

Using a Blended Format for Professional Development Courses

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Introduction

The University of Cincinnati provides a graduate certificate in computer science for continuing engineering education. The program is designed for degreed engineers who 1) need computer science and information technologies skills for their current jobs and / or 2) individuals who wish to obtain a masters degree in CS but who do not have an undergraduate degree in that field (see www.eng.uc.edu/css).

The courses in the certificate program have traditionally been provided in a classroom-based format. To accommodate the schedule constraints of the target population, content was developed to be presented via the web utilizing the Blackboard course management system. However, given the nature of much of the content (significant amounts of programming), it was concluded that a completely web-based course would not meet the needs of many of the students. In order to provide personal instruction, programming help, and opportunities to interact with the instructor, each course has a standard meeting time (evenings after normal working hours) for students to meet with the instructor in a computer lab.

The paper describes the creation of the blended course and the presentation of a representative course. Initial student reaction to this format is also presented.

Development of Course Content

The courses in the certificate program in computer science were developed specifically for working engineers and scientists. Some of the courses have an equivalent course taught to traditional graduate students, while other courses are tailored to a student population that does not have the same background as the traditional computer science graduate student. Courses in the certificate program include:

- Object Oriented Programming
- Data Structures and Discrete Mathematics
- Design and Analysis of Algorithms
- Computer Architecture and Organization
- Software Engineering
- Unix
- Database Theory
- Computer Communications
- Operating Systems

These courses were taught in an electronic classroom that allowed the instructor to use PowerPoint, programming examples, and other computer-based media.

To develop the web-based content two considerations were given high priority: 1) the learning experience for the students should be as good as a traditional in-person course, and 2) the burden on the instructor should be minimized. The College was able to obtain a grant that provided funds to migrate the content to the web-based format. The grant covered much of the cost but did not cover instructor salaries for teaching courses.

Given the constraints listed above, we decided to capture audio and video of the instructor as they taught an in-person course. Like a number of other universities, the University of Cincinnati has developed competencies at creating streaming media. A student helper was employed to convert the audio and video to streaming media that was linked to the instructor's presentation using Microsoft Producer.

A graduate student in computer science was employed to develop companion web pages for each course. While the streaming media lectures formed the majority of the didactic material, we wanted to create a richer learning environment than was possible with the streaming media alone. The web pages supplemented both the lectures and the texts, provided additional examples, provided self-assessment with on-line exercises, and enabled students to explore other resources as they desired.

Material was developed in modules with each module covering a particular topic. The modules did not necessarily have a one-to-one correspondence with the classroom lectures. Each module included a streaming media lecture, textbook readings and web pages.

Introductory material was also developed that provided instruction on how to make best use of the distance learning format. This included hardware and software requirements, a discussion of differences between distance learning and in-person coursework, and information on what students should do if they encountered problems.

By using students to develop supplemental content and videotaping the in-person lectures, we were able to minimize the amount of extra effort the instructor had to provide. The combination of lectures, textbook readings, and supplemental web-based materials provided an educational experience that we felt was at least as rich as the in-person courses.

Figure 1 illustrates the layout of the material.

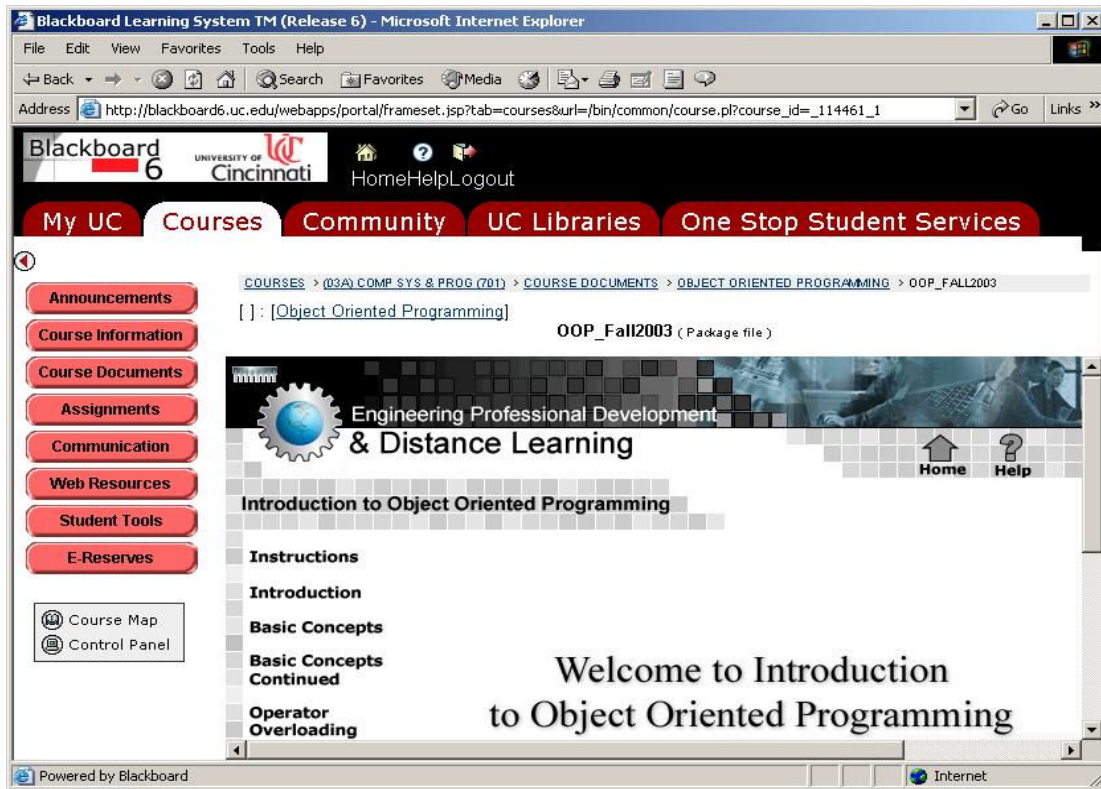


Figure 1 Layout of Course Content

Presentation of Blended Course

All students who registered for a certificate program course have an account on the Blackboard course management system (see <http://blackboard6.uc.edu>). Since email was the primary means of communication between instructor and students, it was important to establish routine use of this medium. At the beginning of the term, email was sent to the students instructing them on the format and structure of the course. Information was also provided on how to access course content and what to do if problems with the material were encountered. The instructor communicated course requirements through the syllabus on the Blackboard system as well as through email to the students.

