

# Virtual Instruction with a Tablet PC and Student Reaction

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The scholarly productivity of faculty is often a metric in determining the ranking of universities. This often leads to higher research expectations on present day faculty. Consequently faculty travel to various conferences during the academic year in pursuit of scholarly activities. Faculty members are forced to send in a substitute instructor or have a make-up class in order to accomplish the course objectives for the term despite the absences. In one such situation, a faculty member used a tablet pc to connect to the classroom remotely and conduct class virtually. The faculty member used a software solution to project the screen from the tablet pc on to the screen of the classroom. The instructor used a conventional land phone line to call the classroom to a high powered conference phone for the audio portion of the communication. This paper describes the technologies and processes used by the instructor to teach class in a virtual environment. A survey of students was conducted immediately after the lecture. The results of the survey and the impressions of the instructor are presented in the paper.

**Keywords:** Virtual Lecture, Tablet PC, Conference Telephone, Student Survey

## Introduction

Graduate students interested in an academic career are often told by faculty that an academic career involves publishing papers in journals and presenting them at conferences (Brown, 2008). Despite all its faults, the ranking of universities is an accepted method to gauge the quality of a university for prospective students, parents and employers (Brooks, 2005). Faculty research productivity is an important aspect of these rankings. This has led many universities to hire adjunct or substitute teachers to relieve the teaching load on faculty members heavily engaged in research related activities. This practice has not always resulted in the best interests of the students (Moore & Trahan, 1998). Data tracking the number of research dollars generated, number of books written by faculty, number publications by faculty, impact factors for journals published, count of citations and other similar factors are gathered to determine the research productivity of faculty. This information is then used in the ranking of universities. As university administrators try to improve the ranking of their university, faculty members are often asked to produce more research. Research productivity is used for evaluations, tenure, promotion and raises of faculty members. In an effort to maintain their research productivity faculty members have to travel to conferences, fund raising meetings. Research productivity and student evaluations are important aspects of tenure and promotion for junior faculty members. A junior faculty member does not have the luxury of risking poor student evaluations by focusing mainly on scholarship related activities and letting the classroom suffer.

Instructors at most construction programs in the US are required to publish papers at conferences as part of their research expectation. Most universities hire new faculty under specific appointment percentages for teaching and scholarly activities. Scholarship often requires faculty to travel to various conferences and consequently miss lectures. Often times a substitute is appointed to cover for the instructor or a make-up class is scheduled outside of the regular class timings in order to cover the required course material. Both options cause hardship to students as they are expected to adapt to the teaching style of the substitute instructor or modify their personal schedule to meet outside of the regular scheduled class time. This may also result in poor teaching evaluations for the instructor.

This paper discusses the experience of an instructor teaching class in a virtual lecture format using a software solution for projecting the screen from the instructor's computer into the classroom and a conventional land telephone line for audio communication. Upon completion of the lecture, the instructor conducted a survey of the

students to capture their reactions to the lecture. The methodology and the results of the survey are presented in this paper. Observations and opinions of the instructor are also presented in the paper. The viability of using this methodology to teach class remotely is discussed.

## **Methodology**

Instruction in a virtual environment was achieved using a software solution for the video communication and using a powerful conference phone for the audio communication. The methodology contains information about the technology used and the processes involved. A survey of the students was conducted to gather their reaction after the virtual lecture was conducted. Details about the survey are also presented in this section.

### *Technology Used for the Virtual Classroom*

The tablet pc has had a long history (Atkinson, 2008) but only became popular after the millennium with their commercial availability (Mock, 2004). A tablet PC is essentially a computer in the shape of a notebook. Users may interact with the tablet pc using a stylus instead of a traditional mouse and keyboard. A tablet pc can be used to write on the screen which can be saved as a handwritten document in a digital format. A tablet pc usually comes installed with software that can interpret handwriting and convert it to text so that the document may be used on a different computer. A Tablet pc has been used successfully used in the classroom to make lectures more interactive (Huettell et al., 2007) and improve the learning experience of students (Rogers and Cox, 2008). Tablet pc was also used by Hannon (2006) in construction education at the University of Southern Mississippi. Hannon has described his experience of using a tablet pc in the classroom a positive one. Domermuth (2005) reported that a tablet pc may be installed in the classroom permanently to create a ‘Smart Classroom’.

