INSTRUCTOR AND STUDENT PERCEPTIONS

OF A VIDEOCONFERENCE COURSE

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Dedication

I dedicate this project to my beautiful and wonderful wife Gisele to whom I am greatly indebted. Without her understanding, encouragement, and dedication, I could not have completed this project.

To my three children, Elyssa, Amanda and Evan whom I cherish and thank for the joy and motivation they give me every day.

To my mother whom has impacted my life more than she will ever know. She continues to influence and mould who I am today with her wisdom and love.

To my late father who taught me perseverance, endurance and the importance of life and family through his difficult and painful 5-year battle with leukemia. He taught me to always do what is right no matter the cost.

Abstract

The Faculty of Arts and Science and the Faculty of Fine Arts at the University of Lethbridge (U of L) developed a plan to offer a number of first year courses to three remote communities via videoconferencing beginning in the fall 2005. To prepare, a pilot project was conducted during the spring semester of 2005 for an instructor, the administrators, and support staff to gain experience using videoconferencing as a teaching tool. This pilot divided a first year English course where half the students participated face-to-face with the instructor, while the other half participated via videoconferencing in a classroom a few minutes away. Halfway through the semester the two student groups switched classrooms. The purpose of this manuscript is to document all the aspects of this pilot project from the room design and technology, to the perceptions of those involved. It provides an analysis of the instructor's perspectives based on several interviews, student experiences and perspectives based on data gathered from an online survey, and the phenomenological observations of the researcher. The result produced a collection of valuable and practical information that may guide others in their implementation of videoconferencing in both the classroom and for other uses such as meetings, professional development workshops, and presentations. It is intended to inform instructors, technical support personnel, administrators, and policy makers at the U of L, across Alberta, and elsewhere. In spite of the many technical and logistical problems that occurred during this pilot, both the instructor and the students found the experience to be valuable. The instructor has expressed interest in teaching using videoconferencing again and all but two of the students indicated they would participate in a videoconference class again.

Acknowledgements

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Introduction

Statement of Purpose

This project identifies both problems and best practices for teaching using videoconferencing by examining the use of this technology to teach a first year English course at the University of Lethbridge (U of L). Three methods were used to conduct this study. Observations documented what technology was being used, how it was setup, the classroom design, and class structure. Interviews with the instructor provided insights into how teaching strategies were modified or developed to accommodate videoconferencing and what the instructor perceived the effect that videoconferencing had on the course. An online survey measured student perceptions of the use of videoconferencing in the course.

A veteran instructor who had never experienced videoconferencing taught this course. As part of the pilot, he modified and developed strategies for teaching successfully using videoconferencing with assistance from the Curriculum Re-Development Centre (CRDC)[1] at the U of L. During the first half of the semester, half the students participated face-to-face with the instructor in the same room and the other half via videoconferencing from the satellite classroom located on campus approximately five minutes from where the instructor was teaching. This limited the risks to the educational

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[1] A centre at the University of Lethbridge that supports teaching development, the effective and appropriate integration of technology into teaching and research, media production services, and conducts educational technology research.

component of the pilot project: if there were any serious technical problems, the students could be brought together in the instructor's classroom to continue the class.

Furthermore, support staff were able to better control the technical conditions and thereby reduce the potential technical problems that could take time away from assessing other higher-level aspects of the pilot such as rapport, teaching pace, and student engagement. For example, the campus network is highly reliable and the probability of a network problem is far lower than what it would be using networks outside of the University campus to connect the classrooms.

Halfway through the semester the two groups of students' changed classrooms providing each student an opportunity to experience the class face-to-face and via videoconferencing. (See appendix A to refer to the course schedule and room assignments). This provided a good setting to examine the impact of videoconferencing on a university course, its instructor, and its students. When students experienced the class face-to-face with the instructor, they also experienced videoconferencing because they saw, heard, and interacted with the satellite class and also observed the instructor doing so.

Background/Rationale

In 2001 the U of L began to experiment with videoconferencing. It was used in an experimental way for project meetings where partners were scattered throughout Canada. Videoconferencing was also used to deliver a course to students in Calgary. These were humble beginnings, but over the next few years, the CRDC at the U of L continued to experiment with videoconferencing technology and explored ways of improving the experience. They acquired new equipment and used it in many different environments for

different purposes, including: teaching of modules and courses, administrative meetings, screening of job applicants, special events and guest speakers, and linking graduate students with their supervisors during thesis defenses. In gaining this valuable experience the U of L has emerged, and been recognized, as a provincial leader in the use of videoconferencing[2].

In 2004, the U of L pooled its knowledge and experiences with those of Mount Royal College to create VcAlberta.ca, a videoconferencing support site for the learning system in the province. Launched in the fall of 2004, this site was a primer to build a learning community among those using videoconferencing in Alberta's learning system, and to develop a collection of best practices and experiences. It also served as a central directory of videoconferencing facilities in Alberta's learning system. VcAlberta.ca was a timely project because of the growing provincial interest in videoconferencing.

Technology cost, reliability, and quality have improved to the point where videoconferencing is now a viable option, particularly since SuperNet[3] will provide a robust delivery mechanism.

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[2] The provincial government has funded the University to develop and maintain vcalberta.ca and to produce four videoconferencing best practice videos for the learning system. They are also frequently called on to participate and lead sessions and professional development workshops about videoconferencing.

[3] A high-capacity network that connects Alberta's schools, hospitals, libraries, post-secondary institutions, and government offices.

The recent emergence of initiatives such as VcAlberta.ca and increased interest and funding for videoconferencing by the provincial government demonstrate the opportunity for the university community to become more familiar with, and competent in, offering courses through videoconferencing.

In the fall of 2004, the U of L set out to develop facilities and technological infrastructure to enable delivery of some first year courses in Arts and Science and Fine Arts to students located in Claresholm, Pincher Creek, and Blairmore through collaboration with the Chinook Education Consortium, and to students on the U of L's Calgary and Edmonton campuses. This infrastructure also enables the delivery of workshops and speakers to remote communities that would not normally be able to participate in these events, thus extending the reach and influence of the University.

This larger project, that will offer first year courses to remote students, will help learners bridge the constraints of employment, distance, and limited time by allowing them to begin their post-secondary education at remote venues.

Prior to, and during the spring semester of 2005, the University developed two new videoconferencing classrooms that were to be used to link remote students from the communities identified earlier with classes at the U of L main campus. A pilot course in English was taught in the spring of 2005 for an instructor, the administration, and support staff to gain experience in how to best teach a course face-to-face with local students and to remote students via videoconferencing simultaneously.

The first year English course was taught with the instructor located in the same room the entire semester. For the first three classes, all the students were together in the instructor's classroom. The following eight instructional classes involved half of the

students face-to-face in the instructor's classroom. The other half experienced the course through videoconferencing from the first satellite classroom.

Because the first satellite classroom was scheduled for demolition before the end of the semester (due to the construction of a new building), a replacement room had to be built. The replacement room was constructed during the spring semester with a planned completion date of February 25th 2005, which was reading week[4]. This plan allowed for reading week to be the time to move and configure the equipment from the original satellite classroom to the replacement with no disruption to classes. However, construction was delayed and the basic functionality of the new satellite location was not completed until the week following reading week. This caused the course schedule to be changed and the students to meet together face-to-face in the instructor's classroom for two classes after reading week.

During the next eight instructional classes, the students that were in the instructor's classroom for the first half of the semester, experiencing face-to-face instruction, were moved to the new satellite location to experience the course through videoconferencing. The students that were in the original satellite location, experiencing the course through videoconferencing, were moved to the instructor's classroom to experience the course face-to-face. The remaining three classes of the semester were taught with every student face-to-face in the instructor's classroom. (See appendix A for the class schedule.)

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[4]A week during the spring semester when students can concentrate on their individual learning and research. During this week there are no formal teaching sessions.

This project provided an opportunity to develop and identify potential best practices for teaching using videoconferencing and discover technical and pedagogical problems that could be eliminated or mitigated in future uses of the technology.

The instructor, who had not used videoconferencing before, gained valuable experience for when he may teach a future course to students who are hundreds of kilometers away. This project also provides an opportunity for the instructor to mentor other instructors who will be teaching using videoconferencing in the future. Beyond the instructor's experience, both the CRDC and I as the researcher learned valuable lessons based on the problems and best practices identified that will assist the University in future uses of videoconferencing.

The instructor chosen for this pilot project has taught the first year English course seventeen times. As such, this was a good course to pilot via videoconferencing because the instructor is familiar with the content and has developed effecting teaching strategies. He was selected because he was believed to be well regarded as a competent and effective instructor in traditional face-to-face classes limiting issues of poor pedagogy and teaching strategy impacting the pilot.

Evaluation of the pilot project provided valuable practical information that will guide instructors, technical support personnel, administrators, and policy makers both at the U of L and perhaps elsewhere across the province and beyond in their implementation of videoconferencing in the classroom. The results will also help inform other uses of videoconferencing beyond teaching. Many of the best practices identified are applicable to other uses of videoconferencing such as meetings, presentations, workshops, and interviews.

Classroom Design and Technical Setup

Technical features of the videoconferencing classrooms involved in this project include the following.

Common Features to all Three Videoconferencing Classrooms

All had push buttons that the students used when they wanted to speak. Pressing the button activated their microphone and switched the video being sent to the camera at the front of the room and zoomed to where the student(s) were sitting. Once the student had finished speaking, they pushed the button again which turned off the microphone. Pushing the button after they were done speaking was also supposed to return the camera view to its previous state (i.e. return view to the camera displaying the instructor). However, this feature did not work properly in any of the rooms and was not corrected before the semester ended. A technician was required to set the camera view back to the instructor or to the wide shot of the classroom.

The classroom videoconferencing systems all used a feature called 'Duo Video'. This enabled the instructor to send video of himself teaching and video from the document camera, with his notes, simultaneously. These two views were displayed in the satellite classrooms on two large projected images.

A Tandberg 6000 was the videoconferencing codec used in the rooms.

Instructor's Classroom

The classroom was built over the Christmas break prior to the spring 2005 semester. Unfortunately the room was not completely finished by the time classes started. Some problems were rectified in the first few weeks of the semester, while others were not and plagued the class the entire semester. Furthermore, there were inherent design

flaws in some of the construction and the technology that was used. For the room to be useable in the future, changes will need to be made. Some of the problems identified were:

- The microphones installed in the ceiling were inadequate to pick up speech. Compounding the problem was the location of several of the microphones close to the ventilation system and the data projector, which produced loud fan noise.
- The gating[5] feature audio mixing equipment sometimes disengaged too late causing the first few words spoken by the student not to be sent to the satellite classroom.
- Poor quality push buttons on the desks caused several to break during the course.
- There was no password required to access the camera angle setup screen on the system panel, which allowed others to change the camera presets that were linked to the buttons on the desks.
- Some buttons on the desks did not work.
- The document camera was of poor quality.

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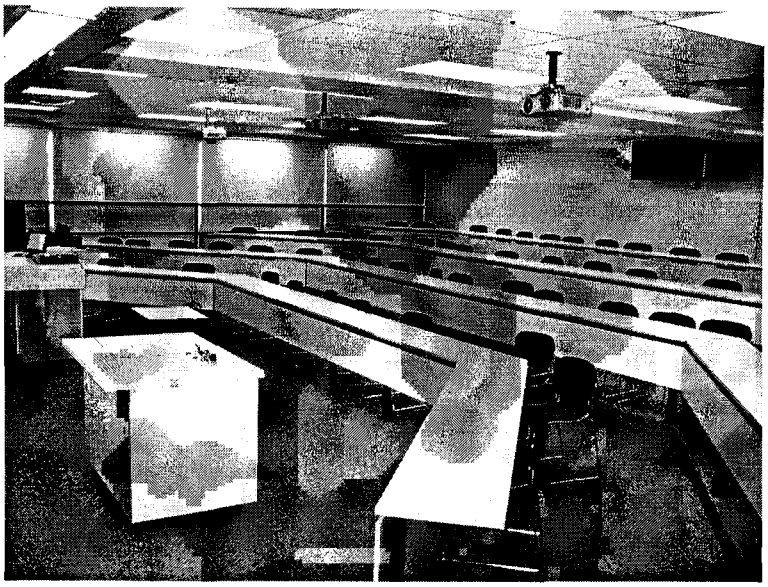
[5] A technology that prevents the transmission of audio automatically unless an amplitude level is met and sustained for a period of time. This helps to reduce background noise.

- There were many bugs and incomplete features in the system panel that operated the videoconferencing system. Some of these were fixed during the semester.
- The functionality of the buttons on the desks was unpredictable and at times did not work.
- A few times the cameras in the room moved without warning to a default or random view.
- Pressing a button on the desk after the student was done talking reset the camera view to the instructor automatically during the first few classes. However, this feature was lost after a programming update and not restored before the end of the semester. This required a technician to reset the camera view after each student was done talking.

