

TEACHERS' TOPICS

Students' Perceptions and Satisfaction With a Web-Based Human Nutrition Course

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Objectives. To assess the perceptions and satisfaction of third-year pharmacy students with a Web-based, distance-learning course, *Principles of Human Nutrition*, and describe the challenges faculty members encountered while implementing the course.

Design. The human nutrition course was redesigned from a traditional classroom-based format to a Web-based format. Precourse and postcourse surveys were administered to 2 consecutive classes of 120 students.

Assessment. Students gave positive feedback regarding the Web-based format and especially appreciated the flexibility the course offered. Students recommended that a hybrid Web-based/classroom-based course be developed instead of a Web-based only course.

Conclusion. A Web-based format was used to effectively deliver a course in human nutrition to third-year pharmacy students; however, implementation of the course revealed several challenges that will need to be addressed before additional Web-based courses can be added.

Keywords: Web-based, distance learning, online learning, Internet, nutrition

INTRODUCTION

The Internet has become an integral part of our daily lives and many students clamor for Web-based courses that offer them flexibility that fits their lifestyles.^{1,2} Web-based learning in pharmacy education comprises educational strategies that use the Internet and can include tutorials, online discussion groups, or the use of virtual patients.² Online tutorials, though similar to face-to-face lectures, can be enhanced by multimedia features such as sound, graphics, video, and animation. In online discussion groups, the lecturer, called the facilitator, facilitates online discussion. Facilitators provide rules and boundaries, and students communicate either asynchronously (delay between sending messages and receiving responses) or synchronously (live). Virtual patients are computer-based patient simulations. Students glean information from the virtual patient such as medical or medication history, chief complaint, or physical examination findings. Students can also order laboratory tests or initiate pharmacological or non-pharmacological therapy for the patient. Recent research and learning theory has

provided enough evidence to suggest that innovative learning environments with the Internet can provide useful features not available in the traditional classroom; however, in terms of learning/education, it is the quality of instruction rather than the capabilities of the technology that is most important.³ Advantages of Web-based courses include flexibility in participation, ease of accessing tutorials or updating materials and documenting evaluations and assessments.² Despite all the benefits of Web-based learning, there are several negative aspects that may be encountered, including social isolation as the student studies alone, faculty members not providing individualized instruction for specific learning needs, cost, technical problems, poor instructional design, and the use of technology for entertainment rather than education.^{1,2} The literature describes additional barriers that faculty members may encounter when re-designing a traditional classroom lecture into a Web-based curriculum, including additional time needed for course preparation; excessive one-on-one faculty-student communication (eg, e-mails, telephone calls, etc); and lack of technical expertise needed to design quality instructional/curricular components.^{1,2} The latter barrier particularly may be a problem because students expect and demand a high level of quality from Web-based courses, and faculty members are responsible for developing quality Web-based courses that stimulate students' learning experiences.⁴

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The University of Maryland School of Pharmacy provides fewer than half of the pharmacists needed in the state of Maryland; thus, stakeholders are asking for expanded pharmacy student enrollment. The current physical facilities do not allow for increased enrollment on campus. To address this critical issue, the school started to explore innovative ways to deliver its curriculum through Web-based or distance learning options. *Principles of Human Nutrition*, a required didactic one-credit course for third-year pharmacy students, was redesigned into a Web-based distance-learning course from traditional delivery. The objectives of this study were to assess the perceptions and satisfaction of third-year pharmacy students toward a Web-based, distance-learning course, *Principles of Human Nutrition*, and describe the challenges the faculty members encountered while implementing the Web-based distance-learning course.