The instructor in this study used a tablet pc for the video portion of the virtual lecture. The instructor prepared handouts for the class on engineering grid paper and scanned the sheets into an image file which was imported into Microsoft OneNote on the tablet pc. The instructor used the stylus on the scanned images. Students were able to view the instructor’s screen remotely and take notes on their handouts.

“LogMeIn” was the software solution used in the virtual lecture. “LogMeIn” is a web based tool commonly used by information technology professionals to remotely access and fix computers. A free version and a paid version of “LogMeIn” are available to users. The free version of the software was used in this lecture. The instructor was required to install an active X component on the tablet pc and no software was required for the computer in the classroom. The software allows the classroom computer to view the instructor’s desktop on the Tablet PC. The software does not require any firewall or proxy configuration to enable the process. The classroom computer was displayed on the screen just as in a traditional PowerPoint lecture and students were able to see the screen from the instructor’s tablet pc. The instructor used Microsoft OneNote to write on the Tablet PC. A lecture handout was given to the students and the handout was imported into OneNote so the instructor and the students were looking at the same sheet. The instructor used different color pens in OneNote during the lecture to discuss a certain aspect of the figure or problem by referencing to that color.

A “Polycom SoundStation” conference phone was used for the audio communication portion of the virtual lecture. This conference phone was relatively inexpensive and has excellent 360 degree sound distribution. Two additional microphones were connected to the Polycom unit to accommodate students asking questions. The microphones were tethered by 7 foot cables and were placed at two opposite ends in the classroom. The Polycom unit itself was placed on a separate table in the middle of the classroom. The decision to not use sound over the internet was made as it may sometimes lag and be a potential distraction to the students. The use of audio over the internet also cuts into the bandwidth available for the video transmission of the instructors’ computer screen.

### *Survey of Students*

The virtual lecture was conducted in a structures class to sophomore and junior level undergraduate students. The students were majoring either in construction or architecture fields. The instructor taught two sections of the same

course which were scheduled back-to-back. The virtual lecture was conducted in both classes with the same topics. The topics included a discussion of the stress-strain curve of steel, followed by doing some problems related to the discussion. The instructor also used some pictures of the stress strain experiment during the lecture. A teaching assistant was present in class during the duration of the lecture to co-ordinate any technology issues in class and give the handouts to students. The survey was also conducted by the teaching assistant at the conclusion of the lecture. The handout prepared by the instructor included the stress-strain curve of steel with all the significant points listed but not labeled. The handout included problems that were to be solved during the lecture. The instructor also had the text book handy and often referred to specific pages within the text for getting values of constants while solving problems and assigning homework problems upon completion of the lecture.

A lecture typically lasts for one hour and fifteen minutes. The instructor conducted class in the virtual environment for one hour and the teaching assistant administered the anonymous survey immediately after the lecture in the remaining time. There were thirty five students registered in one section of the class and forty students registered in the other. Sixty three students combined from both sections attended the virtual lecture and took the survey. The use of a student survey to measure the effectiveness of using tablet pc in the classroom has been sufficiently demonstrated by Mock (2004), Anderson et al. (2004) and Hulls (2005).

Students were asked to rate the quality of the audio and video components of the lecture. A handout was prepared for students to assist in taking notes during the lecture. Students were asked to rate the effectiveness of the handout. Students were asked to rate whether the lecture format was effective in their ability to ask questions of the instructor. Students were asked about the effect of the lecture format on their ability to paying attention to the lecture content. A question was also asked to determine if the lecture format had any effect on their ability to understand the lecture content. Students were asked whether an alternate professor or a teaching assistant would have been better to deliver the lecture instead of the faculty member presenting it virtually. Students were also asked if a make-up lecture at another time would have been better instead of the virtual lecture at the designated class time.

Students were given two open ended questions requiring them to provide a written response. The first question inquired whether the virtual lecture enhanced or detracted from their learning experience. The second question asked the students for suggestions for improvement to the lecture in a virtual format. Selected student comments from these two questions are presented in the results section of the paper. The last question asked the students to rate the overall effectiveness of the lecture.

## **Results**

The results of the student survey are presented in this section. Observations and opinions of the instructor are also presented.

