Pyrex Journal of Educational Research and Reviews

Vol 2 (6) pp. 59-66 December, 2016

http://www.pyrexjournals.org/pjerr

ISSN: 2985-8879

Full Length Reseach Paper

Team Based Learning Application Exercises in Nursing Education: A Review of Literature

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Accepted 19th December, 2016

Abstract

The need for instructional strategies that engage the student, improve academic achievement, and enhance the transfer of learning to real-world encounters has increased dramatically. To achieve this goal in the field of higher education, various strategies are used. One of such strategies is team-based learning (TBL). TBL is a learner-centered instructional strategy that promotes engagement, collaboration, and transfer of learning. While the literature is rife with research studies on the effectiveness of the TBL instructional strategy, research studies on the use and effectiveness of specific TBL application exercises within nursing education is sparse. This literature review examines the existing research evidence on the use of TBL application exercises in nursing education and the existing gaps. The results showed that most studies compared TBL to the traditional lecture approach, and no specific studies focused on the impact of TBL application exercises on the learning outcomes of nursing students. Although positive results were noted with the TBL strategy, other studies failed to identify the types of application exercises used. The results suggest that research gaps exist regarding the use and effectiveness of application exercises, the key element of the TBL instructional sequence. More high quality TBL research studies are needed to build and support the use of effective TBL application exercises within nursing education.

Keywords: Active learning, nursing education, team collaboration, concept mapping, case studies.

INTRODUCTION

The use of effective instructional strategies to help learners close the gap between classroom knowledge and real-world practice settings is essential in higher education (Benner, Sutphen, Leonard, & Day, 2010; Choi & Lee, 2009; Hung, 2013; Johnson & Johnson, 1999). Educators in nursing education are also challenged to improve the learning outcomes of students who will soon be faced with the rapidly changing and complex health care environment. Hodges (2011) closely links learning outcomes and the transfer of learning to the effectiveness of instructional strategies used in nursing education. Handwerker (2012) reviewed current nursing educational practices and re-emphasized the need for instructional strategies to close the theory practice gap in the field of nursing education. The type of instructional strategies applied in higher education can also predict a future work

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place performance (Hung, 2013).

TEAM BASED LEARNING INSTRUCTIONAL STRATEGY

Several learner centered instructional methods have been used in nursing education. One of these strategies is team-based learning (TBL). TBL uses small-group collaboration to encourage student participation and application of classroom knowledge to the practice setting (Michaelsen & Black, 1994). TBL is a structured approach that uses four major steps — (a) pre-class assignments (b) readiness assurance (c) application exercises, and (d) peer evaluation— to help the student master fundamental course contents (Michaelsen & Sweet, 2011).

Pre-class preparation is the first step of the TBL process and provides an opportunity for learners to complete assignments at home before the actual classroom experience. The readiness assurance process (RAP) is the second step of the TBL process and motivates learners to prepare in advance before the actual classroom experience. During the RAP process, students in a TBL environment, complete an individual test, a team test, a written appeal if needed to appeal any incorrect test responses, and a short clarifying instructive discourse (Michaelsen & Sweet, 2008a). Although the individual and team tests contain short multiple-choice quizzes centered on the assigned course readings for pre class preparation, the instructor uses these tests to determine if the student actually comprehends the course concepts (Parmelee, Michaelsen, Cook, & Hudges, 2012). The third and "key step" of the TBL process is the use of application exercises based on a structured criteria (Michaelsen & Sweet, 2008a). The structured application exercise criterion is known as the 4-S framework and this review of literature focuses mainly on the third TBL step. Peer evaluation is the final step of the TBL process and encourages team accountability and peer feedback.

STATEMENT OF THE PROBLEM

While the literature is replete with research studies that compare the TBL strategy to classroom lecture, research on the effectiveness of application exercises utilized within TBL is sparse. TBL application exercises are identified as the "most important component" of the TBL instructional strategy (Parmelee *et al.,* 2012), and a key step in the TBL implementation process (Michaelsen & Sweet, 2008a).

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Fatmi, Hartling, Hillier, Campbell, and Oswald's (2013) systematic synthesis highlighted the importance of the application component of the TBL steps. During the review conducted by Haidet *et al.,* (2014), the researchers further emphasized that no TBL studies specifically highlighted application exercises used in TBL, rather most studies focused on comparing an active learning strategy such as TBL with the passive learning seen in the lecture approach. Fatmi *et al.,* (2013) emphasized that more TBL studies should focus on the application of knowledge in real-world practice settings and the impact that knowledge application has on students' academic outcomes.