DESIGN

The human nutrition course was designed to emphasize the basic principles of medical nutrition therapy (MNT) and the role of the pharmacist in nutrition, and provide an introduction to adult and pediatric parenteral and enteral nutritional support. The role of the pharmacist in nutrition was stressed throughout the course as students were informed that (1) community pharmacists are inundated with questions on nutrition and weight loss due to patients' easy access to them as first-line/frontline health care professionals, and (2) consumers pay millions of dollars yearly for weight-loss products so pharmacists need to provide evidence-based information to answer their questions. Students also learned that in the hospital and acute care setting, nutrition support pharmacists and dietitians coordinate the nutrition care of patients. The terminal performance outcomes for this course included the following:

- (1) Calculate a patient's body mass index and waist to hip ratio and assess biochemical markers to evaluate their nutritional status;
- (2) Given an ambulatory patient case, evaluate a patient with chronic medical conditions, nutritional deficiencies, or obesity and recommend medical nutrition therapy to promote health, wellness, and cardiovascular benefits;
- (3) Given a patient case, recommend medical nutrition therapy for patients at various life cycles to achieve health and wellness;
- (4) Given a prescriber's orders, design and monitor parenteral and enteral nutrition therapeutic regimens for neonatal, pediatric, and adult patients based on nutritional needs to promote health and healing.

Students were required to have a high-speed Internet connection to access the Blackboard Learning System, which is a software application and learning management system that facilitates classroom instruction. All students had received Blackboard training in their first year of pharmacy school.

The course consisted of online tutorials specifically for adult and pediatric total parenteral nutrition (TPN). Students were given a self-study, step-by-step tutorial on calculating TPN orders in patients with various progressive acute and chronic complications. In addition, students could view 1-hour traditional videotaped lectures that had been uploaded to softTV.ShowAndTell PowerPoint. Figure 1 shows a snapshot of the program. The lectures served to clarify difficult concepts and helped students develop problem-solving skills. The content of these lectures was directly related to the online tutorials. However, they were short and intentionally omitted details to encourage self-study. Students were instructed to use other literature sources to find the missing information.

An interdisciplinary team of faculty members consisting of a registered nutritionist, board-certified nutrition-support pharmacists, and a certified diabetes educator served as facilitators and role models for the course. All facilitators used real-life patient case scenarios along with their practical experiences to provide authentic contexts for learning. Students had access to the facilitators via e-mail, telephone, and online discussion boards.

Students engaged in group discussions using the online discussion groups on Blackboard Learning System. Each topic had a separate online section created for discussion. The forum was used for group problem-solving on assignments, evaluating the literature, and discussing the tutorials. As an incentive, 5-bonus points were assigned to any student responding to a peer's question with supporting data. Students could receive a maximum of 10 bonus points for the course. Students received weekly assignments. With the guidance of the registered nutritionists, students used online nutrition calculators, guides, and programs to develop medical nutrition plans for select patients. In addition, they completed generic hospital parenteral forms for calculating accurate dosages for TPN admixtures online.

Students were given 6 case-based assignments to complete that were worth 70% of the final grade. Assignments were released from the Blackboard Learning System at a preprogrammed time and students had 1 week to complete each assignment. The ability to submit assignments online was automatically discontinued after the deadline passed for each assignment. Students who turned