1. **Quality of sound:** Students were asked to rate the quality of sound during the virtual conference. Students were asked to give a numerical rating of one for 'Least Effective' and a rating of five for 'Most Effective'. The results shown in Figure 1 indicate that students did not have any significant problems with the quality of the sound. Forty nine of the sixty three respondents rated the quality of the sound as 4 or better. The average effectiveness for the quality of sound was 4.05 on a scale of 5. The conference phone used was designed for room that was about 500 square feet but was used in a classroom measuring close to 2500 square feet. This may have lead to some spots in the room where students could not hear properly.

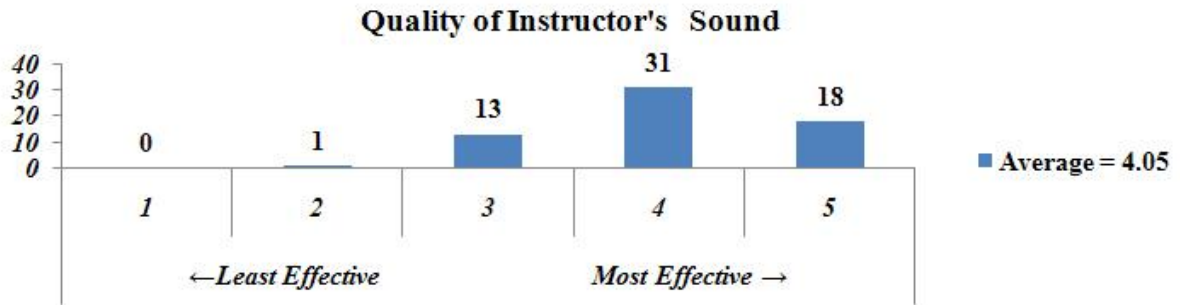


Figure 1: Effectiveness rating for the quality of sound during the virtual lecture.

- Quality of video projected on screen: Students were asked to rate the quality of the video as projected on the screen during the virtual conference. Students were again asked to give a numerical rating of one for 'Least Effective' and a rating of five for 'Most Effective'. The results shown in Figure 2 indicate that students did not have any significant problems with the quality of the video projected on the screen. All but one of the sixty respondents gave a rating of 4 or better for the quality of the video. The average effectiveness for the quality of video was 4.57 on a scale of 5.

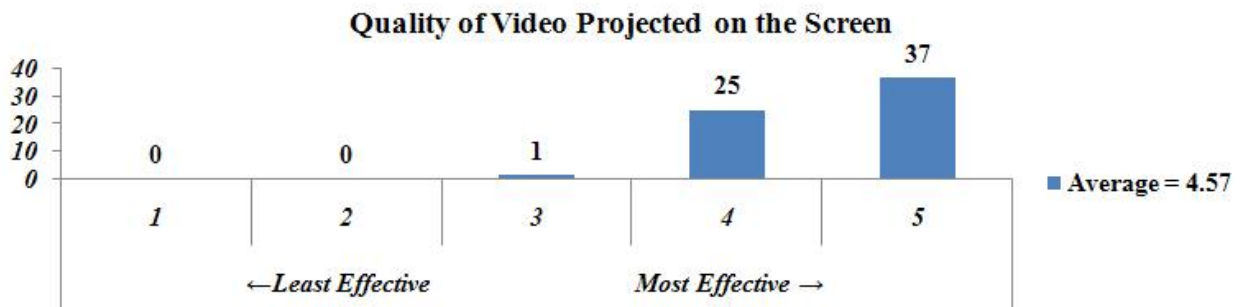


Figure 2: Effectiveness rating for the quality of video projected during the virtual lecture.

- Quality of handout: Students were asked to rate the quality of the handout used in the lecture. The effectiveness was rated on a scale of five as described earlier. The results presented in Figure 3 suggest that the students thought the handout was effective in the virtual lecture. Fifty eight of the sixty three respondents gave a rating of 4 or higher with an average rating of 4.49.

