Application of Technology in Project-Based Distance Learning

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ABSTRACT

Present technology and the accessibility of internet have made distance learning easier, more efficient, and more convenient for students. This technology allows instructors and students to communicate asynchronously, at times and locations of their own choosing, by exchanging printed or electronic information. The use of project-based approach is being recognized in the literature as a potential component of courses in the faculties of engineering, science, and technology. Instructors may have to restructure their course differently to accommodate and facilitate the effectiveness of distance learning.

A project-based engineering course, traditionally taught in a classroom settings using live mode at the College of Engineering and Computer Sciences at the University of Central Florida (UCF) has been transformed to a distance course taught using distance modes. In this case, pedagogical transitions and adjustments are required, in particular for obtaining an optimal balance between the course material and the project work. Project collaboration in groups requires communication, which is possible with extensive utilization of new information and communication technology, such as virtual meetings. This paper discusses the course transition from live to distance modes and touches on some issues as they relate to the effectiveness of this methodology and the lessons learned from its application within different context. More specifically, this discussion includes the benefit of implementing project-based work in the domain of the distance learning courses.

Keywords: Distance Learning, Technology, Project-Based Learning, Asynchronously, Senior Design Project.

1. INTRODUCTION

Prior to the availability of computer technology used routinely today, distance learning was refered to as an individualized mode of learning only available

through correspondence. Today, distance learning is commonly refered to as a field of education that studies pedagogical technologies and the design of advanced instructional systems used to deliver education remotely to students who are not physically present in the classrooms. Present technology and the accessibility of internet have made distance learning much more viable, and it evolved from traditional ways to robust, more efficient, and more convenient for students and instructors. Current technologies allow instructors and students to communicate asynchronously, at times and locations of their own choosing, by exchanging printed and or electronic information. New technology, such as WebCT, provides a more efficient and robust management system for remote classrooms. With this new trend in distance learning, the use of project-based approach is being recognized in the literature as a potential component for distance courses in the faculties of engineering, science, and technology. Faculties may have to develop new methodologies, and structure or restructure their course differently to accommodate and facilitate the effectiveness of distance learning. Some very recent studies documented the practicality and effectiveness of distance learning methodologies. (Mehrabian et al., 2007). Results from an early study of the desirability and feasibility of using project-based learning indicated that this teaching methodology has a useful role in distance learning (Macmillan, 1975). The case for employing project-based learning methods as opposed to more traditional teaching methods, where the learning path follows a carefully predetermined structure, has been argued elsewhere (Farnes, 1975).

In this paper, we briefly present our very recent experiences with the application of technology in project-based distance learning. This paper discusses the effectiveness of this methodology and the lessons learned from its application within different context. More specifically, this discussion includes the benefit of implementing project-based work in the domain of the distance learning courses. This paper includes lessons learned from the application of educational tools such as WebCT as a viable and efficient asynchronous remote classroom and document management system. We hope to gain invaluable insight by presenting our case and the lessons we have learned to the interested audience. We are very well receptive of exchanging ideas with the audience for new and improved methodologies and to increase the effectiveness of the methods presented here.

2. COURSE OVERVIEW

With a current estimate of enrollment of 100 students per annum, Senior Design Project is a required design course for all engineering technology majors taken during the last semester of their senior year at the University of Central Florida (UCF) in Orlando, USA. In this course students apply what they have learned throughout their college education in the form of a project. Thus, it is a "hands-on" course and required the students to design, build, and test an end product, commonly, a device. Students are also required to calculate the total cost of their projects, including the labor costs at a rate of $25 per hour. An estimate of the overall project cost including the total labor should be included in you final report. In most case, students work in teams of two to four members, and time is managed by team members approved by a faculty mentor with expertise in that

particular area. It is the students' responsibility to schedule time each week for research, design, and fabrication of their project, a challenge to some students with poor time management skills. This course was traditionally taught in a live classroom settings using live modes. In 2006-07 academic year, this course has been transformed into a distance course taught using distance modes. In this transformation process pedagogical transitions and adjustments were required, in particular for communication facilitations and obtaining an optimal balance between the course material and the project work. Among many essential requirements, project collaboration in groups requires effective communication, which is encouraged and made possible with extensive utilization of new information and communication technologies, such as virtual meetings.

3. TECHNOLOGY AND TRANSITION

We utilize technologies such as WebCT, main types of freely available virtual meetings software (Yahoo Messenger and Windows Live Messenger), web-based cameras, microphones and other devices to make the transition from a live project-based class into a distance class. We also use Camtesia Studios and Tegrity as screen recorder for recording and editing high-quality lectures, and communication videos, presentations (including Microsoft PowerPoint) and screencasts to share online, as Flash, on CD-ROM, and on portable media devices, including iPod. During the transition process, we revised the syllabus and address many issues some of which are discussed here.

