

## Evaluation of Classroom-Based, Web-Enhanced, and Web-Based Distance Learning Nutrition Courses for Undergraduate Nursing

Kathleen M. Buckley, PhD, RN

### ABSTRACT

A traditional classroom-based course was transitioned during three semesters to a Web-enhanced and then a Web-based course. This nutrition course was part of the core curriculum for 58 undergraduate nursing students. Evaluation data were collected and analyzed to compare the effectiveness of the traditional classroom, Web-enhanced, and Web-based courses. Areas of evaluation included midterm and final examination scores and course grades, as well as student self-reports of instructor preparation, instructor-student interaction, testing, course objectives and assignments, textbooks, and strengths and weaknesses of the course. No differences were found in student learning outcomes. Although the Web-based course received the lowest mean course evaluation score, which was significantly different from the scores of the other two instructional methods, the students' qualitative comments revealed both positive and negative aspects of online instruction.

There has been a recent trend toward the replacement of traditional classroom nursing courses with online courses to meet students' needs regarding convenience and easy access to information. Courses offered through the Internet may allow students more flexibility to learn at their own pace as their schedules permit, reduce or eliminate travel time, and provide additional opportunities for reviewing course materials (Billings, 2000; Leasure, Davis, & Thievon, 2000). However, disadvantages of online courses have been reported. One major disadvantage cited by students is their sense of isolation and loss of personal interaction with instructors and peers (Billings, 2000).

To allow students more flexibility in learning and opportunities to improve their computer skills and use of the Internet, the author transitioned a traditional nursing lecture course to an on-campus, Web-enhanced format with online course management tools added, and finally, to a Web-based distance learning course. The transition occurred during three concurrent semesters. With the change in course format, it was important to examine student learning outcomes (i.e., examinations, grades) and perceptions to determine whether appropriate course objectives were being met. Therefore, this study compared the examination scores, course grades, and perceptions of undergraduate nursing students taking a nutrition course via three formats.

### Literature Review

Although many nursing programs have incorporated online instructional

methods, the literature is not entirely decisive on whether these methods are as effective as traditional classroom instruction in terms of student outcomes and perceptions. The answer appears to be complex due to the non-experimental nature of many of the studies. However, the available evidence points to several common themes. Many studies of learning outcomes in nursing distance education report students' learning outcomes using online-mediated courses as comparable to those of students who participate in traditional classroom instruction (Leasure et al., 2000; Woo & Kimmick, 2000; Yucha & Princen, 2000).

Regarding student perceptions, one of the primary advantages of online instruction reported by students has been the convenience and ease of access to information (Ryan, Carlton, & Ali, 1999; Leasure et al., 2000). The ability to effortlessly access, use, and evaluate global health care Internet resources and networks has been a major strength of many online courses. Asynchronous discussions enabled by Web-course learning tools and offered through online bulletin boards also have been lauded for their improved quality and high levels of analysis and critical thinking (Ryan et al., 1999). They provide an opportunity for peers to connect, share information, and collaborate on coursework.

However, instructors and students also have expressed dissatisfaction with online learning. Some lament the absence of visual cues and the inability to view face-to-face, nonverbal aspects of communication (Diekelmann & Schulte, 2000; Reinert & Fryback, 1997). Feelings of isolation with

---

Received: October 30, 2001

Accepted: October 15, 2002

Dr. Buckley is Associate Professor, School of Nursing, Catholic University of America, Washington, DC.

This research was partially supported by the Catholic University of America, School of Nursing research fund.

Address correspondence to Kathleen M. Buckley, PhD, RN, Associate Professor, School of Nursing, Catholic University of America, Washington, DC 20064; e-mail: buckleyk@cua.edu.

reduced opportunities for socialization have been reported as conflicting with students' ability to learn (Ryan et al., 1999). Problems with hardware, software, or Internet connectivity also have caused frustration.

In online classrooms, the student role involves being a self-starter and self-directed in meeting course requirements (Ryan et al., 1999). Students must rapidly become conscious of and at ease with new forms of communication, become skilled at time management, and accept accountability for their own learning. Inquiry learning is a prominent focus of online education. Students are encouraged to research their ideas and engage in discourse. The instructional approach to the course and curriculum shifts from teacher centered to learner centered.

