INSTRUCTIONAL DESIGN AND ASSESSMENT

Weekly Active-Learning Activities in a Drug Information and Literature Evaluation Course

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Objectives. To incorporate learning activities into the weekly 2-hour Drug Information and Literature Evaluation class sessions to improve student ability and confidence in performing course objectives, as well as to assess student perception of the value of these activities.

Methods. In-class activities that emphasized content and skills taught within class periods were created and implemented. Three different surveys assessing student ability and confidence in completing drug information and literature retrieval and evaluation tasks were administered prior to and following the appropriate class sessions. At the completion of the course, an additional evaluation was administered to assess the students’ impressions of the value of the learning activities.

Results. Students reported increased ability and confidence in all course objectives. The teaching activities were also stated to be useful in students’ learning of the material.

Conclusions. Incorporation of weekly learning activities resulted in an improvement in student ability and confidence to perform course objectives. Students considered these activities to be beneficial and to contribute to the completion of course objectives.

Keywords: active learning, drug information, literature evaluation

INTRODUCTION

At The University of Tennessee (UT), the Drug Information and Literature Evaluation course is a 2-hour course taught in the fall of the second-professional year. Traditional drug information, literature evaluation, and drug use policy, taught primarily through 2-hour didactic lectures every week, account for the majority of the course. Past examinations have shown that students struggle with some of the course content, particularly biomedical literature evaluation topics. Course evaluations have further indicated that students do not understand the application of course material to the pharmacy student career or to the practice of pharmacy.

Active-learning strategies, using a variety of teaching methods and relating material to real-life situations foster students’ motivation to learn.1,2 To create an environment where students can apply course materials, engage in active discussion among classmates, and strengthen their ability and confidence in performing drug information retrieval and evaluation tasks, learning activities were incorporated into the Drug Information and Literature Evaluation class sessions at UT. Students’ ability and confidence in performing drug information and literature evaluation tasks were evaluated before and after class sessions.

METHODS

The coordinator for the Drug Information and Literature Evaluation course in the fall of 2002 met with all involved instructors to discuss incorporating active-learning strategies and alternative teaching methods into the course. After instructors brainstormed ideas for each course topic, the coordinator asked that at least 1 alternative teaching method or learning strategy emphasizing course objectives be incorporated into each teaching session. The course was 2 credit hours and met for one 2-hour session weekly for 17 weeks. Three instructors taught 5-6 sessions each with 1 midterm and 1 final examination. Participation in each of the in-class learning activities was evaluated equally and the combined points accounted for 15% of the student’s grade. Each of the in-class activities was graded by the instructor for that session. Often, the students received full credit for an in-class assignment.
simply by completing the assignment and turning it in because the in-class activities were reviewed during the class period. The out-of-class activities were split between the instructors to grade. Each out-of-class activity accounted for 20% of the student’s grade.

A brief list of the major learning activities that were included in the course appears in Table 1. All activities were either conducted in class or reviewed in a subsequent class if the activity required students to complete it outside of class (eg, practice search strategies in secondary databases). The activities incorporated a mix of both group and individual strategies for completion. All in-class activities, aside from one noted to occur in the drug information center, occurred in the large classroom where the course was taught. Groups for the in-class activities that allowed for collaboration between students were formed by the students and usually consisted of students sitting near each other that day. This was done to optimize the time during the course period for the lecture and the activity.

Survey questions to assess student confidence and ability to perform course objectives were then created based on the chosen alternative teaching method or learning strategy. A baseline pre-activity survey instrument was completed at the beginning of the course. The same survey instrument was then broken into 3 post-activity survey instruments and administered after the material to which it referred had been covered in the class. A final evaluation was also administered at the end of the course to assess student impressions of the value of the learning activities.

Students were informed of the project through class discussion and written materials and were aware that completion of the survey instrument constituted consent for participation. Students were also told that completing the survey instruments was voluntary and would have no impact on their grade; however, completion of the learning activities was required. No identification was gathered in the survey instruments. The project was considered to be exempt from review by the Institutional Review Board.

Each of the survey instruments asked students to rate their ability and confidence regarding performance of each objective using a 4-point Likert scale. This scale assessed the ability (not at all able, slightly able, moderately able, or completely able) and confidence (not at all confident, slightly confident, moderately confident, or completely confident) of each objective, with the inclusion of a “not sure” option for both sets of questions. All of the objectives evaluated appear in Table 2.

The first survey instrument covered objectives related to searching and communicating health information. For the first objective, students completed an Internet module that introduced the main textbooks used in pharmacy. Then they met in small groups (n = 15) in the UT Drug Information Center to discuss the books with a facilitator. Additionally, each student created 2 drug information questions that they used tertiary resources to answer. The second objective required students to listen to a didactic lecture on secondary databases. Students were then given a worksheet to find primary literature for 3 different drug information questions in the computer laboratory outside of class. These answers were then reviewed in the next class meeting with the facilitator demonstrating these searches. During the class covering the third objective, several case scenarios were presented that prompted Internet searches. The instructor searched the Internet by student suggested terms, and web sites found during the search were evaluated by the class as a whole.