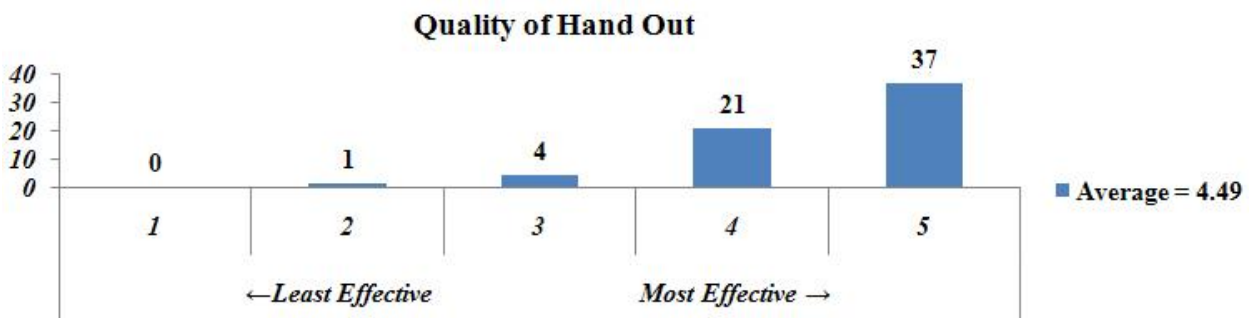


Figure 3: Effectiveness rating for the quality handout provided for conducting the virtual lecture.

4. Ability to ask questions: Students were asked to rate the effectiveness of their ability to ask the instructor a question on a scale of five, as described earlier. The results shown in Figure 4 indicate that several students were not comfortable or experienced some difficulty in asking questions of the instructor. Even though the average rating was above 4, seventeen of the sixty three respondents reported an effectiveness rating of three or below. The students may not have been aware of the presence of microphones and hence may have hesitated to ask questions. The instructor did not expressly tell the students about the microphones. Several times during the lecture the instructor asked the students if they had any questions but did not explain that their questions were audible back to the instructor.

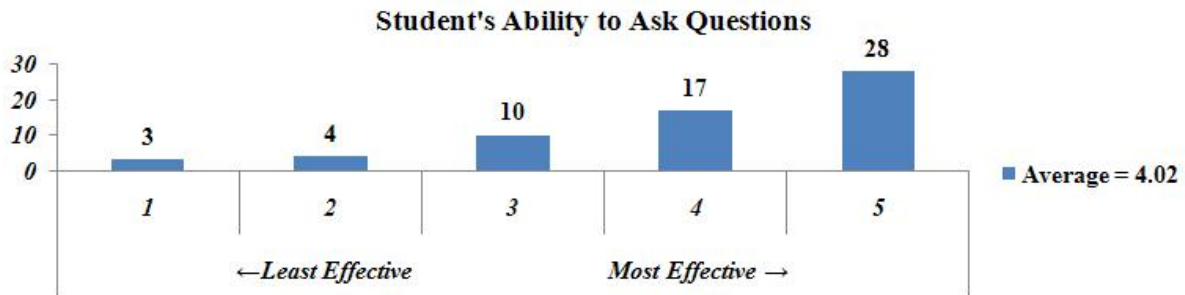


Figure 4: Effectiveness rating for a students' ability to ask the instructor questions during the virtual lecture.

5. Attention to lecture content: Students were asked about the effect of the lecture format on their ability to pay attention to the lecture content. Specific options including 'Paid much more attention', 'Paid more attention', 'Had no effect', 'Paid less attention' and 'Paid much less attention' were presented. The results shown in Figure 5 indicate that a majority of the students did not feel any effects due to the lecture format; however twenty three of them felt they paid less attention to the lecture content due to the lecture format.

