An Experience Integrating Computerized Library Instruction into the Pharmacy College Curriculum

Julia S. Whelan

ABSTRACT. This article describes a program to integrate computerized library instruction into the pharmacy curriculum. Students must satisfactorily complete a sequence of computerized instruction modules during their six years of study. Pharmaceutical education outcomes of this program are: *continuity* of instruction; *uniformity*, because it is mandatory this program will ensure that all students graduate with the same exposure and information competencies; *relevance*, gained by closely tying the modules to other required courses; *comprehensive coverage* of information resources; and *teaching independent, life-long information seeking skills*. The first four modules are available through the college network allowing for flexible, self-paced learning. Initial faculty response has been positive. Students find the modules an effective learning device. The modules will continue to be assessed as they are implemented. *[Article copies available for a fee from The Haworth Document Delivery Service: 1-800-342-9678. E-mail address: getinfo@haworthpressinc.com]*

KEYWORDS. Pharmacy education, computer-based training, library instruction, information skills

INTRODUCTION

The American Association of Colleges of Pharmacy (AACP) suggests that the beginning practitioner "must use the health-related, professional and

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disciplinary literature as a means of acquiring a continuing flow of new knowledge'' (1). In an effort to address this objective, Sheppard Library staff developed a series of mandatory library instruction modules, which are integrated into the pharmacy curriculum.

Tying library instruction into the intense, busy pharmacy curriculum is a perplexing problem. For decades, librarians have tried a variety of methods (2). Currently, several new efforts to integrate information retrieval skills into pharmacology and medicinal chemistry courses are underway (3-5). At the Massachusetts College of Pharmacy and Allied Health Sciences, faculty and librarians identified many problems in our traditional approach. Faculty scheduled library instruction sessions on an *ad hoc* basis and students came to the library for lectures and demonstrations. Among the shortcomings noted at MCP/AHS and at other pharmacy colleges (6) were:

- ineffectiveness of instruction: students often needed to have the same material repeated in a one-on-one encounter with a librarian.
- the *ad hoc* nature of instruction: this meant that some students received extensive instruction while others received very little.
- lack of continuity: there were often several semesters between courses where students were offered library instruction or library assignments. Consequently, librarians often had to repeat basic material while trying to go on to the advanced skills required for the current course.
- underprepared students: many students reached the clinical rotations where information-seeking skills were required and assumed without the appropriate knowledge.

OBJECTIVES

To address these problems, the library staff decided to experiment with a new method of library instruction. A series of mandatory sequential modules were proposed. Given staffing constraints and a curriculum which did not have room for any additional required classes, it was decided to experiment with educational technology as a means of delivery. Another objective was to promote independent learning. The interactive, self-paced, and independent features of computer-aided instruction offered several advantages. As they study the modules, students can assess their learning by responding to interactive questions. They can review different portions of the program in varying sequences. Above all, the responsibility to learn and to achieve competency rests with the student. These features may be particularly beneficial in light of the wide diversity of learning styles, varying language proficiency and educational background of our student body.

The modules are being developed to address these additional and more general educational outcomes:

critical thinking: students will evaluate and compare different information sources and think of new strategies and options if an initial effort fails.

using analytical skills: students will formulate search strategies and decide if the information retrieved is of required quality and of appropriate professional or academic level.

learn to interpret data in order to reach conclusions and solve problems. The ability to conduct proper research, locate, and obtain information is the foundation of data interpretation.

BACKGROUND

In the spring of 1993, the librarians proposed to the college curriculum committee a series of sequential, mandatory instruction modules in information-seeking skills. The proposal included material to be offered to students during each of the 5-6 year curriculum. As in the efforts at other colleges of pharmacy (2,7), this proposal coincided with a major revision of the pharmacy curriculum. The curriculum committee approved the proposal. The fact that a writing proficiency requirement had been successfully implemented at the college in 1991 was an important precedent (8). It established the model of a mandatory noncredit requirement, which all students must successfully pass in order to graduate.

Two other actions laid the foundation for the development of the computerized library modules. First, an educational multimedia specialist with extensive experience in teaching, instructional design, and multimedia technology joined the library staff. Secondly, the library applied for a grant from the in-house Faculty Development Program sponsored by Glaxo Foundation and received $7,000. These funds allowed the library to hire a graduate student as a part-time reference assistant, freeing the reference librarian who serves as coordinator of library instruction to work on this project.