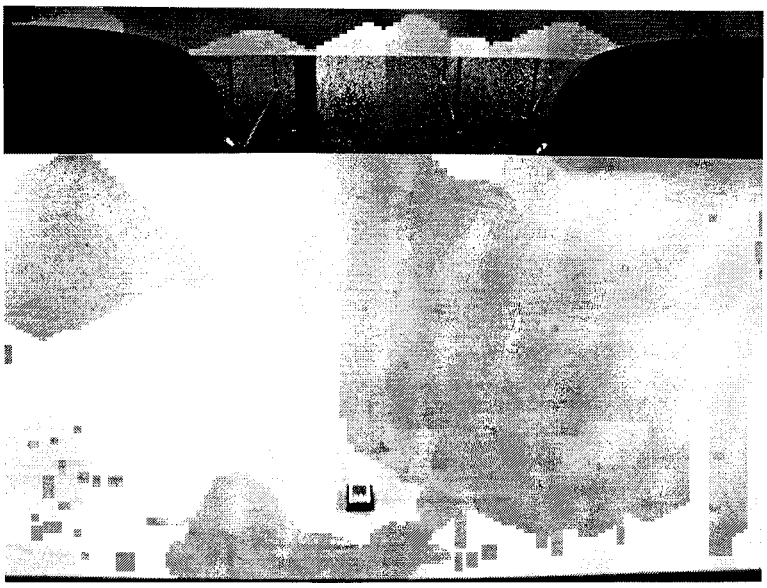
The instructor's classroom seated approximately 64 students in a wide layout with four tiered rows (Figure 1).

Figure 1: Wide View of Instructor's Classroom



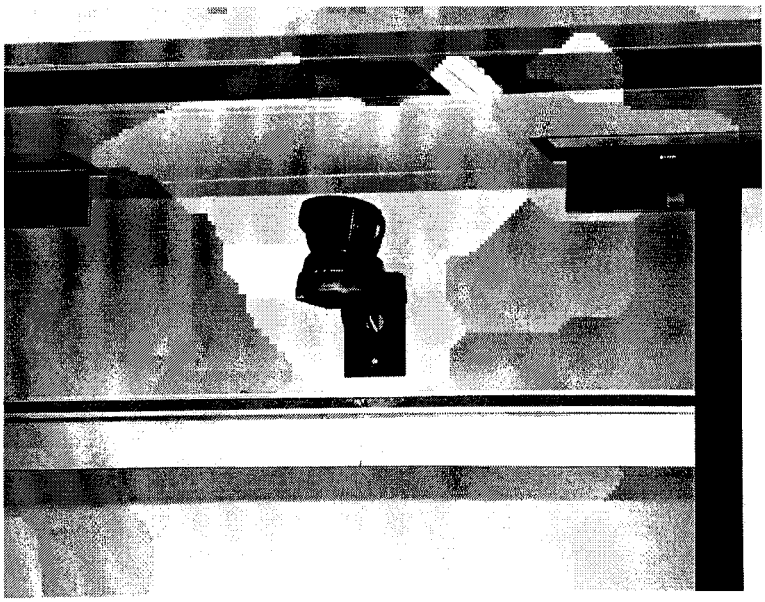
Buttons were wired between every two seats that when pressed engaged a ceiling mounted microphone that was in the 'zone' of the button (Figure 2). These microphones worked very poorly because they picked up too much ambient room noise and were located too far away from the students. They were to be replaced with desk-mounted microphones over the summer of 2005.

Figure 2: Press to Speak Button in the Instructor's Classroom



Pressing the desk-mounted button (Figure 2) also moved the view of one of two cameras (Figure 3) that were mounted on the front wall to the seat location where the button was pressed.

Figure 3: Audience/Class Camera in Instructor's Classroom

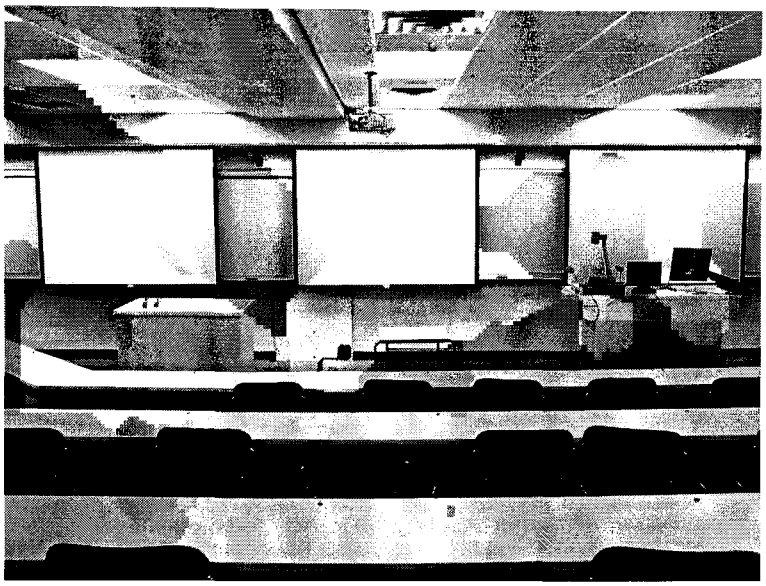


At the back of the classroom, two plasma TV's were mounted (Figure 4) that enabled the instructor, who was teaching at the front of the classroom, to see the students from the satellite classrooms and also see the video he was sending to the satellite classrooms (i.e. document camera). By placing these displays at the back of the classroom, the instructor was able to look at both the local and remote students simultaneously. A camera was also mounted at the back of the classroom with the two plasma TV's. This camera was what captured the video image of the instructor that was sent to the remote classroom and created the illusion that he was looking at the students at the remote classroom.

Figure 4: Plasma TV's and Camera at Back of Instructor's Classroom

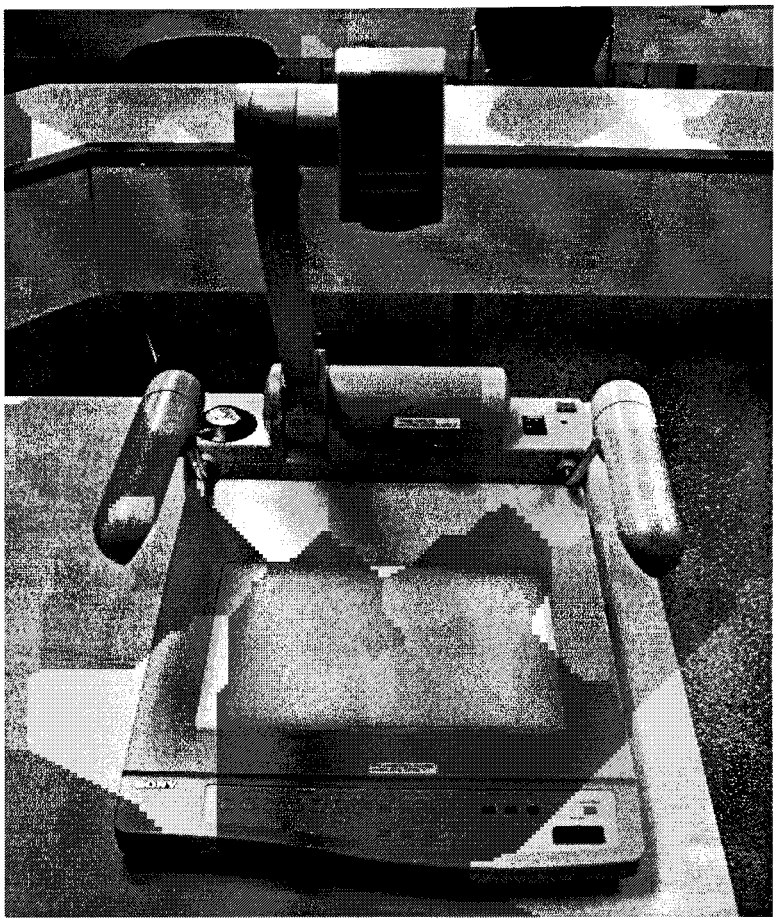
The front of the classroom (Figure 5) had three projection screens. Only two of the screens were used for the course. One of the projection screens displayed the students from the remote site and the other displayed the document camera video signal.

Figure 5: Front View of Instructor's Classroom



Since the instructor was teaching from behind the podium, because he was primarily using the document camera (Figure 6), there was a whiteboard directly behind him. Whiteboards are a poor backdrop for video because they are white, a continuous tone, and are reflective. A blue video backdrop was hung from the whiteboard to enhance the video image of the instructor.

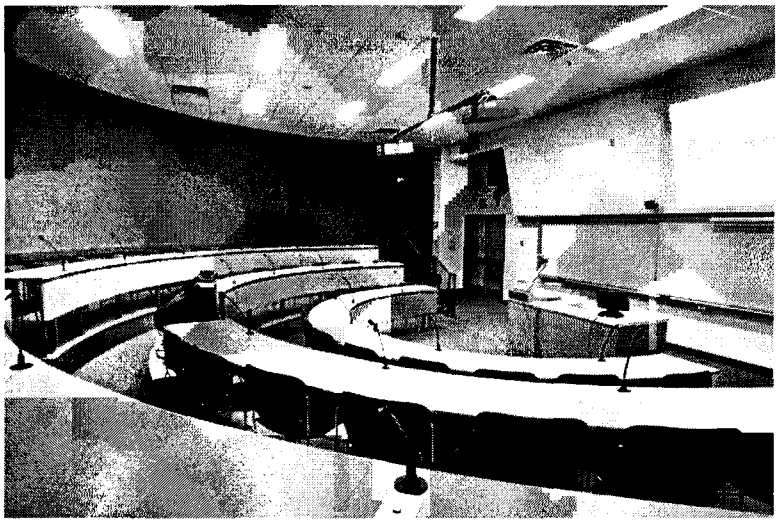
Figure 6: Document Camera in Instructor's Classroom



First Satellite Classroom

The classroom was used for videoconferences several years before this pilot course. It accommodated 48 students over three tiered rows that were curved as a half circle. This classroom had high ceilings and a large bulkhead at the front of the room that displayed the projections. The projections were configured to display both the instructor and document camera video feeds being sent from the instructor's classroom and the image of the first satellite classroom, in a picture-in-picture window, that was being sent to the instructor's classroom (Figure 7).

Figure 7: Wide View of First Satellite Classroom



Every two participants shared a push button microphone (Figure 8). These produced a much better sound quality than the overhead microphones mounted to the ceiling in the instructor's classroom.

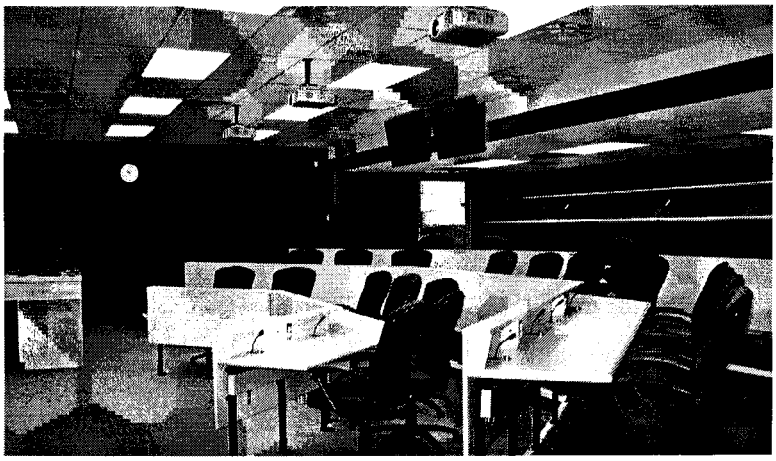
Figure 8: Press to Speak Button and Microphone in First Satellite Classroom

Replacement Satellite Classroom

Constructed over the first half of the spring 2005 semester, the classroom was to be completed by reading week so the equipment from the first satellite classroom could be moved and configured. However, construction was delayed which set back development of the room by more than one week. At that point, only the room's basic features were functioning. Furthermore, there were design and construction flaws that negatively impacted videoconference sessions.

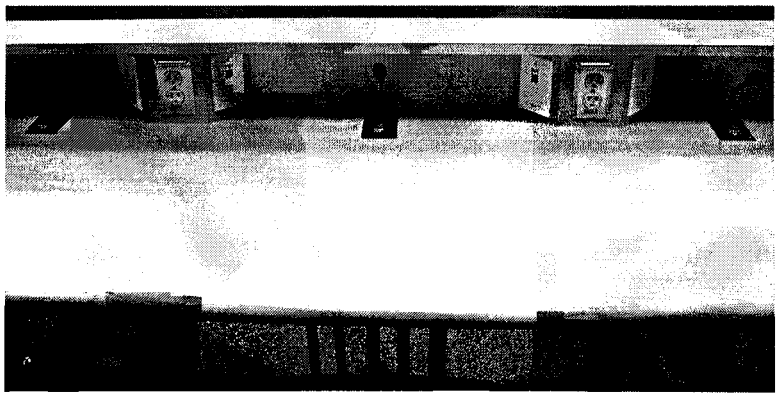
The replacement satellite classroom accommodated 31 students over three tiered rows (Figure 9).

Figure 9: Wide View of Replacement Satellite Classroom



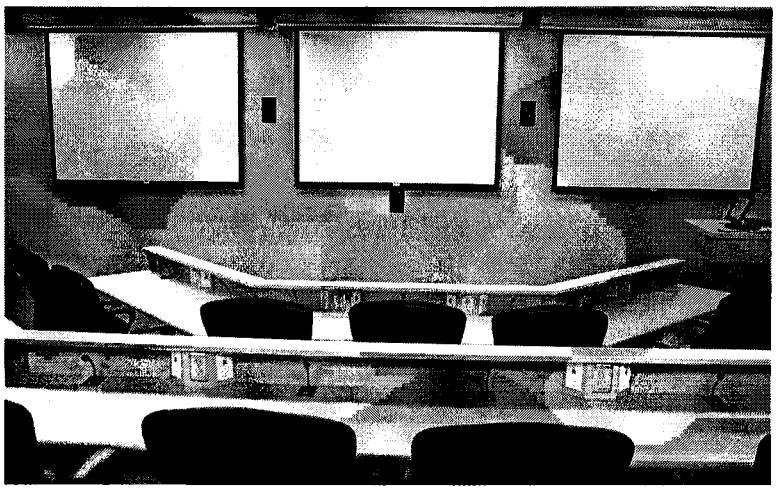
Every participant had his or her own push button microphone. This produced a much better sound quality than the overhead microphones mounted to the ceiling in the instructor's classroom. The push buttons were of much better quality than the ones installed in the instructor's classroom. There were also power and network ports at every seat (Figure 10).

