Teaching While on Travel: Technology Alternatives

J. Wesley Hines[1]

Abstract – Technology has made it possible for faculty members to teach classes while attending conferences, pursuing external funding, or on vacation. Software such as Centra Symposium, Camtasia, SmartRecorder, and PowerPoint make synchronous or asynchronous lecturing possible. Lectures can be pre-recorded and played back in class or streamed over the Internet or the lectures can be delivered in real time with student teacher interaction. Several methods were tested in several classes over the last year. The student feedback has been positive in that the students prefer synchronous distance delivery to a substitute graduate teaching assistant or the asynchronous delivery of PowerPoint slides with embedded audio . As technology advances, faculty members will have more access to alternative delivery methods, which will lessen the detrimental effects of travel and scheduling conflicts.

Keywords: Distance education, distance delivery, streaming.

INTRODUCTION

The Internet and associated technologies have spawned many new teaching paradigms. The University of Tennessee (UT) has been a leader in applying these technologies to Nuclear Engineering Education. This endeavor started with the offering of a MS degree in Nuclear Engineering at a distance [1]. The courses in this program are offered through synchronous internet deliver using the Centra Symposium software suite. This delivery method was extended to teaching both distance and local students at the same time [2] in a hybrid framework using a SMART Board[TM] as the computer interface.

It is common for engineering faculty to be on travel for technical conferences, meetings with funding agencies, or vacation. Faculty may also need to miss class due to scheduling conflicts, sickness, or emergencies. The most common solutions to these conflicts are canceling class or finding a graduate student or other faculty member to substitute. For some graduate level classes there may not be a suitable substitute and class must be cancelled. It is desirable to be able to teach the class from a distance. Recently, the distance education limits have been extended to not only include delivery to a distance, but to also include delivery from a distance. This has been performed using several delivery methods including asynchronous delivery through pre-recorded presentations and synchronous delivery using the Centra Software suite. This paper will present several methods used to teach from a distance and give some results from their application.

METHODOLOGIES

There are a variety of tools that can be selected for class delivery while the professor is at a distance. These tools can be grossly categorized into synchronous tools and asynchronous tools. The asynchronous tools can be pre-recorded and delivered in class or at the student's convenience. The synchronous tools are used in real-time, requiring the faculty to have access to an Internet connection at the time of class delivery. The following will provide a brief description of several methods used and will then discuss their advantages and disadvantages.

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[1] J. Wesley Hines, Nuclear Engineering Department, The University of Tennessee, Knoxville, TN, 37996-23000. Author contact email: jhines2@utk.edu.

Asynchronous Technologies

Several technologies are available for asynchronous delivery. These include methods for delivering pre-recorded class lectures. Historically, this has been done with a video camera and then delivered by VCR. The use of digital media recording devices has made delivery available to the student's electronic desktop rather than delivery to the class at a specified time and location. There are many methods for recording and streaming classroom lectures.

One of the newer methods for recording the lectures is through screen capture tools. Software such as Camtasia can be used to record everything that is displayed on one's computer and includes voice. With the use of a touch sensitive tablet PC (Figure 1) or a PC and tablet input device (Figure 2), and a microphone; an instructor can annotate PowerPoint slides, use an electronic whiteboard, use any windows application, and provide voice annotations. The class lectures can be recorded prior to the class meeting and presented to the class via a PC and projector or compressed and placed on a server for streaming.

Figure 1. Tablet PC   Figure 2. Tablet input device

Dr. Fred Weber, from the UT Chemical Engineering Department, has developed a web-based tool into which a professor can drag and drop a recorded lecture. The tool automatically formats and compresses the lecture and then places it on a server for streaming. Lastly, the tool emails the professor a url to the streaming video so that he can provide a link to it in his course management system or email it to the students.