METHODS

This team of the educational media specialist and reference librarian developed four computerized library instruction modules between 1993 and

1996. The first two computer-assisted modules contain material that had been previously presented to first-year students during the required expository writing sequence. Writing faculty consulted with the reference librarian to ensure that the module covered the necessary skills and was relevant to their courses. Module 1 describes library staff and services, the library consortium, as well as other Boston area libraries. A simulation component teaches students to search the online catalog. Module 2 covers topics such as how to focus or expand a research topic, how to use a print index and a computer database (in this case *Reader's Guide to Periodical Literature* and *Expanded Academic Index* are explained in detail), and finally how to acquire the books and journal articles resulting from the search. Module 3 is an introduction to the computer. Students enter the college with diverse knowledge of and exposure to computers. By passing Module 3, we hope to ensure that all students know basic computer terminology, the fundamentals of using either a Windows or Macintosh operating system, the proper etiquette of computer lab use, and techniques of using CD-ROMs. Module 4 is integrated into the second year required course, ''Introduction to Pharmacy.'' The content of this module familiarizes students with several basic reference works in medicine and pharmacy as well as the *International Pharmaceutical Abstracts* (IPA) database.

TECHNOLOGY ISSUES

As the result of a previous grant, the college obtained a small Macintosh computer lab. Existing computerized instruction at the MCP/AHS involved a HyperCard™ program which presented multitier problem sets based on concepts taught in the introductory chemistry course (9). It was decided to build on this technology. The first three library instruction modules used Supercard™ software and are available to students on Macintosh computers both in the computer lab and in the library. With the advent of a college-wide computer network, the modules and quiz are now available to students on any Macintosh computer connected to the network. The modules are also available on CD-ROM so students with computers at home or work can check out a CD from the library.

Issues of processing speed mean the modules run extremely slowly on older computers. There were numerous technical problems, as the modules were placed on a newly installed network and changes occurred in information technology personnel. The first year of implementation was turbulent. There were times when the modules were not available on the network and many students wished to take them. Given the tenuous situation of Apple Computer and the fact that our Macintosh computers are lower-end machines, the Module 4 was developed with Authorware™ software, which has the advantages of cross-platform capabilities and Web accessibility.

LEARNING ASSESSMENT

Ten-question, pass-fail quizzes were developed for the first three modules. Multiple versions of each quiz are available to deter collaboration. Reference librarians distribute the quizzes on an individual basis. Students who already know the material may attempt a quiz at any time. In the summer of 1996, a Supercard consultant was hired who developed a computerized quiz for Module 1. If students fail the computerized quiz, they receive feedback as to which parts of the module need more study. Choosing from a variety of questions in each of ten categories, the computerized quiz is different every time a student takes it.

The following sample illustrates the types of questions asked in the computerized quiz for Module 1.

- How would you enter a search in the online catalog to find books written by Professor Michael Montagne? *(type exactly as you would in the catalog)*.
- What Boston area library would you visit in order to find a copy of a patent or government regulation?
- You need to read an article in a 1984 issue of *Drug Topics*. Where would this issue be kept? How would you retrieve it?
- You are writing a paper on bilingual education. Which library in our consortium would be most likely to have materials on this topic?
- You can not find the book you want on the shelf. Which library workers can help you search for the title? Where are they located?

Examples of the quizzes given for Modules 2 and 3 are in Appendix A.

Module 4 is assessed through a written assignment. Each student is given a simplified case study (see Appendix B). Using the reference books that were taught in the module, students must answer questions related to the case. A complete citation must accompany each answer. Additionally, students must find a current article on an assigned topic using the IPA database. Students must demonstrate their searching skill by including five elements in their search history: the use of synonyms, use of a subject heading, use of the OR operator to group the synonyms, use of the AND operator to combine concepts, and selection of a relevant article.

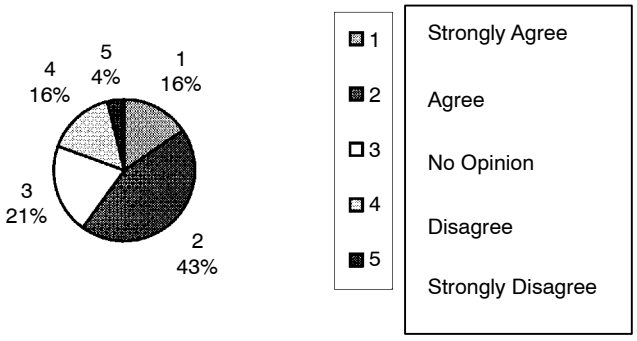
RESULTS

As of the summer of 1998, students have taken more than 1,700 modules. Response to the library instruction modules has been positive. Writing facul-

ty are pleased to recover the class time previously devoted to a library lecture; however, they still allow the instruction librarian to visit each class for a 15-minute demonstration and introduction of the modules. Writing faculty have also supported the modules by making satisfactory completion a corequisite of the expository writing course. Faculty appreciate the fact that now students know where to go when they come to the library to start their research. For example, they know which computer terminals to sit down at to search the online catalog and how to use them. Some faculty expressed frustration because even though material such as how to locate a journal is presented in the module, this process still has to be explained repeatedly to students.