Figure 10: Press to Speak Button in Replacement Satellite Classroom



The front projection screens in the replacement satellite classroom were set up to display both the instructor and document camera video feeds being sent from the instructor's classroom and the image of the replacement satellite classroom that was being sent to the instructor's classroom (Figure 11).

Figure 11: Front View of Replacement Satellite Classroom



Review of Literature[6]

Compared with many other educational research topics, there is little published about the impact of videoconferencing on teaching. This is likely because IP-based videoconferencing in an educational setting is relatively new.

Andrews and Klease (1998) describe a project that taught first year chemistry to three remote sites using videoconferencing and documented the challenges. They indicate that learning to teach with technology is a long-term process of skills acquisition and its importance in gaining acceptance for technology mediated teaching and learning.

Armstrong-Stassen, Landstrom and Lumpkin (1998) examined how students with no videoconferencing experience reacted to its use as a teaching medium.

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[6] The current literature review draws heavily from Anderson and Rourke, "A Comparative Case Study of Innovative IP Videoconferencing in K-12 Alberta Schools" commissioned by Alberta Learning in the fall of 2004. I participated in this project as a researcher among other roles.

Perceptions and Attitudes

Several researchers discuss attitudes of students and instructors that are often in conflict with each other (Arnold, Cayley and Griffith, 2002; Siraj-Blatchford & Siraj-Blachford, 2001; Yost, 2001).

Andrews and Klease (1998) discuss the importance of student preparation as having an impact on their perceptions. Armstrong-Stassen, Landstrom and Lumpkin (1998) also suggest as a key finding the need for good preparation of both students and instructors involved.

Schiller and Mitchell (1993) present staff and student perceptions of the appropriateness of videoconferencing as an interactive medium.

Cavanaugh (2001) conducted a meta-analysis of distance education studies published between 1980 and 1998. Focusing on instructional activities and interactions between the attributes of learners and technologies, she identified differential outcomes for two distinct approaches to distance delivery. Programs that used interactive technologies such as videoconferencing to enhance traditional instruction yielded greater effects on achievement than programs that used interactive technologies as the primary tool to deliver instruction. Cavanaugh concluded that interactive media are most effective when they are used moderately, to achieve specific goals, in combination with other methods and activities.

Hepburn and McMillan (2004) conducted an economic evaluation of a videoconferencing program in a northern, rural, remote school district. Each of the district's five high schools was equipped with sophisticated videoconferencing suites that included document cameras, electronic whiteboards, multiple monitors, cameras,

microphones, personal computers, and desktop videoconferencing units for each of the personal computers. Hepburn and McMillan estimated the annual cost of the suites at $445,000. To conduct a cost-effectiveness analysis, they also collected year-end achievement data on students whose courses were delivered entirely through the videoconferencing suites, and they compared this with similar data from students in the district who took face-to-face courses, correspondence courses or audiographics courses. The authors employed a quasi-experimental research design and processed their data using quantitative data analysis techniques. They concluded that when costs and student achievement are considered together, videoconferencing delivery was more cost-effective than the alternatives. Hepburn and McMillan provide sufficient data for readers to draw their own conclusions.

Stromsland's (1999) doctoral dissertation focuses on the perceptions of fourth- and sixth-grade students who used videoconferencing as a learning tool. Her results showed that videoconferencing was effective in increasing the students' perceptions of their ability and achievement scores, and that the effect persisted across grades and gender.

Interactivity

Much educational research has discussed the advantages of interactivity in the classroom. Many videoconferencing studies make some mention of interactivity as a key aspect to success and as something that videoconferencing can enhance when compared to other forms of delivery other than face-to-face teaching. Several techniques for improving interaction beyond the videoconferencing system are often discussed. The use of electronic whiteboards and screen sharing with computers are two examples of this.

Best Practices for Success

Videoconferencing has been used in many different educational contexts to date. Many have developed and published a set of best practices based on their experiences. Some of the most prominent features in an educational context include:

- The importance of training and support for instructors and others involved
- Establishing leadership and a vision that promises significant advantage for all participants
    - Simplicity of operation
    - A clear understanding of costs and learning effectiveness
- The need to engage learners through effective interaction between and among students and instructors
- The development of instructional designs and learning activities that are compatible with videoconferencing and to a particular instructors styles (e.g., inquiry based, constructivist, and instructional system design)
- The need to develop and implement a variety of behavioral management and etiquette expectations, many of which are generic to all classroom teaching but some of which are unique to videoconferencing (for example http://www.d261.k12.id.us/VCing/classroom/behavior.htm)

Salvati (2001) found that reliability of videoconferencing technology was a key determinant of its success as an effective teaching tool.

The World Wide Web provides tools to allow instructors to share their best practices. Besides the VcAlberta web site (www.vcalberta.ca), other information Web sites documenting best practices provide a wealth of information on all components of

educational videoconferencing. The American Videoconferencing in Education web site is a 'Digital handbook for teachers and students' and is especially strong on guidelines for good pedagogical practice (see http://www.d261.k12.id.us/VCing/index.htm). The Videoconference Cookbook is a generic videoconference resource but does have a special section designed for instructors (http://www.videnet.gatech.edu/cookbook). Individuals who have used the educational technology share their lessons learned and barriers encountered. Other useful sights include Digital Bridges: A Teacher's Guide to Videoconferencing (http://www.netc.org/digitalbridges/teachersguide/vdeoconferencing.html), the Knowledge Network (http://www.kn.pacbell.com/wired/vidconf/links.html), and the Northwest Regional Educational Technology Consortium's K-12 Videoconferencing web site (http://neirtec.terc.edu/k12vc/resources/research.cfm).

Hayden (1999) focused on the impact of videoconferencing sessions to support constructivist applications and learning experiences. Twenty desirable characteristics of videoconferencing that support constructivist learning environments were identified.

The British Educational Communication and Technology Association (2002) evaluated the use of videoconferencing in five rural primary schools. The authors identify important factors for success, including: a champion to lead the project, pedagogical and technical training, and the opportunity for participants to engage in collegial dialogue.

Pemberton, Cereijo, Tyler-Wood & Rademacher (2004) discuss a common barrier to success that others are reluctant to raise. Firewalls - the hardware or software systems that control access to a districts' network - do not discriminate predictably between authorized and authorized users. Attempts to establish a videoconference connection with

sites outside the institution often require the good will, patience, and cooperation of network administrators who possess these qualities in various amounts.

Salvati (2001) presents eight essential elements necessary to achieve success using videoconferencing to teach. Commitment is listed as one of the main ingredients for success.

Research Question

Based on the preceding review of the literature and the U of L's need to benefit from the pilot project, the following research questions were the focus of the current study.

Main Question:

What are the best practices that should be used to ensure a course offered through videoconferencing is successful?

Nested Questions:

- What accommodations does an instructor need to consider when teaching a course through videoconferencing to ensure success?
- What are the instructor and student perceptions of the effectiveness and desirability of experiencing a videoconferenced course?
    - Is the experience different than a face-to-face class?
    - Do students think they learn just as well in a videoconferenced environment vs. a face-to-face classroom?
    - Are the students and the instructor comfortable and receptive in using the videoconferencing technology to interact?

- What role does the physical and technical setup and design of the videoconference rooms play in experiencing a course through videoconferencing?
- What improvements to the technical setup and configuration could improve the experience?
- What support systems are needed to help offer a videoconference course? (i.e. teaching assistant, technical support, course redesign, and senior administration.)

Definition of Terms

Best Practices: Continuously improving procedures, processes, and practices that have been identified as performing very well and among the most effective and/or efficient in a particular context.

Face-to-face: A traditional classroom environment where the instructor and student are physically located together in the same room.

Videoconferencing: Using live video and audio transmissions to link participants at different locations.

Course: Thirty-nine hours of instruction at a first year university level offered twice a week for 75 minutes per class.

Success: Positive student and instructor perceptions about the effectiveness and desirability of using videoconferencing in a course, their willingness to experience such a course in the future, and students effectively learning the course content.

Instructor's Classroom: The main classroom that the instructor taught every class from.

First Satellite Classroom: The remote satellite classroom where half of the students in the first half of the semester participated in class via videoconferencing.

Replacement Satellite Classroom: The remote satellite classroom that replaced the first satellite classroom after the halfway point in the course.

Methodology

Three research methods (observation, open-ended interviews, and online surveys) were used in this study. This triangulation strengthens the study, as limitations of one method were compensated by the strengths of another method. However, all three research methods provided valuable insights.

Phenomenological Observation

During many of the English 1900 classes, I recorded my observations of the instructor and students. At the beginning of the first class, the instructor introduced me and I spoke for ten minutes about what I would be doing during the course and why. I observed the class as if I were a student in the course. I located myself at one of the ends of the back rows with the students. This allowed me to see and experience everything the students saw and experienced.

I observed eleven classes for the entire 75-minute period and spent time in each of the classrooms to provide as broad an experience as possible:

- Two classes at the beginning of the course with all the students face-to-face with the instructor;
- Three classes in the first satellite classroom;
- Three classes in the replacement satellite classroom;
- Two classes in the instructor's classroom; and

- One class at the end of the semester with all the students face-to-face in the instructor's classroom.

I recorded my observation notes during the class on a laptop computer and reviewed these notes several times throughout the semester.

I documented:

- How comfortable or uncomfortable the instructor and students generally seemed with the videoconferencing technology and interacting with the each other.
- The receptivity and the attitudes of the instructor and students to the use of videoconferencing.
- How often the instructor interacted with the students and solicited responses from them.
- How receptive the students were to responding to questions, making comments, or interrupting and asking their own questions in both the satellite and face-to-face classrooms.
- How student-to-student interaction between the two classrooms took place.
- Specific strategies and technologies that contribute to a successful videoconference.

Instructor Interviews

Several scheduled and episodic interviews with the course instructor took place during the semester. These interviews usually occurred once a week often immediately after class, later the same day, or the following day. The instructor would frequently

come to my office or communicate through telephone. At other times I saw the instructor in the hallway and we would talk about the course for a few minutes or as long as thirty minutes. E-mail correspondence was also used. I usually had predetermined questions (see appendix B) in mind prior to the interviews. Many of the questions asked were repetitive and specific to the class observed. I often developed questions to ask the instructor while observing a class. Most of the interviews and conversations were unstructured and we discussed whatever the instructor wanted. I would also think of, and ask, follow up questions during the interview. None of the interviews were taped. Instead I wrote notes on paper or typed on a laptop computer during and after the conversations.

The instructor also did a comparison between the average grades of quizzes and assignments from previous Eng 1900 courses taught by him and the grades of this class that experienced videoconferencing. This is anecdotal evidence based partially on the instructor's perceptions.

Student Online Survey

In an attempt to assess student perceptions of videoconferencing in this English course, I developed an online survey. The survey blue print is provided in appendix C and the final survey is provided in appendix D. This survey went through many revisions as it was tested with several students and staff for clarity and readability.

The survey consisted of twenty questions of which five were qualitative. It also requested a qualitative response to fourteen of the fifteen quantitative questions. Responses to quantitative questions were analyzed to extract descriptive statistics. Qualitative data was analyzed to provide a deeper understanding of the quantitative responses and common themes extracted.

To maximize the number of responses to the survey, two prizes were offered. One prize was given to a randomly selected respondent in each of the two satellite classroom groups. The prizes were 512MB Apple iPod Shuffle's worth approximately $129 each.

The survey was developed as an online form. Each student was emailed a description and link to the survey during their last class in one of the satellite classrooms. The first satellite classroom group was emailed on February 17th, 2005 and the replacement satellite group on March 19th, 2005. Both of these dates occurred on the last day the two student groups experienced the course via videoconferencing. Students then had one week to complete the survey. Because the survey was an online form, it simplified the data analysis process. No data had to be entered which removed the possibility for data entry error and quantitative data analysis was almost instant.

Timeline

The project began January 5th, 2005 and ended with the final results of the second student survey April 7th, 2005.

Human Subjects Research Committee Approval

This study is covered under an existing Human Subject Research approval. It is an extension of a previous project entitled "A Comparative Case Study of Innovative IP Videoconferencing in K-12 Alberta Schools". The approval letter is attached as appendix E.

Results

The following are the results of the three research methods.

Phenomenological Observation

Voice projection.

When I observed all the students together in the instructor's classroom, I noted that several students talked loud enough for the instructor to hear them, but not loud enough for myself and many students in the same room to hear. No one complained, because this is a normal occurrence in university classes. Interestingly, during the first class using videoconferencing a student in the instructor's classroom, who had a quiet voice, answered a question. No one in the satellite classroom, where I was observing, could hear her. This happened several times and the students at the satellite classroom were getting frustrated the more it happened. I subsequently learned that the instructor had several students from the first satellite classroom complain in his office after class. Interestingly, even if these students were in the same room as the student talking, unless they were sitting right beside the quiet talker, they likely would not have been able to hear her. The technology exposed an existing problem independent of the technology, yet students blamed it.