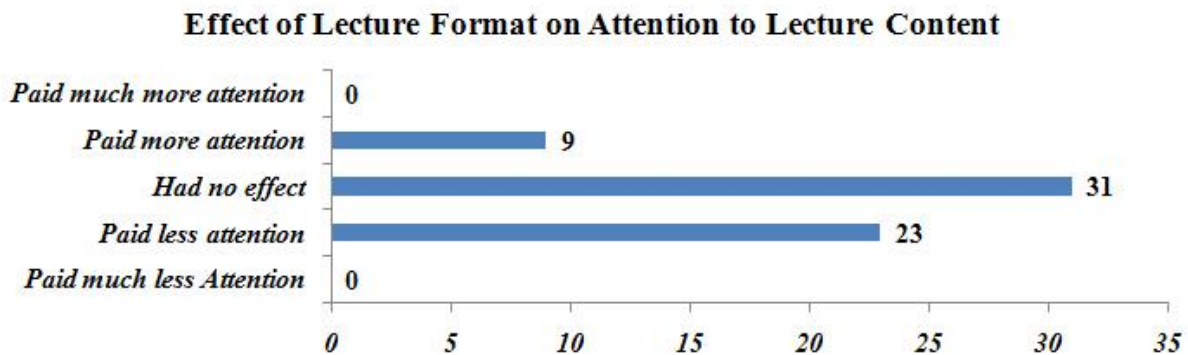


Figure 5: Effect of lecture format to the students' ability to pay attention to the lecture content.

6. Understanding of lecture content: Students were asked about the effect of the lecture format on their ability to understand the lecture content. Once again specific options were given to the students including 'Much easier to understand', 'A little easier to understand', 'Had no effect', 'Harder to understand' and 'Much harder to understand'. The results shown in Figure 6 indicate that a majority of the students felt that the lecture format either did not affect their understanding or made it easier to understand. A significant number of them did indeed report that they had trouble understanding the lecture content due to the lecture format.

### Effect of Lecture Format on Student's Ability to Understand Lecture Content

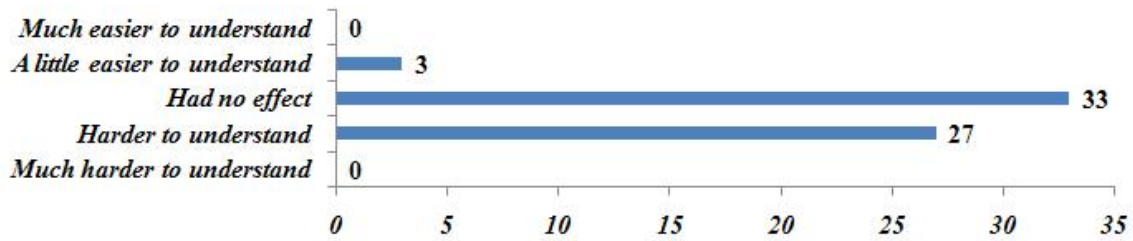


Figure 6: Effect of lecture format to the students' ability to understand the lecture content.

- Guest lecture Vs virtual lecture: As shown in Figure 7, students were asked a question that required choosing between a lecture by an alternate professor or a teaching assistant and a virtual lecture by the course instructor, in the event that the instructor could not be in class due to a conference. Eighty-three percent of them preferred the instructor teaching the class instead of an alternate professor.

### If the instructor has to be away on a conference, who would you rather cover the lecture?

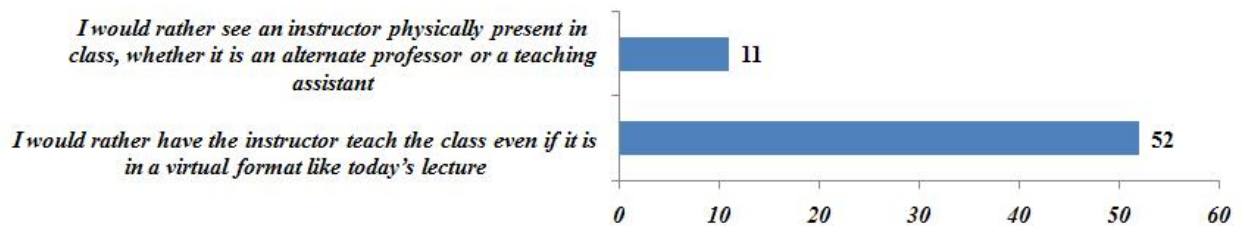


Figure 7: Preference between lecture by an alternate professor and a virtual lecture by instructor.

- Make up lecture Vs virtual lecture: Figure 8 shows the results when students were asked to choose between a make-up lecture at an alternate time and a virtual lecture by the instructor during the scheduled class time. Ninety-seven percent of the students chose a virtual lecture during the designated lecture time.

