AC 2009-2216: DESIGNING AN EFFECTIVE DISTANCE COURSE USING A SYNCHRONOUS AND HYBRID E-LEARNING APPROACH

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Designing an effective distance course using a synchronous hybrid e-learning approach

Abstract

The usefulness of hybrid delivery in education has long been realized and with the advancement of computer and communication technologies and the introduction of Web based authoring tools, its effectiveness has been further extended. In this regard, it has affected the traditional distance learning by transforming it from a static videotape delivery to a more dynamic format by adding or substituting the web as the delivery media. Our focus in this paper is the use of hybrid e-learning with virtual face-to-face for a distance course delivery. We believe that hybrid e-learning in conjunction with a synchronous online delivery can minimize the negatives that are sometimes associated with more traditional, primarily asynchronous distance learning offerings. Details of this work, including design and delivery issues, student and course assessment, and required technology are included in this paper.

Introduction

Clearly the advancement and affordability of computer and communication technologies during the past decade, especially the rapid growth and usage of the Internet, has had major effects on our everyday lives. Online learning offers the prospect of direct delivery of learning to existing learners and to groups traditionally excluded by personal circumstances from institutional learning [1-5]. In this regard, it has affected the traditional distance learning format by transforming it from a static videotape delivery to a more dynamic format by adding or substituting the web as the delivery media. A variety of socio-economic and technological factors are responsible for the increased demand for distance education. Now, more than any other time in the past, educational institutions are using non-traditional and more technological approaches to reach a wider audience[1-5]. The benefits of using distance learning have been long realized and reported. Some of these benefits include: the opportunity to take courses without having to physically travel to the instructor's location, the ability to take courses in one's area of interest, and, depending on the program rules and guidelines, the capability to complete a customized degree using credits from several universities. In this work we present hybrid e-learning with a virtual face-to-face methodology that we have used for distance delivery of graduate level electrical engineering courses. It should be noted that among the recent published studies in this area, some define hybrid learning as a combination of "face-to-face" and "asynchronous" [6-10] and some, like ours, as "synchronous" and "asynchronous" [11-12], where the synchronous part is a "face-to-face" or virtual face-to-face. This methodology is a special case of common hybrid delivery, where technology plays a more significant role, and at the same time, it is more difficult to plan and administer. Based on our experience the adopted methodology has a direct correlation with the level, undergraduate or graduate, and the subject matter. This paper is organized as follows: (i) a brief introduction of hybrid delivery model, (ii)

the implementation plan and related issues, (iii) our experience using the proposed delivery system, and (iv) recommendations and concluding remarks.

Hybrid Delivery Models

The usefulness of hybrid delivery in education has long been realized and with the advancement of computer and communication technologies and the introduction of Web based authoring tools, its effectiveness has been further extended. Work during the past decade associates hybrid with a conventional format (live lectures) and courseware modules. The courseware modules were primarily designed for course enhancement [8]. In later works hybrid delivery or flexible delivery is mentioned in distance learning, where the live lecture has been done through, or substituted with, video-conferencing or the Internet [13-14]. We identify these works and the ones where the courseware modules are used just for enhancement, as plain hybrid delivery models. On the other hand, those works that utilize the courseware modules with an e-learning approach will be referred to as hybrid e-learning. The main characteristic of a hybrid e-learning delivery model is a reduced face-to-face traditional delivery model complemented by e-lectures. As was mentioned before, hybrid e-learning comes in two formats, one with reduced traditional lecture and the other with virtual face-to-face delivery. Our focus in this paper is hybrid e-learning with virtual face-to-face delivery, which we will refer to as hybrid e-learning.

Implementation Plan

This section describes, in detail, our implementation plan including the hardware and software. The selection process was done based on our past experiences in this area. The initial selection and approach were recommended by a committee, which included faculty who were interested in using or experimenting with a hybrid delivery approach, representatives from involved departments, and representatives from the professional development unit of the Penn State University.

Hardware-Software requirements

The hardware and software requirements were handled by the Information and Technology Services (ITS) department. This included the Centra system[15] for virtual face-to-face delivery. The ITS department also provided a list of recommendations for communication equipment, including Internet cameras and headsets for instructors and students. Since Centra includes a built in white-board for the instructor, a graphics tablet or a Tablet PC can be used as a pen input device to enable accurate drawing of formulas, graphs and codes. It is also recommended, if possible, for the instructor's computer to have two video cards in order to have a split screen for better control of the classes. The Internet connection is also an important issue and must be capable of handling the required bandwidth. While broadband Internet connectivity is preferred, Centra works well even at 56K phone modem speeds where connectivity between the instructor and students is not a problem.

Delivery System

The hybrid delivery approach consists of several components: (i) lecture delivery using an online synchronous delivery system, which allows Internet attendance; (ii) asynchronous delivery of classroom lectures via downloadable recordings; and (iii) use of a course management system.

