

AC 2009-1319: A COMPARISON OF INSTRUCTIONAL DELIVERY METHODS BASED ON STUDENT-EVALUATION DATA

John Hackworth, Old Dominion University

John Hackworth is an associate professor and director of the Electrical Engineering Technology program at Old Dominion University. He holds a B. S. Degree in Electrical Engineering Technology and a Master of Science Degree in Electrical Engineering, both from Old Dominion University. Prior to joining the Old Dominion University faculty, John had approximately 20 years of industrial experience in test engineering and plant automation with General Electric Company. He is the co-author of two textbooks which are currently in use by several electrical engineering technology programs at universities within the U.S.

Carol Considine, Old Dominion University

Carol Considine is the Civil Engineering Technology Program Director and Associate Professor of Engineering Technology at Old Dominion University. She has over 15 years of industrial experience in the construction industry. She has a B.S. in Civil Engineering from Virginia Tech, and a M.S. in Civil Engineering from University of California, Berkeley. She is also a LEED AP.

Vernon Lewis, Old Dominion University

Vernon W. Lewis, Jr., P.E., is a Senior Lecturer in the Civil Engineering Technology program at Old Dominion University. He joined the faculty of Old Dominion University in January 1994. He has 40 years of professional experience in consulting, industry and forensic engineering and is registered in several states. His areas of expertise include structural design, contract documents, and materials testing.

A Comparison of Instructional Delivery Methods Based on Student Evaluation Data

Abstract

Distance Education is an increasingly common educational delivery method. At Old Dominion University, all junior and senior level engineering technology courses are offered via distance education at least once every two years. A majority of courses in the distance education system at this university have three simultaneous delivery methods: **on-campus**, **televised** (receiving the course at an off-campus site via satellite video/audio), and internet-based **video-streamed**.

This paper explores the results of student course evaluation surveys for trends, in particular those trends which can be a result of the mode of delivery. Results of these surveys for 23 courses over a 4-year period are tabulated, and probable reasons for the trends are given.

Introduction

In the Engineering Technology Department of Old Dominion University, distance education courses are offered to students worldwide. To accomplish this, courses are transmitted in several modes of delivery. The mode of delivery for each student depends mostly on the student's geographic location, in particular, the student's proximity to an Old Dominion University-operated location. For this paper, three delivery modes will be considered, which are as follows.

On-Campus

The students are present in a television studio classroom. The environment is similar to a conventional classroom setting except that instead of using a chalkboard or whiteboard, the instructor writes on a paper pad with a felt-tipped pen. An overhead camera allows the pad to be displayed on several television monitors within the room. Students in the room who wish to speak are required to use desktop microphones in order for students at other locations to hear them.

Televised

Students are present at a remote location. The remote classroom is equipped with a satellite receiver connected to one or more television receivers so that students can view, in real time, what transpires in the studio classroom. Students may ask questions and converse with the instructor via desktop microphones that are connected through a telephone bridge to the transmit site. When a student at a televised remote site speaks, all students at all locations can hear him/her. There are no video cameras at televised receive sites, so the instructor and all other students can hear but not see the speaker at any televised receive site. University employees at receive sites record course lectures so that students can view them at a later time.

Video-Streamed

Class sessions are viewed via the internet. Courses are streamed live (and archived on a web-server). Once a student logs into the server, the class session is streamed in .mp4 file format to a QuickTime[®] window on the student's computer screen. If the student is viewing the lecture in real time, he/she may ask questions by typing them into a video-streamed question window. The questions then appear on the instructor's desk at the transmit site, the instructor reads the questions to the class, and answers them. Students using the video-streamed delivery mode may login to the server from anywhere using a high-speed internet connection. Students who cannot watch the course in real time (job conflict, other time zone, etc.) can instead watch the archived lecture and discuss course material with the instructor via telephone or email.

