourages the development of new pedagogical methodologies. Design and implementation of these new strategies will require an evaluation of teaching and learning practice.

Key to the success of developing new blended pedagogy is faculty development (Mortera-Guiterrez & Murphy, 2000). Instructors must gain an understanding on how to effectively use technology to create a successful blended learning environment (Chrichton, 2006). The most successful blended learning environments are creatively designed to provide rich and stimulating educational settings (Thorne, 2003). The new delivery model encourages a collaboration of technical and pedagogical expertise.

Shaw and Igneri (2006) outline several best practices for successful blended learning environments. It is important to centre the blended learning on the students, incorporating their diversity of experiences and motivation each individual brings to the group. Keep the structure of the course simple at first and build upon the blend of technologies used over time. Use a variety of instructional and pedagogical strategies when designing a blended course. Finally, use a variety of technology and work on effectively integrating the appropriate technologies for the learning outcomes.

A critical component in any blended learning modality is the learner (Koohang, Britz, Harman & Seymour, 2006). Learner preparation is important to the success of the blended learning environment. Most learners are experienced with interacting in a classroom environment; learning in a blended modality often requires more guidance as

to the expectations and process (Painter, 2007). The technologies and methods used in blended learning environments are often foreign to students. Training students on the practical uses of technology is important in preparing them for the blended learning environment.

Woodall (2005) outlines eight key steps of blended learning; "prepare me, tell me, show me, let me, check me, support me, coach me, connect me". The key is identifying which of these steps are most suited to which technology. Online components can remove time constraints for adult learners, and increase access to educational opportunities (DeNeui & Dodge, 2006). Integrating this with face-to-face interaction can help to provide structure and increased opportunities for deep interactions (Motteram, 2006).

As universities continue to compete in the recruitment of students, new models of educational delivery must be considered to bring the educational experience to the learner (Edmonson & Segalewitz, 2005). Videoconferencing is showing great potential as the next mode of delivery for the blended learning model. The ability to increase access to qualified instruction, while maintaining face-to-face interactivity can improve student satisfaction and engagement in distance education.

Examining new distance modalities is key to educators' continuing effort to meet the life-long learning needs of a changing student demographic. Faculty preparation, technical support, and student preparation are going to be important factors in designing new pedagogical strategies suited to new blended learning environments. Research is showing great potential for emergent technologies, but a review of the literature has shown a need for more detailed study on the impacts of these technologies on student learning.

Methodology

This research study is a detailed evaluation of a single course offering using videoconferencing in the setting of a larger videoconferencing initiative. As such, videotaped classes and interviews from previously offered courses will be used as baseline data for a portion of the research. The research data from the current course was gathered through videotaped classroom observations, student interviews, professor interviews and an online student questionnaire. Videotaped observational and interview data provides an opportunity for the researcher to review the data collected, and can greatly increase the reliability of the qualitative data (Mertler & Charles, 2005). A multi-methodological approach was used in the analysis of this data. Open-ended interview responses will be triangulated with descriptive findings from the survey analysis.

Baseline Data from 2005-2006

Blended learning videoconference courses offered from January 2005 until April 2006 were recorded as part of a videoconference distance education initiative supported by funding from Alberta Education. In an effort to identify strengths and areas for improvement, faculty and students were interviewed. These interviews were used as data collection for the phase I report and in the design of future course offerings. In this research project, the data from phase I was used as a baseline to establish observational strategies and interview questions relative to the existing videoconference environment. The recorded videoconference sessions from Phase I were combined with the observational data from the Fall 2006 course and presented as one set of data.

Observational Data

The Fall 2006 Education 5510 videoconference classes were videotaped, analyzed. The following criteria were used during the observation of these classes:

- The technical configuration of the room used, including network setup and reliability, audio quality, and video quality.
- apparent comfort of the instructors and students with the technology,
- level of interaction and engagement of students at both the local and remote sites,
- student-instructor rapport during the videoconference classes,
- student-student rapport during the videoconference classes,
- the effectiveness of multi-site videoconferences in comparison with point-to-point sessions,
- impact of supportive technologies used during the classes,
- and the level of technical support and its impact on the learning environment.

Interview Data

Interviews were conducted in January 2006 with two students from the remote locations, as well as three videoconference instructors. These interviews were used to validate the results of the online survey (Appendix A). The interviews were administered at the end of the course, and conducted by videoconferencing for students at the remote location. The student interview questions were based on the online survey and observational data collected (Appendix B). The instructor interview questions (Appendix C) were based on classroom observations and geared toward gaining insight into how using videoconferencing compares with previous experiences in blended learning, online learning, and face-to-face classroom environments.

Online Survey

An online survey (Appendix A) was administered to all ten of the students enrolled in the Fall 2006 videoconference course. The survey was used to provide quantitative and qualitative data to triangulate with the observational data. The survey focused on videoconferencing and the other technologies used in the delivery of the course, and measured students' perceptions of the effectiveness of the technologies used.

Analysis of Data

The data collected from January 2005 through to April 2006 was analyzed to create a baseline against which to compare the data collected during the Fall 2006 videoconference course. The observational data was integrated with student and instructor interviews to create the baseline for this research project.

The observations collected by the researcher during class and through reviewing class videotapes were analyzed. This data was used to describe the setting, observed student perceptions, and innovative practices used during the videoconference blended learning course.

Open-ended student and instructor interview questions were based on the classroom observations. These were used to examine student and instructor perceptions that may not be apparent in the online survey. Analysis of the qualitative interview and observational data followed Neuman's (1997) suggested process of thematic conceptualization, open coding, axial coding, and selective coding.

An online survey was conducted at the end of the Fall 2006 semester and the results have been correlated and reported. The online survey was created by the CRDC to allow the data to be exported into a CSV file. This file was then cleaned up in a

spreadsheet program (Microsoft Excel) for mathematical and statistical analysis. The use of an online database and computer software in the collection and analysis of the quantitative data greatly increases the reliability and validity of the quantitative data (Mertler & Charles, 2005).

Results

The following are the results of the multi-methodological collection processes.

Observational Data

Five videoconference classes were observed by the researcher for data collection from January 2005 until December 2006. The classes were all videotaped for further observation and data collection. The following is summary of field notes and review of videotaped videoconference courses organized under the primary themes that emerged from the observations.

Technical

From January 2005 until December 2006 the technical setup of the videoconference environment has evolved. The observed technical setup and reliability of the videoconference classes has been broken into three distinct topics: the network quality, audio quality, and video quality.

Network Quality. The initial course offered in the spring 2005 semester was a multi-site conference involving the University of Lethbridge, the Peace River Health District, and a student with a home desktop H.323 application. The sessions used a bridge to connect an ISDN and a home broadband Internet service together in a single call. The stability of this session was less than reliable. The connection was continually plagued with packet loss and dropped connections.

In September 2005, a dedicated SuperNet virtual private network (VPN) was created between the Peace River District office and the University of Lethbridge. This connection guaranteed bandwidth to the videoconference, and resulted in uninterrupted

videoconference sessions. The downside to this connection was the inability to offer multi-site connectivity.

In January 2006, the SuperNet connection was reconfigured to once again allow multi-site connectivity. The QoS connectivity of the SuperNet provided an uninterrupted connection.

Audio Quality. Audio quality in the first few videoconference courses offered was less than ideal. The audio from the desktop software based videoconference unit was low in quality and often caused technical interruptions to the classes.

When limited to point-to-point conferences, the audio quality improved dramatically. It allowed for smoother, uninterrupted two-way conversations between sites. Multi-site conference audio quality was highest when all sites would remain muted when not talking throughout the conference. This limited spontaneity of the conversation, and required the instructor to take a more facilitative role in guiding the interactivity of the sessions.