The instructor role also changes in online courses. The instructor is no longer "the sage on the stage" or the conveyor of a limited quantity of information, but rather one who facilitates discovery by students. Internet access allows learners to research sources of information and branch out to related topics. Instructors must facilitate means for students to contact them, as well as interact with other students. When isolated students are tentative to ask questions or participate in discussions, instructors must stimulate interaction. Instructors need to adapt to student learning styles by combining technologies and applications to stimulate group thinking and discussion. One innovative method is the use of case studies in which nursing students are assigned to work in groups to research the material using credible Web sites, respond to questions, and participate in an online discussion of the material (Niederhauser, Bigley, Hale, & Harper, 1999).

## Method

### Research Questions

This descriptive comparative study addressed the following research questions:

- Is there a significant difference among three groups of students experiencing the same course content via different formats (i.e., traditional, Web-enhanced, and Web-based)

regarding examination scores and overall course grades?

- Is there a significant difference in perceptions among three groups of students experiencing the same course content via different formats?

### Course Format

In the traditional course, content was presented in 15 lectures, followed by questions and discussion. In the following semester, the course was supplemented with Internet-based instructional materials. The syllabus, outlines, and assignments were placed online using WebCT, a course management tool, and were readily available to students to access any time of the day with a user-ID and password. A course calendar, e-mail, and bulletin board also were used to support communication between the instructor and students.

During the third semester, 15 modules were developed and offered via the Internet in a Web-based course. Each module consisted of an outline, assignment, quiz, and discussion question posted on the bulletin board. The discussion questions frequently integrated hypertext links to health-related sites, which supplemented the readings and were used by students as reference points. Five chat room, synchronous discussions also were held to facilitate instructor-student interactions. Assignments were administered and collected via the Internet. The syllabus, textbook, and content of the examination questions were identical for all courses, and all three groups had equal access to the course instructor during office hours.

### Sample

The convenience sample included students ( $N = 58$ ) enrolled in three consecutive Nutrition and Health (N257) courses during the 2000 and 2001 academic years in the school of nursing at the Catholic University of America. Students included traditional 4-year baccalaureate degree (BSN) students, students seeking a second degree in an advanced 20-month tract for the BSN program, and RN-to-BSN students.

### Instruments

Student's mastery of course content for all three courses was assessed with midterm and final examinations, which constituted 70% of their final grade. Although the multiple-choice examination questions were consistent across all three courses, the testing technology differed. In the traditional course, the examinations were administered in a paper-and-pencil format, using electronic, scanned grading. Students were able to answer the questions in any order and review and change their answers prior to submission. Students reviewed the corrected midterm examination during the following class. However, there was no opportunity to review the corrected final examination.

In both the Web-enhanced and Web-based courses, the examinations were administered online in a computerized classroom under the supervision of a proctor, for security reasons. The online format was designed to allow 1 minute to answer each question. Questions were presented one at a time and had to be answered in the order they were presented. After students submitted their answer to a question, they were unable to change it. All online examinations were graded instantly on completion, and students were provided with immediate feedback.

Student perceptions were measured on the last day of class using the university's standard course evaluation form. The SUMMA (SUMMA Information Systems, Inc., 2000) is a survey of student opinion and instruction, which is used for teaching evaluation across the United States. It consists of 27 questions regarding students' perceptions of:

- Instructor commitment to student learning.
- Instructor preparation.
- Instructor-student interactions.
- Testing.
- Course objectives.
- Course assignments.
- Textbooks.

In addition, student comments were elicited on the strengths and weaknesses of the course, what they would change, and general remarks.

The SUMMA was administered according to university protocol for all three courses. This required the instructor to distribute the survey and read the instructions aloud, request a student volunteer to collect all forms and return them to the registrar's office, and then vacate the room. No student identifiers were included on the forms. Because the SUMMA forms were confidential, results were tabulated by the campus technology center, and scores were not made available until several weeks after course completion.

Internal consistency reliability of the SUMMA has been established by high correlations between the responses of random pairs of students within classes, among all pairs of students by class, and between the mean responses of each item for equal partitions within classes (SUMMA Information Systems, Inc., 2000). The SUMMA also has been found to be valid for use in instructional development.

The sample was described using measures of central tendency and variance appropriate to the level of measure. To analyze the research questions, a comparison of group differences was conducted using the one-way analysis of variance with post hoc testing (Bonferroni or Dunnett C), depending on homogeneity of variance. The level of significance was set at .05 alpha for all test analyses.

