An Internet Training Module for Traditional and Nontraditional Doctor of Pharmacy Students: Content and Evaluation

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The purpose of this project was to develop, utilize and evaluate an Internet training module for doctor of pharmacy (PharmD) students that would introduce the use of e-mail, on-line searching for primary literature and patient information and to compare the student perceptions of the module between traditional and nontraditional PharmD students. A World Wide Web site was developed which provided the students with instructions for the module, but no print-based copies of the module were provided to students. An evaluation was completed and submitted electronically. Both traditional and nontraditional PharmD students agreed that the module was user friendly and that they saw the value of this exercise in identifying potential resources for future courses and clerkship assignments. Development of an Internet training module enabled students to send and receive e-mail messages to and from course instructors. Students learned how to search primary literature citations and patient information sheets for prescription drugs, disease states and herbal remedies on the Internet. Further expansion of this module will include on-line publications, pharmaceutical manufacturers, professional organizational web pages and online professional placement services.

INTRODUCTION

The use of Internet and other computer-based informational technologies are commonplace in the current health care system. A large number of World Wide Web (WWW) sites are devoted to providing drug and health-related information(1,2). Due to the increased use and availability of these technologies, pharmacists must become "sophisticated" in the use of information technologies to keep pace with other health care professionals and patients. However, unlike most journal publications, the Internet lacks a peer review process. Thus, pharmacists must also be able to evaluate the reliability of the information presented by these web sites. To facilitate effective use of computer and Internet technologies, pharmacy educators must incorporate these technologies into teaching methodologies so pharmacists have the tools needed for use in their daily professional practices.

There are many examples of review articles(1-6), Internet training courses for health care professionals and pharmacy school courses utilizing Internet-based technologies(7-17) in the literature. However, there are no published papers describing introductory Internet tutorials for health care professionals or more specifically pharmacy students or the evaluation of these modules. Thus, we developed a WWW-based module to introduce traditional and nontraditional Doctor of Pharmacy (PharmD) students to the basic uses of the Internet. The rationale for developing this module was three-fold. First, as described above, pharmacists must become adept at using the Internet to obtain professional and patient information pertaining to drugs, diseases and health related issues. Second, pharmacists must also be able to retrieve and provide reliable information to patients and other health care professionals related to new drugs, herbal remedies and disease states. In fact, patients frequently come to pharmacies and other health care facilities armed with information related to conventional and/or alternative therapies that has been obtained from the Internet. Many times this information is invalid and/or unreliable. Third, it is imperative that pharmacists are able to determine the reliability of such information and provide patients with appropriate and scientifically based information. In addition to the need for students to have this knowledge, additional reasons exist to introduce them, in this school of pharmacy as well as other programs around the country, to professional uses of the Internet. First, Internet courseware is being introduced into this program's therapeutics sequence during the third professional year and thus, students must be able to navigate the Internet to successfully utilize this courseware. Second, many faculty members of the Department of Pharmacy Practice are located at the Indiana University Medical Center (IUMC) campus in Indianapolis, 65 miles from the main campus. These faculty provide the majority of therapeutics didactic instruction during the third professional year of the curriculum. As a result, new ways of enhancing communication between these sites is crucial. The use of e-mail, chat sessions, Internet video conferencing and virtual office hours is a necessary and low cost approach to maintain efficient contact between students and instructors. A third reason to introduce students to the Internet is that during the fourth professional year of the PharmD program, almost all students leave the main campus for clerkship sites throughout the state, making communication with these students difficult. Ensuring that students are able to use e-mail, WWW-based courseware and other Internet-based resources enhances communication between students, administration and faculty. Job placement information and appointments for stu-

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dents in their fourth professional year are exclusively available at a university web site. Similarly, the nontraditional PharmD program, which is offered state-wide requires effective communication and instruction to these students. Many schools of pharmacy face similar issues related to nontraditional PharmD programs

This module was developed to introduce students to the professional uses of the Internet. It was introduced relatively early in the curriculum (second professional year, fourth collegiate year for traditional students; first didactic class for nontraditional students) as a way of enhancing traditional modes of instruction and communication. While it is likely that many students have had previous exposure to the Internet, this module ensured that all PharmD students had some degree of Internet literacy needed for the program.

The purpose of this project was to develop, utilize and evaluate an Internet training module for traditional and nontraditional PharmD students that would introduce students to the use of e-mail and on-line searching for primary literature and patient information. Secondary objectives were to compare traditional and nontraditional PharmD students' perception of the Internet module and assess past and present computer and Internet use characteristics.