Video Quality. The overall video quality of the videoconference classes was quite good. The only issue arose during the integration of the desktop videoconference session in the early classes. During these courses the multi-site bridge was in a voice switched mode and did not always recognize the site speaking and correctively switch the video signal on the screen. This caused complications for the technician, who was not always able to resolve the issue manually. When all sites used a hardware based videoconference codec, the video quality was high.

Comfort with Technology

Instructor comfort level with the videoconference technology varied dependant upon the individual instructor. Noticeably, all of the instructors appeared to gain confidence and comfort with teaching using the technology within a few classes.

Student comfort levels increased dramatically when one student took responsibility for running technical components of the class. This student gained a quick understanding of using the camera presets, and mute buttons. The confidence of one student appeared to alleviate the technical concerns of the entire class at the remote site.

Student comfort with interacting over the videoconference also varied dependant upon the individual. Some students appeared to be comfortable interacting via videoconference from the first course, while others appeared to take almost a whole course to get used to the idiosyncrasies of the technology.

Student Engagement

The instructors throughout the courses experimented with various student engagement activities. Some instructors included student presentations as the main component of the videoconference sessions. In one course student presentations were designed to be 10 minuets in length, with question and answer periods to follow each presentation. The question and answer sessions were highly interactive and often had to be abbreviated due to time constraints.

When professors lectured for extended periods of time, there was a noticeable drop in student participation and perceived engagement. Professors who limited their lectures to 10-15 min at a time, and included a Socratic approach of questioning were

able to stimulate more interactive learning sessions, than those who lectured for long periods of time.

Student-Instructor Rapport

The students appeared to quickly build a good rapport with the instructors in spite of the distance and technology between them. A highly effective method in creating student-instructor rapport was having the instructor visit the remote site for the first videoconference class. Although the student-instructor rapport appeared strong in all the videoconference classes, the face-to-face initial meeting appeared to create a more natural learning environment faster than when the instructor was only introduced via the videoconference and online tools.

Student-Student Rapport

Across the videoconference and online systems, the student-student rapport appeared to take a number of classes to build. Once students grew comfortable with interacting over the technology, the student-student rapport appeared to increase quickly so that by the end of the first videoconference course, student interaction was similar to that of a traditional classroom.

Multi-site Delivery

Multi-site conferences appeared to increase the observed technical and interactivity barriers in the videoconference sessions. Audio problems increased considerably and interactivity did not appear to flow as naturally. One or two sites heavily dominated the conversations in multi-site conferences. Only in one course did the instructor show an ability to steer the conversation between all the sites, and balance the interactivity from all the students.

Supportive technologies

There was good use of synchronous supportive technologies in some of the classes observed, although the technical setup of the videoconference room often dictated the use of supportive technologies. The videoconference rooms designed with data projectors were more effective in the use of desktop computer sharing. One instructor was able to overcome the limits of only having televisions on the remote site, by using the universal access functionality built into his laptop. This allowed the instructor to zoom in on specific portions of his computer screen, making graphics and text easier to see at remote sites.

Before the introduction of the Bridgit conference server in Fall 2006, instructors were limited in their ability to send only one video feed to remote sites. This meant the instructors could send either video of themselves or an image from their supportive technology such as the computer, or DVD player. This single video signal decreased the interactivity of activities and caused the learning exercises to easily become instructor directed and didactic.

In September 2006 a Bridgit conference server was installed. The technology allowed the instructor to share his computer desktop or SMART board directly to the SMART board of the remote site. This video signal was separate from the videoconference stream, and therefore, allowed the students at both locations to see the instructor and his computer simultaneously. The large display and more natural integration of the computer increased the effectiveness of integrating the computer into the videoconference class.

Technical Support

Technical support appeared highly involved in the setup and support of the online components of the course. Instructor and technical consultation took place on an ongoing basis. The technical support person was present for all of the videoconference classes. The technician monitored the technology throughout the classes, leaving the instructor free to concentrate on teaching. A collaborative working relationship quickly became apparent when observing interactions between the technical support personal and the instructors. The technical support person appeared to be an integral part in making the videoconference courses successful.

Administrative Interview

Administrative Objectives

The Assistant Dean of Graduate Studies at the University was interviewed in an effort to understand the Faculty of Education's motivation for using videoconferencing in a blended learning environment to deliver graduate level programming. The Assistant Dean emphasized four key advantages of using a blended videoconference environment.

The first was the need for increased access to graduate programming for teachers in rural and remote communities where access to university level professional development opportunities has been limited to traditional or online distance education. He suggests it was "set up so that people can actually take advantage of the courses in their work environment and closer to home."

A second advantage was financial consideration. The Assistant Dean contended that it was "much more viable in terms of being able to limit the cost to the students and still have the engagement between the instructor and themselves". However, the Assistant

Dean insisted that it was "not only financial but more for pedagogical reasons we started looking at the videoconferencing".

The Assistant Dean emphasizes that the third advantage was the need for blended learning environments…

> *"to try and bring a little bit more of the atmosphere of a regular classroom. One of the challenges we have had with the distance engagement and delivery of our courses has been really trying to get the participation of the students on an ongoing basis. In an online setting...they (students) miss the spontaneity. Blended learning provides the compliment of having the videoconferencing available which...gives them that face-to-face contact...as well as the online support where they can then work at their own pace for the majority of the course".*

The fourth advantage of using videoconferencing as a substitute for face-to-face interaction in a blended learning environment was the…"potential blending of cohorts…3 or 4 different districts participating in common courses…. because of the diversity of experience within those districts it's an enhanced learning environment for those students".

Instructor Interviews

The interviews with instructors in the videoconference blended learning environment consisted of informal interviews throughout the courses offered, and formal videotaped interviews. Three instructors, each with more than 25 years teaching experience, were formally interviewed during the data collection process for this project. Two of the instructors interviewed had more than 25 years experience teaching at the

undergrad level, and 23 years at the graduate level. All three instructors were new to teaching in a blended videoconference learning environment over the last three years.

Several common themes emerged from all the instructors during the interview process; the following is summary of those themes with supporting transcriptions from the videotaped interviews. The three instructors interviewed will be referred to as X, Y, and Z in the following transcriptions.

Increased Access

The first topic that arose from all three instructors was the benefits of using blended videoconference environment to increase access to life long learning for educators in the field. The instructors felt the use of a blended videoconference learning environment increased educational opportunities.

Instructor X

"The real cutting edge of our program is in the field...so the more I could use online support resources then this made it seamless for my students that no matter where they were placed they would have access to the same resources. When you start blending that in terms of the use of videoconferencing it means they also have contact with you on an ongoing basis...in this case what you could do on a weekly basis is have the class set up for an hour or two hours...they could come out of those classrooms and have their ideas fresh in mind from what they've dealt with all day and be able to apply them in their class."

Instructor Z

"For the courses that I've got and the location of the people, I don't have a better way, this is the better way for me"

Online Tools

The second theme mentioned by all three participants was the advantages and disadvantages of using online asynchronous communication tools for distance education. When discussing the pedagogical advantages of online communication the instructors made comments like…

Instructor Y

"One of the things I like, particularly using the online material, is the ability to post the material and interact in an asynchronous kind of mode...because you can carry on long term conversations about an article, you can post things in advance, give people a chance to look at it view responses over time, so you're not driven by the classroom clock."

Particularly in blended learning environment, the instructors made comments about the uses of online including…

Instructor X

"You want to make sure you have the conceptual components and information available to your students well in advance."

Instructor Y

"Collect information, what are you doing,"

Instructor Z

"Setting them up for success by having them send me questions in advance they want answered on the VC."

Instructor X commented on the ability to use the asynchronous online tools to video podcast the previous lectures for students unable to attend videoconference sessions.

