AC 2007-29: IS IT REAL OR IS IT MEMOREX: A DISTANCE LEARNING EXPERIENCE

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Abstract

Distance learning in engineering education is becoming more prevalent. The literature in educational research extensively covers technology issues. This paper focuses more on the pedagogical issues related to student-instructor interactions, and other issues that both the instructors and students can face in this distance learning environment that are unique and different from the traditional classroom. The constant challenge is to maintain at least the same learning environment as the traditional classroom and, if opportunities arise, enhance the learning environment whenever possible. The venue for discussing these topics is a typical engineering course offering during the summer term of 2006 in the Woodruff School of Mechanical Engineering at Georgia Tech.

Background

Earning a Master of Science Degree in Mechanical Engineering (MSME) completely through distance learning has been an option at the Woodruff School of Mechanical Engineering at Georgia Tech for about ten years. Since its inception in 1996, nearly 720 graduate students have chosen this option and, to date, approximately 158 individuals have graduated through the program.

The admission standards for students applying for the distance learning option are exactly the same as on-campus students. Students participate in the same courses as their on-campus counterparts. There is no distinction in the degree awarded or the annotations on the transcript.

The selection of course work for completing the distance learning MSME degree is quite robust. Each term approximately twelve to fifteen courses are offered via the distance option. Exactly like their on-campus colleagues, distance learning graduate students must complete thirty hours of course work (normally 10 courses). This course work must meet the guidelines published in the Georgia Tech General Catalog and the Woodruff School Graduate Handbook to qualify for the awarding of the Master of Science in Mechanical Engineering (MSME) degree.

Distance learning and on-campus graduate students register for the same courses and participate in the same lectures. Classes are integrated so that there are no “distance only” course offerings. This common experience captures the sentiment of the title for this paper “Is it Real or is it Memorex?” In this manner, the learning experience for the distance learning and on-campus students is the same.

Delivery of the course material to the distance learning students is asynchronous. Historically the completion of graded material for the distance learning students has been on a two-week delay. This delay allows for the delivery of course material and provides some flexibility with the work schedules of the off-campus students who are often working full-time while completing their studies.

At the start of the program in 1996, delivery of course material was primarily done by sending video-cassette (VHS) tapes of the lectures. Starting in about 2000, CD-ROMs were often sent as an alternative to VHS tapes. As technology has improved, today more lecture material is directly delivered through the internet in a streaming audio-video format.

The lead author's first experience with conducting a distance delivered course occurred in the summer term of 2006. The purpose of this paper is to discuss pedagogical topics of that experience and to review the ongoing issues faculty members and students face in the distance learning environment.

Introduction

The course venue described in this paper was a senior-level mechanical engineering elective in structural vibrations. Approximately five graduate students, and forty-five junior and senior undergraduate students, attended the on-campus section. Six distance learning graduate students also completed the course.

A course delivery software package called Tegrity® was used to record the lectures. Course notes were captured using a stylus and a tablet PC. A technician recorded the audio and video of the lecture and this material was completely integrated with the course notes. A link to streaming audio-video of the lecture was available through the internet within as little time as one hour after the completion of the session.

Pedagogical Issues

In this paper I will address pedagogical topics by comparing this distance learning delivery experience to traditional whiteboard or chalkboard classroom lectures. The majority of issues with adapting to the distance learning environment seemed to lie with me, the instructor, rather than with the students. My constant challenge was to maintain an equal learning environment as the traditional classroom and, if opportunities arose, to enhance the learning environment whenever possible.

Classroom display

One of the first challenges I faced was space limitations of the tablet PC. Figure 1 shows a typical classroom display using the Tegrity® system. Compared to writing on a white board or chalkboard, only one board is visible at any time. With the Tegrity® software previous boards are viewable by using a "back" button. An advantage is that all of the material in a given lecture is retrievable. The disadvantage is that this material is not simultaneously viewable with the current board. In typical engineering course work, I often found the need to rewrite equations on the current board critical to the current topic development.

Pedagogically, a second issue I faced with the classroom display was the use of color. In the traditional classroom, different colors of chalk/white board markers in classroom presentations can emphasize points and visually enrich teaching points. I was pleased that this same

pedagogical benefit of using color was available through the use of the tablet PC and the Tegrity® software package. In fact, feedback from both my on-campus and distance learning students emphasized the positive aspects of the presentation venue. This was particularly true for the off-campus population who resoundingly found the tablet PC presentations to be much more readable and effective than the video capture of white board/chalk board material which they had experienced in most of their previous distance learning course offerings.

