Using the World Wide Web for teaching improvement

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Abstract

The World Wide Web has impacted the educational model in a fundamental way and forced educators to think of ways that this technology can be used to improve teaching effectiveness. This paper describes an implementation of the continuous improvement philosophy in a graduate level Operations Analysis class by using the web to obtain immediate and systematic feedback from students on lecture and other course activities. The feedback obtained is analyzed to determine how the delivery and content of the course can be improved. In the short-term the response is to address immediate problems or difficulties encountered by students. In the long-term a fully searchable web site with references to readings, audio/visual modules of class lectures, problem solutions and frequently asked questions (FAQ) materials is to be developed. Technology issues and the lessons learned from the experiment are discussed. © 2001 Elsevier Science Ltd. All rights reserved.

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1. Introduction

The World Wide Web (or simply the web) has demonstrated its potential to change the educational model since its introduction. Schools and universities all over the world are continuously exploring the ways to use this technology for improving teaching effectiveness. Course web pages, discussion groups, bulletin boards, and the distance education model have impacted the teaching process in significant ways, across all disciplines and at all levels (see, for example, Brown & Neilson, 1996; Chrisman & Harvey, 1998; Lewis, 1998; McCollum, 1997; McGowan & Sendall,
This paper describes the use of the web technology as part of a continuous improvement philosophy in a graduate class in the College of Business Administration (CBA) at Loyola Marymount University (LMU).

LMU is a private Jesuit university that offers bachelors and masters degrees in various disciplines. The College of Business Administration within LMU is divided into four departments: Accounting, Finance and Computer Information Systems, Management, and Marketing and Business Law, which offer both undergraduate and graduate degrees with a variety of emphases. LMU’s mission emphasizes excellence in teaching. Faculty members are encouraged and expected to look into ways for improving their teaching effectiveness and helping students with their learning processes. The CBA and the four departments in the CBA actively subscribe to this philosophy and as a result some faculty in the CBA have enthusiastically embraced modern technology to improve the teaching process. The College boasts a state-of-the-art building where all classrooms are equipped with instructor’s computers, state-of-the-art projection facilities, and some classrooms have computers at every student’s seat with Internet connections. Many faculty members use technology on a regular basis for classroom instruction and for interaction with students outside the classrooms. Almost all of the courses offered in the CBA have at least “static” web pages for disseminating general course information, such as the syllabus, faculty office hours and contact information to students. A few courses have “dynamic” (i.e. regularly updated) web sites for distribution of class notes, assignments, updates to lecture notes, study guides, frequently asked questions (FAQs) and other course related materials. Many faculty members use their course web pages as a means for pointing students to supplemental readings and resources in the subject area via links to other electronic sources on the Internet.

2. The project

The main purpose of the current project was to extend the role of the web beyond that of a distribution of information mechanism and implement it as a tool for continuous improvement of the teaching process. Use of the form facility of the web can provide immediate feedback from students on the progress of their understanding and thus can help the instructor to take appropriate action in a timely fashion before it is too late. The traditional course evaluation is usually completed at the end of the course and so provides only historical information that can be used for future improvement but does not provide any help for the students generating the evaluation. An immediate feedback mechanism after every class or topic can address this deficiency and allows the instructor to monitor and assist the learning of the students by taking appropriate action during the course.

Furthermore, such an electronic depository of feedback would enable faculty to identify areas of particular difficulty for the students. These areas can then be addressed by creating multimedia modules that explain the concepts or methods with appropriate examples and applications and can be made available to students via a course CD-ROM or over the web as supplemental learning modules. These would be different from the standard learning modules available with text books as it would be more customized to a set of students in a particular class, addressing their concerns in a more effective manner. In the long run this would lead to the development of an interactive web site that would assist the students in obtaining supplemental readings and multimedia demonstrations for course related concepts and assignments.
The course selected as a test bed for implementing this continuous improvement idea was a graduate level course titled “Operations Management and Decision Support Systems”. This is a core course that must be taken by all MBA students. The course is taught by faculty in the department of Computer Information Systems and covers introductory Management Science and Operations Management techniques with an emphasis on their applications for making effective business decisions. The course material is analytical, well defined and reasonably stable without too many changes in the subject or topics through the semesters. The faculty teaching the course also have experience with the materials and use of technology for the teaching process. The course is typically taught in one of the classrooms in which each student has real time access to a computer on their desktop with a live Internet connection. This allows the instructor of the course to administer and obtain responses from a web based feedback form.

The methodology of the project was straightforward. After the completion of each topic in the course, the instructor asked the students to access the course web page and fill out a feedback form. The web-based form was designed before the class and was made available only after the topic was covered. Each form had no more than six questions seeking feedback in the following areas:

- Students’ understanding of that topic’s materials,
- Students’ difficulty with the subject matter, and
- Suggestions for improvements in delivery of the material and suggestions for improvement in content.