"Accommodate people who weren't able to attend...we were able to post that session...it accommodated those few occasions when they couldn't participate"

All of the instructors agreed on the negative aspects of online learning,

Instructor Y

"The downside is you loose the immediacy of the communication"

Instructor Z

"With online only learning everyone is moving at their own pace and often...we'd start to lose student."

Benefits of Videoconferencing

The instructors felt that videoconferencing was a good substitute for the face-to-face interactivity needed to supplement the asynchronous online learning tools.

Instructor Z

"The videoconference class is more like a regular class there's a group of students that shows up and they've got everything done and they're absolutely ready, and there's a few students show up and they're going to wing it for a while until they get caught up in the class, and that's what

you find in so many classes anyway... When we had a student in Medicine Hat, two in Lethbridge, one in Calgary, one in Fairview and several in Peace River there was simply no sensible way we could have gotten those people together expect by old fashion correspondence other than using the videoconference so that they all got to see each other every Saturday, and got to talk to each other every Saturday. It's a fantastic saving of time and energy and it gives us a tremendous focus."

Instructor Training

All of the instructors commented that they had experienced videoconferencing in some manner prior to teaching in a videoconference classroom. The consensus between all the interviewees was that there is a need for increased instructor prep time.

Instructor Z

"I'm not as adept as I would like to be with using software like Bridgit, even using the camera...I'm not as responsive as I would like to be. I need to spend the time to develop the skills, this is another set of skills"

Comfort with technology

The instructors commented on the need for establishing an initial comfort level with the technology prior to teaching in the blended learning environment.

Instructor X

"Getting rolling with it you begin to understand some of the opportunities that are there, and limitations."

Instructor Y

"Watch some videoconferencing classes, practice where it doesn't matter...so that you become comfortable with the technology...become familiar with the technology before the first day of class. ...Cognizant of some of the bits of etiquette, and the bits of things you can and can't do. As long as the display is setup properly you can very quickly forget that the people you are talking to are hundreds of miles away, and it's as if you're working in a regular classroom...Once you're comfortable with the technology...the lesson becomes the lesson, not the technology"

Planning / Prep Time

The instructors all agreed their planning and preparation to teach in a videoconference environment was crucial to its success.

Instructor Y

"It took some planning to ensure that you force some of the two-way communication. I can't fly by the seat of my pants...when I'm using videoconferencing...and the supportive technologies that go along with it, I have to ensure that it's well prepared and be very conscious of pacing. Think very carefully, what do I want to accomplish. We have two hours tonight, where do I need to be...in terms of an outcome, what kind of learning outcome should we have arrived at, at this point, build materials and pacing around that. With the videoconferencing you need to ensure that you're building in opportunities for that connectivity, I had to make

sure I built into my lesson plan, stop here and ask questions, stop here and discuss this point"

Instructor Z

"Should be about the same over the course of the whole program, initially it's more time because I'm not as skilled with the technology and the integration of the technology. You have to be a full month ahead, start planning in December for the course that starts in January"

Pedagogical Strategies

The instructors interviewed all insisted that teaching in a videoconference environment was similar to teaching in a face-to-face environment. They make comments like…

Instructor X

"The use of videoconferencing allows me to use that repertoire of skills I normally would use in a classroom...it is much easier when you have part of your class directly in front of you...but through time what happens is you start to blend the two into one classroom."

Instructor Y

"Make the learning lessons close to what I would hope to achieve in a normal classroom."

Instructor Z

"Once I get used to the fact that...it is no different than any other classroom I like that environment...Once I got used to the idea that the

class was sitting in front of me virtually rather than sitting in front of me physically..."

When asked to discuss their individual teaching strategies they made comments such as...

Instructor X

"I get that kind of feedback in an ongoing basis because of the videoconferencing, especially when it's every couple weeks rather than once a month."

Instructor Y

"I feel interactive teaching and interactive pedagogical style is the only one that I find really powerful."

Instructor Z

"Using a Socratic approach to the development of discussions and the surfacing of concepts...slow down, check the perceptions, ask for a little bit more, ask for the kinds of follow up questions that explore at the level of analysis rather than simply at the level of yes/no or recall or even some basic application."

Student Engagement

A common theme that surfaced in all the interviews around effective teaching strategies was the need to ensure student participation and engagement during videoconference classes.

Instructor X

"You have to reappraise your teaching styles and how you engage people. Being careful not to become an orator...focus on my questioning strategies and make sure I involve everyone at a distance, especially when they are in multiple sites. Steer...that face-to-face time...focusing on the engagement component...have the students presenting more of the information..."

Instructor Y

"Pick people out...you have to stop and say what do you think about that, how would that fit with your reality."

Supportive Technologies

The instructors all agreed supportive technologies could greatly enhance the videoconference learning environment.

Instructor X

"The SMART board is ultimately one of the best tools that you can integrate...being able to spontaneously direct the discussions and the focus...being able to have my students then respond and provide their views, their conceptual interest through the smart board I think is basically one of the foremost tools available to us now."

Instructor Y

"If the bandwidth can support it, it's almost crucial to a videoconference depending on what you're doing. In a true seminar class, that just a face-to-face videoconference...can work really well. The minute you're

presenting material it's critical to be using a piece of technology like the Bridgit with the SMART board. You have to be careful of what you present, you have to think about how am I going to engage people thousands of miles away with what they're viewing on their screens...what does this look like at their end."

Support

The instructors all insisted quality technical support was necessary to ensure a successful learning environment.

Instructor X

"Support is everything, it's absolutely crucial, knowing that you have the support there...you can focus on your content and your class. Surrounded by talented people...who are not only fluent with the technology but have the insights as to the potential use and appropriate pedagogical use of those technologies. Having a safe environment to experiment with this, to find out the limitations, but also to view the benefits, I think that environment is very important. Having the opportunity to discuss what worked, what didn't work...is very important."

Advice

The following are experts of the interviews identifying key concepts and advice for instructors who are new to the videoconference learning environment.

Instructor X

"The more we become cognitive and fluent with the technology that's there now the better we can adapt to other technologies."

Instructor Z

"It's not an online learning community, it's the regularity and the certainty that we can get together and share with each other and help each other on a regular basis even though we're at a great distance...makes them fell they're getting something out of the course beyond just completing assignments."

Student Interviews

Several informal student interviews were administered throughout the Peace River program. These interviews were designed to verify qualitative observational data gathered during the videoconference courses. Following the completion of the online student survey, two students were formally interviewed to verify, and elaborate on some of the informal interview and survey results. The following is a summary of the topics that emerged from these interviews, along with supportive transcriptions from the formal student interviews referred to below as student A and B.

Online Tools

When asked which online tools were most beneficial to their learning process the two students made comments such as…

Student B

"I liked where you could post an assignment or a comment that needed to be responded to by another student. And you could read everyone else's as well".

Student A

" The chat...a place where you can have discussions back and forth...the ability to access the readings and go back and forth to them, the way the syllabus is constructed...the timelines."

When asked to discuss the online videos, and audio tutorials the two students made comments such as…

Student B

"It gave you an opportunity to hear it and follow along when you're reading it and then also try the practice, click here, do this and it leads you to that and it was less stressful to know that you had that trial run at least to get used to the technology before you had to invest in an assignment or posting something."

Comfort with Technology

The two students interviewed reported that the reliability of the technology and student comfort with the technology was important to the success of the videoconference system. They made comments such as…

Student A

"It's all about the technology, how comfortable people are with using it is what makes it or breaks, it. When we first started...none of us were familiar with the technology...we had a huge number of drop off line, can't hear you, technical issues...not knowing what people are hearing and seeing is a freaky kind of experience."

Student *B*

" It probably took about 3 or 4 sessions...before I felt comfortable to speak and know that I was being heard and seen on the other end."

When asked what were some of the strategies that helped alleviate technological fears, both students agreed that having someone at each location in charge of running the technology was helpful.

