

2006-2520: INVESTIGATION OF DEVELOPING AND DELIVERING ON-LINE COURSES IN CONSTRUCTION MANAGEMENT

Zhili Gao, North Dakota State University

Dr. Gao is an Assistant Professor of Construction in the Department of Engineering Technology at Missouri Western State University. He can be reached at the Department of Engineering Technology, Wilson Hall, 4525 Downs Dr., St. Joseph, Missouri 64507, 816-271-4561, zgao@missouriwestern.edu.

Virendra Varma, Missouri Western State University

Dr. Varma, P.E., F. ASCE, is a Professor of Construction, and the Chairman of the Department of Engineering Technology at Missouri Western State University. He has presented and published extensively in engineering journals and conferences. He is a Past President of ACI-Missouri, and a Past President of NW Missouri Chapter, MSPE of NSPE. He can be reached at the Department of Engineering Technology, Wilson Hall, 4525 Downs Dr., St. Joseph, Missouri 64507, 816-271-4562, varma@missouriwestern.edu.

Christiana Houck, University of Nevada-Las Vegas

Ms. Houck is an Instructional Designer in the Distance Education Office at University of Nevada, Las Vegas. She was the Integrated Media Technologist of Instructional Media Center at Missouri Western State University. She can be reached at Office of Distance Education, 702-895-5534, Christiana.Houck@unlv.edu.

Investigation of Developing and Delivering On-Line Courses in Construction Management

Abstract

While the Internet classes can open up an opportunity for faculty to use a new medium for delivery of education, the benefits are primarily for the students. It allows non-traditional students to take classes at their convenience. It not only allows them to retain their full-time jobs but also gives them the flexibility to maintain their commitments to family and community. In a time when many of the students are not able to attend classes physically, they have the opportunity to take the on-line courses from anywhere in the world. In the area of construction management the faculty should re-evaluate how they teach and present class materials and how they incorporate on-line teaching methodologies in their coursework to enhance student learning. This paper reports the results of an investigation of offering an on-line construction management course. The major components of this paper include courses that are suitable to be offered on-line, the computer hardware and software programs required to develop an on-line course, the method of delivery, course content, and communications between the instructor and students. A sample of the on-line construction management course homepage is also included in the paper.

Introduction

In the recent years, three interesting things have been observed in the area of construction education: first, more college students have full/part time jobs; second, more technology innovations have been introduced in the classroom to improve teaching and learning; and third, the pedagogy in college level education has gradually shifted from teacher-centered to student-centered. While some faculty members choose to stay with their old ways and refuse to make changes in their teaching pedagogy, many faculty members have been including these new trends in their teaching. Web-based on-line teaching is one of the most valuable teaching methods that is growing rapidly.^{1, 2, 3}

Starting in Fall 2002, , a faculty member in the area of construction engineering technology at Missouri Western State university (Missouri Western) adopted web-enhanced teaching methodology in teaching of the course on construction management, and concluded: "It is important to realize that the old forms of teaching and learning must give way to newer forms of teaching and learning. In that regard, integration of technology in classroom setting can not be avoided. The electronic plan rooms, the electronic databases, and the electronic help desks require that our students be job ready, and be ready to hit the ground running on graduation. To reduce the time of on-the-job training by employers, it is important that schools of construction, and especially the construction faculty incorporate web-enhanced teaching methodologies in their coursework to enhance student learning in a way that students are extremely comfortable in utilizing computer technology in their day-to-day work."⁴

While the Internet classes can open up an opportunity for faculty to use a new medium for delivery of education, the benefits are primarily for the students. It allows non-traditional students to take classes at their convenience. It not only allows them to retain their full-time jobs

but also gives them the flexibility to maintain their commitments to family and community. In a time when many of students are not able to attend classes physically, they have the opportunity to take on-line courses from anywhere in the world. Because of an increase in the demand from students for on-line courses in the construction discipline, the Department of Engineering Technology at Missouri Western has launched its first fully on-line Internet course of Construction Management, effective Fall 2005, with help from the Western Institute and the Instructional Media Center.

This paper reports the results of developing and delivering an on-line construction management course in Fall 2005, including the courses that are suitable to be offered on-line, and the computer hardware and software programs required to develop an on-line course, the method of delivery, course content, grading policy, and communications between the instructor and students.

