

# Effects of Team-Based Learning on the Core Competencies of Nursing Students: A Quasi-Experimental Study

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## ABSTRACT

**Background:** An important goal of nursing education is helping students achieve core competencies efficiently. One proposed way of improving nursing education is team-based learning (TBL).

**Purpose:** The aim of this study was to assess the comparative effectiveness of TBL and lecture-style classes in terms of teaching core competencies in nursing education, which include clinical competence skills, problem-solving ability, communication competencies, critical thinking ability, and self-leadership.

**Methods:** This quasi-experimental study enrolled 183 students as participants, with 95 and 88 in the experimental and control groups, respectively. These two groups attended 6 hours (2 hours weekly for 3 weeks) of TBL and lecture-style classes, respectively. Differences in core competencies between the two groups were compared before and after the intervention.

**Results:** The experimental group achieved significantly higher scores for clinical competence skills, communication competence, critical thinking ability, and self-leadership at posttest than at pretest, whereas the control group achieved significantly higher scores for clinical competence skills and critical thinking ability at posttest than at pretest. After the intervention, the experimental group had significantly better clinical competence skills, communication competence, and self-leadership than the control group.

**Conclusion:** TBL is an effective approach method to teaching core competencies in nursing education.

## KEY WORDS:

team-based learning, competency, nursing education.

include not only the perceptual capabilities that enable successful problem solving in clinical situations but also widely applicable and complex capabilities such as healthy attitudes toward the self, others, and the organization as well as effective social skills (Ko et al., 2013). More specifically, nursing students must become capable of integrated nursing skills delivery, possess knowledge of liberal arts and their major area, communicate and cooperate with various professional fields, exercise critical thinking, and exhibit self-leadership (Korean Accreditation Board of Nursing Education, 2012).

Therefore, in nursing education, helping students efficiently achieve these core competencies has become an important goal of education. However, traditional lecture-type classes (traditional instructor-centered teaching centered on the unilateral delivery of knowledge) are limited in achieving the goals of nursing education that are consistent with the demands of the times. This is because the instructor-centered nature of lecture-type classes is not suited to enhancing the abilities of students to manage issues in a flexible and creative manner. Therefore, introducing new education curricula that allow students to experience the process of integrating and applying knowledge autonomously in nursing education is necessary (Branson, Boss, & Fowler, 2016). Team-based learning (TBL) is one of many self-directed and active teaching learning methods (Haidet et al., 2012).

The concept of TBL was introduced by Michaelsen as an instructional method wherein students acquire knowledge and then apply this knowledge to solve problems through discussions in small teams in a traditional lecture room (Michaelsen, Parmelee, McMahon, & Levine, 2008). This type of class structure allows students to receive continuous practice-related feedback as they solve applied problems through individual and cooperative study and iterative learning. In addition, mini-lectures are given by instructors to summarize the core contents (Haidet et al., 2012). TBL sets the scope and direction of learning by supplying prior reading material and allows students to check their level of understanding through quizzes that are administered during discussion, facilitating the active participation of students in

## Introduction

Nursing education aims to develop competent nurses to provide professional nursing services in a rapidly changing nursing practice field (Mennenga & Smyer, 2010). Therefore, nursing students must have the knowledge, techniques, and attitudes necessary to effectively solve problems that are presented in various situations throughout their course of study. This discrete group of knowledge, techniques, and attitudes are the core competencies that nursing students must learn and achieve before graduation (Choi, 2016; Lee, Park, & Jeong, 2012). These core competencies