Student B

"It was nice that someone volunteered to take the responsibility for us...because then I didn't have to worry about, is it going to be on, do I have to dial, where to zoom. I just have to be a student in the class."

Benefits of VC Over Straight Online

Both students agreed having face-to-face interaction via videoconferencing was far superior to straight online distance education courses they had taken.

Student A

"It gives me that sense of a class and a group that sometimes is lacking in straight online material. I think you get a deeper understanding of content when you're able to discuss it with people"

Student B

"I didn't realize how much I liked it until I took that course...that was strictly online, and there was no opportunity to see the instructor...or speak to him, or see the other students and have a conversation...videoconference allows for that dialog that electronically can still happen but is a little bit slower process"

Supportive Technologies

Both students agreed that an increased use of synchronous supportive technologies could enhance the learning experience.

Student A

"I enjoyed having the SMART board there...it's been a good way to share things in this class back and forth".

Student B

"It's great to have the Brigit because you can see what's going up and see the people at the same time...we could share from both ends and be posting and see and then have a discussion about it."

Pedagogical strategies

The two students interviewed agreed some pedagogical practices were more effective than others when videoconferencing was used. The students emphasized the need for limited lecture times and increased student interaction when learning using videoconferencing.

Student A

"Discussion in a videoconference is a little more deliberate because you make sure that every site is heard from."

Student B

" People would shut off the sounds and then they would start talking if it went to long. Even a 10-15 minute kind of a thing, just so that there's an idea and it's being presented and shown a couple of different sides of

it...and then having a discussion about it and then maybe going back to another piece of the lecture."

Student B gave the following example of an engaging learning strategy used.

"When the professor would do a little bit of a lecture and then show us a clip and then we'd write some notes and then we'd have a discussion...that was a more traditional classroom kind of setting that still worked on videoconference."

Student Online Survey

The following is a summary of the results of the twenty-five question online survey students completed in December 2006. Eight out of the ten students responded to the survey (80% completion rate). Quantitative and qualitative responses to the online survey are presented below.

Question 1: How many graduate level courses have you taken to date?

Table 1: Response to Question 1

# of Courses	n	%
12	2	25%
11	3	37.5%
1	2	25%
0	1	12.5%

The survey results show that 62.5% of the students surveyed have completed more than 11 graduate level courses prior to the completion of the survey. This implies the students have an understanding of graduate level expectations and educational practices.

Question 2: How many graduate level courses have you taken using videoconferencing?

Table 2: Response to Question 2

# of courses	n	%
8	1	12.5%
6	1	12.5%
5	2	25%
2	1	12.5%
1	2	25%
0	1	12.5%

More than half of the students surveyed had completed at least one videoconference course prior to taking this course. This implies many of the students are familiar with using videoconferencing for distance learning.

Question 3: Compared to other videoconference courses you have taken this course was.

Table 3: Response to Question 3

	n	%
Worse	1	12.5%
About the same	1	12.5%
Better	3	37.5%
This was my first course	3	37.5%

When asked what made this course better than previous videoconference courses they had taken students commented the "more frequent VC sessions were more effective" in keeping them engaged. The one student who felt the course was worse than previous VC courses taken commented the shorter sessions did not allow enough time for "extended thoughts, discussions and exchange of ideas".

Question 4: How long did it take you to become comfortable with videoconferencing?

Table 4: Response to Question 4

	n	%
Less than one month	5	62.5%
About one month	2	25%
More than 2 months	0	0%
Still not comfortable	0	0%

All of the students surveyed felt they were comfortable with the videoconference technology within the first month of the course, implying that after the first month the technology did not interfere with their learning.

Question 5: Compared to a face-to-face classroom experience, the videoconference experience is:

Table 5: Response to Question 5

	n	%
Worse	2	25%
About the same	6	75%
Better	0	0%

The two students who thought the videoconference experience was worse than a face-to-face commented that the experience was "not quite as good, however an excellent alternative", "about the same as a traditional lecture experience". The other 75% of students who considered the experience about the same made commented, "as long as participants are given the opportunity to interact" and "just like face-to-face and much better than going online"

Question 6: What do you like about taking a course through videoconferencing?

All of the students commented they liked the ability to see and interact with the professor and students at remote sites in "live" discussions. One student commented "it adds to the online environment, allowing students to feel as if they are part of the class"

Question 7: What don't you like about taking a course through videoconferencing?

Table 6: Response to Question 7

n	
2	technical issues may arise
1	difficult to concentrate
2	availability and location of VC equipment can be an issue
1	no opportunity to chat privately with professor and classmates

The majority of students surveyed appear to feel the logistical and technical issues of videoconferencing were the main hindrances in the courses they took. This implies that technical difficulties can hinder the educational experience of students in a videoconference course.

Question 8: Compared to a face-to-face class, how were you able to interact with the professor through videoconferencing?

Table 7: Response to Question 8

	n	&
Worse	0	0%
About the same	8	100%
Better	0	0%

All of the students surveyed felt interaction with the instructor over the videoconference system was about the same as in a face-to-face classroom, suggesting that the technology did not interfere with student-instructor relationship building.

Question 9: My ability to get to know the teacher using videoconferencing is _____compared to a face-to-face class.

Table 8: Response to Question 9

	n	%
Worse	3	37.5%
About the same	5	62.5%
Better	0	0%

Only 3 or the students surveyed felt their ability to get to know the instructor over videoconferencing was worse than if they were in a face-to-face classroom. This suggests that the majority of students felt the technology did not interfere with student-instructor rapport.

Question 10: I am comfortable presenting using videoconferencing?

Table 9: Response to Question 10

	n	%
Strongly disagree	0	0%
Disagree	2	25%
Neutral	2	25%
Agree	3	37.5%
Strongly Agree	1	12.5%

Over half of the students felt comfortable presenting during a videoconference session. This implies that videoconferencing is an effective mode of delivery for student presentations.

Question 11: I am less likely to contribute verbally in a videoconference class.

Table 10: Response to Question 11

	n	%
Strongly disagree	2	25%
Disagree	4	40%
Neutral	2	25%
Agree	0	0%
Strongly Agree	0	0%

The survey data shows that 65% of the students surveyed felt they were just as likely to contribute verbally in a videoconference class, as they would be in a face-to-face class. This suggests that student interaction and engagement over videoconferencing is not limited by the technology.

Question 12: My ability to focus in a videoconferencing class is _____ compared to a face-to-face class.

Table 11: Response to Question 12

	n	%
Worse	2	25%
About the same	6	75%
Better	0	0%

The data shows that 75% of the students' who felt their ability to focus in a videoconference class was about the same as in a face-to-face class. This implies instructors were able to maintain student engagement during the videoconference classes.

Question 13: Would you consider taking another class by videoconferencing?

Table 12: Response to Question 13

	n	%
No	0	0%
Yes	8	100%

All of the students suggested they would consider taking another class by videoconferencing. They made comments such as: "the next best thing to face-to-face", "I prefer VC to online", and "It is the best option for a distance based class"

Question 14: Based on my experience I would prefer to take a class

Table 13: Response to Question 14

	n	%
Via VC only	0	0%
Via web based tools only	0	0%
Using a combination of VC and Online Tools	8	100%

All of the students preferred learning in the blended videoconference environment and made comments such as: "Having both would facilitate a variety of learning styles",

"the combination can make the best of both mediums", "Higher interaction than strictly online courses".

Question 15: What could be done to improve the videoconference experience?

Students commented on the desire to improve technical glitches with audio, and connectivity. One student commented "possibly an online tutorial on how to use the videoconference material or suggestions about how to present would alleviate some of my anxiety."

Question 16: The quality of the video is

Table 14: Response to Question 16

	n	%
Insufficient	0	0%
Sufficient	2	25%
Good	6	75%

The students who thought the video quality was good made comments such as, "the professors/participants can be clearly seen". Students who thought it could be improved made comments such as, "technology of course has its limits, but it gets the job done".