Another method for recording the lecture is through the use of a SmartBoard (Figure 3) and the associated smart recorder software. The SmartBoard is a large monitor with a touch sensitive screen that is used as an input device to a computer. These are currently used in each of the college's 22 classrooms for course delivery but can also be used to record lectures. The resulting lecture would be compressed and delivered as described above.

Figure 3. SmartBoard

Probably the oldest, least advanced, and easiest to use technology is PowerPoint. Under the PowerPoint "Insert" menu item is the ability to record sound. If PowerPoint slides are used for class lectures, the professor can annotate each of the slides with his normal lecture discussion. This has been accomplished for several classes and the audio annotated slides are available on a course management system (Blackboard) for download. The availability of these slides is primarily used by students who must miss class or simply want to review the lecture. This technology can also be useful to new professors as a refresher before going to class.

The main disadvantage of asynchronous methods for class delivery is that there is no opportunity for real-time student teacher interaction. Students cannot ask the teacher questions, but chat rooms or actual classrooms can provide the students with the ability to interact among themselves.

Synchronous Technologies

Although several synchronous technologies such as Lotus, LearnLinc, and Interwise exist, only Centra Symposium was used for CyberClass delivery in this study. This software, developed and licensed by Centra Inc. (www.centra.com), is supplied by The University of Tennessee's Division of Outreach and Continuing Education. These CyberClasses feature shared audio and video, putting the student on-line with faculty and classmates anywhere in the world.

Many engineering professors teach with three main components:
- PowerPoint slide presentations for course content,
- whiteboard (electronic chalkboard) for working problems and presenting visual examples, and
- windows based programs for complex simulations or visuals.

Each of these components is supported with Centra's Symposium[TM] software package. PowerPoint slide presentations, windows media files, and a number of other file types are uploaded to a server by the instructor and then downloaded to the student's computers when logging into the class. This initial transfer of lecture materials decreases the bandwidth requirements during class, because only keys are transmitted to the students' computers to page through the lecture material. This frees up bandwidth for the real-time audio and other windows applications. Figure 4 is a sample screen shot of the software being used for a student homework presentation.
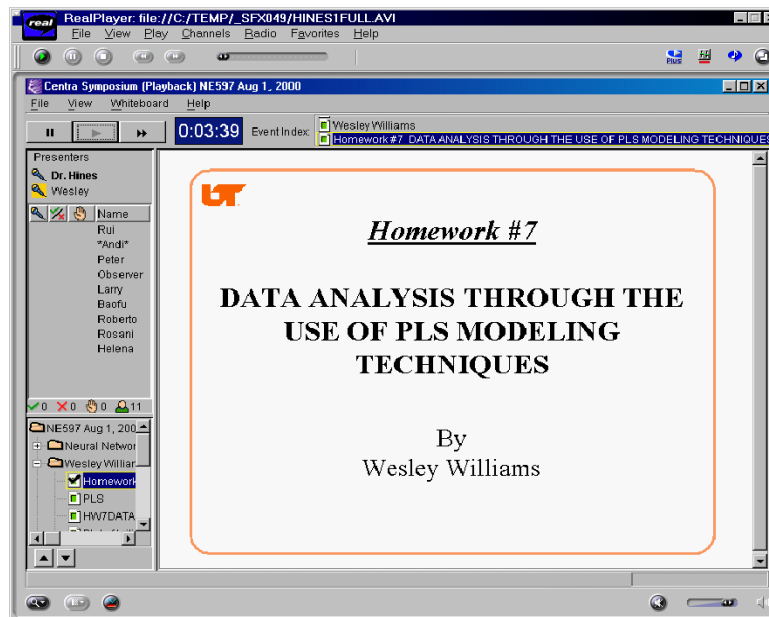

Figure 4. Centra software screen capture of student making presentation of homework proect.

Students are able to interact with the professor by asking questions, providing feedback, and through the opportunity to make class presentation. The software also allows chat windows during the class and breakout sessions for group projects. Feedback from the distance students has been very positive and feedback from in class students with delivery at a distance is also positive.

