

An Efficient Methodology to Transform a Classroom Based Course into a Web Based Course

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Abstract

This paper describes an efficient methodology that was used to transform a classroom based course into a web based course. The course discussed is CS167/467 “C Programming” offered by the Computer Science department at New Mexico State University, but the methodology used for the transformation into a web based course can be easily applied to other courses as well. The author first taught the classroom based course for three semesters. After having the course material completely organized and after studying the learning abilities and problems of the students who normally took the course, the author decided to transform one of the sections of the course into a web based course while keeping another section of the course as a classroom based course. The web based course was an instant success, the students responded very positively, did learn, and enjoyed the course. Even though it did take some time to transform the course into a web based course, the benefits for both the author and the students outweigh the initial set up time. In this paper we describe the steps that were taken to transform the classroom based course into a web based course, the problems that the author encountered, and some solutions to these problems. Furthermore, the student performance and course evaluations of the web based course are compared against those of the classroom based course.

Description of Classroom Based Course

Before describing the methodology used to convert a classroom based course into a web based course, first we will describe the classroom based course which was later converted into a web based course. The name of the course is CS167/467 “C Programming” offered by the Computer Science Department at New Mexico State University. The objective of this course is to learn the basic knowledge of structured programming in C—control structures, data structures, and functions—along with basic problem solving techniques. The course meets for lecture two hours a week and meets in the Computer Science laboratory for one hour a week. All lectures are given using very clear PowerPoint presentations. The students are provided from the beginning of the semester with all the lecture notes so that they can concentrate on the lecture instead of copying the information from the PowerPoint presentations. The students work on a new programming assignment every week. The programming assignments for each week cover the lecture material given in that week. Therefore, the students are able to apply the knowledge they get in the lectures every week. There are five closed book exams: Quiz#1, Midterm#1, Quiz#2, Midterm#2, and Final Exam. Quiz#1 and Quiz#2 are basically practice exams for Midterm#1 and Midterm#2 respectively. The Final Exam is comprehensive. The course grade is computed as follows: Quiz#1 (5%), Midterm#1 (15%), Quiz#2 (5%), Midterm#2 (15%), Final Exam (30%), Lab assignments (20%), Course/Lab participation (10% for undergraduates; 5% for graduate students), project (5% for graduate students).

Transformation of Classroom Based Course into Web Based Course

The first step in the transformation was to generate web pages that would not only show the lecture slides given in the classroom based course but that would provide a written explanation of each lecture slide as well. The explanation for each lecture slide consists basically of a detailed description of what the

professor says in the classroom. Since in a web based course, the professor does not have immediate feedback from the students to adapt his/her lecturing, the professor must write completely clear and detailed explanations of each lecture slide. Figure No.1 shows a sample lecture slide along with its explanation.