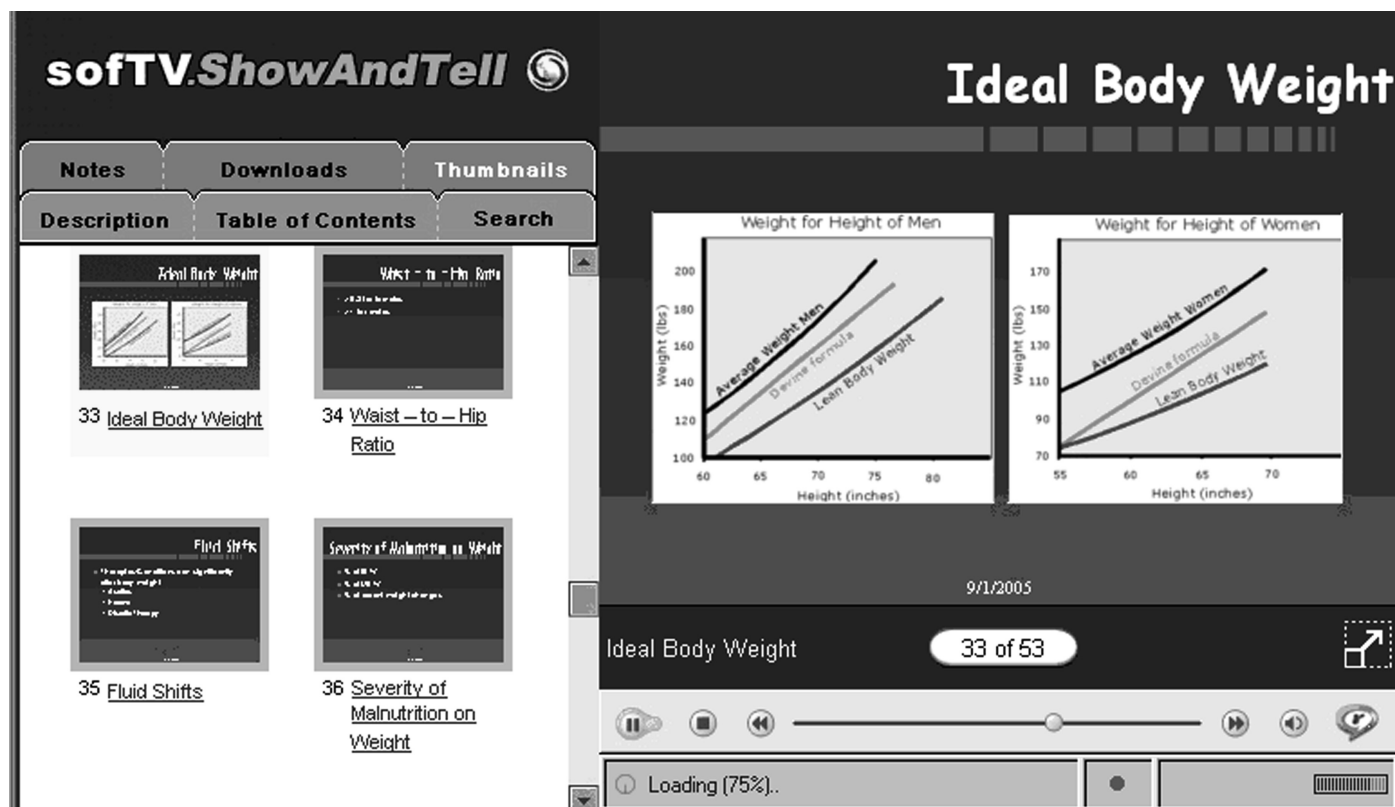


Figure 1. Screenshots of sofTV.ShowAndTell. Reprinted with permission of Xstream Software, Inc, Ottawa, Ontario, Canada.

in assignments after the deadline were penalized 25% per each day late.

Students were only required to attend class on the first day for an introduction to the course and the online format, which was facilitated both by the course master and the instructional technology specialist. During the semester, there were 2 in-class TPN calculation workshops, but attendance was not mandatory. All grades were posted in a timely fashion so that students received prompt feedback. Students were required to complete an online final examination independently and submit it online. The Web-based format of the course did not allow faculty members to monitor students' academic integrity in traditional terms; however, students were informed of the University's standards and expected to uphold them. All grades and scores were posted using the Blackboard Learning System to maintain confidentiality.

An instructional technology (IT) specialist was assigned to assist with the course, as this was the first distance-learning course offered at the School and the first time the SoftTV PowerPoint software was initiated. Prior to the introduction of the course, the IT specialist spent a significant amount of time learning how to publish the recorded lectures, teaching lecturers how to record their lectures, and troubleshooting any technological prob-

lems. When the course began, the IT specialist guided students through tutorials to ensure they were comfortable with accessing and downloading lectures and tutorials, submitting comments on the online discussion boards, and submitting examinations.

A precourse and postcourse survey was administered to students. Questions on the precourse survey instrument sought to determine students' prior experiences with distance learning and determine their perceptions on the impact of the course on their grades and flexibility. Demographic information was also elicited. Postcourse survey questions sought to determine their perceptions and satisfaction regarding the flexibility with their life responsibilities and whether it was a great idea to continue the Web-based format.