### If the instructor has to be away on a conference, which of the following scenarios would you prefer?

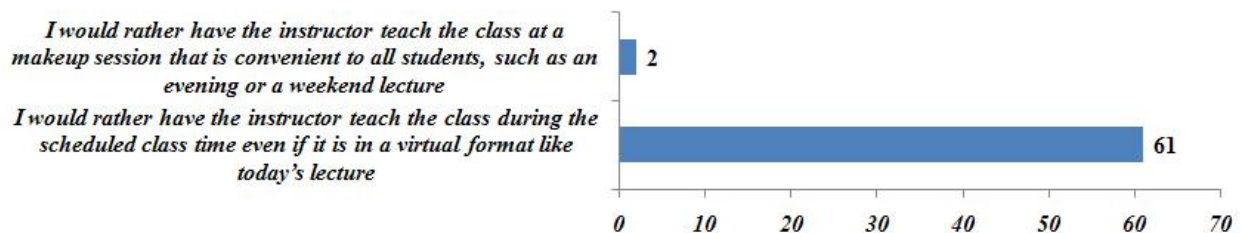


Figure 8: Preference between make-up session at an alternate time and virtual lecture during scheduled time.

- Overall quality of lecture: The final question asked the students to numerically rate the overall effectiveness of the lecture. The rating was based on one being 'Least Effective' and five being 'Most Effective'. The results shown in Figure 9 indicate an average rating of 3.81 on a scale of 5. Forty-one of the sixty three

respondents gave a rating of 4 or above, leading the instructor to believe they viewed the lecture format favorably.

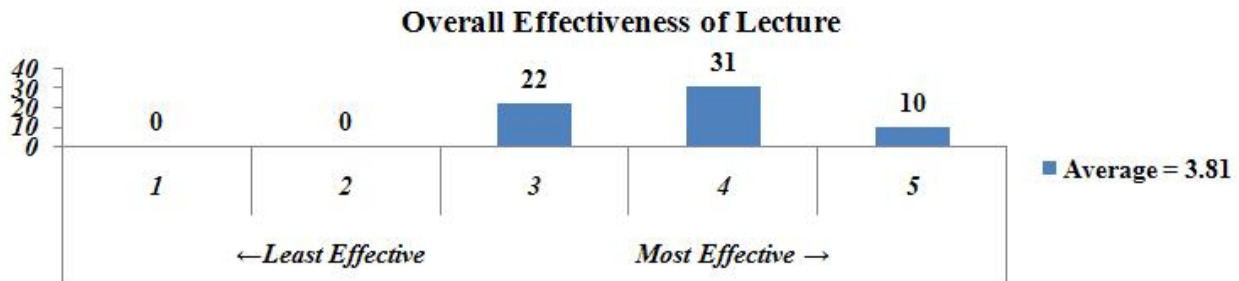


Figure 9: Overall effectiveness of the virtual lecture.

10. Effect of lecture format on learning experience: Students were asked to comment on whether the lecture format enhanced or detracted their learning experience. Some of the common themes noticed in the student comments are presented here. Several students commented that the lecture format had no effect on their learning experience. Several students commented that the lack of an instructor made it difficult to focus and pay attention whereas a few others commented they tried to stay more focused since it was easy to get distracted. Students said that it felt odd to ask questions to a box and were conscious in trying to ask questions since they felt that it had to be phrased accurately the first time. Students also commented that they liked the handout provided by the instructor as this helped them in taking notes.
11. Suggestions for improvement: Students were asked to comment on suggestions on improving the virtual lecture format. Several comments indicate that the students preferred a video conference format where the students and instructor could interact better by looking at each other. Students commented that more speakers should be added to improve the quality of sound. Students wanted the instructor to make the lecture more engaging by asking more questions and showing more pictures. Students felt like the time given by the instructor to ask questions was insufficient. Students observed that this format was effective when the instructor had to travel and did not like the idea of a substitute as they were concerned about the teaching methods used by the substitute.

The instructor noted some observations which might be considered as advantages of using a tablet pc to deliver a virtual lecture. Several times during the lecture the instructor was able to scroll the display back and forth to a certain aspect of the notes. This feature is obviously not available to instructor when using a dry erase marker on a conventional whiteboard. The instructor was easily able to switch to a different application to display pictures. Present day classrooms have screens in front of the whiteboard and it is extremely cumbersome to change media in the middle of a lecture to display one image. The instructor indicated that the ability to travel and still be able to cover classes virtually was very beneficial. The instructor did not feel like there was a lot of work that needed to be done upon returning to the university as the classes had been conducted at the usual time, without the help of a substitute instructor.