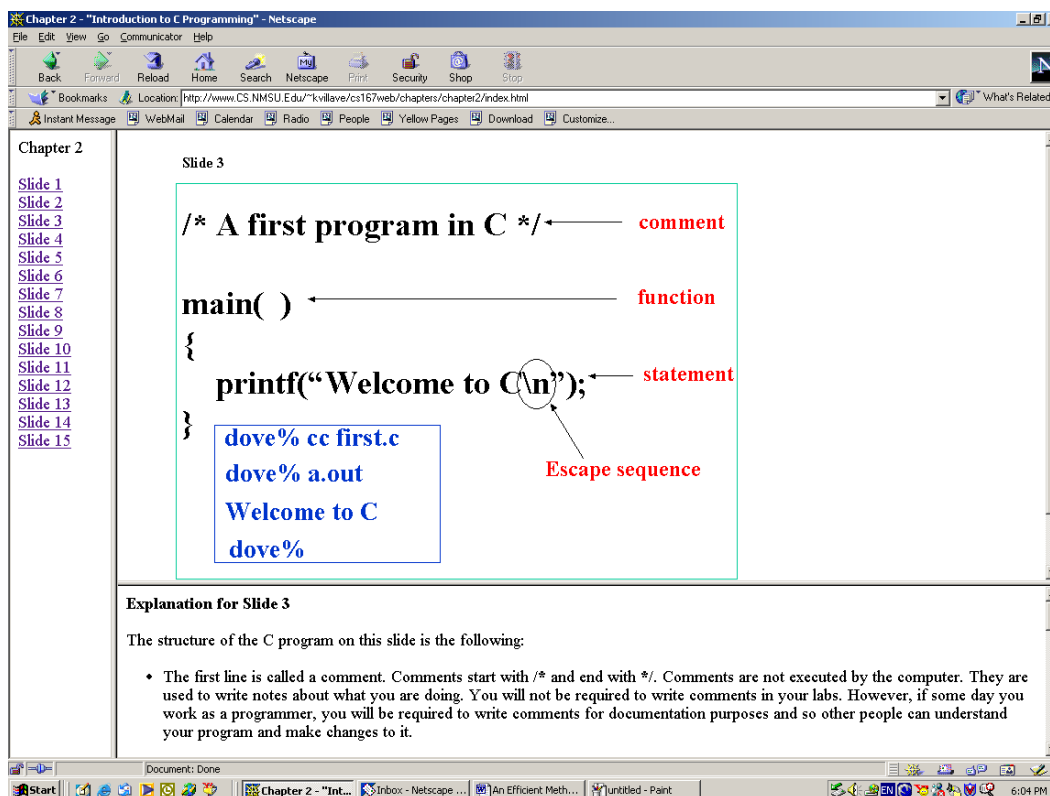


Figure No.1 Lecture Slide and Its Detailed Explanation

The second step in the transformation was to generate a detailed syllabus for the students so that they would know exactly what was going on in the course, especially when the assignments and the online exams are posted, and the deadlines for all submissions. A detailed syllabus is essential in a web based course. However, since the professor can not plan ahead every single detail of what will happen in the course before the course begins, we decided to give to the students along with the syllabus, a web session three times a week where we explain exactly what they should be doing, reading, practicing, implementing in detail. In each web session there are links to the lecture notes and their explanations, lab assignments, exams, solutions to lab assignments and exams, collection of exercises, grades, announcements that they should be reading and doing. Students are responsible for accessing the web site for the course frequently and reading the web sessions every week so that they can keep up with the work. Figures No. 2 and 3 show a list of web sessions and a sample web session for a particular day.

The third step in the transformation was to decide how to give the exams to the students. Since we wanted the course to be completely web based, we decided to give the exams online, open book, and open notes, and the students were told to work on their own. However, in order to make the exams more fair for the professor and the students, the students were given only 24 hours to complete the exams and for each question on the exam—actually a C program per question—they received either full credit or zero. Having a quiz (practice midterm) worth only 5% before each midterm is very effective in reminding the students that the midterm is coming and that they should keep up with the work to do well in the midterm.

The fourth step in the transformation was to decide how the students would submit their lab assignments and exams. We decided that students would submit everything by email instead of creating special submission programs, to make it easy for the students, the TA, and professor. This method proved to be simple and effective and also provided the professor and the TA with a straightforward daily report of the class progress.