The instructor used computer projection for viewing by the entire class. Additionally, students were given an out-of-class written assignment to suggest reliable Internet resources in response to a drug information request. Students were requested to include rationale as to why the web sites were chosen as reliable sources. The fourth and fifth objectives were completed as an out-of-class assignment in which students responded to a drug information request utilizing primary, secondary, and tertiary information. Example drug information requests were reviewed in class and students participated in a walk through of the assignment details. Additional examples were posted on Blackboard, a Web-based course tool, for students to access. Written feedback was provided to each student and common errors were reviewed in class (eg, review articles presented as primary literature and incorrect referencing).

The second survey instrument evaluated specific topics in literature evaluation and drug use policy. For

Table 1. In-Class Activities

| Use tertiary resources to locate answers to a list of drug information questions. |
| Develop search strategies for secondary databases and the Internet for case-based scenarios. |
| Complete a mock medication use evaluation using example patient charts. |
| Evaluate two similar medications for inclusion on formulary. |
| Evaluate several adverse drug reactions using the Naranjo algorithm. |
| Report an adverse drug reaction to MedWatch. |
| Analyze potential medication errors in case-based scenarios. |
| Apply critical literature evaluation skills using two original research articles. |
| Present a journal club. |

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the first objective, pharmaceutical equivalence, therapeu-
tic equivalence, and bioequivalence were reviewed in
class and students were given case examples to identify
what type of equivalence was illustrated. Students were
allowed to work in pairs before answers were reviewed in
class. The second objective required students to perform
a medication use evaluation (MUE). A didactic lecture
was presented on MUEs. During the lecture, students
formed small groups (N = 3-5) and reviewed mock pa-
tient charts to complete a practice MUE. Results were
reviewed and discussed in class. The third objective
involved a didactic lecture evaluating medications for
formulary management preceding an in-class activity.

Students were given a list of medications in class. Infor-
mation about indications, published efficacy studies,
safety issues, and cost was provided for each medication.
In groups of 3-5, the students then decided which of the
medications in the class they would add to the formulary.
Groups were randomly called upon to present the medi-
cation that they chose and their reasons for selection. The
final objectives required students to evaluate the severity
of an adverse drug reaction using the Naranjo algorithm \(^3\)
and to report any adverse drug reactions to the MedWatch
Program. Patient cases were distributed in class. Students
were allowed to pair up to assess the adverse reaction
using the Naranjo algorithm. Any serious reactions found

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**Table 2. Change in Percent of Students Reporting Moderate or Complete Ability and Confidence**

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Ability</th>
<th>Confidence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% Reporting Moderate or Complete Ability</td>
<td>% Reporting Moderate or Complete Confidence</td>
</tr>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
</tr>
</tbody>
</table>

### Survey Instrument 1: Retrieving Drug Information From Multiple Resources (n = 89 Pre; 60 Post)

1. Select appropriate tertiary references to answer drug information requests | 65 | 95 | 30 | 54 | 97 | 43 |
2. Demonstrate efficient search strategies in secondary databases to locate primary literature | 48 | 95 | 47 | 47 | 97 | 50 |
3. Search for and evaluate the quality of health information on the Internet | 58 | 88 | 30 | 55 | 93 | 38 |
4. Interpret and combine information from multiple sources into a concise response to a drug information request | 71 | 88 | 17 | 58 | 88 | 30 |
5. Apply appropriate medication information to patient care situations | 63 | 92 | 29 | 60 | 85 | 25 |

### Survey Instrument 2: Medication Use Policy Tasks (N = 89 Pre; 60 Post)

1. Differentiate between pharmaceutical equivalence, therapeutic equivalence, and bioequivalence | 53 | 72 | 19 | 35 | 72 | 37 |
2. Perform a medication use evaluation (MUE) | 42 | 77 | 35 | 34 | 75 | 41 |
3. Evaluate medications for the purpose of formulary management | 29 | 68 | 39 | 27 | 67 | 40 |
4. Evaluate the severity of an adverse drug reaction using the Naranjo algorithm | 11 | 82 | 71 | 11 | 75 | 64 |
5. Report an adverse drug reaction (ADR) to the MedWatch program | 19 | 75 | 56 | 17 | 78 | 61 |

### Survey 3: Literature Evaluation Skills (N = 76 Pre; 69 Post)

When given a piece of primary literature, I am able to:

1. Describe the study design | 58 | 94 | 36 | 49 | 81 | 32 |
2. Critically evaluate the methodology | 50 | 86 | 36 | 50 | 78 | 28 |
3. Critically analyze the statistical analysis of the data | 54 | 75 | 21 | 46 | 68 | 22 |
4. Assess the external validity of the study | 61 | 96 | 35 | 50 | 87 | 37 |
5. Identify ways to improve the research design | 50 | 83 | 33 | 39 | 77 | 38 |
required each student to complete a MedWatch form for that adverse reaction. The cases were reviewed in class after students had time to complete the assignment.