Question 17: The quality of the audio is:

Table 15: Response to Question 17

	n	%
Insufficient	1	12.5%
Sufficient	4	50%
Good	3	37.5%

Over half the students commented the audio could be improved and made comments such as: "on occasions the audio has cut out", "instructor would not talk directly into the microphone", "when people speak into the microphone they are easy to

comprehend." These comments imply the audio during the videoconference sessions could be improved.

Question18: What advice would you give a graduate student experiencing a class using videoconferencing for the first time?

When asked if students had advice for future graduate students they made comments such as: "It is the same as a face-to-face class" and "be an active participant/learner".

Question 19: The use of the SMART board during videoconference classes increased the overall quality of the lesson.

Table 16: Response to Question 19

	n	%
Strongly disagree	0	0%
Disagree	0	0%
Neutral	3	37.5%
Agree	2	25%
Strongly agree	3	37.5%

Over half of the students felt that when used the SMART board increased the overall quality of the videoconference classes. This suggests the benefit of using a SMART board in a videoconference classroom is not conclusive.

Question 20: The video podcasts used in this course enhanced the overall experience.

Table 17: Response to Question 20

	n	%
Strongly disagree	0	0%
Disagree	0	0%
Neutral	5	62.5%
Agree	3	37.5%
Strongly agree	0	0%

Only 37.5% of the students surveyed felt the video podcasts enhanced the overall experience of the course, the majority of the students were neutral on the question.

Question 21: The place I watch to the video podcasts the most was:

Table 18: Response to Question 21

	n	%
At home	4	50%
At school	1	12.5%
Other	3	37.5%

The 37.5% of the students who selected other commented they didn't listen to the available podcasts. This suggests the use of podcasts in a blended environment may require further investigation.

Question 22: The reflections / discussion boards enhanced the overall experience of the course:

Table 19: Response to Question 22

	n	%
Strongly Disagree	0	0%
Disagree	2	25%
Neutral	1	12.5%
Agree	5	62.5%
Strongly Agree	0	0%

The 25% of students who felt the reflection/discussion tools did not enhance the experience made comments such as: "I found VC a much more effective discussion venue than the online", "interacting using VC was superior to the interaction you get through the reflection tools."

Question 23: The online portion of this course I found the most useful was:

Students commented they "liked the resources and course readings available online", "the assignment exemplars", "the podcasts", and "the schedule of activates".

Question 24: What could be done to improve the online experience?

Students suggested the distance learning experience could be improved through "maintaining more frequent videoconference sessions", "an informal chat area to discuss a given reading or topic", and "more regular podcasts."

Question 25: Please provide any other comments you may have regarding the blended environment experience in Education 5510?

The students made other comments about the course such as: "the blended environment is a great experience", "it is the best alternative to being face-to-face in University", "the method of running a class every two weeks made it easier to keep pace with the work and the interface with other students also made the class more meaningful".

Analysis and Discussion

Technical

The success of the blended learning environment is highly dependent upon the reliability and quality of the technology used. When asked to comment on what they didn't like about taking courses via videoconferencing, 50% of the students referenced availability and reliability of the technology. When asked how the videoconference experience could be improved, students again commented on the need to "improve the technical glitches". This is consistent with the literature which suggests reliability of the technology is key to the student acceptance of the technology and the success of the learning (Atkinson, 1999; Selim, 2005; Woods, 2005).

Network Quality

The completion of SuperNet during the pilot project of this course provided consistent QoS and uninterrupted bandwidth which appears to have solved many of the technical glitches that plagued the early classes.

Audio Quality

Of the students interviewed 87.5% confirmed the audio quality during the videoconference sessions was "sufficient to good". However, students' comments and the observational data suggest that the number one hindrance to active learning was audio problems. Students often struggled hearing the professor, and quieter students were often hard to hear. Although the audio quality was sufficient, the results suggest improvements could be made to enhance the videoconference audio.

Video Quality

Of the students interviewed 75% stated the quality of the video was good. The remaining 25% of the students stated it was sufficient, but could be improved. This is consistent with the observational data, and instructor interviews. The quality of the video when the technology was working properly was quite good. One key to this was having facilitators at each site who would zoom in on the student talking. When the camera was zoomed out on all the participants the instructor was still able to see the individual participants, however their facial expression and body language was often hard to see.

Comfort with Technology

The importance of student and instructor comfort with technology was evident through all three research results. Students and instructors both commented that, once they were comfortable with the technology, it quickly faded into the background and the videoconference became a natural learning environment.

The same importance of comfort with technology for the online tools was also apparent in the results. Students commented on the benefit of having interactive video tutorials to walk them through the online tools.

Students and instructors both suggest that there is a need for introductory sessions or tutorials to allow time to explore the technology and gain a comfort level with it. The videoconference technology did have a short introduction, however, students commented that a self-paced approach similar to the online tool tutorials would have been beneficial.

Support

Technical support was a key factor that appeared in both the observational and instructor interviews. Instructors commented that their comfort with the technology was

increased substantially knowing there was a qualified technical person available. The instructors all commented that it was important the technologist understood both the technical and pedagogical implications implicit in the effective implementation of the lesson.

This need for knowledgeable technical support was apparent in all aspects of the blended learning environment. It is supported by students' comments that having a technology lead at their site greatly alleviated their concerns about interacting with the technology.

Supportive Technologies

The use of synchronous supportive technologies was limited in this case study. The majority of the classes observed consisted of interactive seminars. The technologies that were used showed great potential to enhance the learning process. The research results supports the benefit of using supportive technologies such as video and computers in the videoconferences.

The SMART board, supported by the Bridgit software, was only used occasionally in the last course observed. It showed enormous promise as a tool to increase engagement opportunities. Of the students interviewed, 62.5% felt the SMART board increased the overall quality of the lessons, and all of the instructors agreed it will be an important technology for future courses.

Online Tools

Students and instructors all commented they liked the asynchronous support the online tools provided. The assignment exemplars, access to resources and podcasts were

all highlighted as important components of the blended learning experience. The students suggested the inclusion of more podcasts and an informal chat area would be beneficial.

Pedagogical Practice

Results of all three research components suggest appropriate pedagogical strategies are important to the success of the blended videoconference environment. The instructors suggested that although the videoconference classes allowed them to draw on many of the teaching skills they would use in a normal classroom, it also forced them to re-evaluate their teaching practice. Students and instructors commented on the need to limit lecture time, and emphasized interactivity. This supports the literature and the observational data that suggest interactivity and engagement are key to the success of videoconferencing.

Engagement

The literature suggests student engagement is key to the success of the videoconference learning environment (Hinger, Mrazek, Woods, 2005). This was apparent in the classroom observations and in both the student and instructor interviews. Students and instructors commented on the importance of creating an engaging learning environment. One instructor commented that it is important to use the online asynchronous tools to prepare students prior to the videoconference class; this increased his success in creating active learning sessions.

Frequency

The students and instructors commented that increasing the frequency of videoconference classes enhanced their overall experience in the courses. Scheduling the

face-to-face videoconference time bi-weekly as apposed to bi-monthly appears to increase the success of the blended learning environment.

Rapport

Of the students interviewed 62.5% suggested that they were able to get to know the professor as easily in a videoconference as they were in a traditional face-to-face class. 100% of the students believed they could interact with the professor the same in a videoconference as they could in a face-to-face class.

Site visits emerged as an excellent way to enhance student-instructor rapport. When done at the beginning of a class, the student-instructor interaction over the videoconference sessions evolved more rapidly.

Student-student rapport across the videoconference appeared to take time to develop. It increased substantially through the use of student-student activities through the online asynchronous tools. Student presentations and student marked assignments were both highlighted as effective methods of increasing student-student rapport.

