Through the Eye of the Camera: A Teacher's View of Video-Conferencing

Tom Potter
Mathematics Teacher, Gaston County Schools, Gastonia, NC USA jtpotter@gaston.k12.nc.us

Abstract
Distance learning via video-conferencing has gained popularity in education in the U.S. Once the domain of universities and colleges, this form of classroom instruction has now become a small but growing facet of today's public secondary education. This paper will explore several key questions based on experiences in an AP Statistics class consisting of thirty-four students of which twenty-seven were on site and seven in another location who participated via video-conferencing. What are some of the issues and challenges to teachers in implementing this technology? What pedagogical implications are there, especially those who teach mathematics? How is learning impacted, if at all? Discussion will be based on data from teacher reflection and student surveys. Implications for effecting mathematics teaching and learning will be raised.

Introduction

Compared to post secondary education, distance learning at the secondary level is relatively new to public education in the United States. Decades ago colleges and universities saw the need to provide various course offerings to students who could not attend on-campus classes and began turning resources towards meeting those needs. For many years the mainstay of instruction and assessment for college distance education classes was video taped lectures and correspondence tests sent through the mail. Over the last fifteen years, however, increases in computer technology have resulted in a change of the whole complexion of instructional delivery of college classes (Andrews and Strain, 1985). Many people can now pursue college credit courses via internet connected formats and other on-line media. It is now possible to be present in one location and view and participate in a class located in another.

Because college distance education offerings have been around for many years, a significant amount of data on the effectiveness of this form of education has been collected. Brown and Kulikowich (2004) found that distance education can be as effective as traditional methods for specific content courses and that those students completing distance education courses are more likely to take future courses in that format. At the college level students tend to rate distance education classes as high in concept acquisition as traditional instruction. Achievement levels in distance education at the university level are also comparable to traditional classroom offerings (Restauri et. al., 2001). Not everything is positive, though. One common complaint on student attitude surveys is that there is a lack of one-on-one interaction between student and instructor (Restauri et. al., 2001). Another is that communication between instructor and student in an on-line format is often time consuming.

Like universities, secondary school districts are taking advantage of the convergence of web based technology and are now beginning to expand their ability to meet the needs of all students by offering courses via on-line or video-conference. Secondary distance education, however, has not been around as long as post secondary therefore less data has been collected and analyzed with regards to effectiveness, impact on learning, and student attitudes. Of the few studies that have been conducted, most report some findings similar to those from the post secondary. That is, courses in this format are generally accepted by the students and that, as long as the teacher is effective, the overall experience is good (Downs and Muller, 1999). They also find that more students who normally do not have the resources to take advanced courses are now given opportunities to take them especially those that are for college credit. The similarities stop here, though. Unlike post secondary education, secondary education is composed of adolescent

students who are not yet adults (or considered as adults). Therefore the issues and attitudes of students about distance education classes are different. What has been the experience, so far, for students and teachers involved in video-conferencing classes? What questions are raised from this knowledge? Furthermore, what direction could future research take in light of questions raised? The purpose of this paper is to explore these and ascertain findings that will direct future research.

Method

The sample in this study consists of twenty-nine students between the ages of sixteen and eighteen of which twenty-two attend one suburban high school located in the Piedmont region of North Carolina and seven attend a rural high school located within the same school district. The course being taught is Advanced Placement Statistics and all students have met prerequisite course requirements and are, therefore, considered capable of pursuing the rigorous work necessary for this subject. The course originates from the suburban school mentioned above where twenty-nine students take the course in the presence of the instructor and the seven at the rural school receive the class through a video-conference feed in real time. Technology used in the set-up allows students from both classrooms to see each other and to converse via a system of built in ceiling microphones. Both classrooms are equipped with two monitors for whole class viewing of the various locations and one forty-two inch content screen for display of powerpoint, video, dvd, or internet streamed media. Each class is also equipped with an "Elmo" video overhead screen which can also be transmitted through the content display for each class to see. Each classroom is also equipped to host and transmit instruction making it is possible for the instructor to travel to the remote location and teach all classes from there.

The class is taught on a single semester system which means that all students complete the class after eighteen weeks of study. Four times during the semester the instructor visited the rural school classroom and taught both classes from that setting. During the semester both classes met once in the same location for a single lesson. At the end of the semester, each student was given a survey and asked to complete it and return it to the instructor. The survey contained fifteen questions that were designed to elicit student's attitudes on technology in the distance education setting, classroom atmosphere, interaction between students from both inside the class and between the locations, and overall instruction. Students responded to the survey by selecting the best answer that exemplifies how they feel. Each set of responses was set up on a Likert Scale of 1-5 with the lowest answer indicating disagree and the highest one indicating strongly agree. Three open-ended questions were placed at the end for any comments. The answers were tabulated and results were compiled. A copy of the survey is attached to the end of this paper as appendix A.