Background of Motivation

In 2004, under the guidance of instructional designers and technologists from the Instructional Media Center at Missouri Western, a group of nine faculty members from various departments began intensely to plan and develop full on-line courses to meet the educational and career needs of students as per goals cited in Western's Strategic Plan.⁵

In May 2005, the Western Institute, the distance education arm of Missouri Western, sponsored a two week Internet Pedagogy Workshop for nine members of the Western faculty. The faculty members were introduced to resources for on-line course development including gathering statistical data from on-line assessments, narrated mini-lectures with PowerPoint, and other multimedia tools. These faculty members then began developing their courses that were delivered predominantly during Fall 2005 and Spring 2006. Students enrolled in the on-line courses were asked to participate in a survey rating the multimedia use. Course evaluations have been reviewed for comments on the enhanced course content. Faculty members were asked to reflect on their on-line learning/teaching experiences. This data collection served as one of the tools to evaluate the feasibility of on-line learning/teaching at Missouri Western. Throughout the process, data were gathered to determine what tools and techniques best support student learning at Missouri Western.

Construction Management course and its instructor were part of this process. The suitability of the construction management course for on-line education is summarized below:

- It is a junior level class; therefore, students have already developed the basic understanding of construction methods, materials, and estimating.
- Compared with other courses in the construction curriculum, it is less computational.
- The department has previously used web-based pedagogy for this course.

Tools Involved

Many tools are available for developing an on-line course. The main tool is the WebCT that is available to all faculty at Missouri Western. It has also been the tool for faculty training and has been evaluated to meet the following criteria:

- Ability of integration with current registration system and ease of use.

- Possibility of integration with third-party helper software.
- Acceptable cost.

In order to develop and deliver the course material efficiently, various development software and hardware have also been used to enhance the WebCT:

- Respondus Assessment Software that assists in creation and statistical reporting of tests.
- Tech Smith Camtasia and SnagIt Bundle that record screen activity and produce narrated PowerPoint.
- Wacom Graphire3 that enables writing on PowerPoint slides and marking diagrams.
- Headset Computer Microphone that records audio.

Course Development

The on-line course of Construction Management was designed to introduce students to the basic concepts and issues related to contractor's organization, construction contracts, and management of field construction. The required text book was *Construction Contracting* by R.H. Clough et al with a recommended text *Construction Jobsite Management* by Mincks & Johnson. This combination of two books provided the best reading assignments for effective teaching of construction management using on-line methodology. PowerPoint slides were developed for all the chapters taught for this course.

When putting lecture materials on-line, it is extremely important to have a user-friendly website.¹ The WebCT course is designed with great effort for consideration of configuration, navigation, colors, animation, and guidelines. Besides providing the course-related knowledge, the WebCT course allowed students to experience the ease of use and the power of the technology. Figure 1 shows the homepage of course WebCT. The navigation includes Start Here, Syllabus, Course Content, Assignments, Communications, Quizzes and Exams as well as student grade tool.

Start Here section provides students with the animations on how to view lecture notes and how to use discussion board as shown in Figure 2. This is extremely useful in the first two weeks. Syllabus section, shown in Figure 3, provides students two formats (Word and HTML) of course syllabus, tentative schedule of topics, and key academic dates. Tentative schedule of topics serves as a pace tool for students self-study but students can make their own schedule. The key deadline reminder is also dynamically posted on main page. A WebCT automatic reminder for each event also displays on the WebCT outside of course page. Therefore, once students periodically check the WebCT, no event will be left out. This is very important for implementing grading policy.

As the core of the course WebCT, Course Content section provides the PowerPoint slides of lectures progressively. Figures 3 through 5 illustrate the index of contents, the contents of project management, and a sample of lecture notes, respectively. As shown in the figures, four areas have been emphasized: (1) the materials have been categorized into meaningful units so that students will always have a big picture in their mind and follow the natural theme of knowledge; (2) related chapter readings are given for each certain topic; (3) materials have been posted in an on-line format as well as a PDF format for printing; and (4) a great visualization has been added

from index to lectures. Comments from students showed that the student enjoyed the semester with these lecture notes.