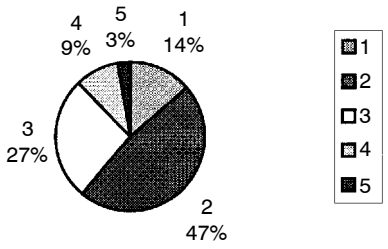
Student response to the modules was measured by a questionnaire distributed with the quizzes and assignments (see Appendix C). A majority of students felt the modules were ''an excellent introduction to library resources'' (see Figure 1). They also ''appreciated the self-paced, flexible features of computerized instruction'' (see Figure 2). Some students expressed ambivalence toward the modules in several categories: only 32% strongly agreed or agreed that the ''skills learned were relevant''; 32% also strongly agreed or agreed with the statement that ''I already knew the information taught.'' When asked if they would ''prefer a traditional lecture or library tour'' students were very divided: 51% agreed, 21% disagreed or strongly disagreed, and 27% had no opinion. Student feedback on other aspects of the modules such as navigation, technical difficulties, and animations is shown in Tables 1 and 2.

FIGURE 1. Student responses to the statement: "The module provided an excellent introduction to library resources."



Results are expressed as percentages of total number of responses to this question (n = 71).

FIGURE 2. Student responses to the statement: "I appreciated the self-paced, flexible features of a computer-based learning experience."



Results are expressed as percentages of total number of responses to this question (n = 71).

DISCUSSION

The computerization of library instruction brings several pedagogical issues to light. Some students surveyed expressed a preference for a traditional lecture or orientation and made comments such as:

> "I don't like working on the computer . . . "

> "I didn't like this form of teaching. Most of this information was already known and very boring."

Perhaps this reflects the fact that computerized instruction may not be equally effective for all students' learning styles or levels of language proficiency. Despite a policy of open-ended re-examinations on the quizzes a small number of students seemed unable to master the material. On the other hand, students found the modules attractive and easy to navigate; they enjoyed the sounds and animation, and appreciated the self-paced features (see Table 1).

Another problem with the modules is that if the library instruction is not integrated into the passing of a particular course, it is extremely difficult if not impossible to enforce the deadlines by which students must complete the modules. For example, despite the importance of the computer skills taught in Module 3, it languishes in relative obscurity. It appears that the other modules are reaching the entire audience for which they are intended because faculty are incorporating them as a course requirement.

Developing the modules has been extremely time-consuming for the reference librarian and the educational technology specialist. At this point, the majority of traditional class sessions devoted to library instruction have been

TABLE 1. Student Response to Evaluation Survey for Library Modules 1, 2, and 3.*

Statement	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
The module was visually attractive.	29	41	19	5	5
It was easy to navigate in the module.	8	47	13	19	13
The module provided an excellent introduction to library resources.	16	43	21	16	4
I already know the information taught.	1	31	34	22	12
I would prefer a traditional lecture or library tour.	15	36	27	19	3
The sounds, animations, and graphics made the module a pleasant experience.	10	38	35	12	5
I found the skills I learned useful and relevant to my current coursework.	3	29	34	23	11
I found the accompanying quiz asked appropriate questions and was easy to understand.	12	29	30	18	11
Technical problems distracted me from the learning experience.	20	30	25	15	9
I appreciated the self-paced, flexible features of a computer-based learning experience.	14	47	27	9	3

*Results expressed in percentages of total responses to each question (n = 71).

virtually eliminated. However, this does not yet equal the amount of staff time invested in developing the computer instruction modules. There is a steep learning curve in becoming proficient with new software. Testing, debugging, and revising require a substantial investment of time. While creating new modules staff must also update existing modules so that they remain current with new library staff, resources, and technology. A more sanguine appreciation of the costs and limits of computerized instruction have replaced the initial naïve enthusiasm felt by the librarians.

