INSTRUCTIONAL DESIGN AND ASSESSMENT

Student Perceptions of Online Lectures and *WebCT* in an Introductory Drug Information Course

Maisha Kelly Freeman, PharmD, Robert H. Schrimsher, EdD, and Michael G. Kendrach, PharmD

McWhorter School of Pharmacy, Samford University

Objectives. To determine student perceptions regarding online lectures and quizzes during an introductory drug information course for first-year professional doctor of pharmacy students.

Design. Formal and online lectures, online quizzes, written semester projects, a practice-based examination, a careers in pharmacy exercise, and a final examination were used to deliver the course content and assess performance. A multiple-choice survey instrument was used to evaluate student perceptions of *WebCT* and online lectures.

Assessment. More than 47% of students reported that online lectures helped them learn the material better, 77% reported that lectures would be used to study for the final examination, and 59% reported that they would use *WebCT* lectures for future classes. Approximately 40% of students agreed that online lectures should be used in future courses.

Conclusion. Students reported that *WebCT* was easy to use; however, the majority of students preferred in-class lectures compared to online lectures. A positive correlation was observed for those students who performed well on the online quizzes and those who performed well on the final examination.

Keywords: drug information, Internet, *WebCT*, active learning

INTRODUCTION

As technology advances, an increasing number of pharmacists will be required to incorporate information technology into their daily practices. Online tutorials are becoming common place in a wide variety of settings that include academia and the workplace; therefore, colleges and schools of pharmacy need to embrace the challenges associated with this teaching style. Furthermore, students will have to become more familiar with computerized testing as the North American Pharmacist Licensure Examination (NAPLEX) and many state board examinations are completed via computer only. In addition, many computer systems in pharmacy are becoming more advanced while new drugs are consistently being approved for use. Therefore, technology must be used to allow pharmacists to keep abreast of the new information that they are expected to master.

Several pharmacy school instructors have developed online lectures and/or used the Internet to facilitate student learning.[1-8] In these assessments, student performance was improved and/or no differences with respect to academic performance was observed between classroom and online instruction.[1,3,4,6,8] For example, Erickson et al evaluated 42 third-year pharmacy students' knowledge and ability to assess metered-dose inhaler (MDI) technique via 3 models: after a traditional lecture, Web-based MDI technique tutorial, or no intervention.[3] Although no differences in academic performance were observed between students who completed the Web-based or lecture tutorial ($p = 0.38$), differences with respect to knowledge were observed between the control group and the groups who received additional education related to MDI technique.[3] Similarly, the effectiveness of Internet-based quizzes via *WebCT*, an electronic course management system, and other teaching methods on learning in a first-year professional health systems course were examined. The investigator determined that students who completed more *WebCT* quizzes performed better on examinations compared to other students.[6]

Three drug information courses are required at Samford University, McWhorter School of Pharmacy, in the first-, third-, and fourth-professional years, respectively, of the doctor of pharmacy program. The first-professional year course serves as an introduction to drug information

Corresponding Author: Maisha Kelly Freeman, PharmD, BCPS. Address: Samford University, McWhorter School of Pharmacy, 800 Lakeshore Drive, Birmingham, AL 35229. Tel: 205-726-4175. Fax: 205-726-4012. E-mail: mkelly@samford.edu

and information retrieval skills are emphasized. Students in the third-professional year course are taught literature evaluation skills. The course in the fourth-professional year is a part of the advance practice experience that students must complete prior to graduation. The instructors of the fourth-professional year course emphasize both written and oral communication, literature evaluation, and information retrieval skills.

Throughout the 3-year sequence of drug information courses, students are exposed to a variety of strategies to facilitate the learning process. Students in the first-year course are expected to complete a series of projects that primarily focus on efficient methods to retrieve information within medication references/resources and textbooks, as well as secondary database searching (eg, International Pharmaceutical Abstracts and PubMed).

Due to the repetitiveness of the learning material delivered through lectures and laboratory sessions between and within each year and the availability of *WebCT*, a series of online lectures were developed. The goals of the online lecture series were to help facilitate learning, decrease the amount of time in class devoted to lectures, and increase the time available for laboratory activities in the first-year drug information course. The development of literature searching, problem-solving, writing, and technology skills were emphasized via classroom lectures, laboratory exercises, and online technology. The activities created for the laboratory sessions were designed to mimic practice in community, hospital, and long-term care settings.