An example of a typical form can be found at the following URL: http://www.lmu.edu/colleges/cba/faculty/zprzasny/mbaa607/fb_forms/example.htm with a printout provided in the Appendix. The purpose of the first two questions was to get insights into the students’ understanding of the main concepts of the topic. The frequency of incorrect or incomplete responses would be an indicator of the effectiveness of the delivery of the course material and provide direction for what remedial action, if any, should be taken. The intention of the third question was to get information on specific difficulties being experienced by students. The frequency of these would indicate areas of greatest concern and consequently the direction and thrust of remedial action. The fourth and fifth questions attempted to solicit students’ suggestions for improvements in the delivery and content respectively. It was decided to use open ended questions on the forms to solicit novel or innovative ideas and insights from the students rather than be constrained by the instructor’s own preconceived ideas or expectations had a multiple choice format been used. This meant that the categorization part of the process took a little longer (in a multiple choice format it would have been literally instantaneous) but it is believed that the resulting content was richer.

The computers in the classroom are configured with dummy e-mail addresses so that the instructor cannot identify the sender. This was demonstrated to students to show that their responses and insights would be anonymous. This was instituted in order to obtain the most candid, and hopefully most useful responses. It was also strongly emphasized that this exercise was not in any way related to a form of assessment, but a real attempt to receive candid feedback and their participation, although voluntary, would be both desirable and an opportunity to influence their own learning experience. The responses to the questions on the form were sent to the instructor in the form of structured e-mails, which were then imported into a spreadsheet and were parsed using a simple macro. The resulting spreadsheet was then analyzed and the feedback points categorized so that appropriate actions could be taken by the instructor.
Parenthetically, it must be stated that since carrying out the project (in the Fall 1999 semester) we have discovered an even more efficient mechanism for gathering the feedback information. Flashbase.com (http://forms.flashbase.com/) allows the instructor to create web-based forms in a very easy and intuitive point and click fashion. It then collects and collates all responses to the form, which can be downloaded as a delimited text file for importing into a spreadsheet or database package for further analysis and categorization. There is no charge for this service, but a small advertisement is displayed on the screen while the form is being completed. We have found that using Flashbase.com is superior to our original “manual” approach in that it retains the anonymity of the respondents (since it is only the collated results that are downloadable) and removes all the administrative chores of collation. The collated feedback can be downloaded from Flashbase.com immediately after the students have completed filling out the form.

Once the feedback was collected they were then color coded (categorized) and grouped into one of the following areas:

- Students lacked the required background preparation for understanding the course concepts (for example, algebra, graphing, computing skills, etc.).
  *Comment:* These kinds of prerequisite deficiencies could not realistically be addressed in the lectures. However, the feedback obtained helped in identifying the nature and frequency of weaknesses of the incoming students and indicated what remedial sessions should be arranged and/or what multimedia modules for self-learning of the pre-requisite materials could be developed.

- Students raised questions the answers to which could be found in the book or had been explained in the class handouts.
  *Comment:* This confirmed that through inattention, or otherwise, students do not always absorb all the required information and insights or even realize that it has been covered. Repetition is a useful and effective form of learning and it was comparatively easy to direct students to the proper topic and readings by means of class announcements and FAQs posted on the course web site.

- Students raised concerns that need additional materials in the topic area including supplemental readings, better explanation of the topic areas and more examples.
  *Comment:* This sort of information would not normally have come to light, since students would not normally ask for it, so this provided an opportunity to reinforce or improve the learning experience by additional postings on the course web site through FAQs and worked examples as well as classroom followup, as appropriate.

- Students raised issues that needed rethinking parts of the lecture including development of new materials and audio-visual help.
  *Comment:* These were the candidates for development of relevant audio-visual materials.

- Wrong answers provided by the students, which indicated lack of full understanding of the course material.
  *Comment:* These were addressed by FAQs or explanations posted on the course web site and/or class announcements as appropriate.

- Issues that indicated a need for changes in delivery style (e.g. talking slower, writing bigger, getting students up to the board).
  *Comment:* These were addressed on a case by case basis.
Once the student feedback was categorized into these groups the action items were identified and appropriate actions were taken so that the issues were addressed before the commencement of the next lecture. Typical actions taken were:

- Posting the correct answers, with full explanations or justifications as necessary, to the questions asked in the form on the course web page,
- Providing guidance to the students for course related readings, supplemental materials and posting of more problems and solutions relating to the topic area,
- Adjusting the delivery style as deemed appropriate,
- Developing audio-visual help for background materials, and
- Identification of long term action items that would help the instructor in improving delivery of the course materials in the future.

In keeping with the instant feedback and continuous improvement philosophy it was ensured that the first three of the above actions were always taken before the next class meeting (fortunately the class met just once a week). This was to address the actual issues raised by students and to let them know that their feedback was treated seriously and acted upon. This also set the correct atmosphere for the next feedback form.

