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ABSTRACT

Although there are many strategies for incorporating active learning exercises into the traditional classroom, incorporating active learning exercises in a distance education delivery format is more challenging. Active learning has been shown to enhance student performance and attitudes when used in conjunction with a traditional lecture format.[1] In order for students to be actively involved they must read, write, discuss, problem solve and engage higher-order thinking tasks such as analysis, synthesis, and evaluation.[2] The implementation of active learning exercises in distance education classes may help establish student rapport and enhance the feeling of community among the students in a distance education environment.

In distance education instruction, it is more difficult to establish student rapport and get student feedback from the remote students than from those in the traditional campus setting. Old Dominion University delivers junior and senior level engineering technology elective courses using one-way video and two-way audio. The limitations of this delivery system compound the problems of establishing student rapport due to the geographical disparity of the students and the instructor.

Active learning techniques commonly used in large classroom environments require creative adaptation to fit the delivery medium used in distance learning. This paper will describe the implementation of active learning exercises in three senior elective courses in the distance education setting, how the implementation of these techniques effected the student evaluation of the distance class as compared to the on campus class, and the observations made by the faculty while implementing active learning techniques in a distant education environment. This paper will also explore additional active learning strategies that can be implemented in the future.

Introduction

Old Dominion University (ODU) is a state university with the home campus located in Norfolk, Virginia. Established in 1930 as the Norfolk Division of the College of William and Mary, today it enrolls over 20,000 students in 66 baccalaureate, 67 master's, and 23 doctoral programs. The University is accredited by the Commission on Colleges of the Southern Association of Colleges and Schools and its engineering and engineering technology programs are accredited through the Accreditation Board for Engineering and Technology.

ODU has developed an extensive distance learning system that delivers classes for degree programs in several academic areas including engineering technology. Classes are available via synchronous video technology, one-way video and two-way audio and video streaming, as well as asynchronous video technology, archived video streaming and CD-ROM. The synchronous video technology is available at over 50 remote sites. A majority of the sites are located at community colleges within the state of Virginia; there are also four sites at the Higher Education Centers in Virginia. In addition there are sites located in North Carolina, Washington, Arizona, Georgia, Indiana and at several industrial facilities throughout the United States.[3]

Implementation of Active Learning in Distance Education

This paper focuses on three senior elective courses that are a part of the Civil Engineering Technology (CET) program at ODU. These courses were offered in the distance education setting using varied lecture formats via synchronous video technology. This paper discusses the implementation of active learning in these distance education classes and the impact of the changes on student rapport in the courses.

CET 460 Construction Cost Estimating, CET 465 Construction Project Management, and ENMA 401 Project Management are senior electives that are applied to the CET Degree at ODU. Each course is offered on TELETECHNET (TTN), Old Dominion University's distance learning network. A traditional lecture format was used during the initial offering of these classes, CET 460 in the fall of 1999, CET 495 in the summer of 2000, and ENMA in the fall of 2001. TELETECHNET classes are typically offered in a three-hour delivery window one-day a week through out an entire semester. The lecture periods were broken into three 50-minute sessions with 10-minute breaks between sessions. All notes were presented via Power Point with the instructor expanding on the content during the class period. This lecture format was tedious for the instructor and the students. The information was fed in one direction, teacher to students, students were given copies of Power Point so there was little note taking, and the instructor performed example problems. Other than a few questions there was very little interaction between the students and the instructor.

One instructor had the opportunity to attend the American Society of Civil Engineers ExCEEd Teaching Workshop in the summer of 2000. This workshop teaches teachers to teach. It introduced participants to the ExCEEd teaching strategy based on the principles of structured organization, engaging presentation. enthusiasm, positive rapport with students, frequent assessment of student learning, and appropriate use of technology. Active learning was one of the workshop seminar topics and was promoted as a way to keep your presentation engaging, build rapport with students and promote student learning.[4] Although the workshop focuses on teaching in a traditional classroom, one of the mentors for the workshop discussed his ability to implement active learning techniques in a distant education setting with success. Upon return to the University it was decided that the instructors would attempt to incorporate the active learning principles to the synchronous format of the TELETECHNET class in order to observe the impact on the students perception of the instructors repartee with the students in this medium.