Unlike traditional face-to-face class, the excellent lecture notes and PowerPoint presentations posted on-line themselves can not be automatically fully digested by students. The discussion board will make up for this disadvantage of on-line lecture. Discussion topics are posted by the instructor with instructions of discussion as well the timeline of posting messages. Figure 6 shows a sample page of student discussion. It has been found that students provided excellent inputs on even a simple topic of discussion. These inputs were based on their real experience, their observation, and real construction projects. Usage of discussion board by students to engage in discussion far exceeded the expectation of course instructor. Most important was that students understood the difference between the textbook knowledge and real-world construction process.

Course Delivery

The first few steps to get the students started in an on-line course were critical. Besides the tutorial materials on course WebCT (Figure 2), an introductory letter was e-mailed to each student enrolled in the course one week prior to the beginning of the course. The letter stated the reasons and benefits of offering an on-line course, explained the difference between an on-line and a face-to-face course, and required that students must attend the first class in person. In the first class, the instructor showed the students the basic functions of course WebCT. At the end of first week, all students were required to attend an on-line learning training offered by the Instructional Media Center. The training provided the information on being self-motivated to work independently, on being comfortable using a computer and WebCT, on having working knowledge of communication inside of WebCT, and on having a reliable Internet service to meet system requirements. Student also had an opportunity to practice taking a quiz on-line.

Although it was pointed out that requiring attendance for a training session could pose a problem for enrolled students who live at a distance from the university, and defeats the purpose of setting up an on-line learning course,¹ the training provided for on-line Construction Management was appreciated by students and proved beneficial.

Following these steps, everything went smoothly. However, during the semester, the instructor was engaged in tons of e-mails to communicate with students. Actually, the time spent on the on-line course was more than required for a face-to-face class. By the end of semester, the students were able to accomplish the same objectives as in a face-to-face class:

- Understand the structure of the construction industry and the relationships that exist between key participants;
- Define and understand common/key terminologies related to the construction management area;
- List and describe types of construction contracts;
- Explain important elements of project management, project productivity, and project funding and costs;
- Understand the basic principles of labor laws and labor relations and apply them to a construction company and its projects;
- Explain basic legal aspects of construction projects, including bids, bonds, insurance requirements, and responsibilities of contract parties;

