AC 2009-2363: DEVELOPING AND DELIVERING AN ONLINE COURSE IN CONSTRUCTION ESTIMATING

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Developing and Delivering an Online Course in Construction Estimating

Abstract

Because of an increase in demand from students for online courses in construction management and engineering, North Dakota State University has recently launched a fully online Master of Science (M.S.) degree in Construction Management. While an online program can expand opportunities for faculty to use new course delivery methods, the benefits are primarily for the students. It allows nontraditional students to take classes at their convenience while retaining their full-time jobs and maintaining their commitments to family and community. This paper reports the process and results of the development and delivery of an online construction estimating course. The major components of this paper include the hardware and software used to develop and deliver an online estimating course as well as the lessons learned. Some snapshots of the course delivery are included in the paper. The student rating responses for this course are discussed, in general, as well. It is expected that this paper can provide some useful information for construction education programs which are migrating toward the distance education environment.

Introduction

In the past several years, the enrollment in the construction management program has significantly increased at North Dakota State University (NDSU). The class size and faculty teaching loads have exceeded acceptable limits. The growth of facilities and resources has lagged behind the growth of student numbers. On the other hand, more and more students, who have full/part time jobs, are expecting a more flexible class schedule that can complement their schedules. Having noticed the above situation and student demands, a group of faculty members have been trying to shift from an instructor-centered to a student-centered teaching philosophy. One of the most important tools for implementing this philosophy is use of innovative technology. Gradually, although controversy does exists (some senior faculty members choose to stay with their traditional in-class lecture delivery), web-based online teaching becomes an integrated part of the program. Research showed that the online teaching is one of most interesting teaching methods that is growing rapidly.^{1, 2, 3}

Based on the previously noted issues, NDSU has recently launched a fully online M. S. degree in Construction Management. Meanwhile, some undergraduate courses were selected, as well, for online lecture delivery in order to best utilize the online teaching resources in conjunction with the Master program. An online program allows nontraditional students to take classes at their convenience while retaining their full-time jobs and maintaining their commitments to family and community. Among a set of courses required by curriculum, construction estimating was one of the most challenging courses for online delivery due to its complexity, hands-on approach of learning, and group work requirements. This paper reports the process, results, and lessons learned from developing and delivering an online construction estimating course during summer and fall semesters in 2008.

Startup

During the 2008 spring semester, the Department of Construction Management and Engineering received approval for an online M.S. program in Construction Management. As part of the overall plan several undergraduate online courses were also selected for development. The targeted timeline is outlined below:

- Obtain necessary training May and June, 2008
- Develop course packages June, July, and August, 2008
- Initial course delivery fall 2008 and spring 2009 pending on the schedule
- Adjust and tune the teaching packages June 2009

The construction estimating course was determined to be part of these packages; however, the instructor was not sure if this course was a suitable for online education. Therefore, the instructor decided to offer an online version of this course during the fall semester 2008. In early May 2008, instructors took part in a meeting hosted by the Distance and Continuous Education (DCE) office to discuss the general methods of developing and offering online courses. The meeting demonstrated some teaching packages developed by other departments and schools. In June, the instructor attended a technology "Dive-In" workshop that focused on the multimedia tools as well other resources for online course development including gathering statistical data, quiz bank, and narrated mini-lectures with PowerPoint. The teaching collaboration tool, Wimba was fully introduced and practiced.

After obtaining the necessary training, summer was used to develop teaching packages that were and will be delivered predominantly during fall semester 2008. Students enrolled in the course were asked to participate in a course evaluation. The data served as one of the tools to evaluate the feasibility of this online course.

Tools Involved

The main tool for the development and delivery of this estimating course is Blackboard, a webbased course management system. Blackboard has been used for years at NDSU. It has an ability of integration with current registration system and is relative easy to use. It is integrated with Wimba, which is very useful collaborative learning software that provides "facial expressions, vocal intonations, hand gesticulation, real-time discussion, creativity and passion can be conveyed in the online learning environment."⁴ It includes the following components:

- Wimba classroom.
- Voice Board that enables asynchronous group discussions using voice.
- Wimba Podcaster that enables to create an RSS-enable podcast.
- Voice Email that enables you to send emails using voice.

The following software was also used to enhance course delivery:

- Respondus 3.5, "a powerful tool for creating and managing exams that can be printed to paper or published directly to Blackboard, WebCT, eCollege, ANGEL and other eLearning systems."⁵
- TechSmith Camtasia and SnagIt Bundle, a tool to record on screen activity.⁶
- Headset Computer Microphone and Webcam.

Course Development

Following the sequence of the Construction Management curriculum and the relationship with other courses, the online construction estimating course was designed to introduce students to basic (undergraduate) and advanced (graduate) methods and techniques of conceptual and detailed construction estimating, including: quantity takeoffs; costs related to labor, materials, equipment, overhead & profit; bidding strategies; and computer applications. The above topical contents are further developed into the course objectives (see later section for details).These course objectives were measured by using a rating scale to indicate how well they believed that they met a particular objective. The primary assessment tools used in this course were exams, assignments, and group projects.

