Incorporating Team-Based Learning In A Drug Information Course Covering Tertiary Literature

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Incorporating Team-Based Learning in a Drug Information Course Covering Tertiary Literature

Abstract
Teaching tertiary literature in a drug information class can be uninteresting to students so a new innovative teaching technique was incorporated, team-based learning. After two years of using team-based learning, the grades for tertiary literature were compared to the two previous years standard lectures were used. Because this technique reinforces the subject matter by having each student take an individual test and then a team test, the increased scores emphasized team-based learning over standard lecturing. For the two years prior to incorporating team-based learning, the average score was 81% whereas the subsequent average was 90%. Students particularly liked to physically look up answers using the databases provided which resembled real life experience. Times to set up the technique along with adequate physical space for teams to collaborate were limitations. Overall, team-based learning provided a new method for students to understand tertiary literature.

Keywords: Team-based learning, drug information, tertiary literature

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INTRODUCTION

In many colleges and schools of pharmacy, drug information is taught as a stand-alone course or intertwined within the pharmaceutical care series. If the drug information class is taught within the curriculum by itself then two scenarios exist: incorporating an introduction of drug information to the students early in their program along with an advanced drug information class later, or combining both and having just one drug information class.

The drug information taught was a combined introduction and advanced 3-hour course consisting of standard lectures along with assignments and tests for assessment. Previous overall grades, and in particular, scores on tertiary literature (databases) fell below expectations. Because students have greater access and feel more comfortable using databases to locate drug information, the expectation was to have database assessment scores higher than overall grades. To rectify this trend, a team-based learning technique was incorporated within the course design for academic years 2007 and 2008.

Guideline 11.2 of the 2007 ACPE accreditation standards states that the college or school must integrate teaching and learning methods and “instructors should employ active learning strategies and encourage students to ask questions wherever possible.”\(^1\)

Incorporating a team-based approach addresses this standard along with fulfilling the educational outcome (Pharmacy Practice: Part D; Retrieve, analyze, and interpret the professional, lay, and scientific literature to make informed, rational, and evidence-based decisions) described in the pharmaceutical care portion of the Center for the Advancement of Pharmaceutical Education (CAPE) outcomes.\(^2\)
Team-based learning (TBL) is a particular instructional strategy that is designed to (a) support the development of high performance learning teams and (b) provide opportunities for these teams to engage in significant learning tasks. Having students work in teams or groups for projects can be a daunting task. If the group must meet outside class time, many complain there was never a good time for everyone to meet. Team-based learning takes on an approach that engages every student within each group and creates a positive outcome. The keys to this are to: (1) promote individual and group accountability; (2) use assignments that link and mutually reinforce individual work, group work, and class discussions; and (3) adopt practices that stimulate give-and-take interaction within and between groups.

A small number of studies have described incorporating team-based models in their courses with much success. Specifically, Earl G, described how cooperative learning was implemented for students to analyze tertiary drug information resources in a literature evaluation course. This paper will describe how team-based learning was incorporated along with outcomes assessed in a drug information course to gain knowledge of tertiary literature. The use of this approach for two years was compared to two preceding years TBL was not used for assessment.

DESIGN

Many objectives were in place for the Drug Information course, of which, two were paramount to the team-based learning exercise covering databases: (1) Demonstrate proficiency when searching selected online databases and (2) Appraise a database for drug information accuracy and limitations. Before addressing these objectives the students were assigned readings in Drug Information: A Guide for Pharmacists, which covered references to tertiary literature. A total of six classroom hours (weekly) were applied to lectures on the different databases, and tutorials were
also given on predetermined questions. The course qualified for 3 credit hours and met
for one 2-hour didactic session followed by a 1-hour didactic session during the 16
weeks of the 2007 and 2008 spring semesters. The TBL exercises were administered
during the 2-hour class sessions due to the length of each time interval.

The first step in developing this technique was to form groups. All groups were
formed heterogeneously by having each student (2007 n=55; 2008 n=60) openly recite a
number starting from 1 to 10 to achieve a total of 10 teams with 6 members each. Before
the exercises commenced, an assigned reading was given outside of class in order to
prepare for the activities. There were then two TBL exercises covering all of the
databases assigned (Table 1).

During each exercise, each student took an individual test followed by a group
test and finally an appeals process (Table 2). The individual tests administered were
considered Readiness Assessment Tests (RATs) over the assigned readings. The
RATs were multiple-choice questions that assessed the comprehension and evaluation
of tertiary literature (Table 3). This model of questions corresponded with the dichotomy
of Bloom’s taxonomy of learning in relation to the course objectives. Due to the length of
the exercise, students were allowed 30 minutes to complete their test and Scantron
scoring sheets were used to simplify the process. Once all tests were collected, the
groups assembled and proceeded to retake the same test. All members within the
group discussed each test question and provided their opinion on why they chose their
previous responses. To receive instant feedback on their selection, Immediate
Feedback-Assessment Technique (IF-AT®) forms were used.

