

Student Perceptions of Web-Based Supplemental Instruction

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Introduction

Nearly every university and college in North America now has a Web presence (Saba, 1998). Approximately 70% of U.S. colleges and universities provide undergraduate applications online and nearly 77% provide their course catalogs online (The Campus Computing Project, 1999). The Internet is also changing the way in which education is delivered, and in fact, some predict that the Internet will become the dominant distribution system for distance education and training (Simonson, Smaldino, Albright, & Zvacek, 1999). Many faculty members are expanding their traditional delivery methods (lecture, laboratory, face-to-face discussion) to include educational options ranging from Web-based course supplements to the complete delivery of courses online. There are endless online choices that instructors may consider in this range, from simply posting a syllabus to creat-

ing Web-based content to enhance classroom instruction to full online delivery. In 1997-98, nearly 44% of all U.S. higher education institutions offered distance-based courses, an increase of one third since 1994-95, with most of the growth being primarily in Internet delivery (National Center for Education Statistics, 2000). The most recent Campus Computing Project (1999) survey identified that 45% of the 530 participating higher education institutions offered at least one full course online.

While the primary focus of Web-based delivery has been in the development of stand-alone Web-based distance education courses, more faculty members are beginning to use the Web to supplement and enhance on-campus instruction (e.g., Goldberg, 1997; Henson, Fridley, Pollock, & Brahler, 2002; Marks, 2002; Masten, Chen, Graulau, Kari, & Lee, 2002;

Mohtar & Engel, 2000; Patterson, 1999; Stith, 2000; Wallace & Weiner, 1998). Data collected by The Campus Computing Project (1999) revealed that 28% of higher education courses have an associated Web page compared to 9% in 1996. The authors have chosen to augment a traditional face-to-face on-campus safety course with an online supplement. This article describes the assessment process used to gauge student perceptions of this new online supplement.

Setting the Stage

The course chosen for the online component was a new junior-level occupational safety course, *Safety in Manufacturing*, required for all industrial technology students at Iowa State University (ISU). This course covers broad topic areas in occupational safety and health from a management or supervisory role in a manufacturing setting. The Web-based supplement, developed using WebCT (see <http://www.webct.com/> for information on WebCT) consisted of outline notes for all course topics, online quizzes, a variety of communication tools, and access to course grades. The course calendar is used to keep students apprised of daily topics, reading assignments, field trips, and due dates for homework and projects. There is a main bulletin board that everyone in the class may access and private bulletin boards that are assigned to each base group to facilitate within-group interaction. WebCT allows students to forward their WebCT e-mail to a different e-mail address should they prefer to receive all of their e-mail at one address. In addition to the communication tools, WebCT was also used to post student grades so that students could access their current grade at any time. This online supplement was initiated the first time this course was offered during the Fall 1999 semester. Freeman and Embleton (2000) provide a more detailed description of the course, the online supplement, and WebCT.

Methods

To gauge the reaction of students to the WebCT supplement for *Safety in Manufacturing*, a student survey instrument was administered. The survey was adapted from work done by the University of Missouri's WebCT Support Team (1999) to meet the authors' needs and address the specific WebCT components implemented. The questionnaire consisted of 13 questions divided into two sections. The first section addressed students'

previous experience with Web-based courses, computer competency, how often and from where they accessed the online supplement, and any problems they encountered. The second section addressed their perceptions of the online supplement. The questionnaire was pilot tested at the end of the Fall 1999 semester with the 34 students enrolled in the course. The questionnaire was distributed with student course evaluations. The completed questionnaires were returned anonymously. The primary purpose of the pilot study was to assess the clarity of the instructions and the usefulness of responses to the questions as written.

Several questions were changed to clarify issues identified during the pilot study. Additional questions were also added to address components of the supplement that were not yet implemented during the first semester (e.g., starting in the second semester, students were required to take an online quiz prior to each class meeting) and to more specifically identify those components of the supplement that the students found useful. In its revised form, the questionnaire consisted of 18 questions and the opportunity to provide additional comments. The questionnaire was administered at the end of each of the following semesters: Spring 2000, Fall 2000, Spring 2001, Fall 2001, Spring 2002, and Fall 2002. Participant responses were anonymous.