Multi-Site Delivery

Evaluation of the effectiveness of multi-site videoconference courses varied. The students and professors both commented that multi-site conferences provided unique learning environments. The ability to bring together students from diverse locations expanded educational perspectives and the diversity of the class discussions.

One aspect of the multi-site conferences that was consistent throughout the findings was its negative impact on interactivity. Multi-site conferences hindered more natural conversation and increased technical issues, although some instructors appeared to be able to overcome this through classroom facilitation techniques.

Blended Learning

Although the majority of this study focused on the use of videoconferencing, there is evidence to suggest the combination of videoconferencing in online learning distance education can greatly enhance the graduate student learning experience. All eight of the students confirmed they preferred the blended learning environment to solely online or exclusively videoconference courses. Students commented that the "blended learning environment was a great experience, and the best alternative to face-to-face". Instructors commented on the ability to increase interactivity and engage students through multiple modalities.

Increased Access

Increased access to education is a recurring theme, which appears in both the research results and the literature review. The research results suggest that blended learning appears to be an effective method of increasing access to quality education for distance education students.

Impact on Teaching

All of the instructors interviewed commented on how the experience in the videoconference classes has impacted their overall teaching style. They commented on how the experience made them more cognizant "on just how much time students stay engaged", and the need to use a variety of teaching and engagement techniques in all of their classes.

Recommendations

The multi-methodological design of this study has increased the reliability of the data and results. Although heavily focused on the impact of videoconferencing in the blended learning environment, the results suggest blended learning is an effective mode of graduate level distance education. Videoconferencing is a suitable substitute for face-to-face interaction, and can increase the affordability and access of qualified instruction to distance education students.

The technology used in this study was circumscribed due to technical limitations during the early courses offered. The emerging technologies that were added over time appeared to enhance the blended learning environment. The increased reliability of the videoconference technologies over time appeared to increase interaction and student engagement. The results suggest increased audio and video quality can greatly enhance the learning experience.

Although, the low number of students in the class limits the statistical significance of the results, the study identifies best practice models that may benefit the design of future blended learning courses at the University of Lethbridge. As such the results of this study provide reasonable answers to the main and nested research questions used in the design of the study. A study of multiple videoconference courses compared with similar online or face-to-face blended learning courses may be necessary to further substantiate the results of this study.

The technology and pedagogical practices used in a blended learning environment impact students' perceptions and satisfaction. Selim (2005) suggests student satisfaction is important in ensuring success in videoconference courses and this study supports his

theory. The students in this study seemed to be satisfied with the technology used and the results suggest the blended environment was a success.

Best Practices Summary

The following is a short list of suggestions derived from this study identifying key factors necessary to ensure a successful videoconference blended learning environment.

Course Preparation

1. Ensure the technology is configured properly and working.
2. Ensure quality, consistent and uninterrupted audio at all sites.
3. Include qualified educational technologist during design of the course.
4. Plan frequent videoconference sessions.
5. Prepare instructors to teach in a blended environment.
6. Plan and prepare learning strategies and outcomes well in advance.
7. Ensure instructor comfort with the technology prior to the first day of class.
8. Ensure the appropriate design and integration of online tools.
9. Ensure the availability of online resources, readings and activities.

Ongoing practices

1. Ensure qualified educational technologies are available and participate actively during implementation stages.
2. Identify videoconference technical leads at all sites.
3. Build in student training to increase comfort with technology.
4. Use appropriate supportive technologies when ever possible.

5. Established strong student-instructor rapport prior to using face-to-face meetings or during the first videoconference.
6. Establish student-student rapport early through interactive VC or online activities.
7. Use a variety of teaching strategies and technologies to ensure student engagement.
8. Ensure the appropriate technologies are used for the appropriate tasks.
9. Limit lectures to 10 minuets max.

Recommendations for Further Study

The results of this study suggest more in-depth research is necessary in all aspects of the blended learning environment. The following is a list of suggested future research topics;

1. The impact of increased use of synchronous communication technologies on videoconference classes.
2. The impact of podcasts on student learning in online and blended learning environments.
3. The comparison of High Definition (HD) to Standard Definition (SD) audio and video quality and its impact on student engagement and learning in pedagogical videoconferencing.
4. The impact of diverse multi-site videoconference learning environments on student learning

Conclusion

Using videoconferencing in a blended learning environment is showing great potential as an effective modality to increase access to quality educational experiences. As new technological innovations appear educators must continue to evaluate the best blend of tools appropriate to meet the demands of their students and the curriculum. Technology will continue to evolve, as such educators must continue to evolve pedagogical strategies in order to take full advantage of its potential as an educational tool.

References

Anderson, T., Rourke, L., Chernish, R., Smith, P., Mrazek, R., Woods, T., Hinger, D., Friesen, S., Gladstone, B., & Edney, J. (2005). Videoconference research community of practice report. Retrieved December 10, 2006 from http://www.vcalberta.ca/community/Research_Summary_Report_word_version_final.pdf

Anderson, T., & Rourke, L. (2005) Videoconference in kindergarten-to-grade 12 settings: A review of the literature. Retrieved December 10, 2006 from http://www.vcalberta.ca/community/litreview.pdf

Alberta Education (2006). SuperNet backgrounder. Retrieved December 12, 2006 from, http://www.education.gov.ab.ca/technology/SuperNet/SuperNetBackgrounder-Nov2006.pdf

Atkinson, T., R, Jr. (1999) Toward Understanding of Instructor-Student Interactions: A Study of Videoconferencing in the Postsecondary Distance Learning Classroom. Louisiana State University (ERIC Document Reproduction Services No. ED 457847)

Axia (2006). Real broadband quality of service. Retrieved February 7, 2007 from, http://axia.com/documents/networks/SP_Services/Axia%20Real%20Broadband%20Quality%20of%20Service.pdf

Badenhorst, Z., & Axmann, M. (2002). The educational use of videoconferencing in the arts faculty: Shedding a new light on puppetry. *British Journal of Educational Technology, 33(3)*, 291-299

Blacker, D. (1994) Philosophy of technology and education: An invitation to inquiry. *Philosophy of Education.* Retrieved January 15, 2007, from http://www.ed.uiuc.edu/EPS/PES-yearbook/94_docs/BLACKER.HTM

Cavanaugh, C.S. (1999). The Effectiveness of Interactive Distance Education Technologies in K-12 Learning: A Meta-Analysis. University of South Florida, Tampa (ERIC Document Reproduction Services No. ED 430547)

Chrichton, S. (2006). Preparing teachers to facilitated blended learning. Retrieved February 1, 2006, from http://pcf4.dec.uwi.edu/viewpaper.php?id=318&print=1

Darn, S., Ledbury, R., & White, I. (2004) The Importance of Eye Contact in the Classroom. *The Internet TESL Journal, 10(8).* Retrieved June 24, 2005, from http://iteslj.org/Techniques/Greer-Pronunciation_of_LR.html

Davies, T. (2004) Changing schools of thought: Back to the future. *Research in Education, 71*, 9-16.

Dede, C. (1996). Emerging technologies and distributed learning. *American Journal of Distance Education, 10(2)*, 4-36.

DeNeui, D., & Dodge, T. (2006). Asynchronous Learning Networks and Student Outcomes: The Utility of Online Learning Components in Hybrid Courses. *Journal of Instructional Psychology, 33(4),* 256-259.

Derntl, M., & Motsching-Pitrik, R. (2003). Patterns for blended, person-centered learning: Strategy, concepts, experiences, and evaluation. Retrieved Feb 1, 2007 from, http://elearn.pri.univie.ac.at/derntl/papers/TR-20033004-Patterns.pdf

Donnelly, R. (2006). Blended problem-based learning for teacher education: lessons learnt. *Learning, Media & Technology, 31(2),* 93-116.