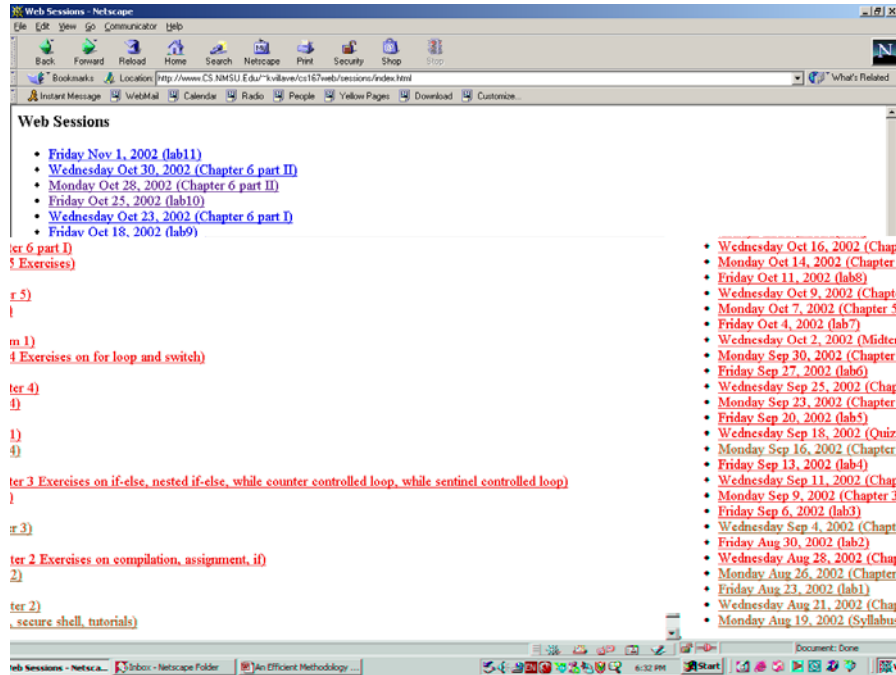


Figure No.2 List of Web Sessions Links

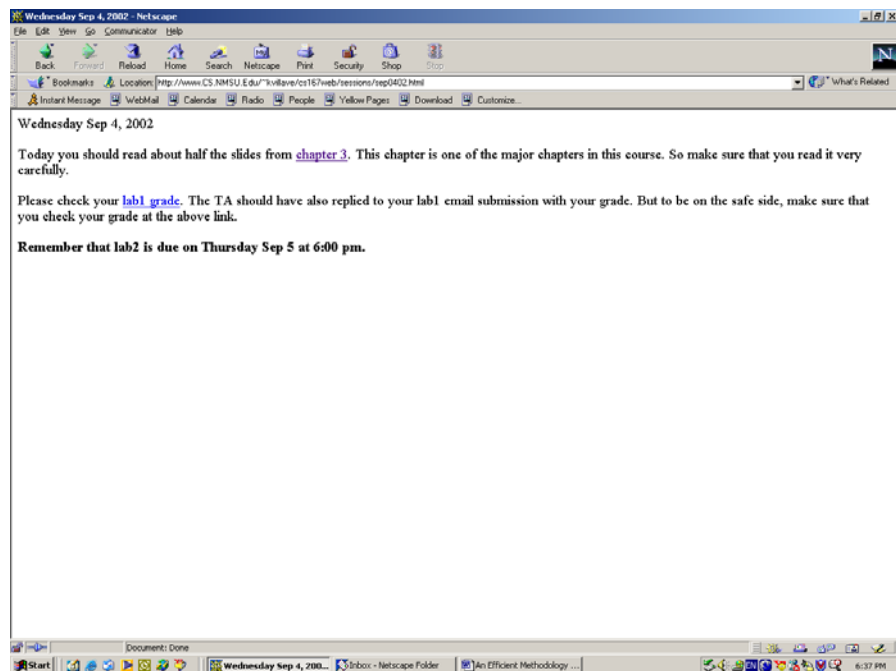


Figure No.3 Web Session

Student Performance Comparison Between the Two Courses

The same lecture materials, collections of exercises, exams, and lab assignments that were given in the classroom based course were given in the web based course. This was done with the purpose of comparing the performance of the students in the two courses. Table 1 shows the percentage of As, Bs, Cs, Ds, and Fs grades from both courses. The classroom based course had 23 students and the web based course had 29 students. We can see that the student performance in the two courses was very similar.

Letter Grade	Classroom based course	Web based course
<i>As</i>	39 %	48 %
<i>Bs</i>	22 %	21 %
<i>Cs</i>	13 %	7 %
<i>Ds</i>	9 %	7 %
<i>Fs</i>	17 %	17 %

Table 1. Student Performance

Course Evaluation Comparison Between the Two Courses

The same course evaluation form that is given in the classroom based course was given to the students in the web based course. Table 2 shows the percentage of As and Bs given to a selected set of topics from the course evaluation form. Although the students from the classroom based course gave better evaluations than the students from the web based course, the evaluations from the web based course are not at all bad considering the fact that the course was given in web based format for the first time and that the course evaluation form was not rewritten or adapted for web based courses.

Topic	Percentage of As and Bs from classroom based course	Percentage of As and Bs from web based course
<i>Ability</i>	100 %	69 %
<i>Attitude</i>	100 %	85 %
<i>Enthusiasm</i>	94 %	92 %
<i>Objectives</i>	100 %	92 %
<i>Content</i>	100 %	92 %
<i>Fair tests</i>	100 %	77 %
<i>Fair grading</i>	100 %	54 %
<i>Exams/points</i>	94 %	85 %
<i>Organization</i>	100 %	69 %
<i>Office hours</i>	100 %	85 %
<i>Syllabus</i>	81 %	54 %

Table 2. Percentage of As and Bs Given in Course Evaluation Forms

Challenges and Some Solutions

The main challenge in the web based course is to make students read the web sessions and the lecture slides along with their explanations. Students who do read perform quite well in the course. A solution to this problem is to track students' accesses to the course website and count them as course participation. The course participation percentage should be about 20% of the course grade in order to force students to read. Another challenge is to make the lecture slides and their explanations more interesting to the students. We have thought about this problem and have decided that lots of animation will definitely attract students into learning. For example, our lecture slides contain lots of source code that is explained in the explanation section of the web page. However, adding a flowchart and some animation may attract the students a lot more to read or at least to understand the code just by visualizing the animation. We have decided to implement these solutions for the next time that the web based course is offered. It is our belief that as web technology keeps advancing, web based courses should take as much advantage of it as possible to attract students into learning a lot better. The third problem that we face is that the course evaluation form of web based courses should definitely be different from the course evaluation form of classroom based courses. It is definitely not fair to judge the two courses using the same set of questions since some of the questions are not even applicable to the web based course. We plan to come up with a new web based course evaluation form.

Conclusion

In this paper we discussed an efficient methodology to transform a classroom based course into a web based course. This methodology was implemented in the course CS167/467 "C Programming" given by the Computer Science department at New Mexico State University. A comparison of student performance and course evaluation forms of the classroom based course against the web based course showed that both courses are similar in terms of student performance but not so similar in terms of student satisfaction. The students from the classroom based course were more satisfied with the class format than the students from the web based course. However, the results are very positive considering that the web based course version was offered for the first time and that the same course evaluation form that was used in the classroom based course was given to the web based course. The course is also the only programming course ever offered in a completely web based format in the Computer Science department at New Mexico State University. The main challenge in a web based course is to make students read. Some solutions to this problem include keeping track of student web accesses to the class website and counting it as web participation, and animating the web material so that students feel more interested in reading. The methodology used to transform the classroom based course into a web based course can also be easily applied to other courses as well.