Participants completed the questionnaire using pen or pencil. The responses were then archived by coding them into a spreadsheet. Each semester, descriptive statistics of the student perceptions were analyzed as part of the process of preparing the course for the next semester. The data were transferred from the spreadsheet database to a statistical software package for the analysis presented here.

Limitations of This Methodology

As with any self-reported survey, it is typically not possible to verify if the students completed the questionnaire accurately, or honestly. Pilot testing the questionnaire, which indicated that the questions were sufficiently comprehensible to allow the students to answer accurately, reduced some of the potential impact of this limitation. The question of honesty is harder to address. However, the responses were anonymous, had no impact on the students' grades, and were prefaced with a discussion of the need for honest feedback to improve the use of the WebCT supplement for future semesters.

Results

During the six semesters of this study, 210 students completed this course. A total of 178 students completed the questionnaire for an overall response rate of 85%. During these six semesters, the class size ranged from 19 to 47. The response rate ranged from 70.2% to 100%. During the Spring 2000 semester, this class was the first Web-based course experience for over 76% of the respondents. The majority of the students for the next two semesters also had no previous Web-based course experience. Then starting with the Fall 2001 semester, the trend shifted in the other direction, and by the Fall 2002 semester, nearly 92% of the students had previous Web-based course experience. This clear demarcation between the percentage of students who had Web-based course experiences the first three semesters versus the last three semesters provided a natural split that was used in subsequent analyses.

The class met face-to-face twice per week, and in every semester over 90% of the respondents indicated that they accessed the course Web site two or more times per week. The locations from which students accessed WebCT most often were the departmental computer labs and their places of residence. However, the location used most frequently changed from the departmental computer lab (59% in Spring 2000) to the student's house or apartment (69% by Fall 2002). Again, a natural split existed between the first three semesters and the last three semesters. During the first three semesters, over half of the respondents (59%, 59%, and 54%, respectively) used the departmental computer labs as their primary location for accessing WebCT. During the last three semesters, 50% or more of the respondents (55%, 50%, and 69%, respectively) indicated that they most often accessed WebCT from their residence. It should also be noted that significant construction of "Internet ready" student housing was opening up during this time.

When ranking their computing and information technology proficiency on a scale from 1 = *novice* to 5 = *expert*, the industrial technology students responding considered themselves to be competent computer users with 86% giving themselves a rank of 3 or better in Spring 2000 and 100% giving themselves a rank of 3 or better in Fall 2002. As expected, they were able to quickly master the WebCT environment and indicated very few problems interacting with

WebCT. The most common problem during the first three semesters was logging in during the first two weeks of class (24%) and slow response time during the last three semesters (49%).

The WebCT course components considered most useful by the students were the course notes, access to grade information, and the online quizzes. Nearly all (99%) of the students who had previous Web-based course experiences indicated that they preferred this WebCT course to those used in the past. More than 90% of these students indicated that the online notes and quizzes helped them prepare for class. Similarly, 89% indicated that the WebCT component was valuable and improved their learning experience and 92% indicated that they were satisfied with their WebCT experience. The last question on the survey asked if they would prefer a class with a WebCT component to one without such a component, given a choice. Ninety-six percent indicated that they would prefer a class with a WebCT component.

Correlations and Comparisons

The primary purpose of this study was to gauge student perceptions of their experience with the WebCT supplement to *Safety in Manufacturing* to help guide continuing development and use of the online supplement in future semesters. In addition, this study also explored potential differences between student subgroups based on (a) their self-reported computer competency, (b) the components of the supplement they considered useful, and (c) their perceptions of their WebCT experiences. All correlations where a significant ($\alpha = 0.05$) difference between students was found in three or more semesters are presented below. The importance and/or implications of these findings are discussed in the next section.