The purpose of this study was to determine student perceptions toward utilizing online lectures and *WebCT* in an introductory drug information course. The survey was administered online via *WebCT*. The correlation between online quiz grades and final examination scores were also examined.

DESIGN

Information Systems is a required, 1-credit hour course for first-year professional doctor of pharmacy students. The goal of this course is to prepare students to be effective providers of drug information. "An effective information provider perceives, assesses, and evaluates drug information requests and efficiently retrieves, evaluates, communicates and applies data from published literature and other sources to provide an integral component of pharmaceutical care."[9]

The course structure included the following components: 4 in-class lectures (50 minutes each) with class lecture notes included in the course packet in sequential order of lectures that was available on the first day of class; 5 online lectures, 5 laboratory sessions; and 7 online quizzes. These quizzes were to be completed 1 week following the completion of the online or in-class lecture. Other course assignments included: 2 written semester projects; a presentation on careers in pharmacy in which students were assigned 1 of 8 careers and presented a skit of a pharmacist interaction with a patient and the necessary educational requirements to complete before entering the specialty; and a practice-based examination in which students were expected to answer a tertiary and secondary literature question within 20 minutes with the available print and electronic references. A final examination was administered at the completion of the course. All written semester projects were submitted electronically via *WebCT*.

Four online lectures were prepared using *Macromedia Captivate Education Version* (Macromedia, Lindon, UT, 2005) that allowed *PowerPoint* presentations and Internet Web pages to be imported into the software for interactive simulations of course content. The *Captivate* software was used in the following lectures: Tertiary Literature; Secondary Literature/International Pharmaceutical Abstracts (IPA); PubMed; Samford University Drug Information Center Web pages; Davis Library online catalog system; and Internet sources. Students were able to access online lecture content anywhere there was Internet connectivity; however, students were encouraged to view the lectures at a designated campus site (eg, Drug Information Center, University library). A descriptive, oral narration was provided for all lectures except those on *PubMed*, Samford University Drug Information Center Web pages, and Davis Library online catalog system. These lectures were supplemented with written, descriptive captions. Students were able to view simulations of tertiary literature searches to assist them in locating information for Internet-based resources including *Lexi-Comp, Drug Facts and Comparisons,* and *Clinical Pharmacology*. Students were also provided with examples regarding the appropriate searching techniques for *PubMed* and *IPA*. In addition, the Internet-based lectures allowed students to observe important characteristics of medically related web sites.

Online lectures were available on the first day of class and students had the ability to view these lectures at their convenience throughout the semester. Students were informed that lectures could not be viewed without high-speed Internet connectivity. No in-class lectures were scheduled during the weeks students were required to listen to online lectures so the students could have a designated time to view the lectures. Headphones were available for check out, free of charge, in the Samford Drug Information Center or campus library for listening to lectures. Most lectures were approximately 1 hour in length

or less. Only students enrolled in *Information Systems* had access to online lectures. A set of 3 practice questions was imported into the Captivate lecture. Students had 3 attempts to answer each question correctly. If the question was answered incorrectly, the lecture was shifted to the subject matter in which the student was experiencing difficulty. Multiple-choice questions incorporated in the *Captivate* lectures were included in the *WebCT* quiz questions.

Seven, multiple-choice *WebCT* quizzes were developed to facilitate student learning. Quiz material was developed from examinations administered in previous years. All students were expected to complete the quizzes within the time allotted (eg, 15 minutes for a 10-question quiz). Quizzes for the week were released at the beginning of the week (ie, Monday) and had to be completed by 11:00 PM Friday of the same week. To ensure that students were comfortable answering questions via *WebCT*, an introductory survey instrument was developed in *WebCT* in which students were expected to communicate pertinent information about themselves to the instructor. Students were invited to ask questions about the proper way to submit quizzes via a session acquainting them with *WebCT*, but further explanation was declined by the students.

