

# **A Literature Evaluation Course Delivered via Computer Assisted Instruction, Electronic Mail, and Teleconferences: A Case Description**

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The successful delivery and evaluation of a drug literature evaluation course utilizing computer assisted instruction, electronic mail communication, and long distance conference calls between two pharmacy schools is described. All evaluative instruments indicated that the course was effective and at least as well received by students as the more traditional "live" classes. This type of instructional delivery of required material may represent a creative, cost-effective alternative to hiring additional part-time or adjunct faculty for didactic teaching.

## **INTRODUCTION**

Higher education is facing mounting pressure to provide quality instruction while keeping costs low. At the same time, pharmacy schools are expanding with the implementation of the entry-level PharmD program, frequently with only a modest increase in faculty resources. This is clearly a time when educational systems must reevaluate their activities, become more

creative, and look for efficiencies. As recommended in a recent American Association of Colleges of Pharmacy presidential-elect address by Kabat, adoption of information technologies is critical for the best use of shrinking resources(1). A successful educational approach to providing instruction in critical drug literature evaluation that incorporates long-distance discussions, computer-assisted instruction (CAI), and transcontinen-

tal inter-institutional cooperation is described.

## BACKGROUND

Oregon State University College of Pharmacy began a post-baccalaureate PharmD program in 1995. One component of the curriculum is a course teaching critical literature evaluation skills. For the first year of the program, the course was taught by a full-time faculty member with expertise in drug literature evaluation. This faculty member resigned at the end of the academic year and due to a re-prioritization of the Colleges' teaching needs, the faculty replacement position was in another discipline. This placed the College in the position of having to find other ways to provide the appropriate instruction. In 1996, a drug information faculty member from a Midwestern university was hired to come to Oregon and teach a concentrated one-week literature evaluation course. Oregon State University incurred the costs of airfare, hotel, meals, and incidentals as well as instructional fees for a total cost of approximately \$5,000. While the instruction was deemed excellent, the student feedback at the end of the first year indicated that the course material was presented too rapidly for reasonable retention of the information. This option, which was deemed less than ideal, was not available in 1997, since the faculty member had left the university for industry. Initially in 1997, attempts were made to contract with local hospital-based drug information specialists for the course instruction. Due to expanded workloads and the other responsibilities of these individuals, the efforts were unsuccessful. A search of the educational literature resulted in information about a computer-assisted instructional program for teaching literature evaluation skills that had been developed by Abate and colleagues(2). Communications with the author followed and resulted in a copy of the CAI program entitled "Evaluation of Clinical Drug Studies" being sent to OSU for review. The CAI program had recently been converted to a Windows format, in addition to a Macintosh version, and feedback from other schools on the usefulness of the program was being sought by the author.

After a careful review by several members of Oregon State University's faculty of the CAI program content (Table I) and the written learning objectives for each section, it was agreed that the program would provide an appropriate foundation for the course. It was also determined by administration that outside faculty support would be needed to conduct student review sessions, write and grade exams, conduct help sessions if needed, and provide supplementary teaching. After several discussions with the computer program author and with the administrative approvals of the two universities involved, an agreement was reached for the author to provide this support. Both institutions felt that this undertaking could serve as a model for other pharmacy schools faced with a similar situation. A description of the course, its delivery, and evaluation follow.

## METHODS

A faculty member from Oregon State University (OSU) coordinated the 3 credit hour drug literature course on the Health Sciences campus in Portland, Oregon. The responsibilities of the OSU faculty member included setting up computer laboratory access and program installation, scheduling class at times convenient for both the students and the CAI program author, serving as a liaison between the students and outside faculty, developing and maintaining a system for allowing interested students access to the program for their personal computers while assuring copyright protection, providing introductions

**Table I. Content of "Evaluation of Clinical Drug Studies" CAI Program**

I.	Clinical Literature and Types of Studies
II.	Introduction/Background
III.	Journals, Titles, Authors, Abstracts
IV.	Patients/Subjects
V.	Controls, Design, Randomization, Blinding
VI.	Treatment Considerations: Drug Considerations, Study Settings, Patient Factors
VII.	Measurements
VIII.	Statistics: Variables, Data, and Distributions; Measures of Central Tendency; Measures of Variability; Statistical Inference; Parametric Tests; Nonparametric Tests; Correlation
IX.	Data Handling
X.	Program Review—Questions to test knowledge of each section

and continuity (the OSU faculty member attended the majority of class sessions), setting up e-mail communications between students and the outside faculty member, receiving and faxing homework and exam materials between campuses, assigning final grades, and providing other assistance as needed. It was also agreed that OSU would provide student evaluations of the CAI program to the developers for their review and information.