Driscoll, M. (ND) Blended learning: Let's get beyond the hype: IBM Global Services Retrieved February 1, 2007, from http://www-8.ibm.com/services/pdf/blended_learning.pdf

Edmonson, C.P., & Segalewitz, S. (2005). *Proceedings of ASEE Annual Conference and Exposition '05: A blended online engineering technology course using web conferencing technology.* Portland, OR: USA

Ehrmann, S.C. (1996). Implementing the seven principles: Technology as a lever. Retrieved April 11, 2006 from http://www.tltgroup.org/programs/seven.html

Flynn, N. (2000). Building Partnerships for a 21st-Century Community College. *EDUCAUSE Quarterly, 4*, 34-37.

Fuchs, A., & Varnhagen, S. (2004) RACOL Final report: Final report of the evaluation team: Education evaluation sub-group. Retrieved June 29, 2005, from http://www.racol.ualberta.ca/publications.html

Ge, X., & Er, N. (2005). An online support system to scaffold real-world problem solving. *Interactive Learning Environments, 13(3),* 139-157.

GigaOM (2006). Videoconferencing…it's hot again. Retrieved February 6, 2007 from http://gigaom.com/2006/10/23/video-conferencing/

Gusnowski, R. (2006). Pedagogy & videoconferencing: Using new technologies in the classroom: Using videoconference technologies effectively in the classroom. Retrieved March 1, 2007 from http://www.vcalberta.ca/community/Videoconferencing_Pedagogy_v2.0_October_2006_Presentation_Notes.doc

Packetizer (1999). H.323: A primer on the H.323 series standard. Retrieved February 1, 2007 from http://www.packetizer.com/voip/h323/papers/primer/

Hilton J. (2006). The future of higher education: sunrise or perfect storm? *EDUCAUSE 41(2)*, 58-71. Retrieved April 9, 2006, from http://www.educause.edu/apps/er/erm06/erm0623.asp.

Hinger D., Mrazek, R., Woods, T. (2005). Best practices in pedagogical videoconferencing [video series], Retrieved December 10, 2006, from http://www.vcalberta.ca/community/videos.cfm

Homfray, T. (2007). CAUGHT ON CAMERA. *Strad, 118(1401)*, 34-40.

Jones, C. M., Klopfenstein, Bruce C.(1997) And the Walls Came Tumbling Down: Augmenting the Distance Educational Experience. Bowling Green State University, OH. (ERIC Document Reproduction Service No. ED 427753)

Koohang, A., Britz, J., Seymour, T. (2006). *Proceedings of Informing Science and IT Education Joint Conference '06: Panel Discussion hybrid/blended learning: Advantages, challenges, design and future directions.* Retrieved Feb 1, 2007 from http://proceedings.informingscience.org/InSITE2006/ProcKooh121.pdf

Kuh, G., D. (2004). The national survey of student engagement: Conceptual framework and overview of psychometric properties. Retrieved Feb 3, 2007 from http://nsse.iub.edu/2004_annual_report/pdf/2004_Conceptual_Framework.pdf

Levine, A. (2005) Leadership: All the glitters. *EDUCAUSE 40(2)*, 8-9. Retrieved April 9, 2006, from, http://www.educause.edu/apps/er/erm05/erm0525.asp

Marks, H., M. (2000). Student engagement in instructional activity: Patterns in elementary, middle, and high school years. *American Educational Research Journal, 37(1),* 153-184.

Marwijk, F. (2004). Body Language: The Language Everybody Speaks (S. van Leendert, Trans.). Bodycom Lichaamscommunicatie, the Netherlands. Retrieved June 21, 2005 from http://www.lichaamstaal.nl/english/bodylanguage.html?communication.html

Matthews, D., Reiss, J.(1995). Guide to Instructional Videoconferencing. (Report No. MCJ-127413). Florida Univ., Gainesville Institute for Child Health Policy. (Eric Document Reproduction Service No. ED 396716)

Mehrabian, A., & Ferris, S. R. (1967). Inference of Attitudes from Nonverbal Communication in Two Channels. *Journal of Consulting Psychology, 31(3),* 248-258.

Menlove, R., Hansford, D., & Lignugaris-Kraft, B. (2000). Creating a community of distance learners: Putting technology to work. Capitalizing leadership in rural education: Making a difference for children and families. (ERIC Document Reproduction Services No. ED 439890)

Mertler, C. A. & Charles, C. M. (2005). *Introduction to educational research* (5th ed.). Boston: Allyn & Bacon.

Mitchell, J., Schiller, J. (1993). Interacting at a distance: Staff and student perceptions of teaching and learning via video conferencing. *Australian Journal of Educational Technology, 9(1),* 41-58. Retrieved June 25, 2005, from http://www.ascilite.org.au/ajet/ajet9/schiller.html.

Mortera-Gutierrez, F., Murphy, K. (2000) Instructor interactions in distance education environments: A case study. Texas A&M University. (ERIC Document Reproduction Services No. ED 439292

Motteram, G. (2006). Blended education and the transformation of teachers: a long-term case study in postgraduate UK higher education. *British Journal of Educational Technology, 37(1),* 17-30.

Mrazek, R., Woods, T., & Hinger, D. (2006). Case study of videoconferencing in Prairie Rose School Division No. 8: An extension of the videoconference research community of practice report for Alberta Education. Retrieved October 2006 from, http://www.vcalberta.ca/community/Prairie_Rose_Videoconference_Report_Executive_Summary.pdf

Neuman, L., W. (1997). *Social research methods: Qualitative and quantitative approaches* (3rd Ed). Boston: Allyn and Bacon.

Odell, E. W., Francis, C., A., Eaton, K. A., Reynolds, P., A., & Mason, R., D. (2002). A study of videoconferencing for postgraduate continuing education in dentistry in the UK – the teachers' view. *European Journal of Dental Education, 5(3),* 113-119

Olivero, F., John, P. & Sutherland, R. (2004). Seeing is believing: using videopapers to transform teachers' professional knowledge and practice. *Cambridge Journal of Education, 34(2).*

Overbaugh, R., & Lin, S. (2006). Student characteristics, sense of community, and cognitive achievement in web-based and lab-based learning environments. *Journal of Research on Technology in Education, 39(2),* 205-223.

Painter, D. (2006). Missed Steps. *T+D, 60(7),* 10-11.

Rossett, A, Douglis, F. & Frazee, R. (2003). Strategies for Building Blended Learning, Retrieved February 3, 2007, from http://www.learningcircuits.org/2003/jul2003/rossett.htm

Sanderson, D. (1992). The CSCW implementation process: An interpretative model and case study of the implementation of a videoconference system. Retrieved February 5, 2006, from http://delivery.acm.org/10.1145/150000/143550/p370sanderson.pdf?key1=143550&key2=4686870711&coll=portal&dl=ACM&CFID=13700173&CFTOKEN=65960452

Selim, H., M. (2005). Videoconferencing-mediated instruction: Success model. *International Journal of Distance Education Technologies, 3(1),* 62-80. Retrieved June 27, 2005, from http://www.igi-online.com/downloads/pdf/ITJ2667_QFBKROCW8L.pdf

Shaw, S., Igneri, N. (2006). Effectively implementing a blended learning approach. Retrieved February 3, 2007, from http://adlcommunity.net/file.php/11/Documents/Eedo_Knowledgeware_whitepaper_Blended_Learning_AMA.pdf

Shea, P., Swan, K., Fredericksen, E., & Pickett, A. (2001). Student satisfaction and reported learning in the SUNY learning network: Interaction and beyond – social

presence in asynchronous learning networks. Retrieved February 1, 2007, from https://urresearch.rochester.edu/retrieve/6545/Student+Satisfaction+2001.pdf

Singh, H. (2003). Building effective blended learning programs. *Issue of Educational Technology, 43(6), 51-54.* Retrieved February 1, 2007 from, http://badrulkhan.com/framework/blended-learning.pdf

Sonnenwald, D., H, Solomon, P., Hara, N. (2003). Collaboration in the Large: Using Video Conferencing to Facilitate Large Group Interaction http://spruce.bhs.hb.se/dis/downloads/video-conf-08chap.pdf

Tapscott, D. (1998) *Growing Up Digital: The Rise of the Net Generation.* New York: McGraw-Hill.

