Old Dominion University

ODU Digital Commons

Teaching Interactively Using Web-Conferencing: The Student Perspective

Pilar Pazos
Old Dominion University

Holly Handley
Old Dominion University

Shannon Bowling
Bluefield State College

Charles B. Daniels
Old Dominion University

Kim Sibson
Old Dominion University

See next page for additional authors

Follow this and additional works at: https://digitalcommons.odu.edu/emse_fac_pubs

Part of the Educational Assessment, Evaluation, and Research Commons, Educational Psychology Commons, and the Online and Distance Education Commons

Authors

Pilar Pazos, Holly Handley, Shannon Bowling, Charles B. Daniels, Kim Sibson, and Patrick Hester

TEACHING INTERACTIVELY USING WEB-CONFERENCING: THE STUDENT PERSPECTIVE

Pazos, P., Ph.D. , Old Dominion University, Norfolk, VA
Handley, H., Ph.D., Old Dominion University, Norfolk, VA
Bowling, S., Ph. D., Bluefield State College, Bluefield, WV
Daniels, C.B., Old Dominion University, Norfolk, VA
Sibson, K., Old Dominion University, Norfolk, VA
Hester, P., Ph.D., Old Dominion University, Norfolk, VA

Abstract

The Engineering Management and Systems Engineering Department (EMSE) of Old Dominion University (ODU) Batten College of Engineering and Technology (BCET) has employed distance-learning technologies for well over three decades. Although the current technologies provide a valuable service for many geographically dispersed students, the faculty continues to explore additional distance learning tools, technologies and methods to promote more student participation and active learning. The goal of this paper is to describe and evaluate an innovative instructional approach using interactive web conferencing in hybrid courses. This paper will explore the use of web conferencing to teach graduate-level courses and explore the impact of this type of web-based instruction on student engagement and participation in hybrid courses. In particular, the paper will report the results of a mixed methods exploratory study of student perceptions about the effectiveness of the new technology as a teaching tool. Finally, lessons learned from several semesters of practice will be presented.

Introduction

Today's globally competitive marketplace has driven many students to obtain a college degree, thereby increasing the student population, many of whom simply cannot attend class in a traditional classroom environment due to temporal, geographical, and capacity constraints. As a result, distance learning is becoming more prevalent in worldwide education. This change does not come without issues, however, as instructor delivery and student learning styles must be incorporated into an evaluation of novel learning modes. Old Dominion University's Engineering Management and Systems Engineering Department has extensive experience with distance learning technology, however a proposed transition is being evaluated to move towards a more collaborative, web-conferencing type approach to graduate teaching. This transition appears to be in concert with Lou, Bernard and Abrami's (2006) assertion that "media and pedagogy that support interaction with the instructor and other students are more important than media and pedagogy that are used to establish individual student interactions with content only" (p. 167). Indeed, an interactive distance-learning environment is the aim. Bork (2001) echoes the need for what he terms high interactivity. The proposed transition is not one to be taken lightly, however, as student learning and instructor delivery may suffer from the delivery mode transition. Thus, the motivation of this study is to analyze the efficacy of the use of web conferencing software as a delivery mode for graduate level courses, from a student learning and engagement perspective.

This paper will contribute to our understanding of the impact of technology on teaching and learning. As both students and instructors transition from more traditional teaching environments to web-based and hybrid contexts, it is important to address any perceived barriers early on. By surveying both students and instructors, problems regarding delivery of content in different teaching environments can be identified. Students can articulate what they feel are impediments to learning; methods can then be introduced to enhance the student learning process. Likewise, instructors can describe successful class experiences as well as those that do not transition well. From this feedback, the process of developing and delivering web-based and hybrid courses can be improved to help faculty become more adaptive. By incorporating lessons learned from both students and instructors, technology can be used to successfully transfer learning classrooms to the web environment. We propose a descriptive study aimed at understanding student perceptions and experience with the use of a Web conferencing technology for teaching graduate level engineering management courses.

Institution and Program Description

Old Dominion University (ODU) is a public doctoral research extensive institution located in Norfolk, Virginia. It offers nationally ranked distance learning programs in sciences, engineering, arts and letters, health sciences, business and education and has a network of almost 50 locations in Virginia, Arizona, and Washington State. ODU has been providing distance learning instruction since the mid 1980s. Delivery modes include satellite delivery, internet, and computer-based deliveries.