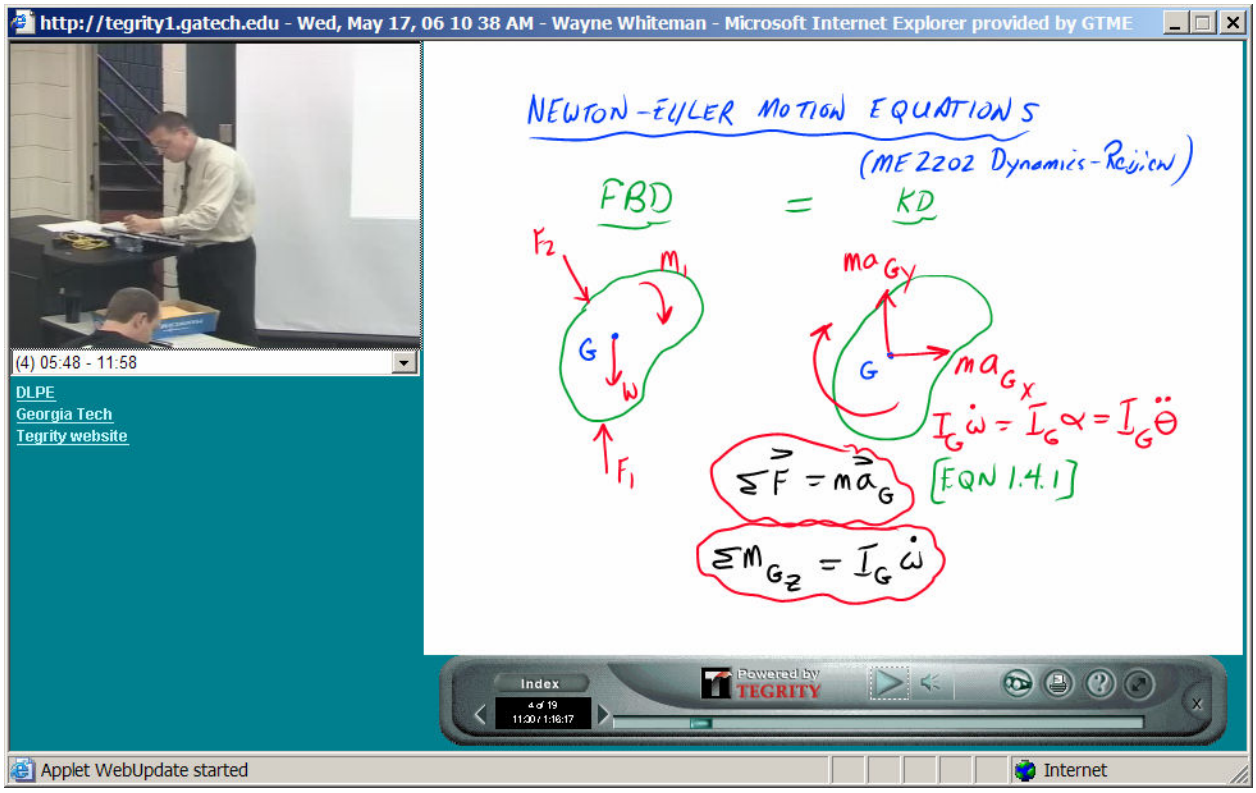

Figure 1. Typical Classroom Display – Tegrity® System

Instructor movement in the classroom

Another restriction of using a tablet PC was my inability to move around the classroom. I felt myself having more of a tendency to remain in the immediate vicinity of the tablet PC. This inhibited some of my interaction with the students in class. I made a concerted effort to leave the location of the tablet PC and engage students whenever possible by moving away from the podium in the classroom. This classroom interaction also often prompted an email or phone call from the distance learning students with similar questions and allowed an interchange that enhanced the learning environment.

Integration of computer applications

A distinct pedagogical advantage was my ability to integrate other computer applications, such as PowerPoint and MATLAB, into the course lectures. This capability seamlessly allowed for multiple teaching tools to be quickly leveraged as a routine part of any lecture.

Releasing distance material to on-campus students

At the beginning of the course, I faced an interesting conundrum which likely enters the decision cycle of all new distance learning faculty members. Since classes are captured and available to the distance learning students, I needed to make the decision whether those same distance learning class resources should be made available to my on-campus students.

My fear was that the on-campus students would stop attending class in favor of viewing the online lectures. My original decision was not to give my on-campus students access to the distance learning lectures. Early in the course, I communicated my concern of non-attendance to the on-campus population and emphasized my opinion that teaching and learning is a "participation sport" that is significantly enhanced by in-class interaction.

However, I reversed this original decision after the fifth lecture. I deemed that the advantage of releasing the distance learning lectures to the on-campus student outweighed any disadvantages. The advantage from a pedagogical viewpoint was the ability for the on-campus students to replay parts of classes that they found difficult to comprehend and thereby enhance their learning experience.

On a positive note, my fear never materialized of on-campus students not attending class once the distance learning resources were made available to them. In-class attendance declined less than ten percent after the distance learning lectures were released. My implied observation was that the mature learners in the course recognized that importance of in-class participation and interaction, and they found value in continuing to be part of this physical learning environment.