The survey instrument, which was administered by an Internet survey tool, was pilot tested with 5 pharmacists who offered recommendations for deleting 2 questions and clarifying 3 questions. The time commitment to complete the survey instrument was approximately 5 minutes. Since we wanted to collect data on students' perceptions of the course, an IRB application was submitted to the University of Maryland Institutional Review Board prior to the initiation of the course and received exempt status.

ASSESSMENT

One hundred forty-eight of 240 students responded to the precourse survey (62% response rate) and 124 responded to the postcourse survey (53% response rate). Sixty-nine percent of the respondents were female and 31% were male. Forty-three percent were less than 25 years old, 42% between 25 and 30 years, and 20% were over 31 years old. Prior to entering the PharmD program, 69% had a bachelor's degree, 7% had a graduate degree, and 24% had less than 4 years of college with no degree. Forty-eight percent of the students had no prior experience with Web-based courses, while 52% had some experience with Web-based courses (Table 1).

In the precourse survey, most students strongly agreed or agreed that they were comfortable accessing course information (94%), downloading audio presentations (64%), posting questions (74%) and submitting assignments (86%) using the Blackboard Learning System. However, 26% remained neutral on the question about their comfort with audio downloads and 19% remained neutral about their comfort with submitting assignments.

Most students also strongly agreed or agreed that they were skillful at accessing course information (95%), downloading audio presentations (68%), posting ques-

tions (80%), and submitting assignments using the Blackboard Learning System (90%). Twenty percent of students remained neutral about their skills in downloading audio presentation and 14% remained neutral about their skills in posting questions on the Blackboard Learning system.

Eighty-seven percent of students agreed or strongly agreed that flexibility in a course was very important to them and 80% of students would support the relevance of a Web-based course if it improved their flexibility. However, only 48% would support the relevance of the course regardless of whether it improved their flexibility. Thirty percent of students remained neutral on supporting the relevance of a Web-based course regardless of whether it improved their flexibility (Table 2).

In the postcourse survey, 83% of students agreed or strongly agreed that the course provided flexibility with regard to their life responsibilities (work, studies, travel, housework, and family life), but 12% disagreed or strongly disagreed. Fifty-five percent of students agreed or strongly agreed that it was more difficult to understand the course content with Web-based lectures as opposed to traditional lectures, while 34% disagreed or strongly disagreed and 11% remained neutral. Fifty-two percent of students agreed or strongly agreed that a Web-based

Table 1. Participant Demographics (n=148)

Variable	No. (%)
Gender ^a	
Male	43 (31)
Female	94 (69)
Age ^a	
<25 years	59 (43)
25-30 years	58 (42)
31-35 years	13 (10)
>35 years	7 (5)
Educational level prior to entering the PharmD program ^a	
<2 years of college	2 (1)
2-4 years of college (with no degrees)	31 (23)
Bachelor's degree	93 (69)
Graduate degree (eg, Masters, Law, PhD, MD, JD, etc)	10 (7)
Other	1 (1)
Experience with Web-based courses ^a	
I have had a previous experience with exclusive course lectures on the web and no face-to-face interactions with the lecturer	44 (31)
I have had a previous experience with exclusive course lectures on the web and at least 1 face-to-face interaction with the lecturer	11 (8)
I have had a previous experience with a course consisting of a mixture of Web-based lectures and traditional lectures and some face-to-face interactions with the lecturer.	18 (13)
I have had no previous experience with distance learning courses	68 (48)
Other	1 (1)

^aThe number of responses was not equal to the total sample size due to missing data

Table 2. Support for a Web-based Human Nutrition Course, % (N=142)

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Flexibility in a course is very important to me	48	39	10	4	0
I support the relevance of a Web-based Nutrition course if it improves my flexibility	44	36	13	5	1
I support the relevance of a Web-based Nutrition course whether it improves my flexibility or not	21	27	30	16	6

course was a great idea for the *Principles of Human Nutrition* course, 12% remained neutral, and 37% disagreed or strongly disagreed.