Providing a review of literature and research findings to nurse educators and instructional designers is of importance, especially with the call for radical transformation in nursing education (Benner *et al.,* 2010; Institute of Medicine [IOM], 2010).

The goal of this review of literature is to examine the application exercises used within the TBL environments so as to inform nurse's educators who teach in these active learning environments. The information gathered from the literature can also provide a recommendation to instructional designers who design social constructivist learning environments. Specifically, this review of literature focused on the following questions:

1). What research evidence exists regarding the use and effectiveness of TBL application exercises in nursing education?
2). What research gaps exist regarding the use of TBL application exercises in nursing education?

COMPONENTS OF TBL APPLICATION EXERCISES USING THE 4-S FRAMEWORK

Before presenting the research evidence that exists on the use of TBL application exercises, it is important to first identify the components of TBL application exercises using the 4-S framework which is often used to create effective TBL application exercises. This framework consists of:

(a) a significant problem,
(b) same problem or case,
(c) specific choice, and
(d) simultaneous reporting by teams (Michaelsen & Sweet, 2008b).

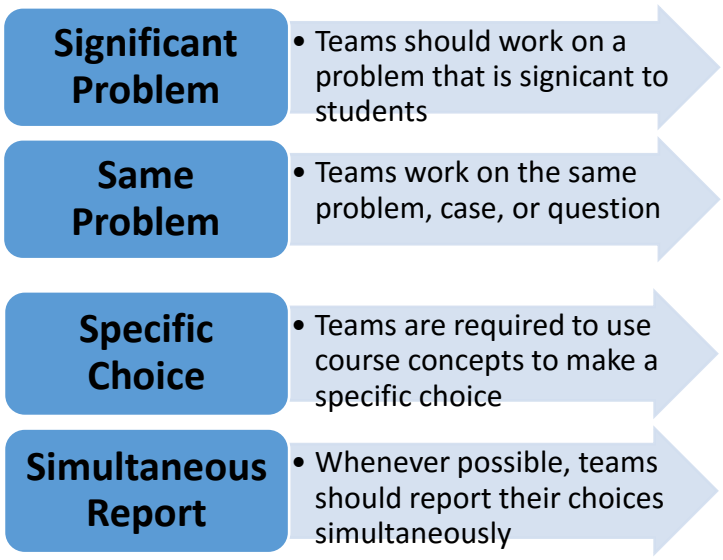

Figure 1. Components of the 4-S framework, adapted from "Team-Based Learning Practices and Principles in Comparison With Cooperative Learning and Problem-Based Learning," by L. K. Michaelsen, N. Davidson, and C. H. Major, 2014, *Journal of Excellence in College Teaching*, *25*, p. 65. Used with permission.

The 4-S framework ensures consistency across teams and provides an opportunity for students to apply course concepts from the pre-class preparation phase of real world patient care experiences.

Significant Problem

An effective application exercise meets the first criterion of the 4-S framework if it is a problem that is instrumental in helping students understand the concepts of a course (Michaelsen & Sweet, 2008a). An assignment that is impractical or does not capture the interest of the students does not meet the first criterion.

Same Problem

For assignments to meet the second criterion of the 4-S framework, student teams must work on the same problem until everyone on the team comes to an agreement with the team decision. Michaelsen & Sweet (2008a) further explained that working on the same problem provides an opportunity for the instructor to provide feedback while teams are still working on the assigned problem

Same Choice

Teams must make a specific choice after all members have engaged in discussions and problem solving of an assigned problem (Michaelsen & Sweet, 2008b). The final consensus is the choice reached by the team members, and gives each team the opportunity to defend their chosen answer.

Simultaneous Reporting

Simultaneous Reporting is the last step of the 4-S framework and occurs after the application exercises comes to a conclusion. This step requires teams to announce their answers at the same time, thereby allowing all to see the similarities and differences in the selected answers of each team (Michaelsen & Sweet, 2008b). Simultaneous reporting is a key step because it can lead to deeper learning based on the decision made by the different teams (Michaelsen & Sweet, 2011). Assignments that follow the 4-S framework are effective, foster active learning, and can lead to application of course concepts in real patient encounters.