The instructor using two strategies subsequently minimized this problem. First, the instructor would ask the students who were talking quietly to speak up so that the microphone would pick up their voices. Most students responded well to this request and understood that the introduction of videoconferencing technology required them to speak in a louder than normal voice. Thus the technology not only raised the issue, but also gave the instructor permission to fix it by requesting students speak louder. Second, the instructor repeated the comment or question to ensure that the satellite classroom, and students in his own room, could hear.

Student and instructor comfort level.

My observations of the students in both locations throughout the course showed a steady increase in the comfort level with the technology. Students who had not initially spoken up or answered questions began to as the semester progressed. My observations also noted some students wanting to speak but they seemed to be intimidated by the technology in the first few classes. After several classes, they then gained the confidence to press the button and speak. For example, in the notes I made from one of the early classes, "subject 8 looks at her neighbor as though she wants to respond to the question but hesitates as she looks back to the projection of the instructor and then at the microphone button".

However, there were a few students whom, for the entire course, seemed too shy to use the technology to speak. These students often would look away or down at their papers on their desk whenever the instructor asked a question or invited comments. A possible explanation is that the students would not have spoken in a traditional face-to-face class anyway or perhaps they were too nervous and shy to use the technology. Furthermore, there were many instances of the camera and microphones not working properly when students attempted to speak. In my opinion, such problems could have caused some people to fear that additional attention would be on them if the technology failed. I noted that sometimes when a student attempted to participate, and the technology failed, they became flustered or embarrassed. Their body language demonstrated their discomfort with being the centre of attention when this happened.

The instructor's comfort level with videoconferencing also seemed to increase as the course progressed. He became more confident with the technology and more relaxed

at handling problems when they occurred. For example, I noted how he was able to create humor out of technical glitches as the semester progressed. This lightened the mood in the classes and seemed to relax the students as they laughed and joked with him.

A few students appeared excited by the technology and the ability to press a button to turn on the microphone and move the camera. They seemed to enjoy using the technology and the attention their picture on the screen at the front of the room provided. As the course progressed, many students did not hesitate to press their button and interrupt to ask a question or make a comment when the instructor was talking. When the student would press their button it would immediately turn on their microphone and the camera would zoom in on them. The instructor's microphone and camera were unaffected by the students action. When a student wanted to speak they would press their button and sometimes the instructor would notice the camera angle changing at the satellite classroom and ask the student if they had a comment. This seemed to work similar to a student raising their hand in a face-to-face classroom. Other times a student would start talking before the instructor noticed the camera angle changing, interrupting the instructor verbally. The instructor appeared to treat this the same as if someone raised their hand in a face-to-face class. It was not a distraction and is an example of something that both the students and instructor became comfortable with as the semester progressed. Sometimes the instructor would ask the student who pressed their button to hold on while he finished his thought. Most of the time the instructor immediately allowed or asked the student to speak.

One of the things I wondered when observing, was whether the students in the satellite classrooms would want to be able to see their classmates in the other location all

the time in addition to the instructor and the document camera. Particularly when the instructor was looking at, and talking to, the local class. As an observer, I found myself wanting to see the other students in the instructor's classroom.

Balancing attention between the classrooms.

During the planning phase before the course started, the instructor was given several tips on how to interact with the students over videoconferencing. One of these tips was to make sure the satellite classrooms did not feel forgotten or ignored. The instructor did a very good job throughout the course balancing responses from the local and satellite classrooms. He would specifically ask for responses from one of the two classrooms or from either. This provided a nice balance based on my observations.

I also noted that because the camera capturing the instructor was located at the back of the room, and beside the display that showed the instructor a view of the satellite classroom (Figure 4), it appeared as though the instructor was teaching to the students in the satellite classroom. This created a stronger sense of being connected to the instructor because of the perceived eye contact.

Technical problems.

There were many technical problems throughout the course that, in my opinion, negatively impacted the course. Inconsistently working buttons was one of the worst problems. The instructor and students often appeared upset or confused when buttons did not function consistently. At times when a button was pressed, the camera would go to the wrong person, causing a delay in the class while the technician in the room corrected the camera angle. Some microphones also did not work properly. In one case, three of the desktop microphones in the replacement satellite classroom did not work at all. This was

not immediately evident however, because a microphone three seats away was unknowingly on and picked up the students who were talking into the broken microphones. The system panel registered the microphone as off even though it was active. In fact, the microphone was on for that entire class and picked up background chatter causing confusion from time-to-time in the instructor's classroom. This problem was only discovered after the class ended.

Time constraints.

Before each class could take place, the instructor's classroom had many pieces of equipment that required setup and configuration before a connection to the remote classroom could be made. From my observations, the technical staff did not have sufficient time to do this in the ten minutes between classes, causing late start times of two to five minutes at least eight times and once for ten minutes. At other times a piece of equipment or cable was incorrectly configured leading to problems that then required time to diagnose and adjust. To setup for each class the technical staff needed to:

- Roll in a portable videoconferencing cart and plug a dozen cables from the room into the cart.
- Configure the document camera and run a cable from it to the cart.
- Setup a blue backdrop to cover the shiny whiteboard.
- Turn on the projectors and plasma displays and bring the projection screens down.
- Perform a basic microphone test to make sure both sites could hear each other.

Audio quality.

The quality of the audio being sent from both of the satellite classrooms was very good because each student had their own microphone directly in front of them. As long as the student pushed their button, and the system acknowledged it, the instructor and students in the instructor's classroom could hear the comments made.

However, the quality of the audio being sent from the students in the instructor's classroom was less acceptable. Because the microphones were mounted in the ceiling and installed near data projector fans and the ventilation system, I frequently observed that a lot of background noise was picked up, making it difficult or impossible to hear the student comments. Furthermore, an automatic gating feature in the mixing equipment that the microphones were connected to sometimes did not engage and prevented the audio from passing through.

The audio for the instructor was very good and clear because he wore a wireless lapel microphone. There were no problems with the quality of the audio from the instructor that I observed, other than if the lapel microphone was turned off or the batteries died. Both of these happened only once that I observed and occurred at the start of class and were quickly fixed.

Video quality.

The quality of the video was as good or better than any other videoconference I have observed. The rooms were well lit and the image was not too dark or light. However, when I was in the instructor's classroom he noted that it was difficult to decipher who the students were in the satellite classroom because the camera was set at a wide angle in order to get the entire class in the view. The document camera seemed to

work well and I could easily follow the instructor's notes. After using the document camera for one class, the instructor came up with a system of using cue cards and a thin marker to write notes and use the document camera to transmit. This was much clearer than using pen and paper and ensured that the document camera was zoomed in enough to make the writing large enough to be easily legible.

Technical staff.

A strategy that the staff from the CRDC used to identify and solve technical problems without interrupting the course was the use of instant messaging through their laptop computers. If the audio volume was too low from one classroom to the other or if something else was not right, the staff could type instant messages to each other using wireless laptops and troubleshoot the problem. The plan for this pilot was for the technicians to be present for the first few classes and then, once the instructor, the instructor's assistant, and the students became familiar with the system and how it worked, only show up for the first few minutes to ensure everything was working fine and then leave. However, due to the technical problems and deficiencies in the classrooms, the technicians were required for the entire class and attempted to make the videoconference run as smoothly as possible.

Teaching assistant.

The satellite classrooms had a teaching assistant present for each class to provide as much support for the satellite students as possible. This appeared to be a useful strategy. Some students seemed more at ease to have someone physically present to whom they could direct questions or make comments. The teaching assistant was also helpful in handing out materials and collecting assignments and other documents. Having

the teaching assistant in attendance during exam periods was beneficial as she could answer questions and invigilate. (Future plans for videoconferencing courses involve a facilitator at the satellite locations to assist the students.)

Instructor Interviews

Eight scheduled and twelve episodic interviews with the instructor took place throughout the semester. I also corresponded with the instructor using email. These interviews and emails provided insights into the instructor's perspective on the course and the impact the technology and videoconference was having compared to his previous experiences teaching the same course face-to-face. The interviews were valuable as it allowed the instructor to debrief and reflect on what had just taken place in the classroom. The instructor was able to articulate how he felt the course was progressing and his experience and perceptions about the use of videoconferencing. The following is a summary of the major themes that emerged from those interviews.

Pacing.

One of the things the instructor identified early in the course was that it took longer to get through the course content than it had in previous offerings of the same course. As the course progressed, the instructor felt this idea was confirmed. He offered three factors to account for this slowdown. The respondent saw the most significant factor as the need for students to click their button and wait for the camera to move to them before they could speak.

The respondent identified two other related items that also contributed to the delay. First, it was the instructor's impression that the students seemed reluctant to click their button and speak. He thought they were more reluctant to shout out an answer than

they would have been in a face-to-face class. He commented that in his previous offerings of this course, students would shout out answers much more and interact more with him than he experienced with this class. Second, it was the instructor's impression (confirmed by my own observations) that the technical problems, such as camera's moving to the wrong location, poor audio quality, and microphones not working properly the first time, also slowed the pace of the class.

In the instructor's view, the nature of this particular course required frequent brief exchanges between instructor and students, and these exchanges were significantly slowed by the intervention of the technology. The instructor reported that he tried to accommodate for the slower pace of the class by relying less on interactions with students and questions to the class, and more on providing formally prepared content so they would have what they needed to complete assignments and exams. He also said that he was providing more printed resources for the students to ensure they had as much assistance and as many resources as possible.

Because of the slower pace of the course, the instructor commented that he thought a course with less interactions and more lecture might be better suited for videoconferencing.

Video quality.

The instructor also observed that it was hard to distinguish between students in the satellite classroom when the camera was in its wide-angle position of the entire satellite class. The respondent said this made it difficult to call on specific students to answer questions or make comments. A strategy that he developed, and believed worked for him to some degree, was requesting the students sit in the same seat each class. The

instructor believed that this helped him to remember a specific student by location rather than specifically how they looked.

Setup time before class.

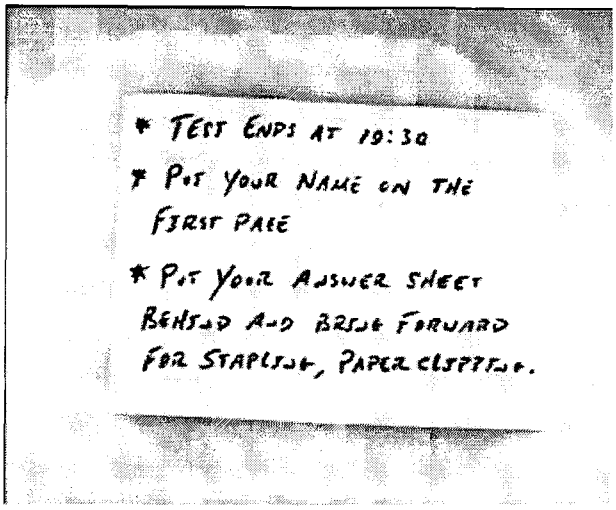
An issue that the instructor said caused problems for him was the amount of time available before class to setup and get ready for the videoconference. A class was booked in the instructor's classroom prior to each English class and did not end until 10 minutes before the videoconference class was to start. The instructor also commented that the instructor who taught the class in the period prior to his typically did not end on time and when he did, spent time at the front of class answering student questions further contributing to time constraints. The instructor suggested that he would have liked twenty to thirty minutes prior to the start of class to get set up and settled. The instructor reported that getting access to the room late and often starting late caused additional stress. He said that this stress was further compounded when technical problems would arise during the class sometimes wearing him out by the end of class.

Use of the document camera.

When the instructor previously taught this course face-to-face, he spent most of his time at the whiteboard explaining concepts. He needed to develop a different strategy to communicate to the satellite classrooms what he would normally have written on the whiteboard. Several options were explored including the use of an electronic whiteboard that consisted of an electronic pen and a pressure sensitive computer screen. However, in the end, a document camera was used. This was a simple solution to the problem. The instructor could write on cue cards (Figure 12) with the document camera zoomed in on the card. This ensured that the camera was zoomed in enough to make the writing legible

at the satellite classroom and limited the amount of content that could be presented on one screen. This strategy worked well not only for the satellite site, but also for the local students. The instructor found that he had to get used to writing in the limited area of the cue cards since he was used to writing on large whiteboards and having a lot of room. He found a thin tipped marker worked well because of the size of writing it forced and because it produced a thicker line that transmitted better to the projection screen.

Figure 12: Cue Card used on Document Camera



Audio quality.

Generally, the audio was not a problem for the instructor. However, sometimes a microphone would not engage immediately in one of the satellite classrooms causing him to ask the student to repeat their comment or question. This was more of an issue with the replacement satellite classroom. He also commented that at times it was difficult having a conversation with a student in the satellite classroom. When both he and a student talked at the same time, sometimes no audio would be heard on either end. He attributed this problem to the half-second delay in the audio between the two classrooms and was also

told by the CRDC that the built-in videoconferencing echo cancellation contributed to the problem.

In one of the last classes, the instructor had his teaching assistant teach in the instructor's classroom while he went to the replacement satellite classroom to see what it was like for those students. He commented at the end of the class that the audio being sent from the students in the instructor's classroom was very poor, and that he had not realized that it had been that bad.