A) Electronics' Document Preparation and Posting: The Senior Design Project course must conform to

the general guidelines outlined in a master document. There are also other required but informational documents called welcome document, class syllabus, and research methods handouts, etc. At the early stages of the transition, these documents are prepared in electronic format and posted on the class WebCT website. Students can access the class website and download these documents from anywhere at any time, asynchronously. Within three to four weeks, a written project proposal must be submitted by each group a posted deadline listed on the course website. This written proposal must be approved in advance by the group's faculty mentor. Approval will consist of an initialized electronics copy of the project's proposal and request for approval which should be attached to the electronic copy of the proposal. Through a time-saving and robust process, proposals and other documents are submitted by the students via course website. The instructor can easily and quickly access and download these documents for reviewing and grading purposes.

B) Conformation to Propose Standards and Specifications: An engineering project, device, etc. usually involves a set of specifications. Before starting the design process, and surely before any equipment is built and tested, a firm specification must be agreed upon by the customer and the engineer. Therefore, students start their projects by preparing a set of specifications that include the absolute minimum and maximum values of all crucial "design goals," "design objectives," and "design parameters." Students will not be graded on how well the final product meets the prepared specifications. They are graded to the depth to which the original specifications go and the extent to which it truly specifies the anticipated product as part of the

design project. In other words, the final result of the project will be evaluated based on the project's proposal. Students must complete all of the goals and objectives that they outlined in their proposal. To align the project's outcome with the project's previously defined goals, objectives, and design parameters, WebCT is employed. This was achieved by using a novel approach in which under WebCT menu, an advanced electronic goal and objective-setting function was created. Each group input the project specifications accordingly and refer to them throughout the project. Accordingly, the function of the project's built end product was measured for consistency with the design parameters for project evaluation purposes.

C) Scheduling and Presentations: It is required that the final results and the final built device, including project demonstration, of the senior design project is presented in three formats: (a) presented orally by the students, (b) submitted as a written report prepared in accordance with the instructor's guidelines, and (c) presented in an electronic format saved on a CD-ROM. An electronic copy of the final report is submitted through the class WebCT site. Oral presentations will be "open to the public" and is scheduled during the last week of the semester. The Instructor can manage robustly many time management issues involved in scheduling and presentations. In this case they are managed by employing WebCT's communication tools such as discussion boards and electronics communication.

D) Collaboration Among Group Members: Collaboration among group members is a key issue in project-based distance learning in which students work in teams. In this process, communication among group members is facilitated through electronic communication via different modes. The students report that technology improved their collaboration ease and abilities, and it empowers them with more efficient, asynchronous collaboration skills. This is particularly applicable and very advantageous in our case. Due to geographic location of our institution and the scattered student population and urbanization in our state, the State of Florida, some group members live as far as 200 miles apart in some cases.

4. BENEFITS

Our experience in this case shows that while application of technology in project-based distance learning within the context of the senior design project might present some pedagogical challenges, it has the following substantial benefits. Due to the lack of space, we only present a few, but main benefits:

1. Time Saving: In an independent senior design project's distance learning environment, time is of an essence. Using WebCT as a class management tool saves time.

2. Student/faculty Interaction Rapidity: Unlike a live classroom settings in which faculty/student interaction is limited to live class time and perhaps office hours, utilization of technologies such as electronic mailing (E-Mailing), message boards utilization in WebCT, and instant messaging help with the rapidity of the student/faculty interaction. This is particularly applicable in project-based distance learning in which the students, many of them working adults, work in groups and require more rapid response due to a tight schedule between work and school.

3. Ease of Document Delivery: Unlike a live class in which the instructor shall make hard copies of the documents to be hand-delivered, electronics documents and file delivery and postings are much easier and faster. In our case, we utilized WebCT extensively to upload and post document files electronically and asynchronously.

4. Reduction in classroom occupation time: Due to the fast growth of our institution, any reduction in classroom occupation time is highly desirable and is beneficial to our department and college. The savings in classroom occupation time is directly translated to cost saving benefits.

5. *Cost Saving:* Considering the cost of learning and instructional time, document duplicating and delivery costs, and other costs such as classroom occupation time and costs, there are many cost saving benefits. In our case in which the educational physical space is limited, this process is highly desirable and cost-reductive.

5. CONCLUSIONS

In this paper, we discuss the application of technology in project-based distance learning within the context of an efficient and robust mode as it was applied to a senior design project course at the College of Engineering and Computer Science at the University of Central Florida in Orlando, USA. Current technology and the accessibility of internet have made distance learning easier, more efficient, and more convenient for students and for the faculty. This technology allows them to communicate asynchronously, at times and locations of their own choosing, by exchanging electronic and or printed information. Faculties of engineering and science may have to revamp and restructure their project-based courses differently to accommodate and facilitate utilization of effective modes of distance learning. In this case, pedagogical transitions and adjustments are required, in particular for obtaining an optimal balance between the course material and the project work. Project collaboration in groups requires communication, which is possible with extensive utilization of new information and communication technology, such as virtual meetings. This paper discusses the course transition from live to distance modes and touches on some issues as they relate to the effectiveness of this methodology and the lessons learned from its application within different context. More specifically, this discussion includes the benefits of implementing project-based work in the domain of the distance learning courses. They include but not limited to time-saving and cost-saving benefits.

6. REFERENCES

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