METHODS

Students and Course

Traditional and nontraditional PharmD students enrolled in CLPH 471, Pathophysiology and Therapeutics I, completed this module as a required homework assignment. This Internet module was introduced to traditional and nontraditional PharmD students during the Spring and Fall Semesters of 1998, respectively. CLPH 471 is a required three credit hour course in the PharmD curriculum and is offered to traditional PharmD students in the spring semester of their second professional year (*i.e*., fourth collegiate year) and nontraditional PharmD students early in their coursework in the nontraditional PharmD program. Nontraditional students are post-BS students taking didactic coursework part-time (by videotape and small group conferences) and experiential training. These students generally complete the didactic portion in 3-4 years and the experiential training in 2-3 years. The Internet training module was worth 50 points out of 650 total points toward the student's final grade. Students received a maximum of 30 points when they successfully completed the required components and submitted their portfolio. A written (print based, not Internet based) twenty point quiz on Internet abbreviations and terms was administered approximately two weeks after the portfolio due date which held students accountable for common Internet terminology.

Location of Module

The Internet training module (http://php.iupui.edu/~bcarlste/clph471.html) was located at one of the authors' web sites. Access to this web site was not restricted to Purdue University pharmacy students or faculty and was easily accessed from any computer connected to the Internet. It was necessary to provide open access of this module due to nontraditional PharmD students who were primarily using the Internet from off-campus sites. As part of the course packet, students were provided the web site address for the module and the due dates for homework assignment. No paper copies of module instructions or content were provided. Students were given four weeks to complete the module.

Students were assigned a drug, a herbal remedy and a disease state for use in the module assignments. A web site (http://php.iupui.edu/~bcarlste/ndhd471.html) listed those drugs and disease states that students would be taught in the course. All material identified and collected by students throughout this module was printed and placed in a portfolio which the students turned in for a grade on completion of the tutorial.

Module Content

E-mail. All Purdue University students have e-mail accounts established upon registration for classes. However, in order for these accounts to be functional, students must activate them through the computing center. Instructions for activating e-mail accounts was provided in the course manual and via a Purdue University Web site. To encourage students to utilize e-mail to interact with faculty in future courses and during clerkships, students were required to activate their Purdue University e-mail account, or alternatively, obtain an e-mail account from a commercial e-mail account provider (*e.g*., Hotmail®, Juno®, America-Online®). After establishing an account, students were required to send an e-mail message to one of the developers of this Internet module to acknowledge that they had established an e-mail account.

Introduction to the Internet. To introduce the Internet and the associated nomenclature, a published Internet guide(3-6) for medical practitioners was made available to students. This guide is available in the traditional journal format(3-6) or via the WWW. Students were required to read the articles entitled: Introducing the Internet(3), Electronic mail(4), The World Wide Web(5) and Logging in, Fetching Files, Reading News(6). In addition to reading the Internet guide, this section of the module included a list of Internet abbreviations (http://php.iupui.edu/~bcarlste/abbr471.html) and terms: (http://php.iupui.edu/~bcarlste/term471.html) for the students to define and learn. Students were later given a written quiz on these abbreviations.

Nonpharmacy/Nonmedical Internet Information and Search Engines. To introduce the use and availability of Internet search engines as described in the above tutorials, students were instructed to identify a nonpharmacy/nonmedical Internet site using an Internet search engine. Students were directed to print a page from this favorite Internet site and search engine and place a copy of it in their portfolio.

Patient Information Leaflet. To increase knowledge about the location of patient information resources, students were required to locate a patient information leaflet for their assigned drug, disease state and herbal remedy. Students were instructed to print the patient information leaflet and place a copy of it in their portfolio. Students were not given any instruction related to where the patient information leaflets were located, nor were they restricted to any particular web sites.

Published Article. To introduce on-line search capabilities, students were instructed to locate a primary literature article citation discussing their assigned drug indexed by either Medline® or International Pharmaceutical Abstracts®. Students were provided two WWW sites, one university and one public site, both accessible by any computer connected to

Table I. Assessment of student use of e-mail and the Internet prior to the Internet training module

Question	Mean (SD)	
	Nontraditional (n=33)	Traditional (n=89)
Prior to completing this module, I used e-mail and the Internet for personal use[a]	3.06 (1.48)*	4.08 (1.10)
Prior to completing this module, I have had to use the Internet and e-mail for other courses.	1.79 (1.24)	2.99 (0.923)

[a] Responses to evaluation questions: Very frequently (5); Frequently (4); Occasionally (3); Rarely (2); Never (1).
*$P<0.01$.