The quizzes consisted of 10 questions for most lectures; however, 15 questions were administered for *IPA* and *PubMed* lectures. The time restriction for all quizzes was 15 and 20 minutes, respectively. When students took the quiz, only 1 question at a time was visible. In addition, all answer choices were scrambled with each quiz that was administered. Quizzes were graded upon completion; however, quiz grades and feedback were not provided until all quizzes for the week had been submitted. Along with their score, students could view questions they answered correctly or incorrectly. An explanation of why an answer was correct or incorrect was included. Students had access to quiz questions and answers after all quizzes were submitted and graded. A copy of the quiz completion schedule was included in the syllabus and *WebCT* alerted students when a quiz was to be completed. Only students enrolled in *Information Systems* had access to online quizzes.

Course grades were earned from student performance on quizzes (20%), written project 1 (10%), written project 2 (15%), practice-based examination (15%), careers in pharmacy presentation (10%), final examination (cumulative, 25%), and professionalism/participation (5%). Pearson correlation coefficients between quiz and final examination grades were analyzed via *SPSS* 12.0.

All students were asked to complete an online survey instrument to assess the use of online lectures and *WebCT*

over the semester. All statistical analyses were performed via *SPSS* 12.0. Samford University Institutional Review Board approved this study.

RESULTS

During the fall semester of 2005, 124 students were enrolled in the *Information Systems* course. Students were asked to voluntarily assess the use of online lectures and *WebCT* over the semester. Students answered questions related to *WebCT* and online lectures via a 5-point Likert scale (1-strongly agree to 5-strongly disagree). A total of 109 (87.9%) students completed the survey instrument. The majority were female (73.4%) and 80.7% were 20-24 years of age. Approximately 45% of students reported previously completing between 1-2 courses that utilized online quizzes or lectures. Greater than 97% of students agreed that they were computer literate. The most frequently reported locations for viewing online lectures were off campus (68.8%; eg, home) and the fewest number of respondents viewed lectures at an on-campus site other than the School of Pharmacy.

Table 1 lists selected questions from the survey instrument that were used to assess student perception of online lectures. Overall, the majority of responders did not have difficulty comprehending either the combined audio/video lectures or video-only lectures (66.1% vs. 46.8%; respectively $p < 0.05$). Greater than 70% of students preferred the combined audio/video lectures compared to the video-only lectures with written captions. More than 47% of students felt that online lectures helped them learn the material better, 77% reported that they would use the lectures to study for the final examination, and 59% reported that they would use *WebCT* lectures from the course to reinforce information presented in future pharmacy classes, if needed. Only 37.6% and 34% of students, respectively, felt that they could appropriately search *IPA* and *PubMed* after completing online lectures. Approximately 30% preferred online lectures to live lectures and 54% did not. A total of 44 (40.4%) students agreed that the instructor should continue to use online lectures to deliver course material; however, 34.8% of the students disagreed with this statement.

Student perceptions regarding overall ease of use of *WebCT* during the course were positive (see Table 2). The majority of respondents agreed that submission confirmations via *WebCT* were received in a timely manner, the overall process for submission of assigned tasks were user friendly, *WebCT* was easy to use, and they preferred the accessibility of viewing *WebCT* lectures any time of the day or night.

The mean score ($\pm$SD) that students earned on online quizzes was 90.8 $\pm$ 10.3 and the mean score earned on

Table 1. Perceptions of First-Year Pharmacy Students Regarding the Use of Online Lectures in an Introductory Drug Information Course (N = 109)

Question	Strongly Agree, No. (%)	Somewhat Agree, No. (%)	Neither Agree nor Disagree, No. (%)	Somewhat Disagree, No. (%)	Strongly Disagree, No. (%)
I did not have difficulty following the combined audio/video lectures	23 (21.1)	49 (45)	11 (10.1)	17 (15.6)	8 (7.3)
I did not have a difficult time following the video-only lectures with written captions	16 (14.7)	35 (32.1)	16 (14.7)	31 (28.4)	11 (10.1)
I prefer the audio/video presentations more than the video-only presentations	56 (51.4)	21 (19.3)	18 (16.5)	10 (9.2)	4 (3.7)
Online lectures helped me learn the subject matter	7 (6.4)	45 (41.3)	13 (11.9)	22 (20.2)	22 (20.2)
I feel that I can appropriately search IPA after completing the online lectures	5 (4.6)	36 (33)	15 (13.8)	35 (32.1)	18 (16.5)
I feel that I can appropriately search PubMed after completing the online lectures	4 (3.7)	33 (30.3)	25 (22.9)	28 (25.7)	19 (17.4)
I prefer online lectures to live lectures	16 (14.7)	16 (14.7)	18 (16.5)	24 (22)	35 (32.1)
I will view the online lectures again to help me prepare for the final exam	40 (36.7)	44 (40.4)	11 (10.1)	6 (5.5)	8 (7.3)
I recommend that more instructors use WebCT to deliver online lectures	6 (5.5)	16 (14.7)	23 (21.1)	31 (28.4)	33 (30.3)
I will use WebCT lectures from PHRD 303* to refresh my memory of the material for other classes, if needed, while in pharmacy school	16 (14.7)	48 (44.0)	27 (24.8)	11 (10.1)	7 (6.4)
The instructor should continue to use online lectures to deliver material in future classes	18 (16.5)	26 (23.9)	27 (24.8)	19 (17.4)	19 (17.4)