Results and Discussion

The first analysis focuses on a set of questions on the survey that is designed to obtain students attitudes on how the technology used in the distance education classes aided in learning and understanding. Table 1 provides basic descriptive statistics on the overall responses given by the students.

The data reveal in question 8 and 9 that while the technology was available to view the archived video of any prior lesson taught during the semester with access from any internet connected computer, the majority of students did not take advantage of it as a resource for learning. Data from question 4, on the other hand, reveal that the technology used to display power points, videos, and live demonstrations was seen a beneficial by the student as an aid in learning. It is interesting to note here that when the data are broken down between on-site and

remote locations for this question the remote location has a mean of 5 compared to an on-site mean of 3.59, indicating that those who received the class found the technology more helpful in learning than those who were present at the host site. Data on questions 10 and 11 indicate that about half of the class used the on-line grade reporting system and found it helpful in their learning.

Table 1

Question #	Mean	Standard Deviation	Sample Size
4	3.93	1.22	29
8	1.55	1.15	29
9	4.14	1.55	29
10	2.03	1.21	29
11	3.00	1.73	29

Table 2

Question #	Mean	Standard Deviation	Sample Size
1	2	1.16	29
2	2.38	1.24	29
6	2.97	1.32	29
12	3.48	1.62	29

The second analysis focuses on a set of questions designed to obtain students attitudes on interactions between themselves and the instructor. Table 2 provides basic descriptive statistics on the overall responses given by the students. The data in this section reveal several things. One is that, as indicated by the low mean responses for questions 1 and 2, the camera has little effect on participation. The mean response of question 6 shows that most students feel that interaction between on-site and remote locations was limited. Still another revelation from the mean response of question 12 is that, overall, being on camera and having voices broadcast was not a prohibiting factor in asking questions out loud for most students. It is interesting to note that the average response per class for this question is higher for the on-site students and lower for the remote site.

The third analysis focuses on a set of questions designed to obtain students attitudes on classroom atmosphere in a video-conference setting. Table 3 provides basic descriptive statistics on the overall responses given by the students.

Table 3

Question #	Mean	Standard Deviation	Sample Size
3	3.17	1.42	29
5	2.59	1.43	29
7	3.59	1.45	29

Table 4

Question #	Mean	Standard Deviation	Sample Size
13	2.57	1.23	28
14	3.69	1.23	29
15	2.03	1.05	29

The data reveal that seeing another group of students on the monitors had both positive and negative impacts on the learning atmosphere of the classroom. From observing the data in question 3 it is noticed that most students felt that seeing other students in the television monitors was distracting and had a negative impact on concentration. On the other hand, it is also seen by the data from question 5 and 7 that about half of the students felt that including students from other locations and hearing their viewpoints did make the classroom experience more interesting.

The fourth analysis focuses on a set of questions designed to obtain students attitudes on overall instruction in a video-conference setting. Table 4 provides basic descriptive statistics on the overall responses given by the students. The data reveal that, overall, students felt that the technology did not make the classroom experience better and did not help to facilitate learning.

The last analysis focuses on the responses given by students when asked three general questions about the overall class experience. When asked what things were found to be helpful about the video-conference setting (part II, question #1) one common answer was that the

content screen used to show powerpoints and other video displays were helpful. Another was that having the ability to interact with students from other classes and schools made the experience more interesting. When asked what were some of the things that hindered the learning in a video-conference setting (part II, question #2) one common answer was that difficulties with technology (i.e. system failures, microphone problems, and camera freezes) caused frustration and a subsequent lack of motivation. Another common response was that students felt pressure to always behave perfectly since they were constantly being filmed and as a result they felt that they could never relax and enjoy the class. All students in the remote class felt that there was not enough one-on-one time with the instructor and that technology did not bridge that gap. Regarding suggestions for improving classes held in a video-conference setting (part II, question #3) the most common answer from all is that it is best to not hold them in this setting at all, especially those classes that need more one-on-one attention like mathematics. Students at the remote site all felt that more and frequent instructor visits to their location would be better because it gave them more chances to get personal instruction. Another common response to this question from both locations was that the school should be more selective in screening students for this type of class and that most students would be better off taking courses taught in a traditional instructional method.