Table II. Student perceptions of computer, Internet and e-mail use and the value of this Internet module

Question	Mean (SD)	
	Nontraditional (n=33)	Traditional (n=89)
I am very comfortable using computers [a]	3.88 (0.781)	3.92 (0.801)
I am very comfortable using the Internet	3.79 (0.893)	4.15 (0.732)
I am very comfortable using e-mail	4.15 (0.755)	4.35 (0.854)
I have confidence using Internet search tools to find articles relating to drugs or diseases.	3.94 (0.704)	4.15 (0.820)
The module was user friendly.	4.09 (0.765)	4.07 (0.780)
It was easy for me to find a computer with Internet capability.	4.06 (1.25)	4.45 (0.769)
Reading the Internet guides from the BMJ helped me to better understand the Internet, e-mail, etc	3.76 (0.830)	3.06 (1.03)*
I am confident I can find information for my patients on the Internet.	4.30 (0.585)	4.17 (0.711)
I see the value of this exercise in identifying potential resources for future courses and clerkship assignments.	4.12 (0.696)	4.08 (0.829)

[a]Responses to evaluation questions: Strongly agree (5); Agree (4); No opinion (3); Disagree (2); Strongly disagree (1).
* $P=0.0006$.

the Internet. The databases at the university site (http://ovid.lib.purdue.edu/) are only accessible by Purdue University students and faculty/staff using a university identification code. This site allows access to several on-line data bases including: Medline®, International Pharmaceutical Abstracts® and Current Contents®. The databases at the public site http://www.ncbi.nlm.nih.gov/PubMed/) are administered by the National Library of Medicine. This site includes access to PubMed® and Grateful Med®. This exercise was intended to demonstrate to students how to access full Medline® resources from any computer with Internet access, both as Purdue University students and after graduation.

Students in the first and second professional years often do not come into contact with many of the faculty in the Department of Pharmacy Practice. To electronically introduce the faculty members, students were asked to identify a publication written by a Department of Pharmacy Practice faculty member. They were instructed to verify that the publication was from a member of that department (*i.e.*, there may be more than one individual with the same name). After finding the publications citing (*i*) one's assigned drug, and (*ii*) a Department of Pharmacy Practice faculty member, the students were instructed to print a copy of the article citations and abstracts and place copies in their portfolio.

Evaluation. At the completion of the course students submitted an on-line evaluation of the Internet module located at a web site (http://members.aol.com/bcarlst/inteval.html).

Computer Access at Purdue University. The Purdue University Computing Center manages 55 instructional computing laboratories on the Purdue University campus each with at least 25 workstations. All of these laboratories are connected to the campus network which provides access to the Internet. Two of these laboratories are located in or immediately adjacent to the School of Pharmacy building and contain workstations with both Pentium®/Windows® and Macintosh® platforms allowing for easy computer access to all traditional PharmD students However, most nontraditional PharmD students did not have the same accessibility to university computer resources.

Data Analysis

Statistical comparisons between traditional and nontraditional PharmD students were made using the Mann-Whitney U Test for ordinal and continuous data and the Chi Square Test or Fisher's Exact Test for dichotomous variables. Differences were considered statistically significant at probability level of < 0.05.

RESULTS

This Internet module was introduced to traditional and nontraditional PharmD students during the Spring and Fall Semesters of 1998, respectively. Ninety-five traditional and 34 nontraditional students were enrolled in this course during those semesters. Of these, eighty-nine traditional and 33 nontraditional students completed the evaluation of the Internet training module providing the data for this report.

The nontraditional students spent significantly more time completing the module. Traditional students demonstrated a median completion time of 2 (range: 1-10) hours compared to 3.25 (range: 1-20) hours for the nontraditional students. Ten percent of all students required greater than five hours to complete the module, while two students in each group required at

Table III. Breakdown of availability of student-owned computers or computers located at the student's residence

	Nontraditional (n=33)	Traditional (n=89)
Students who possess a personal computer	31 (94%)*	40 (45 %)
Internet access at their residence	24 (73 %)**	45 (51%)

Data are presented as actual number (percent of total).
*P<0.001, **P=0.026.

least 10 hours to complete the module.

The results of the survey regarding the use of e-mail and the Internet for personal use and in previous courses are illustrated in Table I. Traditional PharmD students utilized e-mail and the Internet more frequently than nontraditional students both for personal use and in previous courses. Of note, there were students in each group (five percent traditional, 21 percent nontraditional) who reported that they had not used e-mail or the Internet prior to performing this module. In addition, 67 percent of nontraditional students reported that they had not used e-mail or the Internet in previous courses.