Mobility Issues

The mobility possibilities of the distance learning environment represent a paradigm shift in course delivery. With a software package like Tegrity® and a tablet PC, a course can be taught from anywhere in the world. With an internet connection, the material can be immediately uploaded to a server that can be accessed by students anywhere in the world.

As mentioned in the previous section, there is an important pedagogical advantage of in-class participation and interaction. It is envisioned that this barrier will soon be overcome by evolving technology that would allow synchronous online class interaction. This capability is already at least partially available via video teleconferencing.

This increased mobility also introduces another similar advantage in the ability to pre-record lectures if necessary. Travel commitments often cause faculty members to miss some class attendances during a typical academic term. Traditionally the faculty member has to find a colleague or a graduate student to teach the class in his/her absence. Distance learning technology allows these classes to be pre-recorded and presented to the on-campus students while the instructor is away from campus.

Other Issues

The distance learning experience offers other ancillary advantages and disadvantages. The audio-visual capture of classes serves as an excellent archive of material previously taught. A corresponding disadvantage is the temptation to present the same material (or perhaps replay previous lectures) rather than engage in real-time intellectually stimulating learning environments for future terms.

There are some other nuances that require attention in the distance learning environment. While they seem minor, their impact can be major if not properly addressed. As an example, distance learning delivery requires the instructor to wear a microphone. Care must be taken to turn the microphone off when not lecturing or engaged in class activities. Comments made to a colleague outside the classroom environment while the distance learning microphone is still capturing the audio may not only be embarrassing, but may cause more serious concerns if the recorded conversation includes sensitive or personal topics.

The apparatus of the distance learning environment with tablet PCs, microphones, etc. include a plethora of connection cables and other hardware requirements. These extraneous cables and hardware can introduce substantial clutter and may actually introduce a distraction to the learners. Again, management of this equipment clutter may seem minor, but can enhance the learning environment if proper attention and care is given.

One last facet somewhat unique to the distance learning environment is the interaction with support technicians responsible for assisting in the delivery of course material. Extra care must be observed when posting solutions for the distance learning students to make sure that graded requirements are received prior to electronically distributing solutions. This same care must be taken in handling the distribution and security of exam material. If distribution of material involves the use of web postings, web site security may also be an issue that needs to be addressed.

Conclusions

This paper describes pedagogical issues facing both faculty members and students in the conduct of distance delivered course work, with some emphasis placed on the impact upon typical engineering classes. Pedagogical issues are discussed under the topics of classroom display, instructor movement in the classroom, integration of computer applications, releasing distance material to on-campus students, and mobility issues. Other ancillary issues are also discussed.

The focus of the paper is less on technological topics and more on faculty-student interactions. A comparison is made between the distance learning delivery experience and the traditional whiteboard or chalkboard classroom lectures with the overall goal to maintain at least the same learning environment as the traditional classroom and, if possible, enhance the learning environment whenever possible.

Bibliography

[1] Wang, Xuemei, John F. Dannenhoffer III, Barry D. Davidson, and Michael J. Spector, *Can Distance Education Be Unlocked?*, ASEE PRISM, Vol. 26., No. 3, Nov 2005.

[2] Uden, L., *An engineering approach for online learning*, International Journal of Distance Education Technologies, Vol. 1, No. 1, Jan-Mar 2003.

[3] Maor, Dorit, *Using reflective diagrams in professional development with university lecturers: A development tool in online teaching*, Internet and Higher Education, Vol. 9, No. 2, Summer 2006.

[4] Pais, Carlos, Vitor Pires, Rui Amaral, Joao Amaral, Joao Martins, Carlos Luz, and O. P. Dias, *A strategy to improve engineering teaching process based on an e-learning approach*, Proceedings of the Fifth International Conference on Information Technology Based Higher Education and Training, ITHET 2004, 2004.

[5] Cheong, Pauline Hope, Namkee Park, and William H. Dutton, *New Technologies, old practices: The traditional use of electronic courseware in the changing geography of the classroom*, International Symposium on Technology and Society, 2002.

[6] Sharma, M. P. and Gary M. Fetter, *Designing, developing, and implementing an online engineering thermodynamics course using web technology*, ASEE Annual Conference Proceedings, 2001 ASEE Annual Conference and Exposition, 2001.

[7] Cohen, M. S., *Teaching technology in an online, distance education environment*, 31st Annual Frontiers in Education Conference, Conference Proceedings, 2001.

[8] Davis, Shirley M., *What E-learning can learn from history*, USDLA Journal, Vol. 15, No. 10, Oct 2001.

[9] Schrum, Lynne, *Trends in distance learning: lessons to inform practice*, Educational Media and Technology Yearbook, Vol. 24, 1999.

[10] Murphy, Karen L. et. al., *Integrating distance educational technologies in a graduate course*, TechTrends, Vol. 42, No. 1, Jan-Feb 1997.