The guest faculty member and her colleagues designed the CAI program, which was developed as a stand alone course (*i.e.*, to replace formal lectures). A course syllabus with learning objectives, a computer program topic outline, and a copy of the program were provided to OSU for student use. Additionally, the outside faculty member developed and graded homework exercises and the midterm and final exams, and conducted review and discussion sessions via conference calling. The schedule for the class is shown in Appendix A. Four discussion sessions were held to review the questions in Exercises I through IV as applied to a specific journal article. Students were then asked to answer the same questions in Exercises I through IV as applied to a different assigned article, for a grade. Two review sessions were also held for the purpose of answering students' questions about the computer program content as well as to raise points of discussion with them. A composite with student names and pictures was sent to the instructor to permit individual questioning of students during class sessions. Finally, e-mail addresses of all students were provided to the instructor to facilitate communications outside of scheduled sessions.

Students were given the option of utilizing a computer laboratory on campus or signing a copyright agreement statement (Appendix B) and loading the CAI program on their personal computers. They received a course syllabus that listed the dates by which specific sections of the computer program were to be completed and the instructions and due dates for completing the four written Exercises, which were faxed to the outside instructor upon completion. The instructor's e-mail address was provided to students and they were encouraged to contact her whenever they had questions. Students also received copies of the two journal articles that formed the basis of the class conference call discussions and homework Exercises. The point assignments were as follows: Exercise I = 45 points; Exercises II-IV = 15 points each; midterm exam = 40 points; and final exam = 60 points. Class participation counted for 10 percent of each student's grade. The midterm and final exams consisted of short answer, multiple choice and matching questions. In addition, approximately 26 percent of the final exam points involved specific questions about a jour-

**Table II. Student evaluation of computer-assisted instruction course**

“This was my first experience with a computer assisted instruction (CAI) course.”	YES	N = 8
	NO	N = 0
“I did most of the computer work at:”	Home	N = 4
	School	N = 4
	<u>Mean<sup>a</sup></u>	
Program on home computer:		
“Having the program on my personal computer was very convenient.”		4.75
“I was able to study the material better at home than I would have at the university.”		4.75
“As a result of having the program on my personal computer, I spent more time on the program than I would have otherwise.”		4.00
Program used on campus:		
“Having to work on the computer during scheduled lab time was very convenient.”		3.25
“I was able to study the material better at the lab than I would have at home.”		3.50
“As a result of studying during scheduled lab times, I spent more time on the program than I would have otherwise.”		2.50
“Computer lab times were conveniently scheduled”		3.25
General:		
“The CAI program was easy to use and understand.”		4.42
“The CAI program held my interest.”		3.50
“The quality of instruction was excellent.”		4.12
“The conference call reviews and homework recitations were effective methods of teaching.”		4.25
“The course was well run and I was kept informed of assignments, schedule, etc.”		4.50
“I received adequate feedback and all my questions were answered.”		4.75
“As a result of this course, I feel better prepared to critically evaluate the literature.”		4.37
“I would recommend the course to a fellow student.”		4.12

<sup>a</sup> Strongly agree = 5; Strongly disagree = 1.

nal article students were asked to read in advance in preparation for the final.

The standard OSU course evaluation (required by the University) was completed by the students to provide comparative information about this type of course versus the traditional on-campus courses. Another evaluation was performed at the beginning of the next quarter to provide additional more specific information about the students' perceptions of the course. This evaluation was done after the standard evaluation to attempt to eliminate any “Hawthorne Effect” associated with the course and its review. A few separate questions were asked of those students who had access to personal computers at home and those who used the computer laboratory on campus at OSU to determine if access location influenced course study.

