Effects of team-based learning on problem-solving, knowledge and clinical performance of Korean nursing students

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SUMMARY

Background: Team-based learning (TBL) has been used as a learner-centered teaching strategy in efforts to improve students' problem-solving, knowledge and practice performance. Although TBL has been used in nursing education in Korea for a decade, few studies have studied its effects on Korean nursing students' learning outcomes.

Objectives: To examine the effects of TBL on problem-solving ability and learning outcomes (knowledge and clinical performance) of Korean nursing students.

Design: Randomized controlled trial.

Participants: 63 third-year undergraduate nursing students attending a single university were randomly assigned to the TBL group ($n = 32$), or a control group ($n = 31$).

Methods: The TBL and control groups attended 2 h of class weekly for 3 weeks. Three scenarios with pulmonary disease content were employed in both groups. However, the control group received lectures and traditional case study teaching/learning strategies instead of TBL. A questionnaire of problem-solving ability was administered at baseline, prior to students' exposure to the teaching strategies. Students' problem-solving ability, knowledge of pulmonary nursing care, and clinical performance were assessed following completion of the three-week pulmonary unit.

Results: After the three-week educational interventions, the scores on problem-solving ability in the TBL group were significantly improved relative to that of the control group ($t = 10.89, p < .001$). In addition, there were significant differences in knowledge, and in clinical performance with standardized patients between the two groups ($t = 2.48, p = .016, t = 12.22, p < .001$).

Conclusion: This study demonstrated that TBL is an effective teaching strategy to enhance problem-solving ability, knowledge and clinical performance. More research on other specific learning outcomes of TBL for nursing students is recommended.

Introduction

Team-based learning (TBL) is a learner-centered educational strategy comprising a highly structured sequence of activities that promote active learning, and it can be implemented in small (<25 students) or large (>100 students) classes with 1 instructor (Parmelee and Hudes, 2012); it is highly cost-effective since it can accommodate a higher student-to-faculty ratio than that required in problem-based learning (PBL) (Cheng et al., 2014).

TBL generates interest among students, encourages them to prepare prior to the class and to work in a team, and boosts their critical thinking abilities, which have correlations with problem-solving ability and academic performance (Ofstad and Brunner, 2013).

Problem-solving is an important ability for nurses and nursing students in their planning and provision of safe and effective care to patients. Through the work of knowledge application that learners engage in while experiencing TBL, students can exercise and build the problem-solving and critical thinking abilities that are required for practicing as a nurse (Corbridge et al., 2013). TBL has been shown to improve problem solving ability by engaging teams of learners in ascertaining the problem, setting goals, and finding solutions (Medina et al., 2013).

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In a class using TBL as the teaching strategy, the enhanced learner-to-learner interaction fosters active teamwork and student engagement in the class resulting in increased assimilation of knowledge (Cheng et al., 2014). Through TBL processes, students were found to better integrate their knowledge and score significantly higher on content-specific knowledge assessments than students who received conventional lecture-based learning (Jafari, 2014). In addition, as students practice solving similar problems in the clinical environment in parallel patient situations and applying the knowledge and problem-solving abilities learned, clinical expertise to implement nursing care can be further developed. However, the effects of TBL on clinical performance of nursing care to resolve patients' problems are neither well known nor well studied. Therefore, the purpose of this study was to compare the effects of TBL versus conventional education (lecture and traditional case study analysis) on problem-solving ability, knowledge, and clinical performance of nursing students.

Background

TBL is a highly structured type of cooperative learning. Since the 1970s, it has been increasingly applied in nursing, medicine, and other fields (Parmelee and Hudes, 2012; Jafari, 2014). It is an instructor-led, learner-centered teaching/learning strategy with functions similar to those of PBL. However, it is more cost-effective and yet it has equally beneficial effects on learning outcomes as compared to PBL (Cheng et al., 2014).

TBL is composed of 3 phases: advance preparation, readiness assurance, and application of course concepts (Clark et al., 2008; Parmelee and Hudes, 2012; Corbridge et al., 2013). In the advance preparation phase, students are divided into teams and assigned reading material prior to the class to familiarize themselves with the course content. The readiness assurance phase comprises completion of the Individual Readiness Assurance Test (IRAT) and Group Readiness Assurance Test (GRAT), consisting of multiple-choice questions. The phase of assessment is a major component of TBL; the assessments motivate students to prepare prior to the class and promote team cohesion. In the application of core concepts phase, there is an application of course concepts in which case scenarios with probing questions are provided. In this phase, all teams work on the same problems and are required to explain how they arrived at their solution. Through a sequence of activities that ensures frequent feedback, out-of-class preparation, and in-class collaboration with their peers, students' interpersonal communication skills, engagement, comprehension, and satisfaction increase (Mennenga and Smyer, 2010). Failure to comprehend and solve problems can result in significant harm to the patient; therefore, teaching effective problem solving to nursing students is important (Medina et al., 2013).