Students were instructed to go to the course web site, read the instructions and learning objectives for that module, then proceed to the lectures or the web material. Figure 2 illustrates a module.

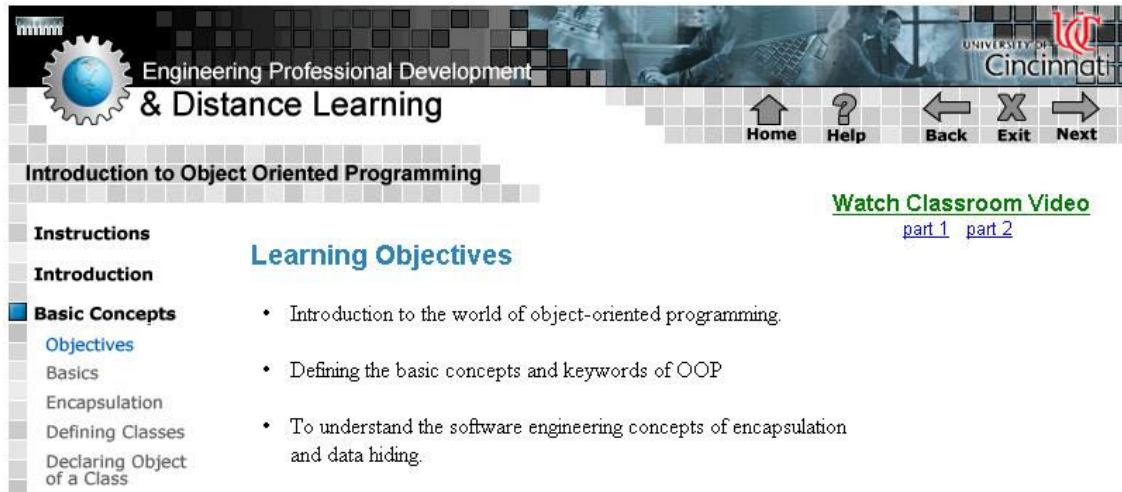


Figure 2 Representative Module

Students were provided homework assignments and programming assignments through the course. The instructor would post the assignments on the Blackboard system and notify students via email about the topic and due date of the assignment. For extended assignments, the instructor would send out reminders encouraging students to accomplish a certain portion of the work within a certain time frame. Students submitted assignments via email as well.

If students had questions, they would first contact the instructor via email. In many cases, this was sufficient to resolve problems. If the students needed additional help they had the option to meet with the instructor in-person during a regularly scheduled session or at a mutually convenient time.

Several students experienced difficulty with the streaming media content. We first attempted to resolve problems so that the students accessed this content via the web. If problems persisted, students were provided CDs with the streaming media lectures.

Evaluation of the Blended Course

Students are asked to evaluate the certificate program courses after each course. An evaluation instrument specific to the blended course format was created and administered. Table 1 provides selected items on the evaluation and the composite response to this item. A modified Likert scale was used in the evaluation with a score of 1 indicating strong disagreement and 5 indicating strong agreement.

Table 1 Course Evaluation

Evaluation Question	Avg Score
Compared to other classes I've taken, I enjoyed the online format as much as a traditional classroom lecture class	3.5
Communication with the instructor was adequate	4.2
Compared to other classes I've taken the overall learning experience was <i>as good as</i> a traditional class	

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Compared to other classes I've taken the overall learning experience was <i>better than</i> a traditional class	1.8
The assignments were adequately explained	4.0
The ability to take the course anytime, anywhere was a benefit	5.0
The class suffered by not having regular, scheduled class sessions	3.5
There was good correlation between the stated learning objectives and the content provided	3.8
Compared to other courses I've taken, the workload was too high	3.0

Analysis of the students' evaluations and discussions with students indicate that there is general satisfaction with this format. Students felt they were able to learn the content and meet their educational objectives. On the other hand, students indicated that a traditional class room experience is something they value.

The certificate program students are working professionals so the convenience offered by the format was extremely valuable. It is clear that a number of the students could not have participated in the courses if they had been offered according to a set schedule in a traditional classroom setting.

Students were also asked how often they met with the instructor. Almost half the students never met with the instructor. For those who did, the number of meetings ranged from 1 to 4. There was no correlation between a student's grade and the number of times they met with the instructor.

Conclusion

The content provided is valued by students and allows them to meet their educational objectives. Additional work is needed on the part of the College to minimize problems with the streaming media.

The structure of the content - streaming media lectures, on-line self-assessment, text books and web-based materials – provides a rich learning environment. Assignments and communication can be handled adequately through email.

The blended on-line / in-person format allows students to participate in the course at their convenience while providing personal attention to students. Initial student response indicates that the convenience allows individuals to participate who might otherwise not be able to attend an in-person course.

Biographical Information

EUGENE RUTZ is director of distance learning and professional development in the College of Engineering at the University of Cincinnati. Mr. Rutz has worked in industry as a mechanical design engineer and nuclear engineer. His academic experience includes program development, engineering and educational research, and teaching.