Comfort with videoconferencing.

As the course progressed, the instructor said that he made accommodations and reported that he felt more comfortable with the videoconferencing technology and handling the problems that would arise. He felt that this allowed him to develop strategies to deal with problems as they arose and minimize their impact. One of the things he said he had to adjust to was physically standing in one place. The instructor said he normally taught by walking around the classroom, but because of the document and stationary camera, was required to stay in one spot. He found this somewhat restrictive but was able to adjust.

Student achievement.

Because the instructor had previously taught this course seventeen times, he had well-established expectations and standards. He reported that the student submissions and grades in the videoconference course were within the normal range.

Support from administration.

The instructor commented that he thinks having a supportive senior administration is an important factor for the instructor to teach a course like this. In his

view, it is especially important if it is a new project and the instructor is new to videoconferencing. By supportive, he meant: understanding that this was a new initiative and that there would be some difficulties, recognizing that he was being innovative and would be putting in extra work for this pilot to be as successful as it could be, and providing additional resources such as a teaching assistant and the CRDC to assist with the development and delivery of the course.

Teaching assistant.

The instructor commented that having a teaching assistant at the satellite classrooms was helpful to him. He stated that it gave him some comfort knowing that the students had someone to whom they could address questions and go to for help during and immediately after the class.

The instructor thought of an idea that may reduce the need for a teaching assistant. He suggested having videoconferencing office hours before and/or after the class where students could interact with him one-on-one via videoconferencing if they wanted to.

Technical problems.

The instructor said that the constant technical problems and glitches were difficult to deal with. He mentioned buttons not working or doing what they were supposed to and cameras going to the wrong students. He said that these problems would need to be addressed for videoconference classes to work.

Technical support.

The instructor stated that he could not have taught this course without the help of the technicians in his classroom and the satellite classrooms. He said this was definitely

the case given all the technical problems that were encountered but also that should everything have worked as it was intended, having a technical person in the room and at the very least the beginning of class would have provided a level of comfort.

Future development.

In several of the interviews, the instructor commented on wanting to spend more time revising the course before teaching it again using videoconferencing. He would like to make more use of educational technology beyond videoconferencing. One of the idea's he had was to provide an online support system that would allow students to access content, check their grades, and submit assignments. He saw this as a way to possibly enable students to feel more connected with the class and to help bridge the distance between him and the remote students.

Student Online Survey

The following is a summary of the results for both online surveys. Group one corresponds to the first satellite classroom students and group two to the replacement satellite classroom students. Quantitative responses to both online student surveys are presented in table format. Summaries of the qualitative responses for the two surveys have been combined unless there were significant differences in the responses between the two groups. Some of the qualitative responses that are quoted have been edited for readability.

Thirteen students (76%) responded to the survey from group one. In group two eleven students (69%) responded to the survey. No reminder emails were sent to those students who did not complete the survey. Why the response rate is not higher is unknown and any ideas are speculative. Perhaps some of the students who did not

respond were not interested in the prize. For those who did not respond from group one it could be that the survey was released to them two days prior to the weekend before reading week and some students assumed they could complete the survey after reading week. It could be that some simply forgot with the excitement of their reading week plans. A thought as to why some group two students did not respond is that the survey was forgotten about due to the end of semester rush and pressure of final assignments and exams.

Question 1. Compared to a traditional face-to-face classroom experience, the videoconferencing experience is...

Table 1: Summary of Responses to Question 1

	Group 1		Group 2	
Better	1	8%	1	9
About the same	9	69%	5	45.5%
Worse	3	23%	5	45.5%

The two students that thought the experience was better than face-to-face both said the reason was the smaller class size. One of the students also cited experiencing new technology as an advantage.

Of those that felt the experience was about the same, six cited interactivity with the instructor as being the same. The students that thought the experience was worse said:

> Not that much worse though! It is just a little hard because of a little time delay between the two rooms, which makes me nervous and unsure of wanting to buzz in.
>
> Just do not feel the closeness as if the teacher was in the classroom.
>
> The videoconferencing experience makes in-class communication more difficult. I missed large chunks of lessons due to problems with the videoconferencing technology.

It is worse because of the teacher and student having to wait for the camera to focus, the microphones to work, and for little bugs to be worked out while in class. The class goes very slow.

If you are not interested in what the instructor is talking about it is too easy for your mind to wander and it is like watching a boring video. You end up not paying attention sometimes and missing something. However, if the instructor is actually in front of you their presence demands more of your attention.

The only real reason I prefer regular classes is because I do not always like having my face blown up on screen. It makes me less interested in participating in class discussions.

The defects in the system take away from the experience. The problem with cameras focusing and the time it takes for the camera/microphone to be activated makes answering questions difficult. With most classes students can make comments and ask questions quickly and it does not take away from the lecture. The time it takes to ask a simple question makes asking questions a waste of time. For this type of class it is not possible to get as much out of the lecture via videoconferencing. The professor is restricted to where he can move and what he can do because of the cameras.

Did the buttons ever work? We wasted a lot of time with hitting buttons getting cameras in focus. I guess if it is going to work make it work the way it is supposed to. It had to be more fluid.

Question 2. What do you like about taking the course through videoconferencing?

Table 2: Summary of Responses to Question 2

15	Opportunity to experience videoconferencing
2	Note clarity on document camera
2	Smaller class size
2	Interactive nature of technology

Students were asked to comment on what they liked about taking the course via videoconferencing. Fifteen of the students from both groups were thankful for the opportunity to experience videoconferencing regardless of how well it worked and six of the students stated they think they may need to use videoconferencing in their future

employment or other endeavors. Two students stated that they appreciated the instructor writing notes on the document camera. One of the students stated they preferred this to the instructor writing on a whiteboard as in a traditional class. Three students commented on the perceived smaller class size (because the class was split between the two locations) being something they liked. One student liked the ability to see other students close up on the screen when they were talking in class and two of them said they liked the interactive nature of the technology.

Question 3. What don't you like about taking the course through videoconferencing?

Table 3: Summary of Responses to Question 3.

10	Technical difficulties
6	Audio being too quiet or not working sometimes
5	Having to press button to be heard and how long it took to engage
4	Intimidated, scared, or anxious when camera on them
3	Limited class discussion and difficult to interact
2	Document camera text sometimes too small and unclear
1	Buttons zooming camera to wrong location
1	System not staying on person who pressed button first if another student pressed a button

Students were asked what they disliked about taking the course via videoconferencing. Ten students mentioned the technical difficulties that occurred throughout the course. Six students identified the audio not being loud enough and the microphones not working consistently. Five students said they disliked having to press the button to be heard and how long it took to engage. Four students said they were intimidated, scared or anxious with the camera zoomed in on them and students in the

two classrooms seeing them on the projection screen. Three students thought that the experience limited class discussion and made it more difficult to interact. Two students complained about the use of the document camera and writing sometimes being too small and unclear to read. One student complained about the buttons zooming the camera to the wrong location and another student complained about the times when more than one person pressed their button at the same time and the camera view not staying on the person who was first.

Question 4. How effectively are you able to interact with the professor over videoconferencing compared to a traditional face-to-face class?

Table 4: Summary of Responses to Question 4

	Group 1		Group 2	
Better	3	23%	0	0%
About the same	5	38.5%	6	55.5%
Worse	5	38.5%	5	45.5%

Of the three students that felt they could interact with the instructor better than they could in a face-to-face classroom, all said they liked the camera zooming in on them because it forced the instructor to acknowledge them.

Three students who felt interaction with the instructor was about the same said that pushing the button was as easy as raising their hand. Two students said it was the same only slower paced and another two said it was the same once they got used to the technology. One student said there was no difference, because the instructor will notice you after pressing the button.

Students who felt they interacted worse with the instructor via videoconference gave many reasons:

It feels a little bit impersonal. Interaction involves making eye contact and using body language, which is lost in the videoconference.

Talking to a screen … makes it harder to interact.

The technology was unpredictable. Sometimes it would work quite well, and other times not. It always seemed that when talking, the first few words of a comment would always be cut off, forcing people to repeat themselves once or twice. That was frustrating.

The time it takes to "click-in" and the hassle of doing this really took away valuable interaction with the professor.

It seemed really unnatural, waiting for the microphone to kick in and the video to get to the person asking the question. Often the camera would go to the wrong place, the class would have to stop, and we have to wait for it to be fixed before the person could interact with the professor.

It can be intimidating to click in and see the camera zoom in on you. I would much rather ask a question after class than to have to ask with my face on a huge screen.

We are ABLE to effectively communicate with the professor, but when it comes to simple questions that the instructor only wants a simple answer to, students are less likely to 'click in'.

Fear of technical problems inhibited participation.

Students may be scared to "buzz in".

Question 5. I do not feel as though I know the instructor as well as I would in a face-to-face class.

Table 5: Summary of Responses to Question 5

	Group 1		Group 2	
Agree	7	54%	5	45%
Disagree	6	46%	6	55%

Approximately half of the students felt they got to know their instructor as well as they would have in a face-to-face class. Four of the students said that it was the same as a

normal classroom. Three said that the instructor's personality and approach was good for videoconferencing because he had the necessary energy and personality. One said the camera did not take away from the instructor's personality. Another student said that it would not have been as good if there were no video of the instructor.

Three students who felt they did not get to know their instructor as well as they would have in a face-to-face class said that they feel like they knew the instructor as well but that they do not think the instructor knew them as well. The remaining students said:

> You do not have the same eye contact as when you are face-to-face.
>
> Because of the time lost due to other problems the instructor is unable/unwilling to devote some of his teaching time to his personal life.
>
> I would be more likely to participate if I were in the same classroom.
>
> We can assume that since the instructor was limited to one spot all the time it interfered with his ability to engage the class with other social movement. In addition, he was always stuck behind a desk. I believe that physical objects serve as a barrier to action and reaction. Like when people talk to each other they should not have their arms folded. The instructor was restricted in his ability to engage the class.
>
> Do students really need to know the instructor that well?
>
> The students do not get face-to-face interaction.
>
> I feel this way because the teacher does not see you enter or leave, and he just cannot see you as up close as the students in his classroom. This might affect how well the teacher and students get to know one another, especially if the student needs to speak to the teacher after class.
>
> Although the communication between the two rooms could be better, the instructor is on all the time, and you do not miss anything he is saying through videoconferencing.

Question 6. I am able to focus in class better/about the same/worse with videoconferencing, than in a face-to-face class.

Table 6: Summary of Responses to Question 6

	Group 1		Group 2	
Better	5	38%	5	45%
About the same	8	62%	4	36%
Worse	0	0%	2	18%

Of the students that thought they could focus better in the videoconference class, three said it was because they were on camera and everyone could see them, including the instructor and themselves. Two students said that smaller class sizes resulting in quieter classrooms was the reason they could focus better. Two students said that having to look at the instructor and document camera screens at the same time was the reason they could focus better. One student said the technology itself forced them to look at the instructor. Another student said they felt they were included more.

The students that were able to focus about the same said:

> There is still someone in the front of the room on which you can concentrate just like having the professor in front of you in real life.
>
> I did not find it difficult to watch and listen to the professor through videoconferencing. Sometimes I did notice myself drifting off at the remote location, but not too much.
>
> Videoconferencing does make the choice to gaze off easier, since you are not directly in front of the instructor.
>
> Some days are harder than others.
>
> It is easy to zone out in both types of classes. If you want to learn something you can listen, it is just hard to learn difficult concepts.
>
> It was easier to see the professor since the screens were above the floor. You did not have to look through other people's heads.

> There is no difference in being able to focus in class if the audio and visual properties are in place. If anything the student is able to focus better because of how the videoconferencing focuses directly on the teacher or student.

The two students that felt they were not able to focus in the videoconferenced class as well as they could in a face-to-face class said:

> Just the fact that I cannot go up and discuss something freely without both classes listening.

> It was alright when I was in the same classroom as the professor, but when I was in the remote location it was to easy to stop paying attention, it was like watching an educational movie a lot of the time.

Question 7. The videoconferencing experience is affecting how I feel about the course.

Table 7: Summary of Responses to Question 7

	Group 1		Group 2	
Positively	7	54%	4	36%
Negatively	2	15%	3	27%
Is not affecting	4	31%	4	36%

Of the students that felt the videoconferencing experience was making them feel more positive about the course, seven said it was because it is an interesting and new experience. The other reasons given were:

> For a course like English I think that this is a good class environment to try but I would not like to take any science class this way. I think that it all depends on the class whether this would work out or not.

> Because I feel there is more interaction with the use of videoconferencing and the option to speak whenever you press the button.

> Videoconferencing has helped me pay more attention to detail and what the instructor is saying, causing me to improve in a course that I was not so strong in.

Of the students that did not think the videoconference was positively or negatively affecting how they felt about the course, all five who commented said that the course material was separate from how it was delivered. For example, one student said:

> Course material is the same as it would be without the videoconferencing.

Students that felt the videoconferencing experience was making them feel negatively about the course said:

> I will probably associate some of the frustration caused by videoconferencing with the course. The course was certainly less enjoyable than I assume it would normally be. Especially with an intriguing, funny, and lively professor like we had.
>
> I get frustrated when we cannot hear and see the person talking.
>
> If I do not understand something, I am not as eager to ask questions in this class.
>
> I think videoconferencing is worse and what I do not like about it produced more negative feelings. The negative feelings outweigh the positive ones.

Question 8. Since the beginning of the course, my comfort level with videoconferencing has ...

