A Student Survey of a Web-based Distance Learning Engineering Course

Scott Schultz[1]

Abstract – In this paper, results of a student survey are presented for a web-based distance learning engineering course taught at Mercer University. All students who took the course felt the course was appropriate for distance learning and would recommend the course to fellow classmates. However, they felt only about 10-15% of engineering courses could viably be taught through distance learning. Students cited flexibility and convenience as the primary advantages for distance learning. Additional survey questions focused on the value of various electronic materials used during the course.

INTRODUCTION

In this paper, results of a student survey of a web-based distance learning course are presented. The purpose of the survey was to obtain feedback about student likes and dislikes of an Engineering Economy and Project Management course taught 100% on-line. This was a first-time offering of this course and the first time the instructor has taught a fully on-line course. The survey attempts to capture student feedback of their experience with this course in particular and their feelings of on-line course offerings in general.

COURSE DESCRIPTION

This course consists of two distinct topics. About 80% of the course is devoted to Engineering Economy. The course text is "Engineering Economy" [Blank and Tarquin,1]. The remaining 20% of the course content is Project Management. All Engineering students at Mercer University are required to complete this course. Depending on the student's discipline, the course is taken in either their Sophomore, Junior or Senior year.

The author has taught in excess of 10 sections of the course over the last seven years, although this was the first time the course was taught on-line. The author has a real passion for the course content and approaches engineering economy as a course that not only supports their future engineering career, but also prepares them to make practical economic decisions in their personal finances.

This course was delivered during the 2009 summer term. Summer terms are taught in 5 weeks, and typically consist of four 2-hour classes each week when taught in a traditional format. The assessment tools for the course consist of 2 mid-term exams, a final exam, and a team project used to demonstrate an understanding of project management.

ON-LINE TOOLS AND DELIVERY APPROACH

The motivation for offering this course on-line was two-fold. First, Mercer University is actively encouraging faculty to increase the number of distance learning courses in order to provide students with alternative means of education with the ultimate goal of increasing the number of students and increasing the 4-year graduation rate. Secondly, the author is interested in experiencing distance learning education first-hand in order to make informed decisions of whether or not to actively pursue additional use of web-based teaching tools.

[1]Associate Professor, Industrial Engineering, Mercer University, schultz_sr@mercer.edu

The overall delivery approach was to largely replicate the traditional delivery of this course, and to do so by electronically capturing most aspects of the traditional course. The components of the distance learning course included streaming videos of lectures, Word documents for each lesson and lab, Powerpoint presentation media, Excel labs, pdf scans of homework solutions, and electronic exams. The course was delivered using the Blackboard Learning System environment.

The Blackboard Learning System environment is a software product distributed by Blackboard Inc. [2]. The Blackboard software environment has numerous features which help facilitate a distance learning environment. Features utilized for this course included learning modules, chat, calendar, mail, and assessment. A learning module was created for each lesson. The learning modules are where electronic media such as lesson plans, labs, videos, and homework solutions can be stored and organized by lesson. The learning modules were attached to a calendar system, and students were expected to keep up with the class by completing learning modules as posted. Of course students could miss a day or two and catch up at their own convenience. The calendar was provided as a guide to give students an idea of how they should be progressing in order to stay up with the course without cramming. The electronic exams were also posted on the calendar and had to be taken on the date of the posting. Chat sessions were used once a week as a place for interaction between students and the instructor. Chat is a facility provided by Blackboard where the students and instructor can all login to the chat room and communicate back and forth via a typed discussion.

A streaming video was made for each learning module. A room in the engineering building has been outfitted with cameras, computers and video monitors to facilitate the video capture of a lecture/lesson. The entire session is controlled and captured by the instructor. This takes a little getting used to, but is not too difficult to master. The instructor can switch from cameras which record the instructor to the camera which captures the computer monitor. For this course offering, a video of each lesson was made without an audience because the decision to create the distance learning course was made after any opportunity to video a live audience. These streaming videos are then posted to the appropriate Blackboard learning module.

A Powerpoint slide show was created for each lesson. The instructor lectured on the video using the slideshow as a guide. These Powerpoint slides were made available to the students via a Blackboard learning module.

Lesson plans were created in Microsoft Word for each lesson. The lesson plan included the topic, lesson objectives, reading assignments, lab assignments and homework problems. These lesson plans were made available to the students via Blackboard. In addition, homework solutions were worked by hand by the instructor. These solutions were then scanned and captured to a pdf file. These homework solutions were also made available to the students via a Blackboard learning module.

One difficulty of distance learning is lab instruction. Fortunately, all labs in the Engineering Economy and Project Management course can be accomplished using Microsoft Excel or Microsoft Project. The lab instructions are provided in a Word document. Example lab problems and solutions are provided in an Excel file. Solutions to the labs are also provided in an Excel file. These files are made available to the students via a Blackboard learning module.