Active learning is described by Bonwell and Eison as an activity that " involves students in doing

things and thinking about the things they are doing."[1] In order for students to be actively involved they must read, write, discuss, problem solve and engage in higher order thinking tasks such as analysis, synthesis, and evaluation.[2] The standard lecture format keeps the students reading and writing. However, it does not involve any higher order thinking skills necessary for active learning to occur. There is no analysis, synthesis or evaluation of the material taking place. Other activities have to be introduced into the classroom setting to enable an instructor to engage the students in these higher order-thinking tasks.

Active learning has been shown to enhance student performance and attitudes. Modification of traditional lectures is one way to incorporate active learning in the classroom.[1] The instructors modified the synchronous lecture formats for the courses to include the following active learning techniques:

- THINK-PAIR-SHARE. Students were asked to individually reflect on specific questions, write down their response, pair with a neighbor and discuss their answers, and then share a final group answer with the entire class. For this active exercise, each distant site became their own group and was expected to share their response as a group. Although some sites had only one student and did not have the opportunity to come to a group consensus, they still had the opportunity to reflect and share their answer with the entire class. The on campus students were typically broken into several groups and also required to share answers.
- QUESTIONING. Both directed, asking a specific person to answer a question, and undirected, asking the class a question for anyone to answer techniques were used. The undirected questioning was difficult at first because students were reluctant to answer the questions. However, once the students were used to the technique, there were too many responses at one time from the distant sites and managing the verbal traffic became an issue. It became easier to use only directed questions to minimize several distant sites speaking at once.
- PROBLEM SOLVING. Students were given problems to solve alone or in groups of two and then students directed the instructor through the solution. Requests for problem solutions were typically directed to specific students or specific distant sites, and if they needed help, then the instructor would ask for help from other students.

The instructors were initially apprehensive about introducing these active learning techniques into the TELETECHNET classroom even though the techniques had been successfully used in the traditional classroom. Barriers to implementation of active learning exercises in distance education included a perceived pressure that all class time on the satellite network be productive, in other words there should not be any extended periods of class time when students and the professor were not talking. In order to allow the students to reflect and solve problems, there needed to be dead air time. Also the instructor was concerned that both the distant students and on campus students would remain passive and not participate. Most of the students taking these courses are used to a passive environment where they do not have to participate. Both the on campus and distant students are reluctant to use the microphones and the on campus students have the added pressure of their video image being relayed when they are speaking.

Results

The implementation of the modified lecture, including active learning in the distant education environment made the classes more enjoyable for the instructor and appears to have made the class more enjoyable for students based on the comments and evaluations for the course. It also appears to have resulted in a class with better instructor/student rapport. Course satisfaction was improved for the instructors because there was a dialog between the instructor and the students, information flowed in both directions and students actively solved problems and then led the instructor through the solutions by answering questions and participating in discussion. Student comments on mid-course evaluations were very positive and final student evaluations in regards to the instructor's helpfulness, sensitivity and responsiveness to students, accessibility and fairness ranged from good to very good.

Lowman produced a two-dimensional model of teaching effectiveness in which the quality of instruction results from the college teacher's skill at creating both intellectual excitement and interpersonal rapport with students. The model evaluates intellectual excitement as Dimension I and interpersonal rapport as Dimension II. Lowman's model has a table that includes descriptors associated with the two dimensions.[5] Using the descriptors provided for Dimension II as a reference, the following are the student comments from the mid-course evaluations to the question "What do you like best about this course and/or instructor?" that apply to interpersonal rapport.

CET 460 Construction Cost Estimating Comments

"Good class interaction with sites"
"The instructor does a good job of including everyone in class."
"It is easy to ask questions and get an answer."
"It is very easy to ask the instructor a question & receive an answer either in class or by e-mail."
"The way the instructor keeps everyone involved in class including the remote sites."
"Instructor's ability to connect with students"
"Instructor is wonderful! Very easy to understand & get along with! I love it when an instructor reads and replies to e-mails!"
"Really takes the time to help the students"

CET 495 Construction Project Management

"Mrs. Considine is very willing to help the students. She is dedicated to her students."
"The Professor - ………….Patient with students."
"Her pleasant and joyful personality makes the class enjoyable."

ENMA 401 Project Management

"He really understands the students, and is always willing to help."
"Prof. Dean was very helpful in this course"
"Instructor effectively communicated concepts presented in class."

"This was an excellent course. I learned more in this course than any other taken at ODU"
"Good teacher. Effective Lesson. Fair grader."