The Department of Engineering Management and Systems Engineering (EMSE) offers two doctoral degrees: Doctor of Philosophy and Doctor of Engineering; two master's degrees: Master of Engineering Management and Master of Engineering with an emphasis in Systems Engineering; a minor in engineering management; and several graduate-level certificate programs. EMSE has been recognized several times, most recently in 2010, with the American Society for Engineering Management's award for Excellence in Academic Leadership. EMSE provided courses to approximately 400 graduate students and 72 undergraduate students in the Fall 2010 semester. The majority of students are in the Master of Engineering Management program (~275), followed by the Doctor of Philosophy program (~50). Many students come to the Norfolk campus for instruction, but courses are also provided to several locations across the Commonwealth of Virginia, Washington State, Arizona, and to students unaffiliated with a site who come to ODU for the flexibility of course offerings, some as remote as Iraq, Afghanistan, Djibouti, and Japan. Due to the proximity of ODU to several military installations, EMSE and the University have made it a priority to enable students who want Old Dominion University degrees to have the flexibility to complete programs anywhere in the world. Most students are working professionals who take courses in the evenings. Since most of these students are subject to work-based travel, the ability to have courses that will travel with them is an important factor.. Courses reported in this study were offered in a hybrid mode in which some students attended live while others attend from remote locations.

During the Fall 2010 semester, there were 147 instances of graduate students using distance learning technologies to complete courses. (An additional 235 were enrolled in a cd-rom program created for the United States Navy, and were not surveyed for this program.)

Facilities used for web-conferencing instruction

Exhibit 1 depicts the room designed to accommodate both live and online students. The room size is approximately 500 sq/ft consisting of 12 mobile chairs, a 4x6 foot table, a teaching station, three 50 inch plasma displays and two overhead projectors.

Three VEC CM-1000 microphones are placed in the classroom, one at the instructor station and two on the students' table. The microphones are omni-directional and daisy-chainable, thereby detecting both the instructors and students voices in the classroom; these are shown in Exhibit 2 All in-class conversations can be heard by students attending through Adobe Connect™. In addition the microphones have echo cancellation technology that block sounds coming from the overhead speakers installed in the classroom, reducing feedback from students asking questions through Adobe Connect™.

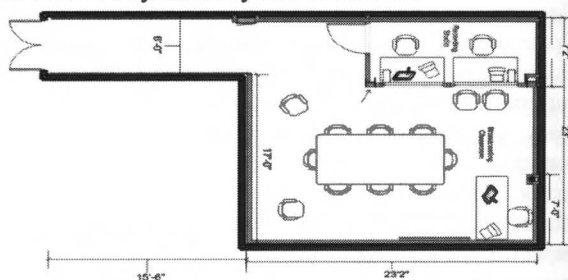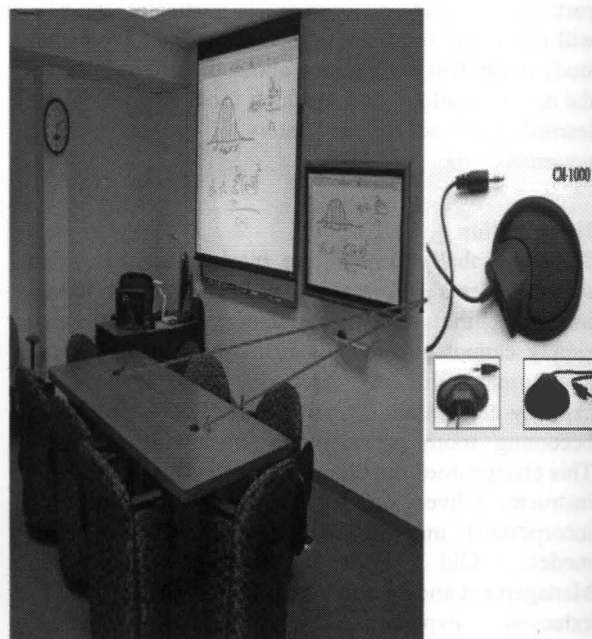**Exhibit 1.** Layout of Hybrid Classroom