Table 8: Summary of Responses to Question 8

	Group 1		Group 2	
Increased	10	77%	9	82%
Decreased	0	0%	1	9%
Stayed the same	3	23%	1	9%

The majority of students in both groups said they became more comfortable with videoconferencing as the semester progressed. Nine students simply said that they got used to the system and were now more comfortable with it. Two students said that they became more relaxed about pressing the button. One said they became comfortable with the idea of pressing the button but would not because they feared "everyone will look at

the new person on the screen". Two students said they did not think about the videoconferencing anymore because it became "normal".

The student whose comfort level stayed the same said:

> At first I thought that videoconferencing might be fun, but as I saw the problems with the equipment, I felt less comfortable with the idea of participating. I would have expected over the course of four months that the problems with videoconferencing would slowly get sorted out. That was certainly not the case.

The comfort level for four students stayed the same:

> It is just very intimidating, especially for shy people.
>
> I really have not involved myself in the videoconferencing much.
>
> I am still nervous for the camera to zoom in on me.
>
> I never had a real problem with the idea from the start.

Question 9. The quality of the video is ...

Table 9: Summary of Responses to Question 9

	Group 1		Group 2	
Good	5	38.5%	3	27%
Sufficient	6	46%	6	73%
Insufficient	2	15.5%	0	0%

Overall, students in both groups found the quality of the video good or sufficient. Three students from group one used their response to this question as an opportunity to express their frustration with cameras sometimes not going to the right person when a button was pressed. Two students from group two said they preferred to see the instructor on the plasma TV screen instead of the projector screen because the quality of the image was better and the instructor was not as big.

Of those that found the quality sufficient, seven students mentioned that the clarity of the image could have been better. The two students in group one that said the video quality was insufficient said:

> It is too blurry when zooming in on students.
>
> The problems with focusing on the right person are important. Occasional errors are accepted, but I think that there were too many errors every class.

Question 10. The quality of the audio is ...

Table 10: Summary of Responses to Question 10

	Group 1		Group 2	
Good	4	31%	1	9%
Sufficient	7	54%	9	82%
Insufficient	2	15%	1	9%

Students that found the quality of the audio to be good said:

> The sound is nice and clear.
>
> The audio was fine when working properly.
>
> It is good and clear and loud, except when problems may arise.

Students that found the quality of the audio to be sufficient said:

> You could always hear what the professor was saying but had a hard time sometimes to hear what the students were saying.
>
> Some days were better than others. There was a small time delay.
>
> Sometimes unclear.
>
> There needed to be more learning on when to speak and how long it takes for a microphone to engage. At times there were numerous cut outs, but I expected that.
>
> Sometimes the sound was not great at all and class had to be held back due to it.
>
> Good and bad days.

Again, there are good times and bad times. It was really frustrating when I was reduced to using sign language to get my point across to the classroom. And in other times if there was a delay on the sound it made communication really difficult. Another note on the sound, in the remote classroom there seemed to be a static noise in the background (this was probably because the volume had to be turned up so loud).

I did not really notice the audio unless there was a real problem, sometimes people in the other class were quiet but it was all right.

There have been problems with the audio in the past... however I believe it is improving.

This being the first part of the semester there have been a few technical difficulties, which have affected the entire experience.

From time to time the other room cuts out. Sometimes its hard to hear the other students if they are in a certain part of the room.

Sometimes the audio is far too quiet to hear properly in the satellite classroom but for the most part it is quite clear.

Sometimes the microphones do not work.

Audio of some of the students has been a little soft at times, but the professor's audio has been good.

Students that found the quality to be insufficient said:

The microphones/speakers were the biggest frustration for me. I do not remember a single day, at the remote location or in the classroom, where the microphones worked perfectly. The professor was not always audible, and there were times when the microphones malfunctioned completely. The students in the other room always sounded poor, in both locations.

The turning on and off of the microphones has not yet been mastered. Because of this a student may be talking, but their microphone is not on and they do not even know it. It is also hard to hear the professor when a microphone on the desk is turned on.

Loud noises during an exam are very rude. I also think that there were too many errors. Some people have a quiet voice.

Question 11. I am able to follow along with the instructor's notes using the document camera.

Table 11: Summary of Responses to Question 11

	Group 1		Group 2	
Yes	13	100%	10	91%
No	0	0%	1	9%

All but one of the students agreed that they were able to follow the instructor's notes using the document camera. The instructor used cue cards with the document camera zoomed to the size of the cards. He had cards prepared ahead of time and wrote on them as he used them in class. The student that disagreed said:

> ... the document camera was horrible compared to an overhead projector (when the small text was up). It became more of a reference point as to where we were on the page. However, when he used the cue cards and the font was big enough (and thick enough) it was easy to read.

Those that agreed said:

> It was slower to adjust to changes when we were in the remote site so sometimes it was a little blurry.

> The document camera was all right. It was a bit blurry at times, but I could make out what was being taught most of the time. It was by no stretch of the imagination smooth in terms of movement, though.

> The technical person may want to concentrate more on moving the small picture of the class so that it does not interfere with the notes.

> Most of the time, unless it was breaking up.

> It is clear and easy to read.

> Depending on how big the instructor writes, sometimes the words can be pretty small.

> Some days I thought the document that he was reading from or giving reference to was really hard to make out. Blurry, very blurry.

He does not write many notes, but it is still possible.

It makes it easier to follow, as he must move along with us as he records his thoughts.

Question 12. If you lived outside of Lethbridge, and wanted to take a course from Lethbridge, would you consider taking the course by way of videoconferencing?

Table 12: Summary of Responses to Question 12

	Group 1		Group 2	
Yes	13	100%	9	82%
No	0	0%	2	18%

In spite of the complaints about the technology from students, all but two of them would take a course through videoconferencing if one were offered in the future. Those that would take such a course said:

Gives you a good sense that you are actually there. The videoconferencing, allows you to learn normally.

It feels as if you are in the classroom.

It is a great way to take a correspondence course. I have taken classes over the Internet before and videoconferencing is more effective. I would also prefer this method to independent learning. Videoconferencing creates many more opportunities for a larger number of people.

I definitely would, simply because the teaching/instructing is still just as good.

It would depend on the course.

I think the experience is very similar to being in a classroom setting with the teacher; I like the idea of taking a class via videoconference.

As long as video and audio are in good condition.

I would because it is a great advantage for those people who cannot move or travel here. It all has to be considered on the personality of a professor. If a professor were "boring", the attention span would be short. Having that vibe helps learning much more interesting.

> It would depend on my interest in the course. I would be terribly hesitant, but it if it was something I REALLY wanted to take and there was no alternative I might consider it, because of the course, not the method the information is taught to me.

Two students (8%) that said they would not take a videoconferencing course in the future:

> If there were a serious problem, how would it be fixed? How would I alert them of the fact that their microphone was not working or that I could not see a thing? The option of just going down to the other classroom would be out of the question.

> I prefer the traditional teaching method, where students and professors are able to interact easily. Currently the opportunity costs seem to be too high for videoconferencing. Throughout the semester we had at least two technical people on hand. I believe they would be required regardless of when the bugs are worked out of the system, as it is too much work for the Professor to run as him or her teaches. Also the amount of equipment required to pull off such a stunt would be ridiculous! In the remote classroom alone there had to be almost $50,000 in equipment. Outfitting classrooms and hiring IT people would cause fees and tuition to go up. Essentially you would be paying more for a service that (from what I experienced) seems to be less.

Question 13. Was the opportunity to experience a portion of this course through videoconference beneficial to you?

Table 13: Summary of Responses to Question 13

	Group 1		Group 2	
Yes	13	100%	10	91%
No	0	0%	1	9%

All of the students except one agreed that experiencing part of the course via videoconferencing was beneficial to them. Seventeen of the students said they saw it as a valuable experience and nine of those seventeen as an experience that will help them in their future endeavors. The student that did not think this experience was valuable to them said:

I do not think so. I know that for a management student or someone in education this could be beneficial but I'm an art major. It does not really benefit me.

Question 14. What advice would you give to a student experiencing a course using videoconferencing for the first time?

Table 14: Summary of Responses to Question 14

8	Do not be shy
6	Go on camera and participate
3	Stick with it, it takes a few classes to get used to
3	See the instructor if you are too shy to talk in class

In both groups all but one student had advice for students that are experiencing videoconferencing for the first time. Eight students said not to be shy, nervous or intimidated by the technology. Six students would urge others to go on camera and participate. Three students said to stick with it and that it takes a couple of classes to get used to. Three also said to see the instructor for help if you are too shy to speak in class. Other comments include:

Be ready to put up with lots of technical delays.

Do not worry about it. It is just as good if not better than a regular course.

It is actually fun. Does not make learning the material hard in any way.

Question 15. What could be done to improve the videoconferencing experience?

Table 15: Summary of Responses to Question 15

7	Fix audio problems and make clearer
5	Minimize technical problems
3	Cameras need to zoom in on right people
2	Allow students to see the students from the other location all the time
2	Get a better, clearer document camera

All but six of the students had advice for how to improve the videoconferencing experience. Seven students suggested fixing the audio problems and making the audio clearer and louder. Five students commented generally on the technical problems and the need to minimize them. Three students directly mentioned the need for the cameras to zoom in on the right person when a button is pushed. Two students requested a feature that allowed them to see the students from the instructor's classroom at the same time as the instructor teaching. Two students suggested getting a better, clearer document camera. The following are some of the other comments that were made:

> One of the first classes should be designated to getting to know the system. Every student should have to click onto the microphones once. The day we spent going around the classroom saying our names/majors should have been done again in front of the cameras.
>
> A faster connection to eliminate the delay between classrooms.
>
> If the cameras moved a little quicker to the student and landed directly on them.
>
> Use it in classes that do not require heavy discussion (i.e. Math).

Question 16. I am less likely to talk in class when participating over videoconferencing.

Table 16: Summary of Responses to Question 16

	Group 1		Group 2	
Agree	6	46%	9	82%
Disagree	7	54%	2	18%

Fifteen students agreed that they were less likely to speak out in class when participating via videoconferencing. Five of the students mentioned that use of the technology and having ones face on the screen was intimidating. Two students said that

the procedure and the problems made it too much of a hassle to speak out in class. One student said that they were not confident in the technology working to give it a try.

Of the students that disagreed with the statement, two said pushing a button to talk is really no different than putting up your hand to talk. Two students said they do not talk in class anyway. One said they interacted the same as in other classes and another student said they have participated more in this class than they have in any other classes.

Question 17. I am less likely to go see the instructor in his office for help than I would be if this were a face-to-face class?

Table 17: Summary of Responses to Question 17

	Group 1		Group 2	
Agree	1	8%	1	9%
Disagree	12	92%	10	91%

The instructor of this course was curious to know if students were less likely to see him during office hours. The two students that indicated they were less likely to see the instructor said:

> It seems as if I do not know him and he has no idea who I am, so going to see him may be awkward.
>
> I tend to forget what it is I want to ask about when I go to seek help at his office. My hours do not always line up with his.

Question 18. Having a teaching assistant that is familiar with the course content in Pe256 is beneficial.

Table 18: Summary of Responses to Question 18

	Group 1		Group 2	
Agree	12	92%	11	100%
Disagree	1	8%	0	0%

All but one student agreed that having a student assistant in the satellite classroom was beneficial. Five students commented that having an official person present in the satellite classrooms also helped their comfort levels.

Question 19. Do you have any other comments to make regarding your experiences in English 1900 using videoconferencing?

A total of eleven students commented:

> The more students use the system the smoother it will run. This being an experimental class does not truly allow us to get the full experience.
>
> Thanks :)
>
> I have enjoyed the experience.
>
> I enjoy it because it is new and interesting, and I get to tell my family and friends about it.
>
> Keep it going, things are working well.
>
> It was a good experience overall.
>
> It was a great class to experience videoconferencing in!
>
> For the first time being used, I thought they did a pretty decent job.
>
> Videoconferencing is promising, however it would require significant amounts of polishing before it could be completely effective.
>
> Thanks for the experience.

Question 20. How many college or university courses had you completed at the start of this semester?

Table 19: Summary of Responses to Question 20

	Group 1		Group 2	
Less than 10	8	62%	7	64%
10-20	3	23%	1	9%
20-30	2	15%	2	18%
30+	0	0%	4	9%

Analysis and Discussion

Many of the results in each of the three methods used to collect data were very similar and one method confirmed the results of another. This pilot project was set up with both the instructor's and the satellite classrooms in the same location to limit the technical problems that may occur and to be able to bring the students together in the same classroom if there were any major technical problems. Unfortunately, there were many technical problems throughout this project, but most of the problems were endured with the exception of one class where the students from the replacement satellite classroom physically joined the students in the instructor's classrooms because the audio failed completely. I think that these technical problems may have affected the data in a negative way. It is worth noting that the technical problems were worse in the second half of the course and that the survey results from the second group of students were more negative than the first. I think that this increased negativity in the second group is due to the increase in technical problems.

It is also important to note that this pilot project was set in a somewhat controlled environment in an attempt to limit the technical problems that could occur. This clearly

did not work out as anticipated. However, the majority of the problems were with room and technical configuration issues due to the construction and development being done immediately prior to, and during, the course. Had those issues been sorted out prior to the start of the course, one could predict that the technical problems would have been far less.