Implications for Future Research

While this study is not a complete and comprehensive scientific investigation of video-conferencing and its impact on secondary education there are, nevertheless, some interesting findings which have implications for future research. One is in the area of student's attitudes on the use of technology in a video-conference class. The survey results found that most of them (in fact, all of the remote location students) felt that the use of televised content screens displaying powerpoints, dvds, and live demonstrations were helpful in gaining understanding of the concepts. They also felt that the technology allowing them to have students from other locations participate in conversations enriched the experience and made the class more interesting. On the other hand they felt that the same technology that allowed them to see the classes on television also provided a distraction and prevented them from focusing. Perhaps this can be addressed from an instructional standpoint. What pedagogical methods are best in utilizing the technology in a video-conference classroom to eliminate distractions and increase student concentration? What can be done to make the classes feel more included and motivated to participate?

Another interesting finding which has implications for future research is in the area of course content and it's appropriateness as a distance learning subject. It is already hypothesized that in college courses one prevalent difference between traditional and distance education is the lack of one-on-one instruction (Coldeway, MacRury, & Spencer, 1980) however, other studies (Brown & Kulikowich, 2004) found that those who took college courses in a distance learning format are willing to take others taught in the same format. This study indicates the opposite for high school students. Could this be one result of the age and development differences between high school adolescents and college adults? Are there other factors that contribute to secondary student's desire to not take future classes in this format? Is lack of one-on-one instruction an overall cause or is it content specific? Could this be addressed through a combination of technology and pedagogy? These are all guiding questions for further research.

References

Andrews, J. & Strain, J. (1985). Computer-assisted distance education: Off-line and on-line American experiences. *Distance Education, 6*(2). 143-157.

Brown, S. & Kulikowich, J. (2004). Teaching statistics from a distance: what have we learned?

International Journal of Instructional media, 31(1). 19-35.
Coldeway, D., MacRury, K., & Spencer, R. (1980). Distance education from the learner's perspective: The results of individual learner trackning at Athabasca University. Edmonton, Alberta: Athabasca University. (ED 259 228)
Downs, M. & Moller, L. (1999). Experiences of students, teachers, and administrators in a distance education course. *International Journal of Educational Technology, 1*(2). 1-13.
Restauri, S., King, F., & Gordon, N. Assessment of student preference for two methodologies of teaching via distance learning: an evaluative approach based on accreditation. Jacksonville, AL: Jacksonville State University. (ED 460 148).

Appendix A

Student Survey on Video-Conferencing

PART I

Please circle the number that best describes your opinion of this distance learning format.
1=Disagree, 2=Somewhat Disagree, 3=No Opinion, 4=Somewhat Agree, 5=Strongly Agree

1. I felt that being on camera made me more alert and attentive 1 2 3 4 5
2. Being on camera made me feel uncomfortable and restricted my participation 1 2 3 4 5
3. Seeing another group of students on the monitor was distracting 1 2 3 4 5
4. Use of the content screen for power points and videos made the concepts easier to understand 1 2 3 4 5
5. It was helpful for me to hear the viewpoints of students from other location(s) 1 2 3 4 5
6. Interaction between the locations was limited because of instructor preferences or technological issues or both 1 2 3 4 5
7. Including students from other classroom locations made the class experience more interesting for me 1 2 3 4 5
8. I sometimes use the class archives to catch up on teachings that I missed or to reinforce concepts I did not understand 1 2 3 4 5
9. I never used the archiving system to review or catch up 1 2 3 4 5
10. The classroom website was useful to me 1 2 3 4 5
11. I often accessed my personal grades for this class on the web and found that knowing my grade helped in my learning 1 2 3 4 5
12. It was easy for me to ask questions despite being on camera and having my voice recorded 1 2 3 4 5
13. The video-conferencing technology made me feel like I was in the same classroom with all of our class members 1 2 3 4 5
14. The instructor was always easy to hear and access, even from remote sites 1 2 3 4 5
15. Overall, this format made it easier to learn the subject 1 2 3 4 5

PART II

Please answer the following questions honestly and candidly. Your answers will benefit those who come into this class after you. If you need more room to write, use the back of this page.

1) What are some of the things you found helpful about this class setting (i.e. video-conferencing)?
2) What were some things that hindered your learning in this type of classroom setting?
3) What suggestion(s) do you have for improving the way classes are held in a video-conferencing format.