Centra, a real-time communication, collaboration and learning software environment, is employed for lecture delivery, recording, and facilitating active student participation. The instructor can either share the computer screen, document, or an application. Typical PowerPoint lecture presentations are converted into individual GIF, JPEG or HTML slides or pages during the upload process. The instructor presents the material one screen at a time and can jump to any screen by just clicking the slide title. There are many features available that can be used to enhance the presentation. The built-in "laser pointer" and "highlighter" capabilities are useful for stressing important points and topics on the slides. Centra will also allow students to download the recorded sessions for later viewing at their own convenience. Based on our experience, we consider this a significant advantage. Another useful function that focuses on interactivity is a chat session. Students can send feedback to the instructor in real-time and contact classmates through a chat session as well. In comparison, a chat session in a real-time Centra "classroom" is not as disruptive as a chat session in a physical classroom. Another useful feature of the software is the "Meeting Room" that allows a host to e-invite participants to a virtual conference or to attend a lecture.

ANGEL[16] (A New Global Environment for Learning) is the Penn State's CMS (Course Management System) tool that is used for posting courseware modules, course syllabus, weekly schedule, exams, homework folders, and grading. ANGEL offers a timing capability to control access that is used for exams.

Tablet PC is used for our second course delivery, Stochastic Control Systems. We believe for mathematically oriented courses it is more appropriate that students observe the step-by-step derivations of concepts. Although one can use the animation capabilities of PowerPoint to enhance the presentation, the uploading conversion process in Centra or Adobe Connect[17] transfers the slides to images where the added enhancement cannot be observed. The Windows Journal Viewer was used for portions that included derivations. The editing capability of the Journal, mostly different color pens and highlighting, was extensively used to enhance the presentation.

Design and Delivery Consideration Issues

The following were identified/recommended for the design and delivery process.

- Hybrid-based courses should be clearly designated and advertised as such to prevent student confusion at the time of enrollment.
- Students should be informed about the requirements for student participation. This is particularly important from the point of view of student satisfaction, as student expectations must be molded to fit the constraints of the online-based course delivery.
- Support for online delivery classes needs to be expanded. Both students and instructors require support. Student and instructional needs may differ, but lack of support leads to low satisfaction in both groups.
- Clear and specific specifications for the student's computer hardware, software, and telecommunications must be published prior to course registration so that enrolling students can be ready to participate in the online course.
- Students should be trained in how to effectively use the Centra (or Adobe Connect) system. This should happen before the first formal lecture or at the first meeting.
- The course syllabus should clearly identify the number of synchronous class teachings, the amount of expected asynchronous learning by students, the expected conduct during the synchronous delivery, and the grading and attendance policies.

E-Lectures

- Every lecture should include objective and appropriate discussion activities.
- In order to keep students engaged, lectures should be designed in such a way that after a certain period, perhaps 15-20 minutes, a discussion occurs. This also promotes active learning.
- Every lecture should include appropriate measures of learning.

Estimated design time for each hour of synchronous delivery: 3-5 hours.
Estimated design time for one hour of e-lecture: 4-6 hours.

A Typical Class Meeting

Students are expected to log-in to review the prior week's presentation and to log-in to the Centra system before the start of each class. Prior to each class, session material, in PowerPoint format, is uploaded to a scheduled event on the Centra delivery system by the instructor. This includes the daily agenda, required weekly readings, assigned homework problems, deadlines, and the session lecture material. Once the instructor starts the Centra session, students will be able to view each slide as it is being presented by the instructor on their own computer screens. The lecture material consists of several segments of 15-20 minutes of instruction followed by an in-class activity. Classroom instruction consists of presenting material using imported PowerPoint slides in Centra, switching to the Windows Journal for derivations and explanations of the topics via the Centra AppShare feature. The Centra system also provides to the instructor the capability of sharing students' work with the entire class and the ability to interactively modify and correct their work. This feature was not used in our graduate course deliveries. All activities are recorded by Centra and available for student downloading and viewing.

The instructor can view a list of all attendees on the Centra screen at all times during the event. Attendance time is logged and stored for later viewing via the Centra reporting mechanism.

Delivery Experiences

Spring 2006

A graduate course, special topics in control systems focusing on chaos, was delivered to a group of six students residing overseas at Ferdowsi University. The course structure format was designed to reflect the level and maturity of the students. Classes met online twice a week. Hybrid e-learning methodology was used in the design and delivery of this course. TabletPC was not used during this delivery.

Fall 2008

A graduate course, Stochastic Control Systems, was delivered to a group of ten students residing overseas at Ferdowsi University. The course structure format was designed to reflect the level and maturity of the students. Classes met online once a week, see figure 1. Hybrid e-learning methodology was used in the design and delivery of this course. Based on our previous experience and course topics, TabletPC was used during this delivery.

Remarks

The following summarize our observations and recommendations:

- The process requires several test runs in order for faculty to get comfortable with the synchronous delivery system.
- Our experience indicates that it will take students 2-3 weeks to get comfortable using the synchronous delivery system and connecting from outside the campus.
- Student reactions, based on an online survey, have been positive and encouraging.
- The ability to download lectures and watch them again was referred to as the most positive aspect of the new delivery system.
- The ability to record lectures and watch them afterwards did not affect the in-class discussions. It should be mentioned that since in our setup the instructor could only see one student at a time, to make sure everyone is paying attention to the subject, students were randomly asked questions about the presented topics. It is also possible to setup a separate camera that could cover the entire or most of the classroom.
- The pre-assessment quiz plays an important role in reducing the delivery time.
- Hybrid e-learning delivery is ideal for graduate level courses.
- Course evaluation was done similar to a traditional face-to-face course.
- Based on students' feedback and our observations, we feel that the use of virtual delivery systems such as Centra provides an effective distance delivery system.
- We would use Windows OneNote, for its organizing ability, rather than Windows Journal for future deliveries.