*PHRD 303 is the course number for *Information Systems*

the final examination was 79.8 ± 8.9. The Pearson *r* correlation between the scores students earned on online quizzes and overall examination scores was significant: $r = 0.321$ ($p < 0.01$). This indicates a positive correlation between the scores earned for completing online quizzes and examination scores. Students who performed better on the quizzes also performed well on the final examination.

A total of 36 comments were submitted regarding *WebCT* and online lectures. The majority of the students who commented stated that live lectures were more beneficial than online lectures (11 students); however, 6 students said they "liked" online lectures and 5 students commented that they "liked" *WebCT*. Other comments included *WebCT* was easy to use (2 students); the online

lectures consumed too much time (1 student); the online lecture files were too large (1 student); quizzes were difficult (1 student); online lectures were boring (1 student); and video-only lectures were not helpful (2 students). Three students expressed displeasure with online lectures because they felt they could not ask questions. Two students wanted to be able to view the online lectures sooner.

DISCUSSION

Online lectures were integrated in an introductory drug information course to allow more active learning via laboratory activities within the course. The results of the survey indicated that students enjoyed using *WebCT*

Table 2. Pharmacy Students' Perceptions Regarding the Use of *WebCT* in an Introductory Drug Information Course (N = 109)

Question	Strongly Agree, No. (%)	Somewhat Agree, No. (%)	Neither Agree nor Disagree, No. (%)	Somewhat Disagree, No. (%)	Strongly Disagree, No. (%)
WebCT assignment confirmations are received in a timely manner after uploading projects	66 (60.6)	24 (22)	17 (15.6)	2 (1.8)	0
The due dates and deadlines for WebCT projects are clear to me	79 (72.5)	24 (22)	1 (0.9)	4 (3.7)	1 (0.9)
Overall, the process used for submitting assigned tasks (eg, projects, quizzes) is easy (eg, user friendly)	36 (33)	57 (52.3)	11 (10.1)	3 (2.8)	1 (0.9)
WebCT is easy to use	49 (45)	48 (44)	9 (8.3)	3 (2.8)	0
The university/school computers consistently allows me to access course components in WebCT	56 (51.4)	41 (37.6)	11 (10.1)	1 (0.9)	0
My home computer consistently allows me to access course components in WebCT	61 (56)	36 (33)	4 (3.7)	2 (1.8)	5 (4.6)
I like the accessibility of viewing WebCT lectures any time of the day or night	64 (58.7)	31 (28.4)	9 (8.3)	2 (1.8)	3 (2.8)
I enjoyed using WebCT	24 (22)	44 (40.4)	26 (23.9)	9 (8.3)	6 (5.5)

(62.4%) and preferred having the ability to view *WebCT* lectures any time of the day or night (87.1%). Students agreed that they did not have difficulty following content present in the audio/video lectures, but they were less accepting of video-only lectures with written captions. Approximately 48% of students felt that online lectures helped them learn the subject matter; however, fewer students, 37.6% and 34%, respectively, felt they could appropriately search *IPA* or *PubMed*. An overwhelming amount (77.1%) of students reported that they would view the online lectures again to help them prepare for the final examination, which is more than those who felt that listening to the online lectures contributed to their learning. One possible explanation is that the students did not listen to the online lectures as assigned and felt they needed to view the lectures prior to the examination to perform better. For the most part, students did not feel that more instructors should use *WebCT* to deliver online lectures. Students were less clear about whether the online lectures should be continued in this course. Approximately 40% of students felt that online lectures should be used in future classes; however, 35% felt that online lectures should not be used. Students may not have appreciated online lectures for *IPA* and *PubMed* as indicated by 48.6% and