Exhibit 2. Photo of Hybrid Classroom with Daisy-chainable microphones

The teaching equipment consists of a Dell ® quad-core desktop computer running Windows 7 with 8 GB of RAM, a 27" LCD monitor, Logitech Orbit™

Webcam, and ELMO CO-10 document camera, and a 15" Sympodium® display. These are shown individually in Exhibit 3 and as they are configured at the teaching station in Exhibit 4.
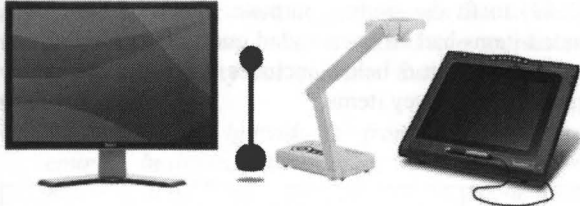
Exhibit 3. Teaching Equipment

Exhibit 4. Layout of Equipment at the Teaching Station

The capabilities of the room include:

- Broadcasting live audio and video of the instructor and students from the hybrid teaching classroom.
- Display drawing and figures from the Sympodium™ to both the live students and online students.
- Display live objects (physical objects, hand drawings, book pages, etc) via the ELMO CO-10 ™ to both the live students and online students.
- Display video and audio clips to both the live students and online students.
- Receive live audio and video and computer displays from remote students attending through Adobe Connect™.

Distance Learning

Lifestyle requirements, large populations of adult learners, and other marketplace pressures have resulted in a substantial number of higher education institutions offering distance-learning courses (Bernard et al.,

2004). Regardless of its ubiquity, web-based education poses several challenges and there is a recognized need to incorporate interactive elements in distance education that increase student engagement and promote learning.

In light of the prominent role of the Internet for training and education, evaluating the effectiveness of web-based instruction is a critical endeavor. Prior studies on the effectiveness of web-based learning focused on media comparison studies of different course delivery media. However, there have been several calls to refocus research efforts on a better understanding of what elements may be predictive of *student* success in web based courses (Bell, Hudson & Heinan, 2004; Wolfe, 2001).

In a meta-analysis, Bernard, Abrami, Lou, Borokhovski, Wade, et al. (2004) examined 232 studies comparing distance education with class instruction on measures of achievement, attitudes, and course completion. They evaluated distance education formats and found that education models that incorporate elements that support interaction between students, between students and instructor and between student and material tend to increase achievement outcomes.

The courses evaluated in this study used a synchronous communication tool for class delivery based on web-conferencing. This tool support all levels of interaction suggested by prior research: student-to-student, student-to-instructor and student-to-material. The student-to-student interaction is possible using both a chat tool and two-way audio during the lecture. Student-to-instructor interaction can use these same tools. The interaction between student and instructor is regulated using a raise hand feature that informs the instructor of a question so that microphone rights can be given to the student. Interaction with the material during the instruction is possible using the screen sharing and presentation modes.

Methodology

Surveys were utilized to collect quantitative and qualitative data about the impact of web-conferencing technology on student learning and on student experience. In particular, we explored aspects of learning related to student engagement, ability to follow course content, perceived appropriateness of the technology for learning, ease of communication through technology, and willingness to participate in the class. Results from the quantitative and qualitative analysis will be compared and evaluated to provide a richer understanding of the research problem.

Data presented were collected from 83 students taking graduate-level courses offered via Adobe Connect™. Data comes from nine courses offered during the Fall 2010 semester, These courses are part

of the masters and doctoral level programs and were taught by eight faculty members. The survey was sent two weeks before the end of the semester using the Survey Monkey software to 122 students taking courses via Adobe Connect™ with a response rate of 68%.

The respondents included 68% males and 32% females. The age breakdown was 27% between 22 and 25, 23% between 26 and 30, 23% between 31 and 40, 21 % between 41 and 50, and 6% between 51 and 60.

As far as highest earned degrees, 60 % of students had bachelor's degrees while 40% had master's degree.

The survey consisted of 17 items, including demographic information (3 items), close-ended (6 items), and open-ended (8 items). The close-ended survey items were adapted from Miliken and Barnes (2002) to fit the study's purpose. Each of the close-ended items had an open-ended question to support the answer. Exhibit 5 below includes a description of the quantitative survey items.