The tables below detail the average student responses on the final course evaluations to questions that relate to student/teacher rapport. The evaluation scale is from 1, unacceptable, to 6, excellent. College means during this same time period are included for comparison. ENMA 401 was taught in a traditional (TRAD) setting and then in the TTN setting with a campus (C) section. Both CET 460 and CET 495 were taught in the TTN setting with a campus section.

CET 460 Construction Cost Estimating	College Mean	1999		2001	
		C	TTN	C	TTN
Rate the instructors helpfulness/sensitivity responsiveness to all students needs.	4.85	5.2	4.28	5.45	5.07
Rate the accessibility of the instructor & TA's outside of class hours.	4.67	4.8	4.24	5.3	4.85
Rate the fairness of the instructor in assigning grades.	4.89	4.60	4.04	5.18	4.57

Table 1. CET 460 student evaluation results.

CET 495 Construction Project Management	College Mean	2000		2002	
		C	TTN	C	TTN
Rate the instructors helpfulness/sensitivity /responsiveness to all student needs.	4.85	5.33	4.75	4.94	5.45
Rate the accessibility of the instructor & TA's outside of class hours.	4.67	5.67	4.64	4.78	4.91
Rate the fairness of the instructor in assigning grades	4.89	5.67	4.67	5.22	5.45

Table 2. CET 495 student evaluation results.

ENMA 401 Project Management	College Mean	2001	2002	
		TRAD	C	TTN
Rate the instructors helpfulness/sensitivity /responsiveness to all student needs.	4.85	5.00	5.00	5.05

Rate the accessibility of the instructor & TA's outside of class hours.	4.67	4.65	4.46	4.63
Rate the fairness of the instructor in assigning grades	4.89	5.22	5.00	5.24

Table 3. ENMA 401 student evaluation results.

The following observations can be made from the results provided above:

- For TTN classes the average student evaluations increased for all questions by a minimum of 0.27, with an average increase of 0.61.
- For on campus classes the results were mixed, with average student evaluations for CET 460 increasing and those for CET 495 decreasing. It is important to note that the student evaluations for CET 495 in summer 2000 were some of the highest averages received by the instructor.
- In the 1999-2000 academic year, TTN student ratings were on average .68 lower for CET 460 and 0.87 lower for CET 495 than the on campus student ratings. With the modified lecture format the average difference between TTN and campus student ratings for CET 460 is only 0.48 and for CET 495 TTN student ratings are actually higher than on campus ratings by an average of 0.29.
- The TTN classes for ENMA 401 actually showed marked improvement and even exceeded the live classroom in several areas as the instructor became more comfortable with the format over time.

Although significant gains were made in the student evaluations for these courses as related to student rapport it is hard to segregate the impact that may have been made due to the instructor's increased familiarity and mastery of the technology and teaching. In addition, it is difficult to determine the positive effect that implementation of the other ExCEEd teaching principles may have had on structured organization, frequent assessment of student learning, and appropriate use of technology.

What appears to be significant is the change in the types of comments made by the students, especially those from the distant sites that include some of the descriptors outlined by Lowman in regards to student rapport. In addition, the narrowing of the gap between the on campus and TTN student evaluations for CET 460 during the 2000-2001 academic year and the fact that the distant students actually gave the instructor higher evaluations than the students on campus for CET 495 during that same year appeared to be significant. Additionally, both instructors, as they became more comfortable with the teaching style, expressed a more enjoyable teaching experience due to student involvement in the TTN course from the students at the distant sites.

Preliminary findings regarding student learning indicate that the average student final grade for each of the courses increased by a small percentage for the years the course was taught incorporating active learning exercises. Further research and data is required to provide statistical evidence of the impact of the active learning exercises on student performance.

Future Changes

The distant learning format of the TTN classroom is moving further from the synchronous format to a more asynchronous format. Many classes are currently being archived on CDROM for use by military personnel that wish to continue with their educational goals while serving their country. The development of games to keep the student active in the learning process is currently being investigated. The two core assumptions of active learning are that learning is by nature an active endeavor and that different people learn in different ways.[6] The experience of learning a subject without the instructor readily available to the student can be accomplished by involving the student in a recreational and challenging way. Early feedback from the introduction of games is positive and is being investigated as an additional supplement to the TNN format as well.

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