Some observations by the instructor that may be considered as drawbacks in the process include the additional time required to prepare the lecture handout, test and retest the technology. The instructor felt that the time required was more than that for a traditional lecture in the classroom. The instructor agreed that a video conference would enhance the experience for the students as well as the instructor. The instructor felt unsure whether the students understood a certain concept without visually observing their reactions. The instructor noted that learning to use a tablet pc requires some time and a new user may not be able to effectively use the tablet pc and might find it cumbersome to write upon and navigate in.

## Conclusions

The instructor was able to successfully conduct a lecture virtually to class in his absence. The processes employed in the study were relatively inexpensive assuming that the cost of the tablet pc is not included and the classroom is equipped with a computer and projection device. The only expense is a high powered conference phone. In this case, the instructor's department already owned this equipment and resulted in no additional cost. The instructor felt that covering classes while being able to travel was an advantage as there were no make-up classes or substitute instructors to deal with. Student comments and the results indicate that better quality of sound and video conference capabilities must be added to enhance the experience. The instructor intends to make those changes at the next occasion requiring a virtual lecture. The comments indicate that some adjustments to the format and technology will improve student reaction to the virtual lecture.

Some students felt that their ability pay attention and understand the lecture was hindered by the lecture format. However they also felt very strongly that the instructor should teach the class instead of a substitute teacher, even if it was in a virtual format. The students also felt that the class needed to be conducted during the scheduled time instead of a makeup session. These reactions lead the author to conclude that while students prefer to have the instructor physically present during class, under unavoidable circumstances they consider a virtual lecture as the second best option to teach a class in absentia. Considering that the research expectation of a faculty member is not going away, there will be a need for faculty to travel to conferences and be away from the classroom. Under those circumstances and based on the feedback from students it may be concluded that a virtual lecture is a viable alternative. Broadband internet speed and relatively inexpensive technology make this a feasible possibility for the traveling faculty member.

## References

- Anderson, R.J., Anderson, R., Simon, B., Wolfman, S., VanDeGrift, T. & Yasuhara, K. (2004) Experiences with a Tablet PC based lecture presentation system in Computer Science courses. *Proceedings of the Special Interest Group on Computer Science Education*.
- Atkinson, P. (2008) A Bitter Pill to Swallow: The Rise and Fall of the Tablet Computer *Design Issues: Volume 24, Number 4 Autumn 2008*
- Brooks, R. (2005) Measuring university quality, *The Review of Higher Education*, 29 (1), pp. 1-21.
- Brown, K. (2008) Writing What I Want in a Publish-or-Perish World *Academe; Jul/Aug2008, Vol. 94 Issue 4, p62-63, 2p, 1 bw*
- Domermuth, D. (2005) Creating a Smart Classroom. *Tech Directions*, 64(6), 2-22.
- Hannon, J. (2006) Instructor Utilization of the Tablet PC in the Construction Classroom. *Associated Schools of Construction Proceedings of the 41st Annual Conference*.
- Huettel, L.G.; Forbes, J.; Franzoni, L.; Malkin, R.; Nadeau, J.; Nightingale, K.; Ybarra, G.A. (2007) Transcending the traditional: Using tablet PCs to enhance engineering and computer science instruction. *37th annual Proceedings Frontiers in education conference - global engineering: knowledge without borders, opportunities without passports*.
- Hulls, C. C. W. (2005) Using a Tablet PC for Classroom Instruction. *Proceedings of the 35th ASEE/IEEE Frontiers in Education Conference*.
- Ito, J. and Brotheridge, C. (2007) Predicting Individual Research Productivity: More than a Question of Time. *The Canadian Journal of Higher Education, Volume 37, Number 1, pp. 1-25(25)*
- Mock, K. (2004) Teaching with Tablet PCs. *Journal of Computing Sciences in Colleges*, 20 (2), 17-27.



Moore, M., & Trahan, R. (1998). Tenure status and grading practices. *Sociological Perspectives*, 41(4), 775–781.

Rogers, J. W., & Cox, J. R. (2008). Integrating a Single Tablet PC in Chemistry, Engineering, and Physics Courses. *Journal of College Science Teaching*, 37(3), 34-39.