## RESULTS

The nine first year OSU students in the postbaccalaureate Pharm.D. program enrolled in and completed the course. All students performed well in the course, with final grades ranging from 83-95 percent. Only three students received grades in the 80-90 percent range (83, 88, and 89 percent). The student receiving a grade of 83 percent withdrew from the PharmD program at the end of that quarter and the course evaluations were unable to be obtained. Thus, completed course evaluations were obtained from the eight remaining students (four who used the CAI program at home and four who used it in the computer lab). With the exception of an initial font problem that was identified and corrected, the CAI program ran without problem on the individual and lab computers.

The evaluation specific for the CAI course is shown in Table II. Students having access to personal computers at home highly rated the convenience of the course material, in contrast to those required to use the computer lab who rated convenience much lower. This occurred despite having relatively unlimited access to the modern computer lab at OSU. Students rated the course coordination, organization, and instruction very highly.

Table III summarizes the results from the standard OSU course evaluation. The students rated the course very highly in all aspects and higher in all categories than concomitant courses offered at the same time using “in person” instruction (Table III).

## DISCUSSION

A previous evaluation of the “Evaluation of Clinical Drug Studies” program found it to be effective in significantly increasing student knowledge and skills in critical literature evaluation(2). Although the content focus was different, another study reported that use of an on-site CAI program to teach drug information skills was as effective as traditional classroom instruction(3). Other studies in the pharmacy literature have found that, when used to supplement traditional instruction on-site, CAI is an effective instructional method(4-6). However, most pharmacy students have felt that CAI should not be used to replace lectures(4,6-8). Thus, there was some initial uncertainty from both involved institutions as to how well a long distance CAI course with no formal lectures would be received by, and delivered to, students. The drug literature evaluation course, however, exceeded all expectations. The number and complexity of the questions asked by the OSU students during the telephone conference sessions were substantial and did not appear to be influenced by the methods of instruction. The OSU students spoke frequently and generally filled the allotted conference times with questions, in contrast to students at the outside institution who seldom spoke during similar on-campus question and answer sessions conducted by the same instructor.

Responses to a number of categories in the OSU standard evaluation form were unexpected and deserve comment. Question 4, “The Instructor was sensitive to my/class' ability to understand the material” was rated 3.67/4.0 versus live class scores of 3.23/4.0. Question 6, “The instructor provided scheduled office hours or was readily available for consultation with me” scored a 3.71/4.0 versus live class scores of 3.28/4.0. Although the OSU students infrequently sent the instructor e-

**Table III. Summary of course evaluations**

Question	Mean score <sup>a</sup>	
	Drug Literature course	All other courses
1 Course objectives and requirements were clearly presented to me.	3.56	3.54
2 The instructor was well prepared and organized.	3.56	3.44
3 The instructor explained the material clearly.	3.44	3.27
4 The instructor was sensitive to my/the class' ability to understand the material.	3.67	3.23
5 The instructor stimulated enthusiasm for the subject matter of the course.	3.33	3.12
6 The instructor provided scheduled office hours or was readily available for consultation with me.	3.71	3.28
7 The instructor was fair and impartial in dealing with me.	3.57	3.35
8 The instructor encouraged me to think for myself.	3.56	3.16
9 The examinations were relevant to the reading assignments and to the material presented in class.	3.78	3.40
10 The instructor used good communication skills.	3.78	3.36
11 As a result of having this instructor I have learned a significant number of new ideas and/or skills.	3.78	3.30
12 All things considered I was favorably impressed by this instructor.	3.75	3.46
Combined total score for items 1-12	3.62	3.33

<sup>a</sup>Strongly agree = 4; Strongly disagree = 1.

mail messages, perhaps knowing they had the option to do so at any time was desirable.