- The time requirement per week is the same for a hybrid class and a traditional class, as far as students are concerned and for the instructor it would be 3-5 hours more than a traditional course preparation.

The time difference between the instructor and the students would place some restraint in scheduling. In our case we had 8.5 hours of time difference, which meant that the instructor was delivering the course early in the morning and students were taking it early in the evening.

Conclusion

We believe hybrid delivery, with a synchronous online component, can play a significant role in the enhancement of distance education. It can minimize the negatives sometimes associated with more traditional, primarily asynchronous distance learning and help to change passive delivery to a more active and flexible delivery methodology. It is also a very effective means for delivering quality distance-workshops and collaborative research-projects where participants are not from the same geographical area.

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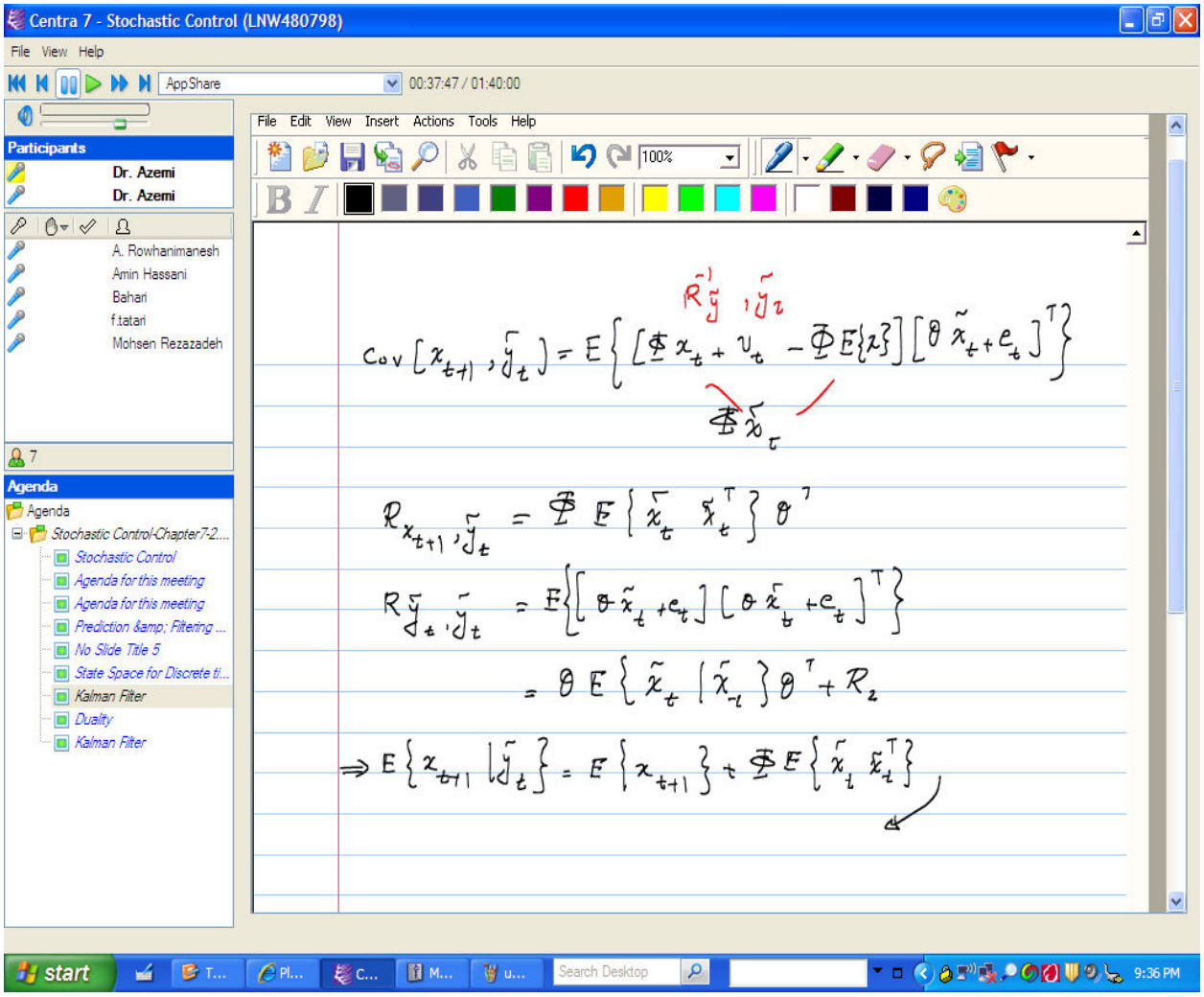

Figure 1. Sample page from Centra playback recording