Review of Literature

There was nothing found in the literature in regard to variance in course evaluations based on course delivery mode. It could be that this is a fairly unique situation at ODU where courses are offered via several delivery modes simultaneously. The majority of 4-year degree-granting postsecondary institutions that offer distance education do so through asynchronous internet-based technologies.¹

Course Evaluations

Anonymous student course evaluations are used as part of the evaluation of instruction at Old Dominion University. Course evaluations are submitted on-line. Students are notified via e-mail that they can evaluate courses, and faculty are encouraged to remind students to participate in course evaluations. Course evaluations are made available during the final two weeks of semester classes and are closed just before final exams begin. Students are encouraged, but not required to participate in the evaluation process.

Student course evaluations are segregated by mode of instructional delivery, and then an aggregate course evaluation is determined from the average of all students, regardless of delivery mode. The standard course evaluation includes fifteen questions, which are evaluated on a 5-point Likert scale. Possible responses are "1 Strongly Disagree, 2 Disagree, 3 Neither Agree nor Disagree, 4 Agree, and 5 Strongly Agree." Course evaluation questions are provided below:

1. IN THE FIRST WEEK OF CLASS THE INSTRUCTOR PROVIDED DOCUMENTS AND INFORMATION THAT CLEARLY EXPLAINED THE COURSE CONTENT, ASSIGNMENT, GRADING AND OTHER IMPORTANT POLICIES.
2. THE COURSE MATERIALS, EXAMS, PROJECTS AND/OR PAPERS IN THE CLASS REQUIRED ME TO THINK CRITICALLY.
3. THE INSTRUCTOR WELCOMED QUESTIONS AND OTHER CLASS PARTICIPATION.
4. THE INSTRUCTOR WAS ENTHUSIASTIC WITH RESPECT TO THE SUBJECT MATTER.
5. THE INSTRUCTOR WAS AVAILABLE FOR CONSULTATION AND HELPFUL DURING OFFICE HOURS.
6. THE INSTRUCTOR ARRIVED ON TIME FOR CLASS AND USED THE FULL CLASS PERIOD ALLOTTED.
7. IN ORDER TO GET GOOD GRADES ON TESTS AND ASSIGNMENTS, I HAD TO KNOW THE COURSE MATERIALS OUTLINED IN THE SYLLABUS AND DISCUSSED IN CLASS.
8. THE INSTRUCTOR'S PRESENTATIONS WERE INFORMATIVE.

9. OVERALL, I HAVE LEARNED OR BENEFITED FROM THIS CLASS
10. OVERALL, THE INSTRUCTOR IS AN EFFECTIVE TEACHER.
11. RATE THE PUNCTUALITY OF THE INSTRUCTOR IN RETURNING STUDENT ASSIGNMENTS & EXAMS.
12. RATE THE ACCESSIBILITY OF THE INSTRUCTOR & TA'S OUTSIDE OF CLASS HOURS.
13. RATE THE QUALITY OF EXERCISES, LABS, & WRITTEN ASSIGNMENTS USED IN THE COURSE.
14. RATE THE RELEVANCE OF THE EXAMS & PROJECTS USED TO ASSIGN GRADES IN THIS COURSE.
15. RATE THE FAIRNESS OF THE INSTRUCTOR IN ASSIGNING GRADES.

Results

Three Engineering Technology faculty, each with a minimum of ten years of teaching experience, compiled data from 23 courses taught from the fall of 2005 through the fall of 2008. In many instances the same instructor taught the course either every semester, or every fall or spring semester. There are a few instances where the course was only taught once by the instructor. All courses are either junior or senior-level Electrical Engineering Technology or Civil Engineering Technology courses, and are a mix of required courses and electives.

The overall results of the surveys are shown in Table 1, and can be summarized as follows:

- Of the 969 total students in the 23 courses, 457 students (47%) completed the course evaluations.
- Of the 457 total responses, 172 (37.6%) were from on-campus students, 117 (25.6%) were from televised students, and 168 (37.7%) were from video-streamed students.
- A larger percentage of the distance education students responded to the surveys. 43% of the on-campus students, 61% of the televised students, and 57% of the video-streamed students responded.
- Response rates for the individual courses ranged from 19% to 65%, with a majority of the courses having overall response rates greater than 45%.
- The weighted mean response from on-campus, televised, and video-streamed students is 4.63, 4.33 and 4.53 respectively.
- The average variation between student course evaluations for televised and video-streamed delivery in comparison to on-campus students is -2.3% and -6.5% respectively.
- Compared to their on-campus classmates, on average approximately 3 in 4 televised students rated their course lower, and 2 in 3 video-streamed students rated their course lower.