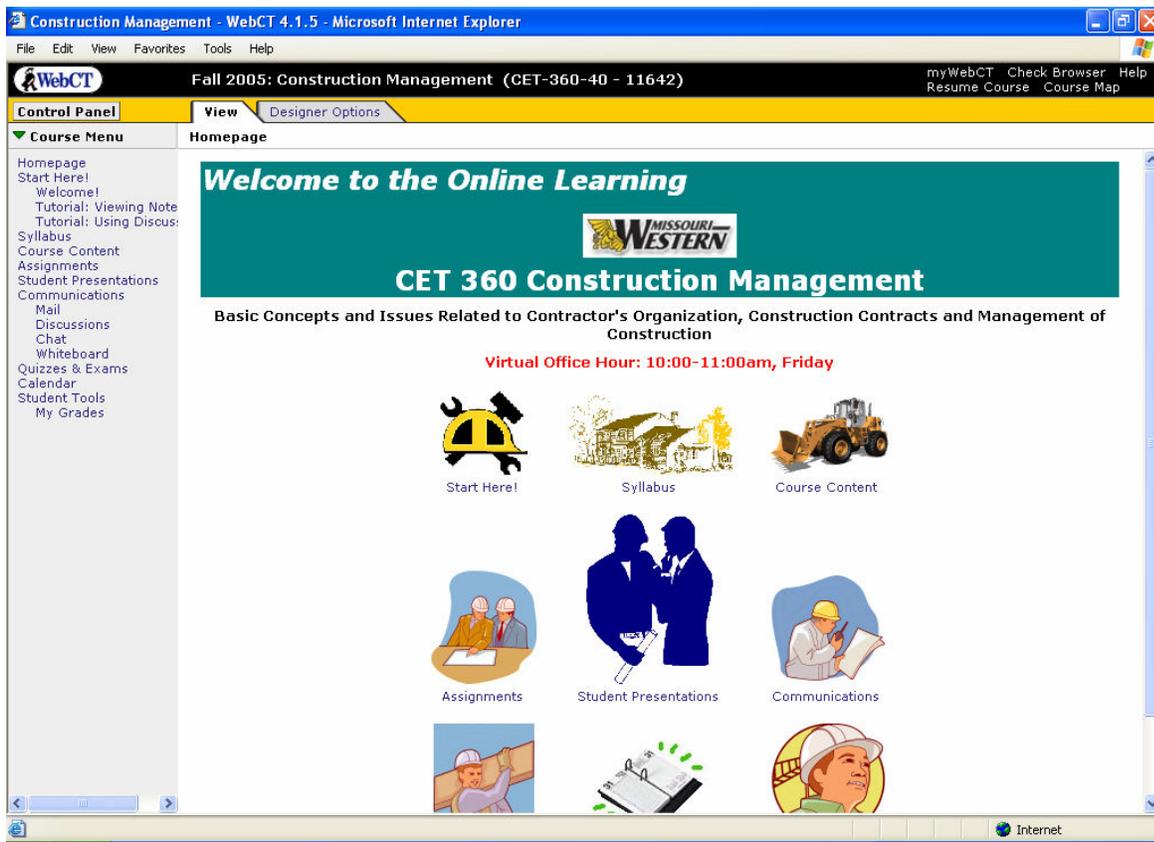


Figure 1. Main Homepage of Construction Management WebCT

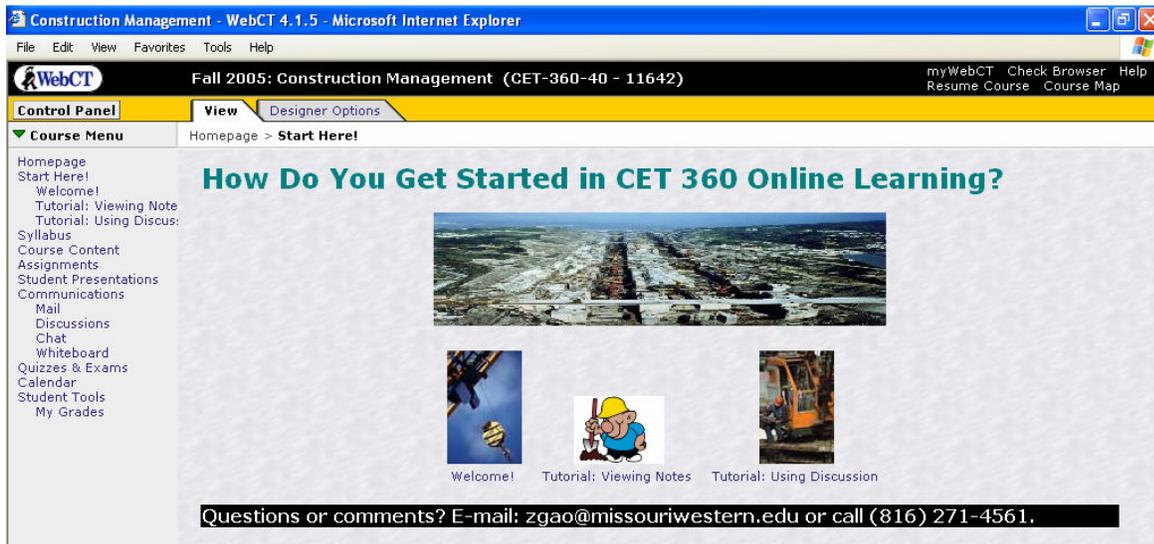


Figure 2. Start Here Page of Construction Management WebCT

WebCT Fall 2005: Construction Management (CET-360-40 - 11642) myWebCT Check Browser Help
Resume Course Course Map

Control Panel View Designer Options

Homepage > Syllabus

Syllabus - What You Want to Know Upfront

For your convenience, several files are provided here. The three HTML files - separate policy, keydates, and course schedule - are good for a fast review and a slow computer. The one complete syllabus in Microsoft Word format is good for a better printout and a faster computer.