Each Sunday evening during the course offering the class held a chat session. Chat is a facility which allows students and instructors to interact via typed messages. Only students signed up for the course can enter the course chat room. A typical session began with the instructor discussing course logistics such as what learning modules should be complete and when exams were being offered. The instructor then very briefly reviewed topics completed to date. The instructor then would ask problem type questions and expect responses by students to determine their understanding.

The final electronic component of the class was the exams. In this class, two mid-terms and one final exam were delivered. A software tool called Respondus v 3.5 provided by Respondus, Inc. [3] was used by the instructor to create the exams. Respondus allows for the creation of true/false, multiple-choice, matching, short answer, and essay type questions. Respondus files can be posted to the Blackboard assessment facility. Numerous test taking features are available such as time windows, time limits, grading, and feedback to students. For this distance learning course offering, the primary question type used was multiple choice. While the exam questions did not

substantially differ from the traditional live course, the traditional exams do not use multiple-choice and allow for partial credit.

SURVEY RESULTS

The following section details results of the student survey. The section begins by providing some notes on how the survey was performed, followed by the survey questions and how the students answered the questions.

Survey notes:

- 9 students took the survey (using Blackboard).
- 5 percent of the final grade was allotted for students taking this survey, so a "good" effort was put forth on the survey.
- The survey was given before final grades were posted, however students appeared to answer truthfully.

Background questions:

1. Was this your first on-line University course?
    - Yes – 7
    - No – 2

2. Are you a Sophomore, Junior or Senior?
    - Sophomore – 1
    - Junior – 3
    - Senior – 5

General questions about taking this course on-line:

1. Was this particular course, Engineering Economy, appropriate to be taught on-line?
    - Yes – 9
    - No – 0

2. If you had the choice of taking this course on-line or in a traditional lecture format, which would you choose?
    - Lecture – 4
    - On-line – 5

3. Why did you take the on-line Eng. Econ. course this summer rather than during the Fall or Spring term?
    - scheduling to graduate
    - lighten load next year
    - catching up

General questions about Engineering courses on-line:

1. What percent of the engineering courses that you have taken would you think be appropriate as on-line courses?
    - < 10% - 2
    - 10% - 3
    - 15% - 1
    - 20% - 1
    - Don't know – 2

2. List courses (by name) which you think might work well as on-line courses.
    - Technical Communications (TCO341)*
    - Professional practice (EGR108)*
    - Probability and Statistics (EGR252)*
    - Programming for Engineers (EGR126)*
    - Engineering Economy (EGR312)*
    - Feedback Control
    - Thermodynamics
    - Engineering Graphics
    - Digital Design
    - Into to Engineering Design (EGR107)

    * 3 or more students

Specific questions on electronic materials:

1. The electronic material provided for this course included a lesson plan, powerpoint slides, homework solutions, lab assignments, lab solutions and videos. Are there additional material you would like to see available?
    - Previous or practice exams
    - Videos as direct downloads as opposed to streaming
    - I would like to see the Discussions page used more for general questions and even introductions

2. During face-to-face classes I work homework problems on the board. In the on-line course I provided pdf's with a scan of my solution. Were the pdf's sufficient?
    - Yes – 5
    - Yes, but watching solution formulation and asking questions would help - 4

<u>Videos</u>

1. Were the videos helpful?
    - Yes – 9
    - No - 0
2. I had to create the videos without a live audience. Would you recommend I capture videos from when I teach the face-to-face course next semester. Keep in mind the face-to-face videos would be longer, but would include working out homework solutions and responding to questions.
    - No, would be cumbersome and probably would not watch – 4
    - Yes, student questions and seeing problems being solved would be helpful - 5
3. Do you have any other suggestions for the video sessions?
    - No – 4
    - Downloadable versions (not streaming) – 2
    - Seeing problems worked – 1
    - Poor audio on some – 1
    - Project assignment video - 1

<u>Chat</u>

1. Were the chat sessions helpful?
    - Yes – 9
    - No - 0
2. Were you comfortable with the pace of the chat sessions?
    - Yes – 9
    - No – 0

3. Was the time of the chat session good (Sunday 8-9pm) or would you suggest an alternative time and day?
    - Good/perfect – 7
    - Good, but hour earlier – 1
    - Work conflict, but was able to attend - 1
4. Do you have any additional suggestions for the chat session?
    - No – 5
    - Use Skype video – 1
    - Use WebEx – 1
    - 2 chats per week – 1
    - Visually work problems - 1

Exams

1. Were the exams of appropriate length (2.5 hours)?
    - Yes – 8
    - No - 1
2. Did the exams test your knowledge of the material?
    - Yes – 9
    - No – 0
3. The exams were multiple choice, what are your feeling of this type of test format versus a traditional written exam.
    - Format worked fine – 4
    - Didn't like not having partial credit – 5
4. Would you have preferred to take a written exam, scan your work to a pdf file, and email to me?
    - Yes, to get partial credit – 6
    - No, stay with multiple choice - 3
5. Do you have any other suggestions regarding the taking of exams in an on-line course environment?
    - More questions
    - Enter governing equations

Summary questions about this on-line course:

1. What is the greatest advantage to taking a class on-line?
    - Flexibility
    - Convenience
    - Work around personal schedule
    - Not being local
    - Replay videos

2. What is greatest **dis**-advantage to taking a class on-line?
    - staying on track/getting behind - 5
    - missed interaction and face-to-face questions with professor - 4

3. What did you like most about taking this course on-line?
    - Flexibility
    - Convenience
    - Work around personal schedule
    - Not being local
    - Replay videos
    -
4. What did you like least about taking this course on-line?
    - Amount of time required (Summer A 5 week course)
    - Only 4 major grades
    - Length of exams

5. Would you recommend this on-line version of Engineering Economy to your fellow classmates?
    - Yes – 9
    - No – 0

DISCUSSION OF RESULTS

The sample size was small (9 students), but representative of the Engineering school at Mercer, including the various Engineering specializations and a cross section of Sophomores, Juniors and Seniors. Seven of the 9 students were taking a distance learning course for the first time.

All students felt the course was appropriate to be taught on-line. When given a choice, about half the students would prefer a traditional face-to-face course while the other half would rather take the course on-line. When asked if other engineering courses are appropriate in the on-line environment, most of the students felt only about 10% of the engineering courses were appropriate as on-line courses. Only two felt 15%-20% of the courses could be taught on-line. When asked to cite which engineering courses might be appropriate, some core courses and freshman level courses were mentioned, with almost no mention of Junior or Senior level courses. The percent of courses deemed appropriate as on-line courses may rise as students are exposed to more distance learning courses.

The predominant advantage cited for taking an on-line type course is the flexibility and convenience. References [McCue and Scales,4] and [Peltz,5] similarly indicate that flexibility and convenience are the primary benefit cited by students for distance learning. Being able to replay lecture videos was also cited as a benefit. The disadvantages cited of the on-line experience included difficulty in staying on track with the pace of the course and the missed interaction with the instructor. The pace issue may have surfaced because the course was taught as a 5-week summer course as opposed to the traditional 15-week semester.

For the most part, the electronic media provided for the course was deemed sufficient. Additional requests for materials included previous or sample exams, and videos provided in "downloadable" format instead of streaming video. One concern of the author was that for this on-line offering, solutions to problems were not demonstrated, but rather worked out solutions were provided. Five of students were satisfied with being provided the worked solution, while the remaining four would have preferred to discuss and see the problems worked. The author's other concern was that the lecture videos were produced without a live audience. This was done because the request for the on-line course occurred before an opportunity to record a live course could be arranged. About half the students would have preferred to see the live course which would have included problem solution sessions. However, the remaining students thought this would unnecessarily add to the length of the video and may have inhibited them from watching.

Chat was a new approach for the author as a communication medium and was approached with some skepticism. However, the chat sessions appeared to flow well, and all students indicated the sessions were helpful and of a good pace. There appeared to be nearly 100% participation for each session, with most students actively asking and answering questions during the session.

A final concern of the author was that exams were given in multiple choice format. Past exams in the traditional classroom had always been to work problems and partial credit was given. Surprisingly 4 of the 9 students preferred the multiple choice approach, whereas the remaining 5 students preferred partial credit from worked problems. Six of the 9 students said they would have been willing to take a written exam and scan and email their exam.

Plans for Next Offering

This same course is scheduled to be taught again online during the summer of 2010. Specific changes that will be made based on the survey results include the following:

- Schedule the course for more than 5 weeks, most likely 7 weeks.

- Experiment with requiring students to take a traditional written exam, then scan and email the exam results to the instructor. Exams taken by the students will not be identical, thereby reducing the possibility of collaboration.
- In addition to the currently available "streaming" format, videos will be provided in a "downloadable" format.

CONCLUSION

The students were generally pleased with the online course offering and will recommend taking the course online to other students. The online course is planned to be offered again during the summer of 2010. Minor changes to the course will be made based on this student feedback.

REFERENCES

[1] Blank L. and A. Tarquin, *Engineering Economy, Sixth Edition*, McGraw-Hill, New York, NY, 2005.

[2] Blackboard Inc., www.blackboard.com.

[3] Respondus, Inc., www.respondus.com.

[4] McCue L.S. and G. R. Scales, *Embracing the middle ground: Engaging on- and off-campus students within the same 'classroom'*, ASEE Southeast Section Conference, 2007.

[5] Peltz, S., *West Valley College Distance Learning Fiscal and Statistical Report 2007/2008*.

Scott R. Schultz
Dr. Scott Schultz is an associate professor of Industrial and Systems Engineering at Mercer University in Macon, Georgia. He also consults at the Mercer Engineering Research Center in Warner Robins, Georgia. He comes from an Industrial background with thirteen years of experience with Ford Motor Co. in Dearborn, MI and Windsor, Ontario and two years of experience at the North Carolina State University Furniture Manufacturing and Management Center. Ten of his years at Ford were as an Information Technology manager in areas of development, installation and support. His primary research and teaching interests are in scheduling, heuristics and process modeling.