This model of fostering independent learning of information skills still seems an excellent way to nurture the professional goal of the pharmacist whose practice is based on ‘‘the continuing flow of new knowledge’’(1). Qualities such as flexibility, self-pacing, and remote access make computer-

TABLE 2. Student Response to Evaluation Survey for Library Modules 4.*

Statement	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
The case study format gave the assignment relevance.	11	20	2	1	0
It was easy to navigate in the module.	2	22	3	6	1
The module provided a good introduction to library resources.	5	17	5	7	0
The module taught the techniques I needed to use in my database search.	6	16	6	5	1
I would prefer a traditional lecture.	6	7	12	8	1
The graphics made the module visually attractive.	4	18	10	1	1
I think the skills I learned will be useful and relevant to my coursework and professional practice.	11	16	3	3	0
I found the interactive quizzes reenforced the material presented.	2	18	7	4	3
Technical problems distracted me from my learning experience.	13	10	7	7	1
I appreciated the self-paced, flexible features of a computer-based learning experience.	6	20	8	1	0

*Results expressed as number of responses to each question (n = 34).

ized learning an extremely attractive form of instruction for the new nontraditional programs being created at MCP/AHS and elsewhere. As Crawford Kilian writes, ''We should be helping [students] advance toward their own goals . . . [this] means encouraging them to be self-propelled toward ambitious but realistic goals. 'Cybernetics' comes from the Greek word for 'steersman'; we should teach students how to steer for themselves'' (10). There remains much to be learned as to the correct mix of computerized and traditional instruction, the most effective presentation, and assessment techniques. However, at this point, it is clear that the majority of our pharmacy students have a positive response to computerized, self-paced library instruction. Library staff have reached the conclusion that computerized library

instruction will remain a vital player in our efforts to integrate information skills into the pharmacy curriculum. Continued assessment will guide the librarians in deciding whether the computerized programs will remain at the core of instruction or as an enriching or remedial role.

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APPENDIX A

Examples of Module Exams

Quiz for Module 2

This is one of four versions of this exam. All versions require students to actually use the resources taught in the module.

To answer many of these questions, you will need to go to the Reference Room and use the resources taught in Modules 1 and 2.

Inspired by the publicity over the new prescription diet drugs (fenfluramine, phentermine), you plan to write a research paper on the pros and cons of these products.

1. If you look up the subject heading **Diet Pills** in the 1995 volume of *The Reader's Guide to Periodical Literature*, what new subject heading are you referred to?

   _____

2. Still in *Readers' Guide to Periodical Literature* (1995) list the two *see also* subjects suggested under weight-reducing products.

   _____

   _____

3. In the online catalog you perform a subject search on **diet pills**. List the related subject heading suggested.

   _____

4. You would like to expand your search. Circle at least three related/synonym words you could add to increase your retrieval and **still stay on topic**.

Weight loss programs	Redux	Slim Fast
Obesity	Anorexia	High Cholesterol
Bulimia	Vegetarianism	Pondimin
Adipex	Jenny Craig	Appetite depressants

5. What operator would you use to group these terms? (*circle*) AND OR NOT

6. If you search **diet pills** in Expanded Academic Index what other **subject heading** is suggested?

   _____

   How many citations are retrieved? _____

7. If you search **diet pills** as a **keyword** phrase how many articles do you retrieve?

   _____

APPENDIX A (continued)

8. If you search the brand name Redux as a **keyword** 158 citations are retrieved many of which are irrelevant. What feature of Academic index would allow you to focus your topic?

   _____

   Suggest another keyword that you would add to this search to focus it? _____

9. What type of library resource would most likely provide in-depth information on how these drugs work? (*circle*)

   magazine article medical journal article encyclopedia circulating book

10. One of the articles you want to get is: ''Diet pills, boom or bust: How to know if your new body is in these bottles.'' Marisa Fox. *Prevention* April 1997 v49 n4 p92(7). Use the tools you learned about in the module to find one library in Boston where could you find that magazine?

    _____

Example Questions from Module 3 Quiz

This is one of several versions of this quiz that tests knowledge of basic computer skills, procedures and vocabulary.

1. _____ Is a design scheme for personal computer desktops, which permits display of more than one program or file of information at a time.

2. What is the appropriate way to back up a file when using the computer lab?

3. Under the words listed across the top of the computer screen are lists of commands called _____

4. List 2 examples of system software:

   _____

5. What is the purpose of a disinfectant program?

   _____

6. To delete files or eject a disc or CD-ROM on the Macintosh use the mouse to drag the item to the _____

7. Small pictures or symbols which respresent application programs or files on the desktop are called _____

APPENDIX B

Simplified Case Study with Questions and IPA Search: Library Module 4
(written by Assistant Professor Susan Jacobson)

Case Study #8

Chief Complaint (CC):
CB is a 64-year-old female who presents to the geriatric outpatient clinic for a follow-up visit.