Table II shows that the traditional and nontraditional student comfort level related to computer, e-mail and Internet use was similar. In addition, each group of students agreed that the module was valuable and saw its benefit for future experiences. The only category that differed statistically between the traditional and nontraditional students was in the utility of the Internet guides that were included in the module. As illustrated in Table III, a statistically greater percentage of nontraditional students owned personal computers and had Internet access at their residence.

DISCUSSION

This module was developed to increase student awareness of the Internet and its valuable professional uses early in the PharmD curriculum. Most traditional and nontraditional PharmD students found the Internet module to be user friendly and experienced the value of this exercise in identifying potential resources for future courses and clerkship assignments. Although there was substantial variability in the number of hours it took to complete the module (*i.e.*, overall range 1-20 hours) nearly 70 percent of students completed the module in three or less hours, a reasonable amount of time.

Several differences were noted between nontraditional and traditional students that require comment. Nontraditional students took significantly longer to complete the Internet module than traditional students, which may be due to several reasons. First, As shown in Table I, prior to using this Internet module nontraditional students used e-mail or the Internet for personal or instructional use less frequently than traditional students. Second, nontraditional students are likely enrolled in one academic course at the time, and may have had more time to complete the module than traditional students who were also enrolled in five other courses. Third, access to high-speed Internet connections may be more difficult for nontraditional students who, because they are not using on-campus Internet connections, are restricted to modem connections with maximum modem connections of 56,000 bytes/second. For this reason, it is important to design Internet modules that are primarily text-based rather than graphics-based to reduce the time needed to load images over modems to decrease student frustrations. The fact that the module took longer for nontraditional students to complete and that they were also less likely to have used e-mail and the Internet either for personal use or in previous courses illustrates the need for Internet training exercises for nontraditional students.

There were benefits to this Internet training module. Traditional PharmD students were introduced to the Internet early in the professional program likely allowing the incorporation of Internet-based instructional technologies in future courses and the experiential year of the program with little additional student training and/or skill development. This is useful in that the Internet is incorporated and relied upon extensively during the third professional year therapeutics sequence utilizing web-based course tools. Nontraditional students, who are postbaccalaureate students, were exposed to the Internet during their first didactic course in the PharmD program and also benefitted for the same reason as the traditional students. Second, both traditional and nontraditional PharmD students now have e-mail addresses and are able to send e-mail messages to course instructors. This will enable the use of virtual office hours by faculty located off the main campus. The use of virtual office hours, or other instructor communication, is particularly important for nontraditional students since they take courses via videotaped lecture presentations supplemented by live case presentations. Utilizing e-mail to ask instructors questions after viewing lecture presentations may be particularly convenient for off-campus students. Finally, traditional and nontraditional PharmD students will be able to access primary literature citations on the Internet using two sites which are available free of charge. This will be useful for all students, particularly those at clerkship sites not equipped with a major medical center library.

The intent of this module was to introduce PharmD students to basic professional uses of the Internet. There are numerous other activities that will be subsequently incorporated into the module to reflect current technologies and resources for pharmacists and other health care professionals. Future exercises to be incorporated into this module will be: (*i*) examples of electronic publication (many publications feature at least abstract or table of contents searching); (*ii*) professional organizational web sites (almost all professional organizations have web sites and some have professional placement services, meeting information, etc. available on-line); (*iii*) evaluation of the reliability of web site information (not only should students be able to access web sites for information, they must be able to assess the reliability of that information); (*iv*) development of electronic portfolios (in addition to or in place of paper based portfolios) that will allow students to update their portfolios as they utilize the Internet further; and (*v*) additional e-mail processes such as utilizing attachments, sending to multiple users, etc.

Future investigations will proceed in three directions. First, we will determine if skills learned in the second professional year (seventh semester) of the curriculum are still applicable in the fourth year (experiential year) of the PharmD program for students in the traditional pathway. Second, we will determine the future need for this module based on the

premise that students entering the curriculum may now have additional Internet and e-mail skills over students in this report. Third, for students in the nontraditional pathway we would like to investigate if information they acquire in this module is immediately incorporated into their practice setting.

In conclusion, this Internet training module was useful as a tool to introduce traditional and nontraditional PharmD students to professional uses of the Internet. The module enabled students to send and receive e-mail messages to and from course instructors. Students learned how to search primary literature citations and patient information sheets for prescription drugs, disease states and herbal remedies on the Internet. Future revisions to this module will incorporate new informational technologies. Development of Internet training modules should take into account the differences that exist between traditional and nontraditional students with regard to previous use of the Internet and computer and Internet access.

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