The IF-AT® answer sheets consist of 5 boxes and require that students scratch
one of the boxes with the correct mark corresponding to the answer. Full credit is
received if the mark is found on the first scratched try and subsequently their score is
reduced with each unsuccessful try. This immediate feedback allows group members to
discuss any misunderstandings with the content and learn how to work as a team more
efficiently. The final process allows all the students within each group to appeal any
answer(s) to question(s) they missed. These appeals may be due to ambiguous
questions or inadequacies throughout the assigned readings or lectures. The students
may use their notes for which this causes a re-study of the material and adds
clarification to any misinterpretation one may have.

Due to the test questions relating to tertiary literature, many questions dealt with
students physically scouring a database to find the correct answer. This provided
students an example of experiencing a real-life question in their future work setting.

Since the TBL exercise had different components, each performance was
weighted differently. The individual test was weighted to be 40% of the exercise score,
while the group performance was 35% and a group maintenance score was weighted to
25% of the total score. The group maintenance scores were paper forms for each
person in the group to peer evaluate every other group member. Each student was
required to assign a different numerical grade to each member and justify his or her
reasoning. Michaelsen and Fink have developed two different approaches to calculate
these maintenance scores.\textsuperscript{11} For the Michaelson method, students assign each team
member a score based on their belief how each teammate contributed to the overall
team performance. For example, a five-member team would entail forty points be
distributed among the four team members (self-excluded) while stating each teammate
cannot receive ten points each. A minimum score of six and a maximum of fourteen
may be delivered with the total equaling forty points. The total scores received from
each teammate are then added to receive the overall individual score. For the Fink
method, students are allocated one hundred points and then divide them among each
teammate. The student may award all one hundred points to each teammate and there
is no requirement for differentiation between teammates. Each student’s overall score is
tallied by the sum of the points they are awarded by each team member and then their
mean readiness test score multiplies this total. The individual test and group
maintenance scores were kept confidential between each team member.

**EVALUATION AND ASSESSMENT**

Two TBL exercises evaluating tertiary databases were administered throughout
the course and comprised 30% of the total grade. A comparison of the database exams
taken in years 2005 and 2006 were evaluated to the scores received using the TBL
method for the same material (2007 and 2008). The number of questions and point
value of each were constant throughout the 4 years, along with the formation of each
question.

Student performance scores are displayed in Table 4. The average traditional
database exam (i.e. test questions procured from slideshow lectures) score for the two
years prior to application of the TBL method was an 81.4, while the overall grade
average was an 82.0. While respectable and above average, incorporating the TBL
method produced improved results. The average database exam score for the two
subsequent years incorporating the TBL method was a 90.3 and the overall grade
average increased to 83.8. This increase in both exam scores and overall grade suggest
that an active learning technique was superior to the traditional lecturing technique
employed previously.

Following the administration and collection of results of the examinations that
included tertiary databases, students were given a short survey on their perceptions
using the team-based learning technique. A Likert scale design was utilized and
students gained access to the survey via Blackboard under the course site. As this
survey was given during normal class schedule (during the 2-hour session break), one
hundred percent (2007 n=55, 2008 n=60; total 115) of the class completed the
evaluation (Table 4). The highest percentage (94.9) believed this team activity
reinforced their individual learning while a majority felt this technique promoted a higher
learning compared to non-team taught classes. In comparing this technique to previous
group projects, 87% indicated they had more responsibility and input. Finally, a vast
majority (93%) believed team-based learning was more effective than lecturing and
increased their overall understanding of the material.

Implementing the TBL method required a significant amount of time to restructure
the course, develop team-based exercises, and fully explain the concept to the students.
This restructuring takes into account what was previously taught in the course, with the
time to implement TBL determined to be similar of that required to put together a course
conventionally. As for explaining the intricacies of the technique, all was done on the
first day of class along with a mock example administered to the newly formed teams.

DISCUSSION

Pharmacists entering the field upon graduation are now more electronic
dependent than before. With the induction of Smartphone’s, students and pharmacists
have a plethora of drug information resources at their fingertips through electronic
databases. A major component of any drug information course is to have students
become proficient when searching secondary literature. The team-based learning
technique applied in this academic setting exhibited a more thorough student
understanding of the material than previous teaching methods.

In theory, using a team-based learning approach in any class drives four kinds of
transformations: “Small groups” into “teams”; technique into strategy; quality of student
learning; and joy of teaching. All four transformations were realized, quantitatively or
qualitatively, at the conclusion of the exercise. The assessments showed an average
7% increase in test scores using the TBL method compared to the conventional lecturing method. This may be due to the repetitiveness associated with each student’s determination of the answer, not only by themselves but that also in congruence with others in their group. The student evaluation assessment also revealed many believed each shared a greater responsibility and input compared to previous group projects. One could conclude that having a higher stake in the overall group score, conversing in a structured environment, and knowing each individual was confidentially graded by their peers by means of maintenance scores led to this conclusion.