The third survey instrument assessed 5 objectives associated with literature evaluation. The survey instrument assessed student confidence and ability in completing several components of evaluating an original research article. All material was covered in a didactic portion, first using 2 original research articles to illustrate the materials. One article was used by the instructor to explain the concept. Students then practiced the concept using the other article and discussed the answers in class. Outside of class, students were also assigned an original research article to evaluate for journal club. The journal club was presented in small group sessions during class time and students were given evaluations afterwards.

The final evaluation assessed student agreement with statements about the learning activities using a 4-point Likert scale, (strongly agree, agree, disagree, strongly disagree) or “not sure,” for several statements. The statements asked whether in-class learning activities, critique of articles in class, and other course assignments (ie, journal club) facilitated learning of class material, contributed to completion of course objectives, or wasted time.

### RESULTS

Ninety-eight students were enrolled in theDrug Information and Literature Evaluationcourse at UT. Approximately 61% of the students completed all 4 survey instruments and the final evaluation. The percentages of students reporting moderate or complete ability and confidence for each question before and after the activities are reported in Table 2. The percent of students who reported moderate or complete ability and confidence in performing tasks increased for all items on each of the survey instruments. Furthermore, the difference in the percentage of students reporting moderate or complete ability and confidence from the pre- to the post-activity survey instruments was at least 25% for 12 of the 15 ability items and for 14 of the 15 confidence items.

Results from the student impression evaluation are reported in Table 3. Overall, students agreed that the activities facilitated learning and contributed to completion of the course learning objectives.

### DISCUSSION

Pharmacists are relied upon to be drug information experts. With the increasing number and amount of information available on medications, this can be an overwhelming task. TheDrug Information and Literature Evaluationcourse at UT is designed to teach pharmacy students the skills necessary to find and evaluate available information on drugs and disease states. Active teaching strategies were incorporated into the course, as these strategies have been associated with increased learning. Self-assessed ability and confidence in knowledge and application of course objectives improved substantially throughout the course. The students also reported that the alternative teaching strategies facilitated learning of the class material and were not considered to be a waste of time.

The assessment of the course objectives revealed a few instances in which more than 50% of the students self-reported moderate or complete abilities prior to the course. These may be areas in which less class time could be devoted to or may be further assessed to see if the pre-course knowledge is adequate.

Alternatively, student reported abilities regarding some course objectives remained suboptimal after the course (eg, reporting an adverse drug reaction to the MedWatch program and evaluating medications for addition to formulary). These may be areas in which activities need to be revised or greater class time is needed. Other forms of assessment, such as examinations and the learning activities may be reviewed to ascertain whether the student

### Table 3. Pharmacy Students’ Responses on a Survey Instrument Assessing Their Impression of Active-Learning Strategies Incorporated into a Drug Information and Literature Evaluation Course (N = 69)

<table>
<thead>
<tr>
<th>Item</th>
<th>Agree or Strongly Agree, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>In class learning activities facilitated my learning of class material</td>
<td>78</td>
</tr>
<tr>
<td>In class learning activities contributed to my completion of the course learning objectives</td>
<td>81</td>
</tr>
<tr>
<td>In class learning activities were a waste of class time</td>
<td>17</td>
</tr>
<tr>
<td>Weekly critique of the <em>H. pylori</em> and alendronate articles helped me learn how to critique primary literature</td>
<td>78</td>
</tr>
<tr>
<td>Weekly critique of the <em>H. pylori</em> and alendronate articles contributed to my completion of the course learning objectives</td>
<td>75</td>
</tr>
<tr>
<td>The writing assignment comparing a news article to original research helped reinforce my critical literature evaluation skills</td>
<td>84</td>
</tr>
<tr>
<td>The writing assignment comparing a news article to original research contributed to my completion of the course learning objectives</td>
<td>90</td>
</tr>
<tr>
<td>The journal club assignment contributed to my completion of the course learning objectives</td>
<td>61</td>
</tr>
<tr>
<td>The journal club assignment was a valuable experience</td>
<td>61</td>
</tr>
</tbody>
</table>
actually achieved the objective and to identify areas that may remain confusing regarding the objective.

There are a few limitations associated with this evaluation. First, there were multiple survey instruments distributed throughout the semester. This was done so that students would be able to remember the activities and objectives; however, it was difficult to coordinate and keep track of all of the survey instruments and to ensure that all students who wanted to participate received the survey instruments. Also, some of the questions on the survey instruments could have been construed to be leading questions. Specifically, this series of survey instruments did not compare alternative teaching methods with, for example, only didactic teaching methods since alternative teaching methods were used throughout the course. Because the survey instruments did not contain identifying information, we were unable to assess pre- and post-activity survey scores for individual students or associations between reported ability and confidence with test scores and academic performance. Identifying information was not gathered in order to assure students that their responses on the survey instruments would not affect their grades. Finally, there was no way to identify any students who may have missed class or who had not completed some of the activities but had completed the surveys.

CONCLUSIONS

Overall, students reported that active-learning strategies contributed to their knowledge of materials covered in the Drug Information and Literature Evaluation course. Abilities and confidence improved in all objectives evaluated.

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REFERENCES