Having identified the 4-S components of effective application exercises, it is important to review the literature to evaluate the use and effectiveness of application exercises used in the TBL environment in light of these four components. The information in this literature review was gathered from searching databases such as Education Research Complete, ERIC, CINAHL, and the MEDLINE database. The key words Team Based

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Learning, nursing education, active learning, and instructional strategies were used. Studies not written in English language and written before 2006 were excluded from this review. Inclusion criteria included peer reviewed TBL studies in nursing education written, between 2006 and 2015.

RESEARCH FINDINGS ON TEAM BASED LEARNING APPLICATION EXERCISES

Within the nursing profession, case studies and concept maps are two common active learning strategies. One reason is the use of concept maps and case study exercises encourage high-level thinking skills needed for learners to solve problems (Michaelsen & Sweet, 2008a; 2008b). Kubitz (2008) also acknowledged that concept maps and case studies are effective application exercises that can be used within a TBL environment. The search in the Education Research Complete and ERIC databases for research studies that combined concept mapping with the TBL environment yielded 3 out of the 49 scholarly peer-reviewed articles. Two of the three research studies focused specifically on concept mapping and collaborative learning. The third study was conducted by Knollmann-Ritschel and Durning (2015) and examined the effect of using concept mapping in a modified TBL environment. None of these three studies specifically examined the effect of using concept mapping as a TBL application exercise in nursing education.

Concept Map Application exercises

A concept map is a visual map or representation that helps students to bring together ideas or concepts and connect the relationships between these ideas (Nesbit & Adesope, 2006). Concept mapping has been used widely in nursing education. In Daley, Morgan, and Black's (2016) historical review of the literature, the researchers investigated the use of concept maps in nursing education over a period of 25 years. Daley *et al.,* (2016) found that the use of concept maps in nursing education fostered critical thinking, self-reflection, and closed the gap between classroom learning and real world practice settings. This success of concept maps has also been established with different audiences (Abel & Freeze, 2006; Knollmann-Ritschel & Durning, 2015; Martínez, Pérez, Suero, & Pardo, 2013; Torre *et al.,* 2007) and in different educational settings (Chen & Hu, 2013; Van Boxtel, van der Linden, Roelofs, & Erkens 2002). Concept maps have also been successfully used in other active learning environments such as problem based learning (Baugh & Mellott, 1998; Chia-Hui & Chen-Yung, 2015).

Michaelsen and Sweet (2011) highlighted concept maps as application exercises that can be used in the TBL environment. A key reason is because effective concept maps meet the 4-S criteria of TBL application exercises. Following the 4-S criteria, students can use concept maps to solve a significant problem, make a specific choice, work on the same problem, and report the team decision at the same time (Michaelsen & and Sweet, 2011). Having teams displays the completed concept maps on the wall at the same time for students and faculty to see is one way to implement simultaneous reporting. In their research study with educational psychology students, Kubitz and Lightner (2012) used concept mapping application exercises within the TBL environment. The researchers had teams of educational psychology students create concept maps based on the information gathered from the pre class readings and readiness quizzes. Kubitz and Lightner (2012) found improved learning outcomes when concept maps were used for the application component of the TBL instructional sequence. Their conclusion is that concept map application exercises meet the 4-S criteria and fosters team learning and improved academic outcomes

Case Study Application Exercises

Like concept maps, a case study is an active learning strategy that helps learners to engage in critical-thinking and problem solving (Connelly, Sackett, & Waters, 2013). The use of case studies as TBL application exercise was also noted in the review of literature. For example, one research study concluded that case study application exercises are valuable to help students understand information in the TBL environment (Eun-Kyung, Jung-Ae, Young-Hong, & Oh-Sun, 2009), while another study highlighted that case study application exercises are effective in the application of course concepts (Van der Putten & Vicht-Vadaken, 2010). Razzouk and Johnson (2013) examined the use of case studies on the individual learning outcomes and team-shared mental models of educational psychology students. A case study group and a knowledge representation group of undergraduate psychology students (n = 104) were used for this study. Students in the case study group worked on in-class case study assignments with their assigned team members while those in the knowledge representation group of students worked on team assignments that did not specifically involve real world problems (Razzouk & Johnson, 2013). Although students in the case study group and the knowledge representation group switched

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places in terms of class assignments by the second half of the semester, the teams remained intact throughout the research study (Razzouk & Johnson, 2013).