Syllabus HTML



Key Dates



Syllabus WordFile



Schedule

If you disagree with any policy or outline specified in the syllabus, please let the instructor know. Modification may be made by instructor. zgao@missouriwestern.edu

Figure 3. Syllabus and Schedule Page of Construction Management WebCT

WebCT Fall 2005: Construction Management (CET-360-40 - 11642) myWebCT Check Browser Help
Resume Course Course Map

Control Panel View Designer Options

Homepage > Course Content

Lecture Units

Each unit contains several lectures. Content will be released the day before the lecture or unit begins.
Example: Tuesday's content will be released on Monday at 5pm.

Make sure you finish the assignments of the previous lecture or unit and read the textbook before continuing on to the next lecture or unit.



Contractor's Organization



Drawings & Specifications



Estimating & Bidding



Term Paper



Construction Contract



Project Management



Labor Law & Relations



Project Safety



Construction Accounting

Each lecture contains two files - one is online presentation; the other is printable and downloadable PDF file.

Figure 4. Lecture Content Index Page of Construction Management WebCT

Table of Contents

Project Management

- ▼ **1. Chapter 10 Project Management**
 - 1.1. Lecture 14 Project Players
 - 1.2. Lecture 14 - Printable PDF file
- ▼ **2. Chapter 10 Project Management**
 - 2.1. Lecture 15 Project Managemnt
 - 2.2. Lecture 15 - Printable PDF file
- ▼ **3. Jobsite Layout & Control - No textbook reading**
 - 3.1. Lecture 16 Jobsite Layout & Control
 - 3.2. Lecture 16 - Printable PDF file
- ▼ **4. Records & Reports**
 - 4.1. Lecture 17 Records & Reports
 - 4.2. Lecture 17 - Printable PDF file
 - 4.3. RFI example for last question of Assignment 10
- ▼ **5. Subcontracting**
 - 5.1. Lecture 18 Subcontracting
 - 5.2. Lecture 18 - Printable PDF file
- ▼ **6. Meeting**
 - 6.1. Lecture 19 Construction Meeting
 - 6.2. Lecture 18 - Printable PDF file
- ▼ **7. Chapter 10 Project Management (!!!Lecture20 is repeating the lecture 09 slides 23-32)**
 - 7.1. Lecture 20 Construction Claims
 - 7.2. Lecture20 -Printable PDF file
- ▼ **8. Computerized Project Management - Primavera Expedition**
 - 8.1. EXPlogon.pdf)

The screenshot shows a web browser window displaying a slide from a presentation. The slide title is "CONSTRUCTION MANAGEMENT" in large, bold, black letters, with "Project Management" in a smaller, teal font below it. A teal box on the left side of the slide contains the text "LECTURE 14". Below the title, there is a photograph of a construction site featuring a large concrete pump truck with a long, articulated boom. The Missouri Western logo is visible in the bottom left corner of the slide. On the left side of the browser window, a vertical table of contents is visible, listing 17 items, with "LECTURE 14" highlighted at the top. The browser's status bar at the bottom indicates "Slide 1 of 18".