## Results

### Sample

The study sample ( $N = 58$ ) consisted of three groups of students categorized by semester and type of instructional format:

- Group 1: traditional lecture format ( $n = 24$ ).
- Group 2: Web-enhanced format ( $n = 23$ ).
- Group 3: Web-based format ( $n = 11$ ).

The sample consisted primarily of White (76%) students. Ninety-seven percent were women, ranging in age from 18 to 52 (mean = 23). The majority of students were working on their first college degree (93%) and living on or near campus (71%). Group 3 was

half the size of Groups 1 and 2, reflecting a decline in undergraduate enrollment during that semester. One-way ANOVA and chi square were used to test differences in age and place of residence, and no significant differences were found among the groups. However, these results may be reflective of the low number of cases in each group.

For the first research question, no significant differences were found between Groups 1, 2, and 3 on the midterm examination scores ( $F[2,57] = 2.94$ ;  $p = .06$ ), final examination scores ( $F[2,57] = .46$ ;  $p = .62$ ), or course grades ( $F[2,57] = 1.37$ ;  $p = .3$ ). However, for the second research question, there was a statistically significant difference in the SUMMA course evaluation scores for the three groups ( $F[2,80] = 18.53$ ;  $p = .000$ ). The Bonferroni post hoc test showed the Web-based course was significantly different ( $p = .000$ ) from the traditional and Web-enhanced courses. The Web-based course received the lowest average SUMMA scores (mean =  $3.82 \pm .39$ ), followed by the traditional course (mean =  $4.29 \pm .38$ ). The Web-enhanced course received the highest scores (mean =  $4.38 \pm .33$ ).

On review of the students' comments, responses varied depending on the instructional format of the course. For the traditional course, student comments centered on course content, lectures, and discussions. Although students in the Web-enhanced course continued to comment on the course content, the majority of responses centered on use of the new technology. Student responses included:

- I like being able to access the outlines, syllabus, or my grades with the click of a mouse button.
- It was easy to get in touch with [the] instructor through e-mail and the discussion board.
- At first, I hated taking exams on the computer, but it really has helped reduce my nervousness and should better prepare me for taking the board examinations.

Students in the Web-based course were divided in their comments. Five of the 11 students in Group 3 indicated they liked the online format.

Responses included:

- It was convenient to go online whenever my schedule permitted.
- I enjoyed the discussion because each person had something unique to share.
- I think the chat sessions were helpful but need to occur on a regular basis.

The other 6 students in Group 3 described what they liked least about the Web-based course, including:

- I like least that it was completely online. You don't get to know the teacher and vice versa. You don't have the demonstration aspects of having a lecture.
- As much as sitting through a lecture can be boring, this was worse! I hated feeling as though I was on my own to learn this information.
- Part of nursing is developing interpersonal relationships and communication. How are we supposed to get that over the Internet?

### Limitations

One limitation of this study was the instructor/principal investigator (K.M.B.) was not blinded to the instructional format of each class. However, the examinations were all multiple choice, which restricted instructor bias in grading. Although the study was based on a nonprobability convenience sample, which increases the risk of bias, the sample was consistent with the demographic characteristics of the school from which it was taken.

### Discussion

The finding that no difference existed in terms of examination scores or course grades among the three groups, although instructional technology and examination format varied, probably reflects the consistency of course and examination content. Students were able to grasp the content at comparable levels regardless of how they received the materials.

Although no difference in grades was found between groups, there were significant differences in student per-

ceptions, as measured by the SUMMA course evaluations. This may be explained by a closer examination of the student profiles. In this study of primarily traditional younger students living on campus, the convenience of an online course may have been viewed as advantageous but not a necessity. One of the primary advantages of distance education reported in the literature is the convenience of a flexible schedule for students who are older and live a distance from the school. Satisfaction levels for nontraditional students tend to be higher because the distance learning format affords them the opportunity to continue their education at their own convenience.