Most studies on TBL have examined improvements in the knowledge of practicing professionals in nursing, medicine, and other disciplines (Clark et al., 2008; Ofstad and Brunner, 2013; Banning and Gam, 2013; Mennenga, 2013). Few studies have examined the effects of TBL on problem-solving ability, knowledge of nursing and clinical performance of nursing students. Therefore, the examination of the effects of TBL on the problem-solving ability, knowledge of nursing, and clinical performance of nursing students was the focus of the present study.

Methods

Design and Sample

A randomized controlled trial was designed to evaluate the effects of TBL in nursing students. Eligible participants were 130 third-year nursing students from C University College of Nursing in South Korea. Participants met the following inclusion criteria: no experience of TBL or simulated learning, no current physical or psychiatric symptoms that would impair ability to provide informed consent or participate in the education sessions and assessments, and willingness to participate in this study. Sixty-three nursing students agreed to participate and were enrolled in the trial and randomly allocated to 1 of the 2 groups. There were no dropouts from the trial. Data from 32 students in the experimental (TBL) group and 31 students in the control group were analyzed.

Instruments

This study employed a problem-solving scale for college students, which was developed by Lee (2003) at the Korean Educational Development Institute. This scale comprises 45 items that are answered on a 5-point Likert Scale (1 = strongly disagree, 5 = strongly agree). This tool contains 5 subscales: issue specification, cause analysis, counter-proposal developments, plan and practice, and evaluation. Potential total scores range from 5 to 224; higher scores indicate better problem solving. Cronbach's alpha at the time of development (Lee, 2003) was .94. Cronbach's alpha for our sample was .85.

A 20-item multiple-choice questionnaire was developed by the research team to test the knowledge of participants. Two professors of adult nursing verified the content validity of the pulmonary nursing care knowledge tool. Total scores could range from 0 to 20.

A 13-item clinical performance checklist was developed by the research team (Table 1). Medical and nursing experts in acute care confirmed that this instrument had high content validity (content validity index >.80). The instrument employed a 3-point Likert scale (0 = did not perform, 1 = performed partially, 2 = performed completely). Potential total scores range from 0 to 26.

Data Collection and Procedures

Approval was obtained from the human ethics committee of C University in South Korea, where the participating students were enrolled. To recruit participants, details of the study along with its inclusion criteria were posted on the web site for third-year nursing students and on a communication board at the nursing school. Sixty-three students provided written informed consent and were randomly assigned to the treatment (TBL) or control (lecture and traditional case study) group. Students were given an overview of the entire course for the group they belonged to, and they completed a demographic form and questionnaire on problem-solving ability prior to the intervention. Participants were asked to maintain the confidentiality of the evaluations and the content of each class.

The TBL group comprised 32 students divided into 7 teams of 4–5 each, using collaborative learning techniques (CoLT) (Barkley et al., 2005). The TBL course was held for 3 weeks, including 3 in-class sessions of 2 h each. Participants were provided the main topic of the class on an online board a week beforehand and asked to prepare before attending the class. At the first in-class session, faculty presented the aim and overview of a lesson (5 min). Participants took the IRAT (15 min) and GRAT (20 min). The IRAT was composed of 10 multiple-choice questions. Students submitted the test papers and then took the GRAT, which comprised the same questions as the IRAT. In taking the GRAT, the students discussed and decided on the answers to the questions within their small groups, thus it took longer to complete than the IRAT. After the GRAT, answers of each team were presented on the board and each team described how they arrived at their solutions, including the pros and cons they had considered (20 min). After the readiness assurance tests, students applied the course concepts (20 min). Participants were given materials with a scenario developed for group application exercises (GAE). They discussed and documented the problem, symptoms, treatment, and nursing care for patients, and the teams reported their answers during the class (40 min). The process remained the same for the next 2 classes but the scenario was different for each class: pneumonia and adverse effects of drugs (1st class), COPD and electrolyte imbalance (2nd class), and pneumothorax and management of chest tubes (3rd class).