I was surprised by how positive the students and the instructor were, in spite of problems such as rooms being delayed and technology not working or not working consistently. Overall, the students responding to the survey seemed very positive about videoconferencing, were grateful for the experience, and thought they learned a lot without compromising the course content.

Comfort with Videoconferencing

All three methods showed an increase in student comfort with videoconferencing. Phenomenological observation and instructor interviews both showed an increase in the instructor's comfort with videoconferencing as the course progressed.

Technical Problems

All three methods confirmed that technical problems, which occurred throughout the course, had a negative impact. This was mentioned in the responses to almost every question in the student survey, almost every interview with the instructor, and I noted these problems in every class that was observed. This is consistent with the research. For example, Salvati (2001) found that reliability of videoconferencing technology was a key determinant of success.

Time constraints

Phenomenological observation and instructor interviews both identified the time to setup for each class as being too short. The CRDC, which was supporting the instructor and course and has experience setting up videoconferences, suggested more time is needed before class to setup and troubleshoot any problems. Their standard practice is to book thirty minutes before and after every videoconference to deal with any planned or unplanned issues. In this pilot, had there been time before each class to test the system, problems such as camera angles being programmed wrong or cables being attached incorrectly could have been fixed before class started.

Audio Quality

All three methods identified problems with the audio not working, particularly the audio being sent from the students in the instructor's classroom. The poor audio from this classroom was in large part due to the ceiling microphones that were used. These failed to pick up many students who spoke in a low voice; further compounding the problem was their placement near the projector fans and air circulation system resulting in loud background noise. However, since the instructor's audio was clear because he wore a lapel microphone and repeated what students said and asked, many students overlooked the poor audio from students in the classroom.

In the context of audio not working in a remote classroom, one student made the comment, "how would I alert them of the fact that their microphone was not working or that I could not see a thing?". One strategy that the CRDC suggests is interrupting the session and communicating that you cannot hear the other location by waving ones arms in the air and pointing to your ear to indicate that you cannot hear. They recommend that

there be a facilitator identified for each videoconference site who would be responsible to do this. However, if students were too shy to press a button and speak into a microphone, then it may be too much to ask them to wave their hands if the audio stops working. Instead, it may be more likely that one of the more assertive students would do this or the instructor could assign a specific student this task.

Video Quality

All three methods confirmed the video quality was sufficient but that there is still room for improvement. A key problem identified from the instructor interviews and the phenomenological observation was the wide-angle video of the satellite classrooms showing all the students. The onscreen image of the students was too small to identify who they were. There does not appear to be an immediate solution to this problem due to the limitations of the technology.

Technical Support

Phenomenological observation and instructor interviews both confirmed that due to the technical problems in the course, the support of technical staff was essential to keep the course functioning. Both also identified the need for some technical support even if the technology worked as it was supposed to.

Teaching Assistant

All three methods validated the use of a teaching assistant at the remote sites. This will contribute to the cost of offering a videoconference course. The instructor's idea of having videoconference office hours before and/or after each class is a good idea in my opinion and worth trying. It could reduce or eliminate the need for a teaching assistant in

many cases. Another strategy that is complimentary would be to appoint a volunteer student as a class representative or monitor to act in this capacity.

Malfunctioning Buttons

All three methods identified that when the buttons were pressed, and did not zoom the camera to the correct student, frustration and stress frequently emerged. This likely contributed to the negative perceptions of some of the students and the instructor.

Document Camera and Cue Cards

Most of the students commented that it was easy to read and follow the notes on the document camera. This confirms the instructor's appropriate use of cue cards and my similar observations.

Videoconferencing course vs. Face-to-Face

The first question the student survey asked was whether the videoconferencing course was better, about the same, or worse than a face-to-face class. Six of the eight students that thought the videoconferencing course was worse stated the technology problems as the reason. This may lead one to question if those students would have responded differently had the technology worked as it was intended.

Negativity about the Course

I was surprised by the generally positive response to question seven by the students. Only five of the students said that videoconferencing was causing them to feel negatively about the course. This is interesting given all the technical problems that occurred throughout the course. As someone who observed many of the classes and the problems, I was surprised by how positive the responses were to this question. An explanation could be that these students are familiar with technology and technology

failing; therefore, they are able to deal with technical problems easier and have a more forgiving attitude. An alternate explanation is the novelty factor. Since this was a new approach to teaching and new to most of the students involved, they may have been more forgiving.

Ability to Focus in Class

Ten students (42%) said that they thought they could focus better in a videoconference class vs. a face-to-face class. These comments are not surprising. Research has claimed that the use of audiovisual tools increases the participant or learner's attention and focus (Arnold).

Slower Class Pace

Because of the slower pace of the course, the instructor noted that a course with less interactions and straight lecture might be better suited for videoconferencing. This is an interesting comment because it contradicts the current body of literature. For example, Ho (2004) stated the following:

> A lecture-style presentation is less effective for a videoconference audience than for a live audience. The key challenge for a VC presenter is to use teaching strategies that strike a balance between dialogue and program structure, leading to engaging and content-rich experiences that involve a high degree of interaction for participants.

The instructor's differing opinion from the literature could be explained by the fact that this was his first attempt at using videoconferencing and the plethora of technical problems that occurred. Both could explain why the course progressed at a slower pace. The new experience causes a learning curve as one adapts to the new environment and

the technical problems caused many delays. Also possibly contributing to the difference of opinion is that the research points to the need of increased interaction over videoconferencing at the expense of the amount of content that can be covered. The research suggests an increased dependence on interaction to help with student engagement and compensate for the instructor not being in the same room as the students.

Self-Consciousness

It should be noted that many students claimed that they were more self-conscious during the videoconference classes. Many researchers have claimed videoconferencing, and whenever a camera is present, increases ones self-awareness (Storck 1995). Generally, three reasons are given to explain this, all of which are confirmed by comments made by students in this study. The first, is that pressing the button to speak and seeing the camera zoom in on them reminds them that they are being observed; second, there is a screen at the front of the room that displays what is being sent to the other classroom and the student sees their own image; and thirdly they may be concerned that they may be recorded even though it has been made clear to them that they are not. It is interesting to note that in the survey question that asked for advice to give to students using videoconferencing for the first time that six students made comments such as:

> Everyone should click onto the microphone at least once. If you do it once, you will become more comfortable.

Support for the Instructor

It was clear during this pilot project that support for the instructor engaged in videoconferencing is crucial to its success. Supports need to come from various sources and the literature supports their necessity (Owston, 2004). First, the administrative team that the instructor reports to needs to visibly support the project and ensure that their

actions demonstrate support for, and confidence in, the instructor. This could be as simple as being available to discuss the experience as it occurs, to providing action when necessary to remedy a problem. Without perceived support from the administration, the instructor may feel abandoned and isolated. The instructor confirmed this in his interviews with me. Several tips for administrators are presented with the best practices summary in the conclusions and recommendations section.

Technical and pedagogical support also needs to be provided to the instructor as they begin to use videoconferencing. Having a person or a team available to assist with the technical setup and potential problems eases the instructor's anxiety and allows him/her to focus on the important task of teaching and engaging the students without concern of technical issues. Over time, dependence on technical support may lessen. However, in the beginning, such support makes a huge difference. The instructor also mentioned this support during his interviews.

Another area of support that perhaps could be easily overlooked is that of the students. Gaining student support and understanding before the first class and during the semester by setting expectations (that is, both informing them of what to expect from the experience and what is expected of them) provides another level of comfort in the classroom. This was done in this pilot project in two ways. First, the instructor emailed each student who registered for the course explaining what was going to happen in the course. He did this during the registration period in the previous semester. Second, at the beginning of the course in the first class the instructor invited me in to explain with him in more detail what was going to transpire. This explanation was done prior to the

add/drop period giving students the opportunity to drop the course and sign-up for a replacement if they desired.

Importance of Good Teaching

Overall, in spite of the technical problems, the course went very well and students were pleased with the experience. I think one of the strongest contributing factors to this is that in my opinion, the instructor is a very good teacher. This became evident during the course and was confirmed by many student comments in the survey. If this pilot project had been completed with a poor instructor, the results may have been different.

Conclusions and Recommendations

Best Practices Summary

The following is a summary list of the best practices learned from this project.

- Do ensure all the technology is working as expected before offering a course using videoconferencing.
- Do plan time before the start of each class to test the system and troubleshoot any problems.
- Do encourage interruptions if technology is not working properly.
- Do ensure that technical staff is easily and quickly accessible if there is a problem.
- Do use an instant messaging tool so technical staff (if they are used) can communicate behind the scenes and not disrupt the class.
- Do have predetermined strategies in place to identify and deal with problems. For example, if the audio stops transmitting, those at the affected site should interrupt the session by communicating they cannot

hear the other location while waving their arms in the air and pointing to ears to indicate that they cannot hear.

- Do insist on microphones on the desk for every student or every second student to produce good sound.
- Do use a fresh set of batteries in wireless microphones each session or track the usage and replace often.
- Do use a wireless lapel microphone for the instructor to ensure consistent high quality sound.
- Do teach participants to speak up when in a videoconference to ensure the remote site can hear what is being said.
- Do have the instructor repeat questions and comments that are made by students to ensure nothing is missed.
- Do teach participants not to talk at the same time as the participants at the opposite location. Try not to interrupt another person talking. If you are interrupted, let the other person talk, or continue talking yourself without a break to prevent confusion of both people not knowing if the other person is pausing or going to continue talking. (Because of the half-second delay in transmission).
- Do reduce student fears of videoconferencing by providing an orientation of the system during the first class where everyone learns and practices using the system.
- Do provide videoconferencing office hours for the remote students, before and/or after each class.

- Do be prepared that less content can be covered in a class discussion when compared to a traditional face-to-face class. Additional out-of-class support materials are beneficial to make up for a reduction in seminar like class time.
- Do ask students to sit in the same location each class to aid the instructor in identifying students.
- Do explain to participants before hand what is going to happen, what they can expect, and what is expected of them.
- Do use a backdrop to improve the quality of the video image.
- Do use cue cards and a thin marker to ensure that the document camera is zoomed to a default state that ensures students can read the text that is written. (Vs. 8 1/2 x 11 sheet of paper with the document camera zoomed out so the entire page is in the view causing the writing to appear too small to read but good enough to be used as a guide if the student has a hard copy in front of them.)
- Do ensure supervisors and/or senior administration show their support of the initiative by:
    i. being available to talk about the experience as it occurs;
    ii. providing action as issues arise;
    iii. providing incentives such as a teaching assistant to help prepare material and/or participate at the remote site;
    iv. providing technical support;

v. providing pedagogical support for adjusting the content and teaching approach to this method of delivery.

- Do not build the videoconferencing technology just before or while the system is being used.
- Do not change or upgrade the videoconferencing system or technology while it is being used for a course. Wait until a break when there is sufficient time to test and fix any unexpected problems resulting from the changes.
- Do not use ceiling microphones because of their poor ability to pick up voices.
- Do not alienate the remote site or the local site. Ensure that both are getting equal attention.

Recommendations for Future Study

This study should be replicated with one or more remote satellite classrooms. It would be good for the future study to try to control each of the problems identified in this project. If the videoconferencing technology were working properly, it would be interesting to note if student and instructor satisfaction were higher.

It may also be useful in the future to also interview the technical and other support staff that may participate in such a project.

Another question that could be explored is what, if any, are the effects on both student and instructor perceptions of success when using online resources and tools in a course that is taught via videoconferencing.

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Appendix A

Classroom Schedule (Revised)

Tuesday, Thursday, 9:25am-10:40am

Tuesday	**Thursday**
	January 6 *All students in instructors classroom face-to-face*
January 11 *All students in instructors classroom face-to-face*	January 13 *All students in instructors classroom face-to-face*
January 18 *Group x in instructor's classroom* *Group y in satellite classroom*	January 20 *Group x in instructor's classroom* *Group y in satellite classroom*
January 25 *Group x in instructor's classroom* *Group y in satellite classroom* **Quiz**	January 27 *Group x in instructor's classroom* *Group y in satellite classroom*
February 1 *Group x in instructor's classroom* *Group y in satellite classroom*	February 3 *Group x in instructor's classroom* *Group y in satellite classroom*
February 8 *Group x in instructor's classroom* *Group y in satellite classroom*	February 10 *Group x in instructor's classroom* *Group y in satellite classroom*
February 15 *Group x in instructor's classroom* *Group y in satellite classroom* **In-Class Essay #1 Written**	February 17 *Group x in instructor's classroom* *Group y in satellite classroom*
February 22 **Reading Week: No Class**	February 24 **Reading Week: No Class**
March 1 *All students in instructor's classroom face-to-face*	March 3 *All students in instructor's classroom face-to-face*
March 8 *Group x in replacement satellite classroom* *Group y in instructor's classroom*	March 10 *Group x in replacement satellite classroom* *Group y in instructor's classroom*
March 15 *Group x in replacement satellite classroom* *Group y in instructor's classroom*	March 17 *Group x in replacement satellite classroom* *Group y in instructor's classroom*
March 22 *Group x in replacement satellite classroom* *Group y in instructor's classroom*	March 24 *Group x in replacement satellite classroom* *Group y in instructor's classroom*
March 29 *Group x in replacement satellite classroom* *Group y in instructor's classroom*	March 31 *Group x in replacement satellite classroom* *Group y in instructor's classroom* **In-Class Essay #2 Written**
April 5 *Group x in replacement satellite classroom* *Group y in instructor's classroom*	April 7 *All students in instructor's classroom face-to-face*
April 12 *All students in instructor's classroom face-to-face*	April 14 *All students in instructor's classroom face-to-face*

All students will meet in C640 on January 6, 11, and 13. Following the January 12 "Add/Drop Deadline," the instructor will divide the class into two groups: x and y. Students will be informed of these groupings by email and during the lecture on January 13. On January 18, students in group x will resume meeting in C640; students in group y will start meeting in PE256. On **March 8**, students in group x will begin meeting in B716; students in group y will resume meeting in C640. All students will meet in C640 on **April 7, 12, and 14. [Changes have been made necessary by construction delays. The Arts and Science Dean's Office have been informed of these changes, and they recognize that they are necessary to ensure that both groups get eight instructional days in the remote site and eight instructional days in C640.]**

Appendix B

Predetermined Instructor Interview Questions

- What went well in today's class?
- What caused you problems in today's class?
- Did you enjoy the class today?
- What could be done differently? Thoughts on how to minimize or avoid problems?
- Were you able to hear the students in the satellite classroom?
- How well so you think the document camera worked today?
- Did you feel comfortable with the technology?
- How do you think the students responded to, were impacted by the technology?
- How do you think the students found the videoconference today?
- Was the technician useful/necessary?
- Are you enjoying the experience? Why?
- Do you think you would want to do this again?
- What changes do you want to make in your teaching for future classes?
- What technology in the room should be improved to make the course run smoother?