Thoms, K.J. (1997). A systematic approach to training faculty to teach via a two-way interactive television system. (ERIC Document Reproduction Services No. ED 430517)

Thorne, K. (2003). *Blended learning: How to integrate online & traditional learning.* London, UK: Kogan Page Limited.

VIDe (2006). Popular collaboration technologies. Retrieved February 1, 2007, from http://www.vide.net/cookbook/cookbook.en/list_page.php?topic=3&url=H323_hardware.htm&level=1&sequence=1&name=H.323

Watts, M. M. (ed.) (2003) Technology: Taking the distance out of education. *New Directions for Teaching and Learning, 94.*

Woodall, D. (2005) White paper: Eight phases of workplace learning: A framework for designing blended programs. Retrieved Jan 10, 2007 from

http://www.skillsoft.com/infocenter/whitepapers/documents/EightSteps_Paper.pdf

Woods, T. J. (2005) Instructor and Student Perceptions of a Videoconference Course. (Masters Project, University of Lethbridge, 2005).

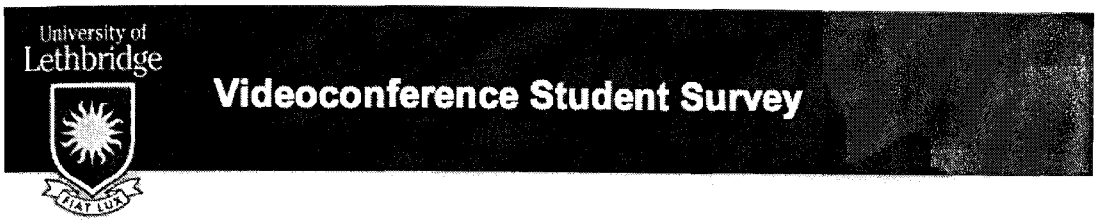
Woods T., Hinger D., & Cambell, K. (2005). Proceedings of Broadband Summer Institute 2005. How can we improve our videoconferences. Retrieved August 30, 2005, from http://www.vcalberta.ca/bbsi/canmore/improve_our_vc_woods_hinger_campbell.pdf

Wikipedia.(2007.) Integrated services digital network. Retrieved January 15, 2007, from http://en.wikipedia.org/wiki/ISDN

VcAlberta (2007). VcAlberta: Documents: A list of videoconference research papers and videos published on the VcAlberta website. Retrieved March 10, 2007, from http://vcalberta.ca/documents/index.cfm

Vignare, K. (2006). Blended learning: Education innovation & productivity. Retrieved Jan 15, 2007 from http://campustechnology.com/articles/40730

Appendix A Student Online Survey



Please respond to the following questions based on your experience in Education 5510ol at the University of Lethbridge. Please note all of your answers will remain anonymous and secure.

Thank you for your time.

David Hinger, Researcher

1) How many graduate level courses have you taken to date?

2) How many graduate level courses have you taken using videoconferencing?

3) Compared to other videoconference courses you have taken this course was:

- ○ Worse
- ○ About the Same
- ○ Better
- ○ This was my first course

Why?

4) How long did it take you to become comfortable with videoconferencing?

- ○ Less than one month
- ○ About one month
- ○ More than 2 months
- ○ Still not comfortable

5) Compared to a face-to-face classroom experience, the videoconference experience is

- ○ Worse
- ○ About the Same
- ○ Better

Please explain:

6) What do you like about taking a course through videoconferencing?

7) What don't you like about taking a course through videoconferencing?

8) Compared to a face-to-face class, how were you able to interact with the professor through videoconferencing?

- ○ Worse
- ○ About the Same
- ○ Better

9) My ability to get to know the teacher using videoconferencing is _____compared to a face-to-face class.

- ○ Worse
- ○ About the Same
- ○ Better

10) I am comfortable presenting using videoconferencing?

- ○ Strongly disagree
- ○ Disagree
- ○ Neutral
- ○ Agree
- ○ Strongly Agree

11) I am less likely to contribute verbally in a videoconference class.

- ○ Strongly disagree
- ○ Disagree
- ○ Neutral
- ○ Agree
- ○ Strongly Agree

12) My ability to focus in a videoconferencing class is _____ compared to a face-to-face class.

- ○ Worse
- ○ About the Same
- ○ Better

13) Would you consider taking another class by videoconferencing?

- ○ No
- ○ Yes

Please explain:

14) Based on my experience I would prefer to take a class

- ○ Via VC only
- ○ Via web based tools only
- ○ Using a combination of VC and Online tools

Please explain:

15) What could be done to improve the videoconference experience?

16) The quality of the video is

- ○ Insufficient
- ○ Sufficient
- ○ Good

Why?

17) The quality of the audio is:

- ○ Insufficient
- ○ Sufficient
- ○ Good

Why?

18) What advice would you give a graduate student experiencing a class using videoconferencing for the first time?

19) The use of the SMART board during videoconference classes increased the overall quality of the lesson.

- ○ Strongly Disagree
- ○ Disagree
- ○ Neutral
- ○ Agree
- ○ Strongly Agree

20) The Video Podcasts used in this course enhanced the overall experience.

- ○ Strongly Disagree
- ○ Disagree
- ○ Neutral
- ○ Agree
- ○ Strongly Agree

21) The place I watch to the Video Podcasts the most was:

- ○ at home
- ○ at school
- ○ other

22) The reflections / discussion boards enhanced the overall experience of the course:

- ○ Strongly Disagree
- ○ Disagree
- ○ Neutral
- ○ Agree
- ○ Strongly Agree

Please explain:

23) The online portion of this course I found the most useful was:

24) What could be done to improve the online experience?

25) Please provide any other comments you may have regarding the blended environment experience in Education 5510?

Submit

Please report any problems to the CRDC

Appendix B: Student Interview Questions

Which online tools did you find most beneficial to the learning outcomes of the class?

Were the online video and audio tutorials useful, and if is so in what way?

How long did it take you to get comfortable to interact over the videoconference system?

Was there any strategies that did or could have helped to alleviate any fears or concerns you may have had about using the technology?

How did using the videoconference course compare to straight online courses you have taken?

What did you think of the use of supportive technologies, such as the Smart Board Bridgit sessions?

As a teacher, did you notice any pedagogical styles used by the instructors worked better over videoconferencing?

What did you think about the overall quality of the videoconference technology?

Would you have any advice for a student who is using videoconferencing for the first time?

Appendix C: Instructor Interview Questions

How many years have you been teaching at the Undergrad & Graduate Level?

How many graduate courses have you taught using a Blended Learning Model?

How many online only graduate courses have you taught?

How many videoconference courses have you taught?

How does teaching in this environment compare to teaching in a face to face / blended learning?

Are you detecting any changes in the way you teach, as a result of this? The carryover in your other classes as well?

Have you found any differences in your pacing and how you move through a class?

What teaching strategies or methods work best in a videoconference environment?

Have you used any supportive technologies in your VC courses and if so how have they contributed to the success of the course?

Have you found the VC classes impact in anyway on the online components used in the course?

Do you have any advice for a new instructor using VC for the first time?

Did VC have an impact on the amount of preparation required?

Was there a noticeable difference in student interaction?

Did VC have an impact on other technologies used in the course?


Blended Learning
Through
Videoconferencing
David Hinger
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