Exhibit 5. Quantitative Survey Items

Item #	Item description	Scale (Anchors)
1	Engagement in course topics	1-6 (very disengaged-very engaged)
3	Appropriateness of Adobe Connect™ for course delivery	1-5 (strongly disagree-strongly agree)
5	Ease of communication with instructor and students	1-5 (strongly disagree-strongly agree)
7	Adobe Connect facilitated my learning	1-5 (strongly disagree-strongly agree)
9	Ease to follow content using Adobe Connect™	1-5 (strongly disagree-strongly agree)
11	Less inhibited to participate in class than in traditional instruction	1-5 (strongly disagree-strongly agree)

Results

We conducted a descriptive analysis to evaluate the factors under study. The goal of the analysis was to gain understanding of the students' perception of Adobe Connect™ and its impact on student learning and student experience. This study measured self-reported variables from the survey. Exhibit 6 shows the results from the descriptive analysis of survey results. The first five items had a 5-point Likert scale with anchors strongly disagree (1) and strongly agree (5). The last item had a 6-point Likert scale anchored with very disengaged (1) and very engaged (6).

Exhibit 6. Descriptive Analysis of Survey Report

	Mean	SD	% Agree	% Disagree	% Neutral
Adobe Connect™ is a good technology for course delivery when compared to traditional classroom.	3.93	.967	73.6	7.4	19
I felt it was easy to communicate with instructor and students using Adobe Connect™.	3.88	.993	82.6	5.8	11.6
I feel Adobe Connect ™ helped facilitate my learning.	3.94	1.043	65.4	9	17.9
I felt it was easy to follow the content of the lectures using Adobe Connect™.	4.10	.894	85.5	5.8	8.7
I felt less inhibited to participate with Adobe Connect™ than I would in a face-to-face lecture.	2.95	.899	30.2	27.9	41.9
	Mean	SD	% Engaged	% Disengaged	
How engaged in the course topics do you feel during class?	4.86	.989	88.4	11.6	

As evidenced from Exhibit 6, a high proportion of the students felt that the web conferencing technology was good for course delivery when compared to traditional classroom. The open-ended responses related to this same question presented several broad themes. Most students found that what made the technology appropriate was its accessibility to students that worked full time that otherwise could not attend live courses as well as the flexibility for students that travel. One student stated:

> "It empowers individuals from all over the country, in different time zones, while at home, on business travel, or even vacation to attend and complete college courses; this is great."

The next general theme was the ability the technology to support parallel access to students' comments, presentations, and the professor. For instance one participant stated:

> "You can see the professor, you can "raise your hand" and ask questions via a mic and also use the chat box to type discussions if needed"

Some students also highlighted that the technology provides them with the ability to interact and ask questions:

> "The instructor is better able to acknowledge my questions and desire to speak"

There were also two negative comments to this question that related to the sound problems that sometimes occur during the lecture and also regarding a problem with low image quality.

A high proportion of students also agree they could communicate easily with the instructor and other students. Students also had high agreement that Adobe Connect™ did not hinder their learning process. Interestingly, when evaluating if Adobe Connect™ made students less inhibited to participate we found an even distribution of the results between agreement and disagreement.

Conclusions

This article presented the development of an instructional model using web-conferencing and the results from an exploratory study conducted to explore levels of student satisfaction and experience with this technology.

Initial conclusions about the viability and the value of web-conferencing for course delivery were provided. There is little doubt that these instructional methods make education accessible to professional students that would not otherwise have the opportunity to further their learning. These offering fulfill and increased need for accessibility and flexibility in educational programs. Our results support the appropriateness of web-conferencing technologies for graduate engineering-level course delivery. High levels of student satisfaction with the technology were reported, along with ease to follow content and ability to communicate with instructor and fellow students. The migration of students from in the classroom to participating via Adobe Connect™ over the course of the semester also adds circumstantial evidence to student satisfaction with the technology.

Though encouraging, these results are just a preliminary evidence of the viability of this model for graduate engineering education. More robust experimental studies controlling for confounding variables such as instructional methods, course content, etc. are necessary.

References

Bell, P.D., Hudson, S., & Heinan, M. "Effect of teaching/learning methodology on effectiveness of a web based medical terminology course," *International Journal of Instructional Technology & Distance Learning, 1*(4), (2004).