As in any new teaching method implemented, barriers and limitations were encountered. The logistics to coordinate 6 – 10 teams can be daunting with adequate physical space, computers, and time being major issues. The classroom must be one that has moveable chairs, tables or desks for teams to achieve optimal conversation and confidentiality. The overall time to administer the RATs can be accomplished in a typical 50-minute block but for class sizes 100 or more, a 2-hour class schedule is more advantageous. Because the TBL method involves three different assessments, a substantial amount of time outside classroom is devoted to grading. Two of the assessments use a fairly straightforward score (Scantron and IF-AT answer sheets) while the individual maintenance scores must be calculated and then incorporated into the overall percentage breakdown.

Evaluation of this technique brought upon a few limitations. No set end-point was established for the overall grades or database exam grades. Future studies should incorporate set end-points. Furthermore, statements on the student evaluation assessment may be considered leading statements. No other objectionable teaching methods (TurningPoint®, case studies) were discussed nor included in the survey. In addition, stratified assessment of the different components within the TBL method was not included in this study.
SUMMARY

Incorporating a team-based learning method provided a greater educational support during the drug information course covering tertiary literature. Compared to previous years during which teaching material was provided by standard lecture, subsequent classes achieved higher assessments on the tertiary test alone and overall final grade. Overall, students resoundingly believed this new method enhanced and promoted a better understanding of the material.
References:


Table 1. Tertiary Literature Covered in a Drug Information Course

<table>
<thead>
<tr>
<th>Literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical Pharmacology</td>
</tr>
<tr>
<td>American Pharmacists Association PharmacyLibrary</td>
</tr>
<tr>
<td>E-Facts and Comparisons</td>
</tr>
<tr>
<td>Lexi-Comp</td>
</tr>
<tr>
<td>Micromedex</td>
</tr>
<tr>
<td>NaturalStandard</td>
</tr>
<tr>
<td>Stat!Ref</td>
</tr>
<tr>
<td>UptoDate</td>
</tr>
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</table>
Table 2 Team-Based Learning Outlined Procedure

IF-AT: Immediate Feedback Assessment Technique
Table 3. Multiple-choice examples for Readiness Assessment Tests

1. Using Micromedex, the therapeutic use(s) for Alesse 21 is (are) FDA approved for:
   a. Menorrhagia
   b. Emergency contraception
   c. Endometriosis
   d. All of the above

2. Using Natural Standard, the best scientific evidence found for the use of Aloe is:
   a. Pressure ulcers
   b. Burns
   c. Sebhorrheic dermatitis
   d. Constipation
Table 4. Comparisons of Database Assessments and Overall Grades

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
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</thead>
<tbody>
<tr>
<td>Enrollment</td>
<td>48</td>
<td>51</td>
<td>55</td>
<td>60</td>
</tr>
<tr>
<td>Traditional exam scores, % mean (SD)</td>
<td>80.0 (6.4)</td>
<td>82.8 (4.3)</td>
<td>na</td>
<td>na</td>
</tr>
<tr>
<td>TBL exercise scores, % mean (SD)</td>
<td>na</td>
<td>na</td>
<td>89.4 (3.9)</td>
<td>91.2 (3.7)</td>
</tr>
<tr>
<td>Overall grades, % mean (SD)</td>
<td>81.0 (7.8)</td>
<td>82.9 (8.6)</td>
<td>83.1 (6.1)</td>
<td>84.6 (6.4)</td>
</tr>
</tbody>
</table>

SD: Standard deviation
Table 5. Student Evaluation on Using Team-Base Learning for Assessment (n = 115), %

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Promoted higher learning compared to non team-taught classes</td>
<td>0.0</td>
<td>1.6</td>
<td>13.3</td>
<td>71.6</td>
<td>13.3</td>
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<tr>
<td>Team activities reinforced my individual learning</td>
<td>0.0</td>
<td>0.0</td>
<td>5.0</td>
<td>31.6</td>
<td>63.3</td>
</tr>
<tr>
<td>I had more responsibility and input than previous group projects</td>
<td>1.6</td>
<td>5.0</td>
<td>6.6</td>
<td>16.6</td>
<td>70.0</td>
</tr>
<tr>
<td>Team learning strategy is more effective than lecturing</td>
<td>0.0</td>
<td>3.3</td>
<td>3.3</td>
<td>66.6</td>
<td>26.6</td>
</tr>
<tr>
<td>Overall, team-based learning was helpful and increased</td>
<td>1.6</td>
<td>0.0</td>
<td>5.0</td>
<td>28.3</td>
<td>65.0</td>
</tr>
<tr>
<td>my understanding of secondary databases</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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</table>