Evaluation of Results

Based on the percentage of responses to the student course evaluations, Old Dominion University and the Engineering Technology Department need to improve student participation in course evaluations. In the fall of 2008, one of the authors actively encouraged students in CET 495 to evaluate the course and received a 43% response rate, the same instructor did not actively encourage participation in another course, CET 460, and the response rate in that class was 19%. Although Old Dominion University currently communicates to students and faculty regarding the online system and employs e-mail reminders, additional approaches should be devised to increase response rates. Additional approaches that should be considered include additional

promotional efforts, incentives, and communication to the students about how the feedback is used by the instructors, the Engineering Technology Department, the College of Engineering and Technology, and Old Dominion University².

With regard to the variation in the student course evaluations based on delivery mode, there are many factors that may contribute to these variations. The authors anticipated results that indicated that on-campus evaluations are always higher than televised or video-streamed, although this was not the case. Factors that may contribute to (or even temper) the variations include:

- Course instruction is not designed for all delivery modes. - Course instruction is usually designed for televised delivery. On-campus students are in the classroom with the instructor, but take notes from televisions at the front of the room. A traditional classroom delivery including whiteboard or chalkboards is not feasible. Students using video-streamed delivery view the lecture on a much smaller (computer) screen, and courses designed for televised delivery may not provide adequate image quality for video-streamed delivery.
- Student Demographics – Distance education students (televised and video-streamed) at Old Dominion University tend to be older (between 25 and 50), working adults with families, who have returned to college to complete a degree needed for employment advancement. This is very similar to demographics of typical distance learners as cited by Moore and Kearsley³. These students have different needs and expectations in comparison to on-campus students.
- Student-centered instruction needs are different for each of the course delivery modes used⁴.
 - Active learning exercises can be used for all three delivery modes, but feedback to individual televised and video-streamed students is limited during class.
 - Learning communities are developed on campus and can be developed at televised sites if they are populated by more than one student, but video-streamed students do not have the same opportunities. Video-streamed students do have access to a chat room during class, where they can create a learning community, but instructors do not have access to the chat room during class. It would be difficult for an instructor to participate in the video-streamed chat room during a lecture, in addition to managing on-campus students, televised students, and questions from the video-streamed question window.
 - Interaction with students should be tailored to the instructional delivery mode. Since there are three delivery modes, it is difficult to address all the needs of all students in every delivery mode. The instructor can interact with on-campus students before and after class as well as during office hours. However, interaction with televised and video-streamed students is limited to phone conversations and email, and is less frequent than those interactions with on-campus students. Additional interaction methods such as online journaling, and online discussion threads can be incorporated to improve interaction with these groups.