Figure 5. Sample Lecture Page of Construction Management WebCT

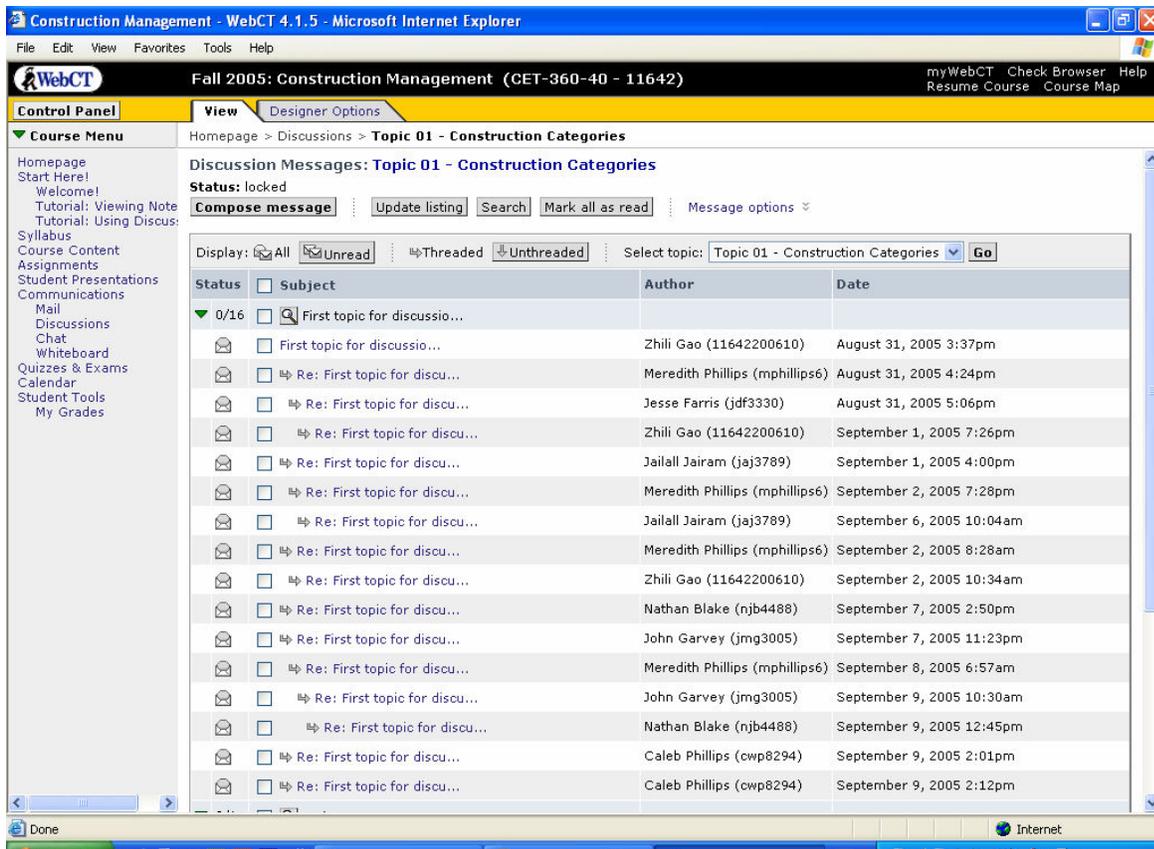


Figure 6. Discussion Page of Construction Management WebCT

Assessment by Students

Missouri Western students were asked to complete on-line course evaluations using the survey tool in a WebCT course separate from the instructional course. This evaluation is not accessible by the instructor and records student comments anonymously. Typically, response rate is approximately 60%. The data shows that students requesting more classes to be offered on-line due to busy schedules, commuting costs, and learning preferences. While some students do report that keeping up with the discussion board posts can be difficult, the majority report that they enjoy having the time to compose a thoughtful response and being able to read the ideas of their classmates.

Students in all on-line classes using multimedia at Missouri Western report that the use of narrated PowerPoint presentations aided in their understanding of course content. While Missouri Western is located in a rural area with limited broadband Internet access, there were not any reports of slow download time or the inability to watch a presentation. During course development, the instructional designer and the instructor discussed best practices for small file sizes in WebCT.

Conclusion

This paper provides an insight into the development and delivery of an on-line course on construction management, including its suitability for an on-line student environment, the requirements for computer hardware and software, the method of delivery, course content, and communications between the instructor and students. The experience of teaching an on-line construction management course verified the previous finding that it is important to realize that the old forms of teaching and learning must give way to newer ways of teaching and learning. In the area of construction management, faculty should re-evaluate their teaching pedagogy to present class materials to students in a way that facilitates educational delivery and enhances student learning.

Bibliography

1. Wahby, "Teaching Construction Project Management On-line: A Case Study." Proceedings of 2005 American Society for Engineering Education Annual Conference & Exposition, ASEE, 2005.
2. Bury and Mutter, "Implementation of a Web-Based Curriculum in Architectural Engineering Technology." Proceedings of 2005 American Society for Engineering Education Annual Conference & Exposition, ASEE, 2005.
3. Lester and Mutter, "Development of a Web-Based Curriculum in Civil Engineering Technology." Proceedings of 2005 American Society for Engineering Education Annual Conference & Exposition, ASEE, 2005.
4. Varma, "Web-Enhanced Teaching of Construction Management Using Current Educational Technologies." Proceedings of 2003 American Society for Engineering Education Annual Conference & Exposition, ASEE, 2003.
5. Houck et al, "Proposal for Funding to Enhance Online Education", Missouri Western State University, 2004.