43.1%, respectively, of students disagreeing that they learned the material from the online lectures well enough to search databases in the future; however, this value may be more of a reflection of students (54%) not preferring online lectures. Furthermore, if students did not prefer online lectures, they may have responded in the same manner about any material presented via this technology. Although the majority of responders were female students (73.4%) and 66% of the class is female, it is unclear whether the results would have been different if more male students had responded to the survey.

Overall, there were no significant correlations between the number of courses in which students had been enrolled that utilized online quizzes or lectures and the students' agreement that online lectures should be used to deliver material in future classes ($p = 0.905$). Approximately 92% of students completed all of the quizzes for the *Information Systems* course and there was a positive correlation between academic performance on online quizzes and final examination scores. One possible explanation is that students may have had access to previously administered examinations, as most students performed better on quizzes delivered early in the semester than on those given later. The content on the latter quizzes was

derived from the final examination from the previous year, which students did not have access to before completing the online quizzes. The students may have gained access to the information on the quizzes administered in previous examinations from former students. Although questions and answer choices were randomized to discourage cheating, students may have shared answers and that could have made a positive impact on their online quiz score. In addition, some students may have used lecture notes to assist them in answering online quiz questions.

Some discontent with online lectures was identified. Revisions to the methods of delivery and selected other items need to be incorporated for future use. Possible actions for future classes include the following: all lectures will have narrated voiceovers to convey pertinent information; more exercises will be available to allow the students to simulate the material they have learned throughout the online lectures; students will be responsible for completing the simulations before they are allowed to view the remainder of the lectures; students will be encouraged to work individually on online lectures as it will be easier to record their time spent completing online lectures for use in developing course content; and additional time will be given to complete online quizzes. Hopefully as technology becomes more common in the workplace for learning new daily operational procedures and for post-graduation requirements (eg, continuing education), students will be more accepting to this online instructional teaching method.

Distance education is becoming increasingly popular in pharmacy as more colleges and schools of pharmacy are founded and more pharmacists are completing the requirements for a doctor of pharmacy degree. Online lectures serve as a unique way of uniformly delivering information to all students, reducing inconsistencies with learning experiences, delivering material to larger groups of students, offering learning flexibility to students with part-time jobs or other needs, actively engaging the learner, decreasing the need for printed handouts, monitoring learning more effectively, and increasing students' accountability by having an electronic trail of accessed lectures.[5,10] Potential disadvantages to this type of learning include the amount of time required to prepare lectures, students' sense of isolation from the instructor, "screen fatigue," computer malfunctions (eg, crashes, long load times, etc),[5] and inability to have immediate answers to questions that may arise when students are viewing lectures.

Investigators of several studies have examined the benefits of using Web-based education in medicine and nursing.[10-16] The majority of experience with interactive, Web-based education is present in graduate nursing education literature. In these studies, graduate student nurses reported that the benefits of online courses with respect to flexibility outweighed the disadvantages of online courses.[11,15,16] Another study evaluated the perceptions of undergraduate and graduate nursing students regarding Web-based courses.[12] Five hundred fifty-eight students (328 undergraduate students; 230 graduate students) from 6 schools of nursing were eligible for the survey. No differences between the groups were observed for the use of technology (eg, the availability and reliability of technology). Several differences were observed regarding educational practice among graduate and undergraduate students. Undergraduate students perceived a greater need for student-faculty interaction compared to the graduate students ($p = 0.01$). In addition, graduate students anticipated a greater time commitment for studying Web-based courses than undergraduate students. Overall, students did not feel they were at a disadvantage because of inadequate computer skills.

The student perceptions of *WebCT* in the introductory drug information course were positive; however, perceptions about online lectures were less favorable. Possible explanations related to unfavorable thoughts about online lectures include: students may not have anticipated the amount of time required outside of the classroom to prepare for class; students transitioning from undergraduate training may have required more contact with a faculty member; and students may have been more accustomed to passive learning instead of being an active participant in the learning process.