The long-distance faculty-directed course scored an overall 3.62/4.0 versus an average of 3.33/4.0 for all on campus courses. The outside faculty member was highly rated by the students, and the faculty coordinator, for teaching and the way class was conducted. When the instructor first received the e-mail addresses of the students, a "welcome" note was sent to each one encouraging them to ask questions and to respond. Very polite response notes were received from each student. The photograph composite was important and effectively used by the instructor during conference sessions to "call-on" individuals via the telephone. All students were drawn into the telephone discussions. Student questions via e-mail were responded to in a timely manner, answers to questions were shared as appropriate with the other students via the e-mail system, and the exercises and exams were graded quickly and the results were e-mailed to students while the materials were being mailed back. Although the instructor was never face-to-face with the OSU students, the students felt they learned a significant number of new ideas and/or skills (3.78/4.0 vs. 3.30/4.0 for on campus classes) and the outside instructor believed likewise.

Higher average scores for availability of the faculty member, sensitivity to the students' understanding of material, and overall course evaluation versus the averages for all other on-site courses could reflect the use of a combination of instruction and delivery methods, the skill of the faculty instructor, additional attention paid to an "experimental" class to assure its success (especially the attention to detail in planning and coordinating the course), or other unknown factors.

Finally, use of the computer instructional program was cost-effective from the Oregon State perspective. Costs for access to the program, learning objectives, content outline, and instructional time was half that of the previously described arrangement. The time involvement of the OSU coordinator was more than in the previous year, but most of the time was required by the fact that this was the first time the course was offered and the need to assure a quality course. Many of the activities outlined above could be performed by an administrative assistant and would not require large time commitments. From the perspective of the distance faculty member teaching the computer course to the OSU students, relatively little

preparation time was required since similar exercises developed for on-site students could be used for the OSU class. The six telephone conference sessions generally lasted about one and one-half hours each, and grading of the midterm and final examinations and exercises required a total of about five hours for the relatively small number of students involved.

**Limitations.** This course was presented to a small group of highly motivated, postbaccalaureate PharmD students. The implementation of this type of teaching may not be as successful in other situations involving other types of students, different class sizes, or other unknown factors. Whether other instructors will be as effective as the author of the program remains to be established.

## CONCLUSIONS

The critical evaluation of the literature course is planned to remain an important component of the PharmD program at Oregon State University. A high quality course was provided to students by combining computer assisted instruction, written course materials, long-distance discussions, e-mail access to the faculty instructor, and local coordination. All assessments indicated the course was effective, met the objectives, and was highly rated.

The delivery of the course was cost-effective. The course was taught again at OSU in the 1998-1999 academic year in the same manner with similar success. Cooperation between the administrations at both universities was exceptional and critical to its overall success. The creative use of shrinking resources to deliver quality instruction and facilitate optimal student learning will likely remain a priority for schools of pharmacy.

Future interest in the use of the literature evaluation CAI program has been generated at the Oregon Health Sciences University following presentations of the results of this cooperative arrangement. Currently, the Emergency Medical Technician and Physician Assistant programs are considering the CAI for use in their programs. The CAI program can now be accessed via the Internet for possible use by other interested schools and programs.

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**APPENDIX A. SCHEDULE — DRUG LITERATURE EVALUATION**

**Due Dates**

Friday, September 5            Computer Program Topics, Assignments

  Clinical Literature and Types of Studies; Journals, Titles, Authors, Abstracts &

Introduction/Background; Patients/Subjects; Controls, Design, Randomization, Blinding; Treatment Considerations; Measurements

Monday, September 10\*      Discussion of Exercise I questions applied to fish oil study

Monday, September 15      Exercise I due — gentamicin study

Friday, September 19      Statistics: Variables, Data, and Distributions and Measures of Central Tendency

Wednesday, September 24\*   Review session

Friday, September 26      Statistics: Measures of Variability

Friday, October 3            Discussion of Exercise II questions applied to fish oil study

Wednesday, October 8      Midterm exam

Friday, October 10          Exercise II due — gentamicin study

Friday, October 17          Statistics: Statistical Inference

Tuesday, October 21 \*      Statistics: Parametric Tests

Friday, October 24          Review session

Monday, October 27\*        Statistics: Nonparametric Tests

  Discussion of Exercise III questions applied to fish oil study

Friday, October 31          Exercise III due — gentamicin study

Friday, November 7\*        Statistics: Correlation

  Discussion of Exercise IV questions applied to fish oil study

Monday, November 10      Data Handling

Friday, November 14      Exercise IV due — gentamicin study

  Final exam

\*Conference call session.