There are many other voice over IP (VOIP) technologies that perform similar functions as Centra. A partial list is included below.

Cata	Voxwire MeetingRoom
eBLVD	WebConference
Eedo WebClass	WebTrain
ezWebCar	Breeze
Glance	Centra
Instant Presenter	Convoq
Ivocalize	DyKnow Vision
Linktivity WebDemo	EduVoice
MS NetMeeting	Elluminate
Orbitalk	Groove
RoomTalk	HorizonLive/Wimba
Session	iVisit
SightSpeed	Merlin
VCOM Central	MS LiveMeeting
VoiceCafe	

The Innovative Technology Center at UT is currently evaluating these technologies and will pick three for extensive evaluations by focus groups. It is expected that the evaluations will be complete by the end of the Spring 2005 semester and the University will then decide whether to licensing CENTRA for faculty use, switch to another product, or support additional products.

IMPLEMENTATION

The Centra system has been used six times to teach both undergraduate and graduate level classes in a pilot test program. In the summer of 2004, several lectures of a graduate engineering class: "Advanced Monitoring and Diagnostic Techniques" were taught from a distance. The professor first taught the class from a hotel room in Colorado Springs using a tablet PC connected to the Internet with a high–speed wired connection. The small graduate student class size allowed both local students and distance students to view the class on their own computers at a location of their choosing. The class went well and the technology worked as desired. The class was delivered several more times from distance locations using both hard-wired and wireless hotel Internet connections. The only problem encountered was that low signal strength wireless connections tend to be less reliable than high signal strength or hard-wired connections.

In the fall of 2004, the Centra system was used to teach several lectures of an Engineering Thermodynamics class with 70 students. Because of the large class size, personal accounts were not supplied to each student. A teaching assistant set up a single client computer in the classroom and the lecture was shown in real time using a projector and large screen. Students with questions raised their hand and the teaching assistant provided the student with a microphone so that he could communicate directly with the professor. This arrangement proved successful and the students unanimously agreed that they preferred it to a class delivered by a graduate teaching assistant.

On two occasions, class lectures were not performed and the students were required to download the PowerPoint slides with embedded audio. This was the most simple asynchronous method discussed and is probably the least effective. The embedded audio files included discussion of the bullets, descriptions of the figures, and talked the

student through problem solutions. There was not method for the student to interact with the instructor and since it was not performed in the classroom, the student did not have the opportunity to collaborate with other students.

Of the methods used for class deliver in this informal study, the synchronous delivery using Centra was found to be the most desirable. This conclusion was made through an informal show of hands and through discussions with students. It provided the students with the opportunity for real time interaction with the professor and each other. Additionally, all Centra classes are recorded and were made available for later viewing. This made it possible for a student who missed a class to view it at a later date.

CONCLUSIONS

Several methods have been tested for at a distance engineering class delivery, which is valuable when professors are on travel or have scheduling conflicts. These methods include technologies for both synchronous and asynchronous delivery. An informal survey showed that students prefer a synchronous technology because it provides student teacher interaction. The Centra system, which was previously used solely for class delivery to students at a distance, has been used for delivery from a distance and is the system of choice.   A future implementation objective is to give all engineering professors access to this technology and provide them with the training necessary for its effective use.

REFERENCES

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J. Wesley Hines

Dr. J. Wesley Hines is an Associate Professor in the Nuclear Engineering Department at the University of Tennessee. He received the BS degree in Electrical Engineering from Ohio University in 1985, and was a nuclear qualified submarine officer in the Navy. He then received both an MBA and an MS in Nuclear Engineering from The Ohio State University in 1992, and a Ph.D. in Nuclear Engineering from The Ohio State University in 1994. Dr. Hines teaches and conducts research in advanced statistical and artificial intelligence applications in process monitoring and diagnostics. Additionally, Dr. Hines was the Maintenance and Reliability Center Educational Coordinator for four years and is currently the College of Engineering's Extended Education Coordinator.