3. Benefits and discussion

Several benefits have been obtained as a result of the project. The obvious one was the impact of the immediate feedback and real time adjustment of the course to help students learn better. It is believed that this creates a better learning environment as the students see their concerns being addressed by the instructor. The electronic nature of the feedback also offers some other benefits that are described below.

First the feedback is immediate. Although this kind of feedback could be gathered by conventional (non-electronic) means, coding it up (especially if an open ended format was used) would be a time consuming and laborious process and directly proportional to the number of students in the class. This would become prohibitive in large classes. The electronic format (especially with the Flashbase.com approach) reduces the administrative and processing aspects to a matter of minutes so that the instructor can concentrate on choosing the appropriate response to the students and on improving the course materials. Using Flashbase.com would make it viable even in large classes where, arguably, the greatest benefits could be obtained, since students would now “have a say” as part of the course infrastructure and not be part of a faceless audience.

Secondly, all the feedback is in an electronic repository, thereby facilitating quick access for future reference. Student responses, as well as student weaknesses over time, can be easily reviewed. This provides excellent long-term feedback for the instructor and evaluation of their teaching improvement efforts from semester to semester.

Thirdly, the feedback can be used to foster interaction between students to make them active learners through discussions with each other. The responses to the feedback as well as the questions raised by the students can be posted on a threaded discussion site and the students will answer/respond to those questions. This forces the students to think through the topics, show
the instructor their collective weak areas, and make students understand the difficulties in the material. This approach would allow a student to explain the concept to another student in their language and terminology as opposed to the language of the instructor, who sometimes fails to appreciate the students' perspective due to his/her comprehensive knowledge of the materials.

Another long-term end product and benefit of the project was a list of course topics or issues that could be improved or supplemented by audio-visual modules. These audio-visual modules would help the students to understand the materials better than at present in that they would get a chance to go through the materials over and over again. This is very different from the standard classroom delivery concept where a student gets only one chance to listen to a lecture and is expected to absorb all its ramifications completely. It is believed that integration of the multimedia materials into the current instructional process is superior to either method of delivery taken separately as it creates a richer learning environment for the students.

Finally, the project has created very tangible resources for other faculty who may wish to teach the same course or a similar one in future. The long-term goal of the project is to develop a library of such multimedia modules, some of which could be used to address “prerequisite materials” from other courses. These modules, with minor alterations, could easily be integrated into the lecture materials of other courses on a mix and match basis. Thus the current project could be considered the beginning of a knowledge bank for future use.

The focus of this project was one of using technology as a tool for continuous improvement of the teaching process. It is believed that the approach is both feasible and beneficial, and there are choices in the mechanics of the technology used to suit different levels of individual sophistication and experience with technology. This paper described a generic approach requiring comparatively little experience and startup overheads to demonstrate a manageable beginning for someone new to this area. Instructors using web-based teaching support sites such as Blackboard.com, Emba-net and WebCT already have the forms features as part of their “package” (although the categorization and responses would still be the responsibility of the individual instructor). These packages are popular with some professors but others prefer not to invest in the long setup time or the rigid structure and steep learning curve. For this latter group, or simply for those who would want to experiment with instant feedback, the approach described in this paper is an easy to implement and readily available alternative.

4. Future work and conclusion

This project attempted to use the web beyond simply a means for distribution of class materials. Six feedback forms were administered during the course of the semester. The responses obtained were very encouraging and provided a list of things that needed to be done immediately and also before the course was offered in future semesters. The web posting of supplemental materials and addressing issues raised by the creation and maintenance of FAQ sites was carried out throughout the semester. Students in the course were appreciative of these on-going changes and indicated that these were indeed helping them to understand the course materials better. The development of the multimedia modules and the student threaded discussion ideas are the focus of two current projects by the authors.
The success of this project opens up various possibilities for using web-based forms for teaching enhancement. A comprehensive collection of students' responses over multiple semesters can be used for statistical analysis to identify patterns or trends in students' learning and comprehension. This will be very useful for the entire pedagogical aspect of the course as it identifies the inherent issues. Lectures, texts, examples, and software for the course can be reviewed and redeveloped based on such findings.

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Appendix A

**FEEDBACK FORM: LP-graphical solution**

Please answer the following questions related to the LP-formulation and LP-graphical solution parts of the course.

Also, please send the form ONCE only!

**LP-Graphical Solution**

1. What are the three main terminologies (i.e., types of solution) to an LP problem?

2. Describe briefly (just the 3 or 4 main steps) how you would solve an (already formulated) LP problem graphically.

3. What are the main difficulties that you experienced in the graphical solution of LP problem? (If none, write "None").

4. What can be improved in terms of the class delivery of the "LP-graphical solution" part of the course?

5. What changes or additions in the content itself would you suggest to make "LP-graphical solution" clearer or more understandable?

Very many thanks for your participation and input.
References