Appendix C

Online Student Survey Blueprint

Research Question	Issues	Survey Question
Is the experience different than a face-to-face class?	Why is the videoconference experience better, worse, or similar to a face-to-face class.	1. Compared to a traditional face-to-face classroom experience, the videoconferencing experience is Better About the same Worse Why?
What are the instructor and student perceptions of the effectiveness and desirability of experiencing a videoconferenced course?	Positive aspects of videoconferencing.	2. What do you like about taking the course through videoconferencing?
What are the instructor and student perceptions of the effectiveness and desirability of experiencing a videoconferenced course?	Negative aspects of videoconferencing.	3. What DON'T you like about taking the course through videoconferencing?

Are the students ar:u:u:u:u:utructor comfortable and re u u u u u un using the videoconferencing;y;y;y;y;y;gy to interact	Are the students able to interact effectively with the instructor?	4. How effectively are you able to interact with the professor over videoconferencing compared to a traditional face-to-face class? Better About the same Worse Why?
Is the experience different than a face-to-face class?	Can the instructor and students connect with each other as well as they would in a face-to-face class?	I do not feel as though I know the instructor as well as I would in a face-to-face class. Agree Disagree
Is the experience different than a face-to-face class?	Do students find it harder to pay attention in the videoconference class?	I am able to focus in class better/about the same/worse with videoconferencing, than in a face-to-face class.
What are the instructor and student perceptions of the effectiveness and desirability of experiencing a videoconferenced course?	Is videoconferencing making the students dislike the course?	The videoconferencing experience is affecting how I feel about the course. Positively Negatively Is not affecting

Are the students a[illegible]utructor comfortable and re[illegible] using the videoconferencing[illegible] to interact?	Are students gaining confidence and becoming more comfortable with the technology as the semester progresses?	Since the beginning of the course, my comfort level with videoconferencing has Increased Decreased Stayed the same
What are the instructor and student perceptions of the effectiveness and desirability of experiencing a videoconferenced course? What role does the physical and technical setup and design of the videoconferencing rooms play in experiencing a course through videoconference? What improvements to the technical setup and configuration could improve the experience?	What are student impressions about the quality of the video?	The quality of the video is Good Sufficient Insufficient

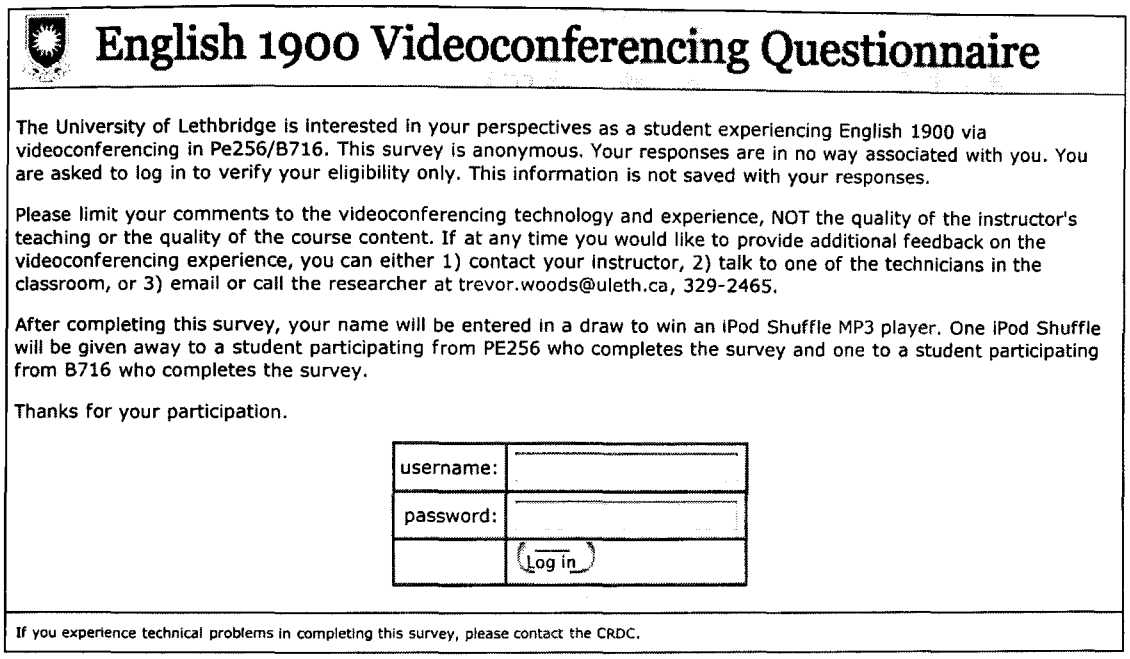
Are the students a[illegible]utructor comfortable and re[illegible] using the videoconferencing[illegible] to interact?	Are students gaining confidence and becoming more comfortable with the technology as the semester progresses?	Since the beginning of the course, my comfort level with videoconferencing has Increased Decreased Stayed the same
What are the instructor and student perceptions of the effectiveness and desirability of experiencing a videoconferenced course? What role does the physical and technical setup and design of the videoconferencing rooms play in experiencing a course through videoconference? What improvements to the technical setup and configuration could improve the experience?	What are student impressions about the quality of the video?	The quality of the video is Good Sufficient Insufficient

What are the instructor and student perceptions of the effectiveness and desirability of experiencing a videoconferenced course?	Do students like videoconferencing enough to take another course using it?	If you lived outside of Lethbridge, and wanted to take a course from Lethbridge, would you consider taking the course by way of videoconferencing? Yes No
What are the instructor and student perceptions of the effectiveness and desirability of experiencing a videoconferenced course?	Are students glad they participated in this course using videoconferencing?	Was the opportunity to experience a portion of this course through videoconference beneficial to you? Yes No
What are the instructor and student perceptions of the effectiveness and desirability of experiencing a videoconferenced course?	What did the students learn from this experience that they think is important for others to know?	What advice would you give to a student experiencing a course using videoconferencing for the first time?
What are the instructor and student perceptions of the effectiveness and desirability of experiencing a videoconferenced course?	What do the students think could be done better?	What could be done to improve the videoconferencing experience?
Are the students and the instructor comfortable and receptive in using the videoconferencing technology to interact?	Is the videoconferencing technology inhibiting the students?	I am less likely to talk in class when participating over videoconferencing. Agree Disagree

Are the students aururururustructor comfortable and ru u u u u un using the videoconferencinggygygygygygy to interact?	Are students requiring more assistance with the course because of the videoconferencing experience?	I am less likely to go see the instructor in his office for help than I would be if this were a face-to-face class? Agree Disagree
What support systems are needed to help offer a videoconference course? (i.e. teaching assistant, technical support, course redesign, and senior administration.)	Do students feel the need to have an official person in the room with them to assist them?	Having a teaching assistant (Stacy) that is familiar with the course content in Pe256/B716 is beneficial. Agree Disagree
	Do students have any other comments that they did not get a chance to articulate?	Do you have any other comments to make regarding your experiences in English 1900 using videoconferencing?
	How much experience has the student had with university courses?	How many college or university colleges had you completed at the start of this semester? less than 10 10-20 20-30 30 +

Appendix D

Online Student Survey



English 1900 Videoconferencing Questionnaire

The University of Lethbridge is interested in your perspectives as a student experiencing English 1900 via videoconferencing in Pe256/B716. This survey is anonymous. Your responses are in no way associated with you. You are asked to log in to verify your eligibility only. This information is not saved with your responses.

Please limit your comments to the videoconferencing technology and experience, NOT the quality of the instructor's teaching or the quality of the course content. If at any time you would like to provide additional feedback on the videoconferencing experience, you can either 1) contact your instructor, 2) talk to one of the technicians in the classroom, or 3) email or call the researcher at trevor.woods@uleth.ca, 329-2465.

After completing this survey, your name will be entered in a draw to win an iPod Shuffle MP3 player. One iPod Shuffle will be given away to a student participating from PE256 who completes the survey and one to a student participating from B716 who completes the survey.

Thanks for your participation.

username:	
password:	
	Log in

If you experience technical problems in completing this survey, please contact the CRDC.

English 1900 Videoconferencing Questionnaire

The University of Lethbridge is interested in your perspectives as a student experiencing English 1900 via videoconferencing in Pe256/B716. This survey is anonymous. Your responses are in no way associated with you.

Please limit your comments to the videoconferencing technology and experience, NOT the quality of the instructor's teaching or the quality of the course content. If at any time you would like to provide additional feedback on the videoconferencing experience, you can either 1) contact your instructor, 2) talk to one of the technicians in the classroom, or 3) email or call the researcher at trevor.woods@uleth.ca, 329-2465.

After completing this survey, your name will be entered in a draw to win an iPod Shuffle MP3 player. One iPod Shuffle will be given away to a student participating from PE256 who completes the survey and one to a student participating from B716 who completes the survey.

1. Compared to a traditional face-to-face classroom experience, the videoconferencing experience is

   ○ Better
   ○ About the same
   ○ Worse

   Why:

2. What do you like about taking the course through videoconferencing?

3. What DON'T you like about taking the course through videoconferencing?

4. How effectively are you able to interact with the professor over videoconferencing compared to a traditional face-to-face class?

   ○ Better
   ○ About the same
   ○ Worse

   Why:

5. I do not feel as though I know the instructor as well as I would in a face-to-face class.

- ○ Agree
- ○ Disagree

Why:

6. I am able to focus in class [better] with videoconferencing, than in a face-to-face class.

Why:

7. The videoconferencing experience is affecting how I feel about the course.

- ○ Positively
- ○ Negatively
- ○ Is not affecting

Why:

8. Since the beginning of the course, my comfort level with videoconferencing has

- ○ Increased
- ○ Decreased
- ○ Stayed the same

Please explain :

9. The quality of the video is

- ○ Good
- ○ Sufficient
- ○ Insufficient

Please explain :

10. The quality of the audio is

- ○ Good
- ○ Sufficient
- ○ Insufficient

Please explain :

11. I am able to follow along with the instructor's notes using the document camera.

- ○ Yes
- ○ No

If no, why:

12. If you lived outside of Lethbridge, and wanted to take a course from Lethbridge, would you consider taking the course by way of videoconferencing?

- ○ Yes
- ○ No

Why:

Why:
Why:
Why:
Why:
Why:

13. Was the opportunity to experience a portion of this course through videoconference beneficial to you?

- ○ Yes
- ○ No

Why:

14. What advice would you give to a student experiencing a course using videoconferencing for the first time?

15. What could be done to improve the videoconferencing experience?

16. I am less likely to talk in class when participating over videoconferencing.

- ○ Agree
- ○ Disagree

Why:

17. I am less likely to go see the instructor in his office for help than I would be if this were a face-to-face class?

- ○ Agree
- ○ Disagree

Why:

18. Having a teaching assistant (Stacy) that is familiar with the course content in Pe256 is beneficial.

- ○ Agree
- ○ Disagree

Why:

19. Do you have any other comments to make regarding your experiences in English 1900 using videoconferencing?

20. How many college or university classes had you completed at the start of this semester?

- ○ less than 10
- ○ 10 - 20
- ○ 20 - 30
- ○ 30 +

Thank you for your time and feedback.

Submit

If you experience technical problems in completing this survey, please contact the CRDC.

Appendix E

Human Subjects Research Committee Approval

The University of Lethbridge

MEMORANDUM

TO: Trevor Woods and Sharon Friesen
FROM: Rick Mrazek
Date: November 1, 2004

RE: Human Subject Research Application: "A Comparative Case Study of Innovative IP Videoconferencing in K12 Alberta Schools "

The Faculty of Education Human Subject Committee has approved your HSR application.

Please contact the Field experience Office to gain approval from the necessary school authorities for your research if it has not already been granted. To facilitate the process, be prepared to provide an electronic copy of your proposal, including appendices. Your letter and forms will then be forwarded to the required jurisdictions and you will be notified when approval has been obtained.

Good luck with your research.

Rick Mrazek, Ph.D.
Chair Human Subject Committee
Faculty of Education

Cc: Graduate Studies
Field Experience Office for Zone 6