

7-2011

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Recommended Citation

Redwanski, John, "Incorporating Team-Based Learning In A Drug Information Course Covering Tertiary Literature" (2011).
Pharmacy Practice Faculty Publications. Paper 1.
http://dune.une.edu/pharmprac_facpubs/1

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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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No conflict of interest or financial disclosure present from this study.

1 **Incorporating Team-Based Learning in a Drug Information Course Covering** 2 **Tertiary Literature**

3 4 5 **INTRODUCTION**

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

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

20 Guideline 11.2 of the 2007 ACPE accreditation standards states that the college
21 or school must integrate teaching and learning methods and “instructors should employ
22 active learning strategies and encourage students to ask questions wherever possible.”¹
23 Incorporating a team-based approach addresses this standard along with fulfilling the
24 educational outcome (Pharmacy Practice: Part D; Retrieve, analyze, and interpret the
25 professional, lay, and scientific literature to make informed, rational, and evidence-based
26 decisions) described in the pharmaceutical care portion of the Center for the
27 Advancement of Pharmaceutical Education (CAPE) outcomes.²

1 Team-based learning (TBL) is a particular instructional strategy that is designed
2 to (a) support the development of high performance learning teams and (b) provide
3 opportunities for these teams to engage in significant learning tasks.³ Having students
4 work in teams or groups for projects can be a daunting task. If the group must meet
5 outside class time, many complain there was never a good time for everyone to meet.
6 Team-based learning takes on an approach that engages every student within each
7 group and creates a positive outcome. The keys to this are to: (1) promote individual
8 and group accountability; (2) use assignments that link and mutually reinforce individual
9 work, group work, and class discussions; and (3) adopt practices that stimulate give-
10 and-take interaction within and between groups.³

11 A small number of studies have described incorporating team-based models in
12 their courses with much success.⁴⁻⁶ Specifically, Earl G, described how cooperative
13 learning was implemented for students to analyze tertiary drug information resources in
14 a literature evaluation course.⁷ This paper will describe how team-based learning was
15 incorporated along with outcomes assessed in a drug information course to gain
16 knowledge of tertiary literature. The use of this approach for two years was compared to
17 two preceding years TBL was not used for assessment.

18

19 **DESIGN**

20 Many objectives were in place for the Drug Information course, of which, two
21 were paramount to the team-based learning exercise covering databases: (1)
22 Demonstrate proficiency when searching selected online databases and (2) Appraise a
23 database for drug information accuracy and limitations. Before addressing these
24 objectives the students were assigned readings in *Drug Information: A Guide for*
25 *Pharmacists*, which covered references to tertiary literature.⁸ A total of six classroom
26 hours (weekly) were applied to lectures on the different databases, and tutorials were

1 also given on predetermined questions. The course qualified for 3 credit hours and met
2 for one 2-hour didactic session followed by a 1-hour didactic session during the 16
3 weeks of the 2007 and 2008 spring semesters. The TBL exercises were administered
4 during the 2-hour class sessions due to the length of each time interval.

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

11 During each exercise, each student took an individual test followed by a group
12 test and finally an appeals process (Table 2). The individual tests administered were
13 considered Readiness Assessment Tests (RATs) over the assigned readings.³ The
14 RATs were multiple-choice questions that assessed the comprehension and evaluation
15 of tertiary literature (Table 3). This model of questions corresponded with the dichotomy
16 of Bloom's taxonomy of learning in relation to the course objectives.⁹ Due to the length of
17 the exercise, students were allowed 30 minutes to complete their test and Scantron
18 scoring sheets were used to simplify the process. Once all tests were collected, the
19 groups assembled and proceeded to retake the same test. All members within the
20 group discussed each test question and provided their opinion on why they chose their
21 previous responses. To receive instant feedback on their selection, Immediate
22 Feedback-Assessment Technique (IF-AT[®]) forms were used.

23 The IF-AT[®] answer sheets consist of 5 boxes and require that students scratch
24 one of the boxes with the correct mark corresponding to the answer.¹⁰ Full credit is
25 received if the mark is found on the first scratched try and subsequently their score is

1 reduced with each unsuccessful try. This immediate feedback allows group members to
2 discuss any misunderstandings with the content and learn how to work as a team more
3 efficiently. The final process allows all the students within each group to appeal any
4 answer(s) to question(s) they missed. These appeals may be due to ambiguous
5 questions or inadequacies throughout the assigned readings or lectures. The students
6 may use their notes for which this causes a re-study of the material and adds
7 clarification to any misinterpretation one may have.

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

11 Since the TBL exercise had different components, each performance was
12 weighted differently. The individual test was weighted to be 40% of the exercise score,
13 while the group performance was 35% and a group maintenance score was weighted to
14 25% of the total score. The group maintenance scores were paper forms for each
15 person in the group to peer evaluate every other group member. Each student was
16 required to assign a different numerical grade to each member and justify his or her
17 reasoning. Michaelsen and Fink have developed two different approaches to calculate
18 these maintenance scores.¹¹ For the Michaelson method, students assign each team
19 member a score based on their belief how each teammate contributed to the overall
20 team performance. For example, a five-member team would entail forty points be
21 distributed among the four team members (self-excluded) while stating each teammate
22 cannot receive ten points each. A minimum score of six and a maximum of fourteen
23 may be delivered with the total equaling forty points. The total scores received from
24 each teammate are then added to receive the overall individual score. For the Fink
25 method, students are allocated one hundred points and then divide them among each
26 teammate. The student may award all one hundred points to each teammate and there

1 is no requirement for differentiation between teammates. Each student's overall score is
2 tallied by the sum of the points they are awarded by each team member and then their
3 mean readiness test score multiplies this total. The individual test and group
4 maintenance scores were kept confidential between each team member.