Forty-eight percent agreed or strongly agreed that Web-based lectures should be implemented over traditional delivery for select didactic courses, while 35% disagreed or strongly disagreed, and 17% remained neutral. In contrast, only 19% agreed or strongly agreed that Web-based lectures should replace traditional delivery for all didactic courses, while 70% disagreed or strongly disagreed and 12% remained neutral. A minority of students (13%) agreed or strongly agreed that the University of Maryland should consider switching to all Web-based courses, 77% disagreed or strongly disagreed, and 10% remained neutral. As a tool for enrollment, only 38% of students agreed or strongly agreed that the school should use Web-based lectures, 48% disagreed or strongly disagreed, and 14% remained neutral (Table 3).

In terms of the course terminal performance outcomes, the students' course evaluations revealed that, in the first year, 66% of the students agreed or strongly agreed that they had mastered the stated course goals/expected outcomes, while 30% disagreed or strongly disagreed and 4% did not respond. Only 58% of the class (70/

120) responded to the course evaluation, as it was not mandatory. For the second year, only 58 of 120 students (48% of the class) completed course evaluations, and 43% of the class agreed or strongly agreed that they had mastered the stated course goals and expected outcomes, while 57% disagreed or strongly disagreed. In the third year, course evaluations became mandatory and 100% of students (121/121) completed them. Eighty-six percent agreed or strongly agreed that they had mastered the stated course goals/expected outcomes, while only 14% disagreed or strongly disagreed.

Some of the written comments submitted by students on the evaluations included: "I really liked the online feature of the course. It gave me the freedom to learn the material at my own pace. I believe that I learned as much by this Web-based course as I would in class." "I loved this class. This was the best class ever because of the online aspect of it, which allowed me to study more."

For the first year, an excessive number of e-mails were exchanged between students and faculty members. The course master documented at least 10-15 e-mails daily from students with regard to assignment and lecture clarifications, whether they were going out of town, needed to set up an office visit, etc. The coursemaster

Table 3. Satisfaction with the Web-based Human Nutrition Course and Support for Web-based Courses in General, % (N = 120)

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The course provided flexibility with my life responsibilities (work, studies, travel, housework, and family life).	40	43	5	8	4
It was more difficult to understand the course content with Web-based lectures as opposed to traditional classroom lectures.	31	24	11	24	10
I believe a Web-based course is a great idea for <i>Principles of Human Nutrition</i>	24	28	12	21	16
Web-based lectures should be implemented over traditional delivery for select didactic courses.	19	29	17	19	16
Web-based lectures should be implemented over traditional delivery for all didactic courses	8	11	12	26	44
The University of Maryland School of Pharmacy should consider switching to all Web-based lectures	5	8	10	26	51
Web-based lectures can be used as a tool to increase enrollment at the University of Maryland School of Pharmacy	16	22	14	18	30

spent approximately 3 hours (day and night) fielding students' questions. In addition, students expected immediate responses to e-mails since a timeframe for the course master feedback was not addressed on the syllabus. By the second year, the coursemaster set fixed hours between 9:00 AM and 5:00 PM for e-mail responses. In addition, the coursemaster requested the use of the online discussion board for all questions related to the lectures, tutorials, and assignments to ensure maximum student-peer collaboration. By the second year, there was a significant decrease in e-mails sent to faculty members to about 1 to 2 per week. Other challenges were the time commitment by the coursemaster in course preparation, evaluating the online discussion board, weekly meeting with the graduate assistant, resolving student-related issues, and developing authentic assignments.