In all but the first semester, students who indicated that the WebCT component was valuable and improved their learning experience were more likely to consider the WebCT quizzes helpful in preparing for class [the corresponding correlation and p values in parentheses for Fall 2000 through Fall 2002 were .632 (.000), .836 (.000), .525 (.002), .649 (.000), and .406 (.024)] and were more likely to be satisfied with their overall WebCT experience [the corresponding correlation and p values in parentheses for Fall 2000 through Fall 2002 were .561 (.002), .561 (.001), .788 (.000), .818 (.000), and .612

(.000)]. In four semesters, students who ranked their computer competency higher were also less likely to think that they spent too much time learning WebCT [the corresponding correlation and p values in parentheses were Spring 2000, .492 (.045); Fall 2000, .499 (.006); Fall 2001, .377 (.037); and Fall 2002, .461 (.009)]. Students who considered the WebCT course notes helpful in preparing for class were more likely to be satisfied with their overall WebCT experience in four of the six semesters [the corresponding correlation and p values in parentheses were Spring 2000, .553 (.021); Fall 2000, .707 (.000); Spring 2001, .502 (.003); and Spring 2002, .517 (.002)]. During the last four semesters, students who considered the WebCT quizzes helpful in preparing for class were also more likely to agree that access to their grade information prompted them to take action [the corresponding correlation and p values in parentheses were Spring 2001, .349 (.047); Fall 2001, .429 (.018); Spring 2002, .358 (.044); and Fall 2002, .427 (.017)].

In three of the six semesters, students who considered that the WebCT component was valuable and improved their learning experience were also more likely to consider it important to have experience using the latest technology applied to their discipline. During three semesters the students who considered the WebCT notes helpful in preparing for class were more likely to indicate that the notes also facilitated note taking in class. Also during three semesters the students who considered the WebCT notes helpful in preparing for class were more likely to indicate that the WebCT quizzes were helpful in preparing for class. Finally, students who indicated that the quizzes were a useful component of the WebCT course were more likely to indicate that the quizzes helped them prepare for class.

Discussion

Less than 25% of the students enrolled in *Safety in Manufacturing* during the Spring 2000 semester had any previous experience with courses that utilized a Web site. While serious efforts are underway across the country to increase Web-based delivery of educational content, the early focus was on using the Web for complete online delivery—distance education. It was not surprising that relatively few resident students, even in a technology discipline, had been exposed to online components in their courses. Although underutilized at the time,

research was available documenting that students who received a combination of face-to-face instruction with a Web supplement performed better than their counterparts who received only traditional or only Web-based instruction and were much more satisfied with their learning experience (Goldberg, 1997, 2000). This may be particularly true for industrial technology students who are already competent computer users and, as the results confirmed, were able to quickly pick up the intricacies of online delivery even without previous experience. However, WebCT was becoming the standard Web-based instructional platform at ISU and its use across campus was expanding. By Fall 2001 over 60% of the students in *Safety in Manufacturing* had previous experience with a course that utilized a Web site. A year later over 90% of the student respondents had previous Web-based educational experiences. Since they were on-campus students, the majority of these experiences were likely to be Web-based supplements to traditional course delivery methods. It is clear that Web-based components are now common across the campus and in the industrial technology curriculum. It is also noteworthy that as the reliance on Web-based components increased (both through the number of previous courses and the number of access times per week) the students were more likely to utilize access from their residence than from departmental computer labs. However, the fact that more students were accessing their Web-based courses from off campus is likely the reason that more students complained of slow network response time in later semesters.

The three components of the online supplement—course notes, grade information, and quizzes—that were considered the most useful were the components that were used most often. The students did not have a choice in using the online quizzes. They were required to take a preparation quiz prior to each class on the topic to be discussed that day. Each quiz was available for the 48 hours prior to the start of the class covering that topic. The online notes were used by students to help prepare for the quizzes and to facilitate note taking in class. Although it was not encouraged or discouraged in any way, it was observed that by the second week of each semester the majority of the students were printing out the online notes and bringing them to class. These results were corroborated in that

more than 90% of the students agreed that the course notes and quizzes helped them prepare for class. Grades were not posted in hard copy or handed out in class. Instead, updated student grades were posted to WebCT. Since the students were accessing the WebCT component on a routine basis, they developed the habit of checking their grades frequently and letting the instructor know if grades were not accessible within a day of handing in assignments. Information that was accessible to the students included grades for all assignments, current data on overall percentage, class rank, and current letter grade. Having access to current grades at any time also received positive comments in the student course evaluations.