Interactive lectures are becoming increasingly popular as training tools for new pharmacists. Several community pharmacies have advertised state-of-the-art prescription systems that require completion of an extensive CD-ROM based training program.[7] Students need to become familiar with this type of learning system before starting practice. As more students are exposed to this technology, overall perceptions of online lectures may improve. In addition, students may become more accustomed to using this technology as the pharmacist shortage increases and new techniques to attract students to pharmacy schools from remote locations are developed.

Limitations

Although academic dishonesty was discouraged through random assigning of answer choices and the ability to view only 1 question at a time, students may have shared answers or conferred with other students after completing the online quizzes and that could have falsely elevated grades for online quizzes. However, since a positive correlation between higher online quiz scores and higher final examination scores were observed, academic dishonesty may be unlikely.

CONCLUSIONS

Examination scores and final course grades indicate that first-professional year pharmacy students are capable of comprehending and retaining the content of lectures administered online. In addition, students have a positive perception of *WebCT* in regards to accessing the learning materials using both on- and off-campus computer terminals, flexibility in accessing the materials, and clarity in the feedback addressing performance. Students preferred an audio/video lecture format over a video-only format with written captions that had to be read.

REFERENCES

1. Crouch M. Using the internet to facilitate student learning in a large therapeutics course: A three-year perspective. *Am J Pharm Educ.* 2001;65:7-13.

2. Klockars SJ, Blair MM, Mazur JN, Ragucci KR, Fermo J. Assessment of web-based applications for ambulatory care rotations. *Ann Pharmacother.* 2003;37:1785-8.

3. Erickson SR, Chang A, Johnson CE, Gruppen LD. Lecture versus Web tutorial for pharmacy students' learning of MDI technique. *Ann Pharmacother.* 2003;37:500-5.

4. Stone VL, Bongiorno R, Hinegardner PG, Williams MA. Delivery of Web-based instruction using *Blackboard*: a collaborative project. *J Med Libr Assoc.* 2004;92:375-7.

5. Andrew M. Use of web-based learning to teach pharmacy undergraduates. *Pharmaceut J.* 2000;265:558-62.

6. Franic DM. Promoting learning in a health care systems course by multiple teaching methods including internet-based quizzes. *Am J Pharm Educ.* 2004;68:Article 119.

7. Willett K BA. Development and assessment of an online elective toxicology course. *Am J Pharm Educ.* 2004;68:Article 57.

8. Delafuente J. Traditional lecture format compared to computer-assisted instruction in pharmacy calculations. *Am J Pharm Educ.* 1998;62:62-6.

9. Troutman W. Consensus-derived objectives for drug information education. *Drug Inf J.* 1994;28:791-6.

10. Leong SL, Baldwin CD, Usatine RP, Adelman AM, Gjerde CL. Web-based education in family medicine predoctoral programs. *Fam Med.* 2000;32:696-700.

11. Bata-Jones B, Avery MD. Teaching pharmacology to graduate nursing students: evaluation and comparison of Web-based and face-to-face methods. *J Nurs Educ.* 2004;43:185-9.

12. Billings DM, Skiba DJ, Connors HR. Best practices in Web-based courses: generational differences across undergraduate and graduate nursing students. *J Prof Nurs.* 2005;21:126-33.

13. Buckley KM. Evaluation of classroom-based, Web-enhanced, and Web-based distance learning nutrition courses for undergraduate nursing. *J Nurs Educ.* 2003;42:367-70.

14. Burgess G, Holt A, Agius R. Preference of distance learning methods among post-graduate occupational physicians and hygienists. *Occup Med.* 2005;55:312-8.

15. Huckstadt A, Hayes K. Evaluation of interactive online courses for advanced practice nurses. *J Am Acad Nurse Pract.* 2005;17:85-9.

16. McAlpine H, Lockerbie L, Ramsay D, Beaman S. Evaluating a Web-based graduate level nursing ethics course: thumbs up or thumbs down? *J Contin Educ Nurs.* 2002;33:12-8.

17. Walgreens. Careers: Technological leadership. Available at: http://www.walgreens.com/about/careers/pharmacy/technology.jsp. Accessed December 13, 2005.