The IT specialist received and resolved all technical problems such as accessing documents, submission of assignments and losing access to the Blackboard Learning System. The IT specialist estimated spending approximately 25 hours learning the program, publishing the recorded lecture, instructing faculty in the use of the recordings, and providing faculty and students with technological support

Every day, a graduate teaching assistant monitored online discussions, assigned bonus points, and responded if the students had questions or problems that they were unable to critically analyze and solve. The graduate student contacted the coursemaster with any immediate issues that needed to be resolved. The coursemaster monitored the discussion board every other day. The graduate teaching assistant documented spending at least 1½ hours daily monitoring the online discussion, assigning bonus points, and responding to students' questions or technical problems. The coursemaster spent 1 hour every other day reviewing the students' discussions.

Some students indicated on their evaluations that they thought the weekly assignments were too much work for a didactic 1-credit course. Some did not like listening to audio programs and preferred a video program or traditional lecture. There were some technological challenges for students who did not have RealPlayer or broadband access on their laptop from home, which was a requirement of the course. Alternative approaches were to view the PowerPoint presentations and the handouts, then proceed to the assignments, or to use the laptop at school, the library, or on campus. Because the students had 1 week to complete assignments, lack of high-speed Internet access did not pose a major problem. Most of the students' problems occurred at the beginning of the semester, but tapered off dramatically as the semester progressed. Technological troubleshooting took place via

e-mails between the IT specialist and students and faculty members.

Despite receiving maximum bonus points, students continued to respond to their peer's questions and concerns asynchronously to foster group learning throughout the course.

DISCUSSION

The response rates to the precourse and postcourse surveys were good given the fact that participation was not required. Most of the students who responded were females over the age of 25 years and students who already had a previous degree. Fifty-two percent of this cohort had prior experiences with Web-based courses. Students in general felt comfortable and skillful accessing all course documents, online tutorials, and online discussion boards.

Although most students agreed or strongly agreed that flexibility in a course was important to them, and most agreed with the relevance of a Web-based course if it improved their flexibility, less than half supported the relevance of the course regardless of whether it improved their flexibility. This finding suggests that it is important for faculty members to ensure that their Web-based courses offer flexibility. Notably, 30% of students remained neutral concerning the relevance of a Web-based course regardless of whether it improved their flexibility. Perhaps these students disagreed but wanted to experience this course before deciding since this question was asked on the precourse survey instrument completed before the beginning of the course.

In the postcourse survey, most students agreed or strongly agreed that the course provided flexibility with regard to their life responsibilities (work, studies, travel, housework, and family life). On the other hand, most students agreed or strongly agreed that it was more difficult to understand the course content with Web-based lectures as opposed to traditional lectures.

About 20% of students reported that they would understand the course materials better if the faculty was teaching in the traditional classroom, if this was a hybrid Web-based course with some lectures, and if technology was more advanced allowing better audio sounds. Students also felt that they had insufficient teacher interaction with delayed feedback.

Despite these concerns, over half of the study participants agreed or strongly agreed that a Web-based course was a great idea for the *Principles of Human Nutrition* course. On the other hand, a smaller proportion of students perceived that Web-based lectures should be implemented over traditional delivery for select didactic courses. Not surprisingly, a smaller proportion (19%)

agreed that Web-based lectures should be implemented over traditional delivery for all didactic courses and that the school should consider switching to all Web-based courses. Over half the students did not think that the school should use Web-based lectures as a tool for enrollment.

Finally, similar to the report by Friedrich and Armer, faculty members did not receive any instructional design training beyond technical assistance from the instructional technological specialist, and this would have been beneficial to the quality of the course.⁴

SUMMARY

This study assessed the perceptions and satisfaction of third-year pharmacy students toward a Web-based, distance-learning course, *Principles of Human Nutrition*, and described the challenges the faculty members encountered in implementing the course. Challenges that faculty members experienced were excessive e-mail communication, the quality of the online programs, and excessive time spent in the implementation of the course. Course strengths included providing students with flexibility for studying, completing assignments, and creating more student-peer interaction than in a traditional classroom setting through the use of the discussion board. Course weaknesses included the substandard quality of

the audio and video, and not setting initial office hours for faculty time. Since the inception of the course, the School of Pharmacy transitioned to increased Web-based courses for their distance learning campus and more faculty members are seeking suggestions for introducing a Web-based course with their elective classes.

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