Course Number	Class Size	On-Campus Rating	Televised Rating	Video-Streamed Rating	On-Campus Responses	Televised Responses	Video-Streamed Responses	Total Participation	% Overall Participation
CET 445 S05	34	4.31	4.36	4.68	11	1	10	22	65%
CET 445 S06	60	4.54	4.72	4.37	13	10	3	26	43%
CET 445 S07	51	4.68	3.92	4.43	12	7	8	27	53%
CET 445 S08	51	3.76	4.19	4.25	8	7	9	24	47%
CET 460 F05	39	4.59	4.16	4.45	7	3	4	14	36%
CET 460 F06	53	4.96	4.42	4.60	4	11	10	25	47%
CET 460 F07	55	4.81	3.94	4.67	10	7	6	23	42%
CET 460 F08	36	4.40	4.13	4.18	3	1	3	7	19%
CET 495 F08	26	4.03	4.50	4.49	2	1	9	12	46%
CET 452 F05	24	4.80	4.41	4.87	6	6	1	13	54%
CET 452 F07	38	4.51	4.03	4.43	11	5	4	20	53%
CET 310 F08	65	4.86	3.97	4.83	11	5	13	29	45%
CET 360 S08	55	4.58	3.90	4.61	10	6	11	27	49%
CET 400 S06	25	5.00	4.20	4.73	3	3	6	12	48%
CET 400 S07	46	4.77	4.43	4.47	10	6	11	27	59%
CET 440 F06	77	4.75	4.29	4.76	14	16	10	40	52%
EET 300 S08	35	4.67	4.83	4.19	4	2	5	11	31%
EET 415 S08	49	4.77	5.00	4.16	5	6	8	19	39%
EET 480 F06	35	4.91	4.76	4.27	6	3	9	18	51%
EET 480 S06	29	4.59	4.16	4.63	7	3	6	16	55%
EET 480 F07	24	5.00	4.75	4.85	3	4	7	14	58%
EET 480 S07	36	4.80	4.93	4.20	6	1	9	16	44%
EET 480 S08	26	4.74	4.47	4.76	6	3	6	15	58%
Total	969				172	117	168	457	47%
Mean		4.63	4.33	4.53					
Std Dev		0.26	0.31	0.22					

Table 1 - Course Evaluation Results

- Courses are designed for synchronous delivery. Some students are taking courses asynchronously (a variable that is not currently addressed in course delivery or course evaluations).
- Course evaluation limitations – Course evaluations are designed for campus instruction. Separate course evaluations should be developed for courses offered via distance education that include questions regarding mode of instruction used and technical support, and students should be encouraged to use the comments section of the evaluation to provide critical feedback on course improvement.⁵

- Student Quality – Better students tend to be more enthusiastic about course subject material, which in turn, tends to overshadow drawbacks in non-traditional delivery modes. Distance education students (both televised and video-streamed) are traditionally better students^{6,7}, i.e., they tend to make higher grades than students in the traditional classroom setting. This will tend to temper the lower evaluations from non-traditional students.

Conclusions

Based on the data contained in this paper, with the currently-available course delivery technologies, instructors can expect their course evaluations from students using televised and video-streamed delivery modes to be 3%-7% lower than those of the traditional students. It appears that limitations in the non-traditional modes of course delivery reduce the students' perceived quality of a course, or raise the effort required (and resulting frustration-levels) of the students, which result in lower evaluations. Faculty, administrators, and technical staff at Old Dominion University have recognized this difference and are currently working to improve the technical quality, level of available in-class interaction, and instructor availability for students using non-traditional delivery modes. Further work is planned to analyze data trends in response to individual evaluation questions, looking at responses in the context of the instructor versus course content. In addition, the Engineering Technology Department at Old Dominion University will implement a plan to improve student participation in course evaluations.

Bibliography

1. Parsad, B., and Lewis, L. (2008). *Distance Education at Degree-Granting Postsecondary Institutions: 2006-07* (NCES 2009-044). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.
2. Sorenson, Lynn D. and Johnson, Trav D. *Online Student Ratings of Instruction*, New Directions for Teaching and Learning, Number 26, winter 2003, Jossey-Bass, page 18.
3. Moore, M. G. and Kearsley, G. *Distance Education: A Systems View*. Belmont, CA.: Wadsworth , 1996.
4. Cyrs, Thomas E. *Teaching and Learning at a Distance: What it Takes to Effectively Design, Deliver and Evaluate Programs*. New Directions for Teaching and Learning, Number 71, fall 1997, Jossey-Bass Publishers page 33-39
5. Palloff, Rena and Pratt, Keith. *Building Online Learning Communities: Effective Strategies for the Virtual Classroom*, 2nd Edition, , Jossey-Bass, 2007, pages 205-226..
6. Flory, Isaac and Hackworth, John R., *The Administration of Senior Design Projects in a Distance Learning Environment*. ASEE 2005 Annual Conference Proceedings.
7. Hackworth, John R. and Jones, Richard L. *Assessment Methods for Comparison of On-Campus and Distance-Learning Laboratory Courses in an Engineering Technology Program* ASEE 2004 Annual Conference Proceedings.