The other three major components of the supplement—bulletin board, calendar, and e-mail—received less enthusiasm. The bulletin board was used to provide general course announcements and provide private feedback to each group concerning group assignments and projects. During the first three semesters, homework assignments were posted to the bulletin board. However, during the last three semesters, the homework assignments were provided in the “Class Resources” section of the WebCT supplement. This seems to have affected the perceived usefulness of the bulletin boards as the ratings dropped more than 10% during the last three semesters. The calendar was probably not deemed as useful as some other components since it duplicated information that was provided in the syllabus; the syllabus was quite detailed and few changes were made to the schedule during the semester. The fact that few of the students considered WebCT e-mail to be useful is explained by the variety of responses to the question on whether they preferred to have the course-related e-mail separate from their personal e-mail. The vast majority of the students already had an e-mail account that they were actively using. The account they used most often was the one they tended to use to communicate with their group members and the instructor. WebCT allows students to forward their WebCT e-mail to a different e-mail address should they prefer to receive all of their e-mail at one address; however, it does not allow other e-mail to be forwarded to WebCT e-mail. Thus, students who wanted only a single e-mail system used one outside WebCT as their primary means of communication with other students and the instructor.

It should be expected that students who believed that the WebCT supplement was valuable and improved their learning were the most satisfied with their overall WebCT experience. If students considered the WebCT quizzes to be useful, it is logical for these same students to use the quizzes to help them prepare for class. If they were using the online notes to prepare for the quizzes, it follows that they would also consider the notes useful in preparing for class. It is therefore not surprising that the students who considered the Web-based supplement to be valuable also considered the quizzes to be helpful in preparing for class. As previously mentioned, the industrial technology students were already competent computer users and were thus able to quickly learn WebCT. It follows that the more competent their computer skills, the less likely they were to perceive learning WebCT as a time burden. What is encouraging is that only two students (of the 173 who responded to that particular question), regardless of previous experience or computer competency, indicated that learning and interacting with the WebCT supplement was a problem. In addition, it seems natural to expect that students who found the online notes useful while preparing for class would use the notes in class to facilitate their own note taking. Since the online notes helped them learn the material, it was expected that those who found the online notes useful would be the most satisfied with their overall WebCT experience. Although students’ response to the online notes is rewarding to the authors, an obvious goal for future semesters is to continue to improve the online notes until all the students find them useful and strongly agree that they help in class preparation.

A positive correlation existed between considering the quizzes to be useful in preparing for class and agreeing that access to grade information prompted them to seek assistance from the instructor or other group members. It may simply be that these students were more proactive in their learning and that the quizzes and seeking assistance from others were both viewed as active measures in learning the material. In addition, a positive correlation existed between regarding the WebCT component as valuable and considering it important to have experience using the latest technology applied to their discipline. This is probably due to the fact that the industrial technology students are competent

computer users and consider Web-based instruction as a “technology” process.

Conclusions and Recommendations

Based on work to date and the results of this study, the following conclusions were drawn:

- Industrial technology students at ISU were already prepared and capable of learning WebCT as a supplement to classroom instruction quickly, regardless of previous experience in using Web-based courses or course components.
- Students appreciated the Web-based supplement to *Safety in Manufacturing* and considered it to be a useful and valuable component to the overall delivery of the course material.
- Students considered the online notes and quizzes particularly helpful to their overall experience in *Safety in Manufacturing*.
- Students considered the access to grade information to be a useful component of the WebCT supplement.
- Students accessed the Web-based material from where they had easy access to the Web—departmental computer labs or personal computers at their place of residence.