5

6 **EVALUATION AND ASSESSMENT**

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

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

22 Following the administration and collection of results of the examinations that
23 included tertiary databases, students were given a short survey on their perceptions
24 using the team-based learning technique. A Likert scale design was utilized and
25 students gained access to the survey via Blackboard under the course site. As this
26 survey was given during normal class schedule (during the 2-hour session break), one

1 hundred percent (2007 n=55, 2008 n=60; total 115) of the class completed the
2 evaluation (Table 4). The highest percentage (94.9) believed this team activity
3 reinforced their individual learning while a majority felt this technique promoted a higher
4 learning compared to non-team taught classes. In comparing this technique to previous
5 group projects, 87% indicated they had more responsibility and input. Finally, a vast
6 majority (93%) believed team-based learning was more effective than lecturing and
7 increased their overall understanding of the material.

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

14

15 **DISCUSSION**

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

23 In theory, using a team-based learning approach in any class drives four kinds of
24 transformations: "Small groups" into "teams"; technique into strategy; quality of student
25 learning; and joy of teaching.³ All four transformations were realized, quantitatively or
26 qualitatively, at the conclusion of the exercise. The assessments showed an average

1 7% increase in test scores using the TBL method compared to the conventional lecturing
2 method. This may be due to the repetitiveness associated with each student's
3 determination of the answer, not only by themselves but that also in congruence with
4 others in their group. The student evaluation assessment also revealed many believed
5 each shared a greater responsibility and input compared to previous group projects.
6 One could conclude that having a higher stake in the overall group score, conversing in
7 a structured environment, and knowing each individual was confidentially graded by their
8 peers by means of maintenance scores led to this conclusion.

9 As in any new teaching method implemented, barriers and limitations were
10 encountered. The logistics to coordinate 6 – 10 teams can be daunting with adequate
11 physical space, computers, and time being major issues. The classroom must be one
12 that has moveable chairs, tables or desks for teams to achieve optimal conversation and
13 confidentiality. The overall time to administer the RATs can be accomplished in a typical
14 50-minute block but for class sizes 100 or more, a 2-hour class schedule is more
15 advantageous. Because the TBL method involves three different assessments, a
16 substantial amount of time outside classroom is devoted to grading. Two of the
17 assessments use a fairly straightforward score (Scantron and IF-AT answer sheets)
18 while the individual maintenance scores must be calculated and then incorporated into
19 the overall percentage breakdown.

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

1

2 **SUMMARY**

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

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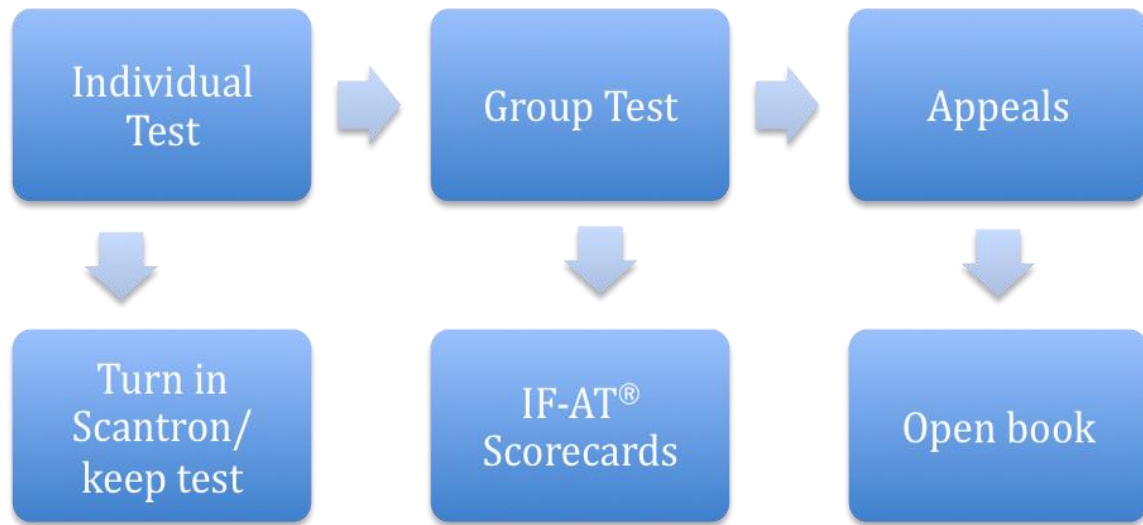
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Table 1. Tertiary Literature Covered in a Drug Information Course

Clinical Pharmacology
American Pharmacists Association PharmacyLibrary
E-Facts and Comparisons
Lexi-Comp
Micromedex
NaturalStandard
Stat!Ref
UptoDate

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. Sebhorreic dermatitis
 - d. Constipation

Table 4. Comparisons of Database Assessments and Overall Grades

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

SD: Standard deviation

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

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