In order to provide students both the estimating theory and practice in a way that students can learn conveniently online, the instructor required a new CSI MasterFormat based textbook and assocuiated Means database for students. The project used in class was a actual commercial project but with some assumptions to address drawing deficiency and to simplify the students' work. The instructor use a detailed self-explanatory notes for the lecture and therefore made the lecture best fit the online student's background and experience. The instructor also provided many hands-on examples that students could review at their leisure.

The course delivery portal, Blackboard, allows students to experience ease of use and the power of the technology, while providing quality course content. The course site is designed with a consideration of navigation and guidelines to make it attractive and easy for students to use. Figure 1 shows the course homepage in Blackboard. The navigation includes Announcement, Course Information, Course Documents, Assignments, and Communications.

The Course Information section provides students with the course syllabus and textbook information, as shown in Figure 2. This is extremely useful to the students since this information is posted several weeks before the semester starts. The syllabus includes the tentative schedule of topics and key academic dates that serve as a pace tool for student self-study.

One of the most important parts of the Blackboard, the Course Documents section provides the lecture materials progressively. Figures 3 through 5 illustrate the folders of documents, the lecture page, and a sample of lecture. Four factors are considered: (1) the lecture materials and project materials are separated by folders; (2) the materials have been organized into meaningful units; (3) related chapter readings, time frame, and assignments are given for each certain topic; and (4) color and picture has been added to lectures.⁷



Figure 1. Course Homepage in Blackboard

Figure 2. Course Information Page in Blackboard

Figure 3. Main Folders of the Course Documents

Figure 4. Sample of the Course Lectures Pages

The Assignment Section gives detailed instructions related to the assignments including the due date, formats, and submission instructions. The assignments are designed to follow the lecture and examples closely and attempt to simulate real-world estimating practices, as illustrated in the Figure 6.

Figure 6. Sample of an Assignment Page

Course Delivery

The course delivery method is very important for online students. Before the first week of semester, an introductory letter was posted and e-mailed to the enrolled students. The letter

explains the difference between an online and an in-class course. During the semester, everything went relatively smoothly. However, PowerPoint presentations posted online are usually not digested by students automatically. Discussion, e-mail, and even phone calls had to be used during the semester. Figure 7 shows a group course tools available for the course, including Wimba which provides a real-time or video tools for communication between students and instructors. During the semester, extensive communication was conducted between the students and the instructor. Due to the preparation time and communications with students, the time spent on the online course was more than required for the in-class course.

Figure 7. Communication Tools

Course Assessment

The student rating survey indicated that the students were able to fully accomplish the objectives, as listed below:

- Perform various types of construction estimates and understand their accuracy relative to the stages of the project;
- Develop a quantity takeoff, and determine appropriate labor, equipment and material costs for items identified in the quantity takeoff using standard estimating guides and database;
- Compare and accept subcontractor bids;
- Produce complete and accurate cost estimates and submit a complete bid package for a typical construction project;
- Prepare an estimate using computer software.

The course evaluation was conducted anonymously and the instructor was provided summary information results after final grades were posted. For this course the student response rate was approximately 80%. Based on the student response, 78% felt they could access the course with minimal difficulty; 45% felt student-to-student interaction is important for an online course; 56% were happy with the level of instructor and student interaction in the course. Overall, 66% of students were satisfied with the instruction in this course and the instructor as a teacher. 67% thought the quality of this course was above the average. About 78% said their understanding of this course was above the average. In addition, 67% were satisfied with Blackboard as a course management system. Also, 56% of said the respondents indicated that they would like to take another online course from NDSU.

Conclusions

This paper reports the development and delivery results of an online construction estimating course, including its suitability for online learning, the software requirements, course content, and student assessment. The basic lesson learned was that traditional teaching philosophies must be modified in order to adapt to the online environment and therein, lies the challenge. Simply converting existing class-based teaching materials to an online format does not address the needs or demands of online students. Based on student response, there is a need to student interaction in an online course that can be conducted simply and in a variety of formats (email, texting, chat rooms, etc.). Simplicity in the overall design of the course cannot be overstated. Organization of course information is a key factor in allowing the students to access the information with relative ease.

Developing a quality online course is a time-consuming process for the course instructor. However, online course delivery is often an underestimated factor. The average of the time required for the actual delivery of this course one and one-half (1.5) to two (2) times as much as traditional in-class courses. Another of the lessons learned during the course delivery was that using even a slightly outdated version of the estimating software packages can cause problems. Online students demand that the software (and all course materials) be relevant and completely up-to-date.

Although the majority of students seemed satisfied with what they learned, several students expressed concerns related to student-to-teacher interaction, as well as student-to-student interaction. There was a perception that the students are learning, but that the instructor is not teaching. Even with the use of interactive tools (i.e., Wimba) some of the students felt as though they were doing all the work and the instructor was "just there" in case questions should arise. It must be noted that this perception was voiced by a minority of the students, but further data collection and analysis is required in order to investigate and address this perception.

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