Bernard, R., Abrami, P., Borokhovski, E., Wade, A., Tamin, R., Surkes, M., et al.. "A meta-analysis of three types of interaction treatments in distance education," *Review of Educational Research, 79*, (2009), pp. 1243-1289

Bork, A.,"Tutorial learning for the new century," *Journal of Science Education and Technology, 10*(1), (2001), pp. 57-71.

Lou, Y., Bernard, R.M., Abrami, P.C., "Media and pedagogy in undergraduate distance education: A theory-based meta-analysis of empirical literature," *Educational Technology Research and Development, 54*(2), (2006), pp. 141-176.

Milliken, J. & Barnes, L. P., "Teaching and technology in higher education: Student perceptions and personal reflections," *Computers and Education, 39*(3), (2002), pp. 223-235.

Wolfe, C. R., "Learning and teaching on the world wide web," San Diego, Calif.: Academic Press, Educational Psychology Serie, (2001).

About the authors

Pilar Pazos is an Assistant Professor in the Department of Engineering Management & Systems Engineering at Old Dominion University. She received her Ph.D. from Texas Tech University (2005) in Industrial Engineering with a focus on Engineering Management and a minor in Applied Statistics from the Rawls College of Business. She earned her M.S. in Systems and Engineering Management from Texas Tech University in 2001. Before joining Old Dominion she has worked in the areas of quality control, team learning and consulting in the areas of design of

experiments, evaluation and measurement. Her research interests include: Knowledge Management, Organizational Learning, Collaborative Learning, Group Decision Making and Performance, Virtual Teams, Team Dynamics, Engineering Education, Applied Statistics.

Holly Ann Heine Handley is an Assistant Professor in the Engineering Management and System Engineering Department at Old Dominion University in Norfolk, VA. Dr. Handley applies systems engineering principles and experience in computational modeling to conduct research and perform analysis on challenging problems of complex organizational systems. Her education includes a BS in Electrical Engineering from Clarkson College (1984), a MS in Electrical Engineering from the University of California at Berkeley (1987) and a MBA from the University of Hawaii (1995). She received her PhD from George Mason University in 1999. Dr. Handley is a Licensed Professional Electrical Engineer and is a member of the Institute of Electrical and Electronic Engineers (IEEE) Senior Grade, the International Council on System Engineers (INCOSE) and Sigma Xi, the Scientific Research Society.

Shannon R. Bowling Dr. Bowling is an Assistant Professor in the Department of Electrical Engineering Technology at Bluefield State College. He received his Ph.D. in Industrial Engineering with a focus in Human Factors Engineering from Clemson University, SC in August 2003. He received his M.S. in Engineering Technology with an emphasis in Quality Management (2000) from East Tennessee State University, TN and his B.Sc. in Electrical Engineering Technology (1998) from Bluefield State College, WV. Dr. Bowling also has a graduate minor in experimental statistics from Clemson University and Management from East Tennessee State University.

Charles B. Daniels is currently a Lecturer in the Engineering Management and Systems Engineering Department of the Batten College of Engineering and Technology of the Old Dominion University. He has over 40 years of experience in organizational management and leadership, communications systems, information systems, management consulting, change management, employee and leadership development and quality improvement in both government and commercial enterprises. He has also served as a senior executive and Vice President for Engineering for a Fortune 500 commercial enterprise.

Kim Sibson is a faculty administrator in the Department of Engineering Management and Systems Engineering. She has a Bachelor's in French ('98), a Master's in Applied Linguistics ('06), and an Ed.S. in Higher Education Administration ('10) from Old Dominion University and is currently pursuing her Ph.D. in Higher Education Administration. Her dissertation will focus on the effect of the Post-9/11 G.I. Bill on colleges and universities in the Hampton Roads region.

Patrick T. Hester is an Assistant Professor of Engineering Managementand Systems Engineering at Old Dominion University. He received a Ph.D. in Risk and Reliability Engineering (2007) at Vanderbilt University and a B.S.in Naval Architecture and Marine Engineering (2001) from Webb Institute of Naval Architecture. His research interests include multi-objective decision making under uncertainty, probabilistic and non-probabilistic uncertainty analysis, critical infrastructure protection, and decision making using modeling and simulation.