The finding that the students reported the highest satisfaction ratings with the Web-enhanced course suggests it was not the introduction and use of a Web-based course management tool that contributed to course dissatisfaction. The Web-enhanced course was the most popular format, despite the noticeable stress incurred by the change to taking examinations online. In contrast, students' comments suggested learner characteristics may have played a role in course satisfaction levels. Because students were in an undergraduate program, they may have been more comfortable in passively acquiring information through a predominantly structured learning style more suitable to a traditional format, rather than actively seeking answers on their own. This is consistent with the findings of Leasure et al. (2000), who reported Web-based learning as more suitable for nursing students who are self-directed and tend to avoid procrastination. In addition, all of the students in the Web-based course reported using the format was a new experience. Coping with such a change in accessing information and being more self-directed may have created stress and interfered with students' approval of the learning experience.

Because students had no choice in the instructional format they received, their remarks suggest motivation may have been another factor affecting the differences in course satisfaction. In a

comparative study of undergraduate and graduate nursing students' responses to Web-based education, Thiele, Allen, and Stucky (1999) found that older graduate students found the Web to be more helpful in understanding course content and ideas. The authors suggested older graduate students may be more motivated to study independently and overcome the problems inherent in separation from the instructor.

Student comments also suggest the predominant form of communication in the courses may have contributed to their satisfaction. Students who tend to value immediate feedback and face-to-face interactions with their peers and instructor generally prefer more traditional, classroom-based formats. Face-to-face communication contains nonverbal cues that convey overt, as well as unspoken, meanings, which may contribute to the learning process. However, writing, the primary form of online communication, moves perception from the ear to the eye as the dominant form of language processing. For some students, the less direct form of communication in the Web-based course may have contributed to a sense of isolation and interfered with their desired level of closeness with the instructor with whom they were familiar.

### Conclusion

No differences were found in student outcomes (i.e., examination scores, course grades) between the three course delivery formats. However, differences in students' satisfaction with the course formats were found, with the Web-enhanced format receiving the highest ratings and the Web-based format receiving the lowest ratings. On the basis of student comments, possible sources of student satisfaction include student profiles, learner characteristics, student motivation, and the communication process.

Too often, instructors who are developing curricula become captivated by the latest technology and disregard fundamental issues of learner characteristics and needs. Information

concerning students' preferred learning styles and motivation for learning could be solicited before selecting the form and extent of technology used in a course. Students' needs for structure, instructor interaction, and a feeling of belonging must be addressed in the development of distance learning courses. Further study to determine methods of motivating and stimulating learning in nursing students in other undergraduate and graduate settings is needed to guarantee the best use of online instruction.

### References

- Billings, D.M. (2000). A framework for assessing outcomes and practices in Web-based courses in nursing. *Journal of Nursing Education, 39*, 60-67.
- Diekelmann, N., & Schulte, H.D. (2000). Technology-based distance education and the absence of physical presence. *Journal of Nursing Education, 39*, 51-52.
- Leasure, A.R., Davis, L., & Thievon, S.L. (2000). Comparison of student outcomes and preferences in a traditional vs. World Wide Web-based baccalaureate nursing research course. *Journal of Nursing Education, 39*, 149-154.
- Niederhauser, V.P., Bigley, M.B., Hale, J., & Harper, D. (1999). Cybercasas: An innovation in Internet education. *Journal of Nursing Education, 38*, 415-418.
- Reinert, B.R., & Fryback, P.B. (1997). Distance learning and nursing education. *Journal of Nursing Education, 36*, 421-427.
- Ryan, M., Carlton, K.H., & Ali, N.S. (1999). Evaluation of traditional classroom teaching methods versus course delivery via the World Wide Web. *Journal of Nursing Education, 38*, 272-277.
- SUMMA Information Systems, Inc. (2000). *Student opinion of instruction: Design and validity*. (Available from SUMMA Information Systems, Inc., 111 West Firetower Road, Suite B, Winterville, NC 28590)
- Thiele, J.E., Allen, C., & Stucky, M. (1999). Effects of Web-based instruction on learning behaviors of undergraduate and graduate students. *Nursing and Health Care Perspectives, 20*, 199-203.
- Woo, M.A., & Kimmick, J.V. (2000). Comparison of Internet versus lecture instructional methods for teaching nursing research. *Journal of Professional Nursing, 16*, 132-139.
- Yucha, C., & Princen, T. (2000). Insights learned from teaching pathophysiology on the World Wide Web. *Journal of Nursing Education, 39*, 68-72.

Copyright of Journal of Nursing Education is the property of SLACK Incorporated and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.