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the class through feedback and motivating students to become active in organizing and acquiring knowledge (Haidet et al., 2012; Parmelee & Michaelsen, 2010). Overall, TBL is a set of teaching and learning methods that is deployed at education sites. TBL combines the strengths of individual and cooperative learning and relies on a system whereby groups lead conceptual learning to solve various problems (Michaelsen & Sweet, 2011; Parmelee & Michaelsen, 2010). Finally, TBL is an educational method wherein the learners become class leaders and the teacher becomes a facilitator and guides who designs and manages the learning process, acting not as a “knowledge deliverer” but as a “learning facilitator” (Vermette & Foote, 2001). These TBL characteristics make it effective for developing communication, problem solving, cooperation, and professional, clinical, and critical thinking skills (Parmelee & Michaelsen, 2010) through its active, cooperative, and problem-solving, team-learning-based process that enables learners to engage in classes through sufficient preparation. Therefore, we expect that TBL may play a positive role in strengthening the core capabilities of nursing students such as integrated nursing skills delivery, knowledge of liberal arts and their major area, communication and cooperation with various professional fields, critical thinking, and self-leadership. Furthermore, because of its teaching/learning-based approach, which allows a small number of instructors to lead classes comprising large numbers of students, TBL should be easy to apply in the current nursing education field, where most teaching still consists of lecture-based classes (Zgheib, Simaan, & Sabra, 2010).

Previous studies have shown TBL as effective in promoting academic achievement and satisfaction (Roh, Ryoo, Choi, Baek, & Kim, 2012), class satisfaction (Clark, Nguyen, Bray, & Levine, 2008; Oh, 2015), learning motivation (Han, 2013), learning attitude (Cheng, Liou, Tsai, & Chang, 2014; Han, 2013), critical thinking (Kim & Hong, 2015), problem-solving abilities (Kim & Hong, 2015; Oh, 2015), self-directed learning (Kim & Hong, 2015), and clinical competence skills (Mennenga, 2013) in nursing students. However, its application in nursing education has not been as widely adopted as in other health education fields, and few studies have assessed the effectiveness of TBL in nursing education.

In particular, the effectiveness of TBL in promoting the core competencies of nursing education remains unclear. Although fragmentary evidence exists for the effectiveness of TBL in promoting individual competencies such as communication competence, critical thinking, and problem-solving ability, no study has yet examined the effectiveness of TBL in enhancing the core competencies of nursing education as a whole. Accordingly, this study was designed to determine the effectiveness of TBL in enhancing nursing student mastery of these core competencies by developing and applying a TBL program for nursing students and comparing its effectiveness with that of traditional lecture-style classes.

## Methods

### Research Design

This quasi-experimental study applied a nonequivalent, control-group, pretest-posttest design. Our main aim was to compare clinical competence skills, problem-solving ability, communication competence, critical thinking ability, and self-leadership between the experimental group (receiving TBL) and the control group (receiving lectures).

### Participants

The participants were senior nursing students of Yeungnam University in Daegu City, South Korea, who were taking an adult health nursing course and voluntarily agreed to participate after explaining of the study purpose, method, and expected effects. G\*Power 3.1.9.2 was used to calculate the necessary sample size; for a two-tailed t test with a significance level of  $\alpha = .05$ , two groups, an effect size of  $d = .05$ , and a power of test = 0.90, 88 subjects per group, for a total of 176 subjects, were needed. One hundred eighty-nine students from two classes agreed to participate. Although 96 and 93 students were randomly assigned to the experimental group and the control group, respectively, only 183 students were selected as the final participants because of incomplete responses from one person in the experimental group and five in the control group. Despite these exclusions, the total number of participants in each group was sufficient.

### Instruments

#### Core competencies

Core competencies represent the set of knowledge, skills, and attitudes that nursing students must have to effectively manage diverse and complex clinical situations and must master before graduation (Choi, 2016; Lee et al., 2012). In this study, core competencies specifically refer to clinical competence skills, problem-solving ability, communication competence, critical thinking ability, and self-leadership.

#### Clinical competence skills

We used an instrument that was developed by Yang and Park (2004) to measure the clinical competence skills of the participants. This instrument is composed of 19 items with six subscales: nursing process, nursing intervention, client education, observation, physical examination, and fundamental nursing. All items are rated on a 5-point scale, with higher scores representing higher clinical competency. The Cronbach's  $\alpha$  measure of internal reliability for this instrument was .86 in its development study (Yang & Park, 2004) and .94 in this study.