A few studies in nursing education have also used case studies as application exercises in the TBL environment. Clark, Nguyen, Bray, and Levine (2008) compared the attitudes and classroom engagement of undergraduate nursing students in a TBL (n = 51) and non-TBL environment (n = 67). The courses for both groups of students varied with the TBL students enrolled in a case management course and the non-TBL students enrolled in a pharmacology course. Although seven application exercises were used in Clarke *et al.,* (2008) study following the 4-S criteria (significant problem, same problem, specific choice and simultaneous reporting), it is unclear what types of application exercises were used. The results of Clark *et al.,* (2008) study showed TBL students to be more engaged and improved attitudes about team value than non-TBL students. The non-TBL students who used a traditional lecture format enjoyed the pharmacology class more than the TBL students in the case study class, which Clark *et al.,* (2008) attributed to the anxiety of pre-class assignments. Regardless of these findings Clark *et al.,* (2008) concluded that TBL leads to improved engagement and learner attitudes

Similar findings resulted from the quasi experimental study by Mennenga's (2010) with undergraduate community health nursing students (n = 143) which compared TBL with the traditional lecture approach. Using case studies and other unnamed small group activities in the community health course, Mennenga (2010) research results (p = .093) showed that there were no significant differences in test scores between the TBL and non-TBL students. This result led Mennenga (2010) to conclude that TBL students and traditional lecture students performed equally on test scores, meaning that the TBL strategy is as effective as traditional lecture. The researcher also found that TBL students were more engaged in class discussions and activities in comparison to those instructed with the traditional lecture approach. Similarly, Lubeck, Tsetchetter, Mennenga's (2013) study with students in a maternal newborn nursing course, application exercises such as crossword puzzles, case studies, analysis of food diaries, development of childbirth educational content, and multiple choice questions relating to the course content were used. The researchers concluded that the benefits of the TBL strategy are evidenced based and should be used in nursing education (Lubeck *et al.,* 2013).

Currey, Eustace, Oldland, Glanville and Story's (2015) mixed TBL study compared pre and post test scores of postgraduate nursing students (n = 28). The researchers highlight the use of group problem solving activities as primarily application exercises but were not specific as to what types of problem solving activities the participants engaged in. The results for four domains using the Team Experience Questionnaire—overall satisfaction, p = .001; learning outcomes, p = .001; clinical reasoning, p = .001; and professional development, p = .003—were statistically significant and led to Currey *et al.,* (2015) to conclude that TBL fosters deep learning. Currey *et al.,* (2015) also surveyed the study participant's level of engagement, and found that TBL students were more engaged than none TBL students.

Roh, Lee, and Choi (2015) conducted a quantitative descriptive study to examine perception, competence, and satisfaction of nursing students (n = 139). Following the TBL steps, Roh *et al.,* (2015) used clinical case study application exercise scenarios of chronic renal failure patients. However, data collection for the research study focused on self-directed learning, student satisfaction, learner's readiness-assurance tests, and peer evaluation. Roh *et al.,* (2015) found that there was only a 1% difference in the learner satisfaction rate among the TBL students (33%) in comparison to the students who were taught with direct lecture (32%). Roh *et al.,* (2015) concluded that more TBL research should be done in nursing education to identify strategies to improve student satisfaction and learning outcomes.

RESULTS AND DISCUSSION

Key outcomes of using the TBL strategy have been documented by empirical research with respect to improved learning outcomes (Bou Akl *et al.,* 2012; Hrynchak & Spafford, 2015; Persky, 2012; Razzouk & Johnson, 2013; Thomas & McPherson, 2011), improved learner attitude (Currey, Eustace, Oldland, Glanville, & Story, 2015; Davidson, 2011), improved problem solving (Frame, Cailor, Gryka, Chen, Kiersma, & Sheppard, 2015), and improved learner satisfaction (Feingold, Cobb, Givens, Arnold, Joslin, Keller,2008; Levine, O'Boyle, Haidet, Lynn, Stone, Wolf, & Paniagua, 2004; Roh *et al.,* 2015; Shellenberger, Seale, Harris, Johnson, Dodrill, & Velasquez, 2009; St. Clair & Chihara, 2012).