The authors believe there are opportunities for faculty members to enhance and improve the educational experience for on-campus students through the use of online course components and encourage all instructors to begin to explore these opportunities. Based on the findings of this project, the following recommendations are suggested for further inquiry:

- Studies need to be conducted to explore the relationships between student perceptions and educational outcomes (e.g., here it was found that students perceived that the online quizzes and notes helped

prepare them for class, but the anonymous nature of the questionnaire did not allow for an exploration of whether the use of these online components resulted in improved class performance).

- Studies need to be conducted to evaluate the use of specific online components (e.g., Why did some students put more value on the online notes? How were they using them? How could they be improved? Were students that valued them using them differently than students who placed lower value on them?).
- Similar studies need to be conducted with other types of courses to determine if student perceptions are consistent across technology curricula. The findings of such studies, if tied to student outcomes, may suggest broad-based curricula reform for on-campus technology courses.

In addition to the recommendations above, industrial technology faculty should also consider whether the lessons learned here and in future studies can be applied to asynchronous delivery of hands-on technology curricula that forms the basis of on-campus technology education.

Readers interested in details of this study in tabular form may contact the authors at sfreeman@iasstate.edu.

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References

- The Campus Computing Project. (1999). *The 1999 national survey of information technology in US higher education*. Encino, CA: Author.
- Freeman, S. A., & Embleton, K. M. (2000). Enhancing a residential safety course with the development of an online component: A limited case study. *Journal of Industrial Technology*, 16(4). Retrieved September 11, 2000, from <http://nait.org/jit/Articles/freeman082200.pdf>

- Goldberg, M. W. (1997, June). WebCT and first year computer science: Student reaction to and use of a Web-based resource in first year computer science. In *Proceedings of the 2nd Conference on Integrating Technology into Computer Science Education* (pp. 127-129). New York: ACM Press.
- Goldberg, M. W. (2000, January 18). To lecture or not to lecture. *Online Teaching and Learning Newsletter*, 1(5). Retrieved October 30, 2003, from <http://www.webct.com/OTL/ViewContent?contentID=2339269>
- Henson, A. B., Fridley, K. J., Pollock, D. G., & Brahler, C. J. (2002). Efficacy of interactive Internet-based education in structural timber design. *Journal of Engineering Education*, 91(4), 371-378.
- Marks, B. P. (2002). Web-based readiness assessment quizzes. *Journal of Engineering Education*, 91(1), 97-102.
- Masten, S. J., Chen, K., Graulau, J., Kari, S. L., & Lee, K. (2002). A Web-based and group learning environment for introductory environmental engineering. *Journal of Engineering Education*, 91(1), 69-80.
- Mohtar, R. H., & Engel, B. A. (2000). WWW-based water quality modeling systems to enhance student learning. *Journal of Engineering Education*, 89(1), 89-94.
- National Center for Education Statistics. (2000). *Distance education at postsecondary education institutions: 1997-98* (NCES 2000-013). Washington, DC: U.S. Department of Education.
- Patterson, K. G. (1999). Student perceptions of Internet-based learning tools in environmental engineering education. *Journal of Engineering Education*, 88(3), 295-304.
- Saba, F. (1998, August). Special report: World Wide Web. *Distance Education Report*, pp. 1-6.
- Simonson, M., Smaldino, S., Albright, M., & Zvacek, S. (1999). *Teaching and learning at a distance: Foundations of distance education*. Columbus, OH: Prentice Hall.
- Stith, B. (2000). Web-enhanced lecture course scores big with students and faculty. *T.H.E. Journal*, 27(8), 21-28.
- University of Missouri's WebCT Support Team. (1999). *Student views on WebCT-based courses*. Retrieved December 5, 1999, from http://web.missouri.edu/~muwww/stusurvey_end_fs99.html
- Wallace, D. R., & Weiner, S. T. (1998). How might classroom time be used given WWW-based lectures? *Journal of Engineering Education*, 87(3), 237-248.