History of Present Illness (HPI):
CB has exhibited a worsening of her Parkinson's Disease symptoms over the past 4 months, which is interfering with her daily routines. Her family is concerned because she is extremely forgetful and is complaining of blurring vision.

Past Medical History:
Parkinson's Disease diagnosed 4 years ago.
Chronic open-angle glaucoma.

Medication List:
Levodopa/carbidopa 25/250 mg 1 tab po q3h
Pilocarpine 2% opth. soln. 2 gtts o.u. qid
Restoril 15 mg po q hs prn

Part 1
Case Study Questions: *(Remember to provide complete citations for each fact)*

1. What drug listed in the medication list is indicated for Parkinson's Disease?
   What is the brand name and manufacturer of this medication?

2. List 5 major Parkinson's disease symptoms.

3. Define chronic open-angle glaucoma.
   What medication on CB's medication list is used to treat glaucoma?

4. What is the generic name for Restoril?
   Why is Restoril prescribed for CB?

Part 2
IPA Search: (CB's physician wants to add the drug Selegiline to her medication list.) Find an article that describes the use of Selegiline in the treatment of Parkinson's Disease.

APPENDIX C

Library Module Evaluation

The Library Instruction Modules are a new enterprise on the part of the staff of Sheppard Library. We would like to have your feedback on their content, structure and usefulness. Please take a few moments to complete this survey and turn it in with your exam.

Today I took module: _____

Please circle the appropriate item to indicate your response to the following statements:

The module was visually attractive.

strongly agree	*agree*	*no opinion*	*disagree*	*strongly disagree*
1	2	3	4	5

It was easy to navigate through the module.

strongly agree	*agree*	*no opinion*	*disagree*	*strongly disagree*
1	2	3	4	5

The module provided an excellent introduction to library resources.

strongly agree	*agree*	*no opinion*	*disagree*	*strongly disagree*
1	2	3	4	5

I already knew the information taught.

strongly agree	*agree*	*no opinion*	*disagree*	*strongly disagree*
1	2	3	4	5

I would prefer a traditional lecture or library tour.

strongly agree	*agree*	*no opinion*	*disagree*	*strongly disagree*
1	2	3	4	5

The sounds, animations, and graphics made the module a pleasant experience.

strongly agree	*agree*	*no opinion*	*disagree*	*strongly disagree*
1	2	3	4	5

I found the skills I learned useful and relevant to my current coursework.

strongly agree	*agree*	*no opinion*	*disagree*	*strongly disagree*
1	2	3	4	5

I found the accompanying quiz asked appropriate questions and was easy to understand.

strongly agree	*agree*	*no opinion*	*disagree*	*strongly disagree*
1	2	3	4	5

Technical problems distracted me from my learning experience.

strongly agree	*agree*	*no opinion*	*disagree*	*strongly disagree*
1	2	3	4	5

I appreciated the self-paced, flexible features of a computer-based learning experience.

strongly agree	*agree*	*no opinion*	*disagree*	*strongly disagree*
1	2	3	4	5

Comments, suggestions, problems:

Library Module 4–Evaluation

We would like to have your feedback on the content, structure and usefulness of this module and assignment. Please take a few moments to complete this survey and turn it in with your paper.

Please circle the appropriate item to indicate your response to the following statements:

The case study format gave the assignment relevance.

strongly agree	*agree*	*no opinion*	*disagree*	*strongly disagree*
1	2	3	4	5

It was easy to navigate through the computer modules.

strongly agree	*agree*	*no opinion*	*disagree*	*strongly disagree*
1	2	3	4	5

I think the skills I learned will be useful and relevant to my coursework and professional practice.

strongly agree	*agree*	*no opinion*	*disagree*	*strongly disagree*
1	2	3	4	5

I found the interactive quizzes asked reenforced the material presented.

strongly agree	*agree*	*no opinion*	*disagree*	*strongly disagree*
1	2	3	4	5

Technical problems distracted me from my learning experience.

strongly agree	*agree*	*no opinion*	*disagree*	*strongly disagree*
1	2	3	4	5

I appreciated the self-paced, flexible features of a computer-based learning experience.

strongly agree	*agree*	*no opinion*	*disagree*	*strongly disagree*
1	2	3	4	5