In the field of nursing education, Clark *et al.,* (2008) primarily compared TBL with the traditional lecture approach. Like Clark *et al.,* (2008), other nursing researchers (Currey *et al.,* 2015; Mennenga, 2010) who have used the TBL strategy, have focused primarily on comparing the learning outcomes and attitudes of students in a TBL and non-TBL environment. While some of these studies have used either a case study or concept

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mapping application exercise, some researchers are not specific about the type of application exercises used in their research study. For example, Feingold *et al.,* (2008) research study mentioned the use of a clinical application problem but failed to indicate the specific type of application exercise used. Further, there was no discussion in Feingold *et al.,* (2008) research study that indicated the impact of the specific application exercise on the students learning outcomes. Similarly, Eun-Kyung *et al.,* (2009) study does not give the reader a chance to draw any conclusions regarding the specific type of application study used in the research study. The researchers in Currey *et al.,* (2015) study highlight the use of group problem solving activities as primary application exercises but were not specific as to what types of problem solving activities the participants engaged in. Although Roh *et al.,* (2015) TBL study used a case study application exercise, more emphasis was placed on the impact of the readiness assessment tests and peer evaluation of learning outcomes.

The study included in this review is available research evidence about TBL and the use of application exercises in nursing education. While much has been written about active learning strategies such as TBL in comparison to the lecture approach, it is clear that research studies that focus on the learning outcomes of individual components of TBL in nursing education is scarce. Although Parmelee *et al.,* (2012) identified application exercises as the most important component of the TBL implementation process, several research studies focus on comparing TBL and traditional lecture and have failed to investigate what types of application exercises should be used with the TBL strategy (Fatmi *et al.,* 2013)

The review of literature indicated that some gaps exist regarding the use of TBL application exercises. First, it was apparent that there were very minimal research studies that specifically investigated TBL application exercises to determine its impact on learner outcomes (Razzouk & Johnson, 2013). Second, the findings indicate there were no empirical studies that specifically investigated TBL application exercises used in nursing education. The scarcity of research studies investigating the impact of application exercises on outcomes is surprising, given that nursing researchers (Benner *et al.,* 2010; Handwerker, 2012) have emphasized the need for active learning instructional strategies that encourage the application of classroom learning in clinical practice and that discourages rote memorization of course content. Further, application exercises have been identified as a key component of TBL strategy (Michaelsen, 2008; Parmelee *et al.,* 2012). Another important consideration is the Institute of Medicine [IOM] report (2010) that emphasized the importance of preparing nursing students to provide safe and effective patient care upon graduation. Therefore, the lack of TBL research studies focused on the application of course concepts in relation to learner outcomes is a major gap.

Nursing researchers can learn from TBL research studies done in education and other health care professions such as medicine and pharmacy. Kalb, O'Conner-Von, Brockway, Rierson, and Sendelbach (2015) found that evidenced-based practice instructional strategies can positively affect academic achievement. Rather than comparing active learning such as TBL with passive learning seen in the direct lecture approach, nurse educators need to understand and use instructional strategies that encourage knowledge application in health care settings.

Practitioners in nursing education need to know how to engage learners and improve learning outcomes in collaborative learning environments such as TBL. Now is the time to move beyond research studies that compare the TBL strategy with the direct lecture approach, as the literature is replete with such studies. In fact, several initial studies highlighted in this review of literature provides evidence as to the effectiveness of the TBL strategy in comparison to passive learning. Further, most the highlighted studies showed that students learning outcomes were based on the results of the readiness quizzes, rather than specific application exercises used within the TBL strategy (Fatmi *et al.,* 2013). For these reasons it is important to gather a strong body of evidence that supports the use of effective application exercises within the TBL environment

CONCLUSION

This review of the TBL instructional strategy and application exercises utilized should arouse nurse educators who teach in collaborative and active learning environments. Educators in nursing and the health care professionals need to play an active role in the choice of active learning instructional strategies used in the traditional or online classroom setting. When TBL is used as an instructional strategy, educators need focus on the types of application exercises used as this can have a significant impact on the quality of the learners education, academic achievement, and future workplace performance.

More TBL research studies are needed in nursing education to provide a body of evidence regarding the implementation of effective application exercises in the TBL environment.

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