#### Problem-solving ability

To measure the problem-solving ability of the participants, this study used a 25-item instrument that was developed by Lee (1978, as cited in Park & Woo, 1999) and modified

and supplemented by Park and Woo (1999). All of the items are rated on a 5-point scale, with higher scores indicating better problem-solving ability. The Cronbach's  $\alpha$  was .89 at the time of instrument development and .89 in this study.

### Communication competence

To measure the communication competence of the participants, this study used the Global Interpersonal Communication Competence Scale, which was modified by Hur (2003) by adding seven items to the eight items that were originally proposed by Rubin (1990) for assessing the communication competence construct. This scale is composed of 15 items, with higher scores indicating greater communication competence. The Cronbach's  $\alpha$  was .72 in Hur's study and .88 in this study.

### Critical thinking ability

To measure the critical thinking ability of the participants, this study used a critical thinking disposition instrument comprising 27 items (Yoon, 2004). This instrument is composed of the subscales of intellectual eagerness/curiosity, prudence, systematicity, intellectual fairness, healthy skepticism, and objectivity. All of the items are rated on a 5-point scale, with higher scores indicating better critical thinking ability. Cronbach's  $\alpha$  was .84 at the time of instrument development and .92 in this study.

### Self-leadership

To measure the self-leadership of the participants, this study used the Revised Self-Leadership Questionnaire that was developed by Houghton and Neck (2002) and modified and supplemented by Shin, Kim, and Han (2009) for Korean students. The instrument is composed of 35 items, and each is rated on a 5-point scale, with higher scores indicating greater self-leadership. The Cronbach's  $\alpha$  was .73Y.83 at the time of instrument development (Shin et al., 2009) and .89 in this study.

## Research Procedure

We assigned students who voluntarily filled out the research participation agreement forms randomly into the test and control groups. The TBL intervention was administered to the experimental group, and the existing lecture-based course was administered to the control group. Each course was administered in one weekly 2-hour class for a period of 3 weeks. This study measured the clinical competence skills, problem-solving ability, communication competence, critical thinking ability, and self-leadership of all study participants using self-report surveys before and after the 3-week experiment. Each tool was used with the permission of its respective author(s).

The methods used to deliver TBL and lecture-based classes are described, respectively, below.

### Team-based learning

TBL is a structured set of methods that are designed to maximize the outcomes of both individual students and

their teams through individual learning and interactions among team members (Haidet et al., 2012). During the preplanning phase, the lecture material, case studies in nursing, and questions for the individual readiness assurance test (IRAT) and group readiness assurance test (GRAT) were based on providing "nursing care for diabetic patients," a topic from the adult health nursing course. In the case study phase, we documented the cases based on clinical experience and adult nursing textbooks. To increase the validity of the TBL program, two professors of adult health nursing modified and supplemented the content.

The TBL instructional process was completed according to a standardized three-stage protocol: individual self-learning through reading assignments (first stage), assessment of readiness assurance through tests and feedback (second stage), and application of course contents (third stage). We applied four main principles throughout these stages: appropriate formation and operation of teams, giving responsibilities for assignments to both individuals and teams, promoting learning and team development through team assignments, and providing appropriate feedback on achievements (Haidet et al., 2012).

In the first stage (i.e., self-learning), the purpose and method of TBL were explained to the experimental group in an orientation that was held 1 week before the first session. Then, each learning objective and related content and materials were presented to group participants on a weekly basis during the 3-week TBL course. The experimental group participants attended the session after completing their self-learning of the provided learning material.

The second stage (readiness assurance) was completed by administering, consecutively, the IRAT, GRAT, between-group evaluations, and feedback consistent with the learning result. The seven IRAT and GRAT questions that were used to measure the level of understanding of the training contents were multiple-choice (with five possible responses for each question) and identical every week. Of the 100 minutes of the total session time, we assigned 10 minutes for the IRAT and 30 minutes for the GRAT. After this, each group of participants held learning evaluations and exchanged feedback with instructors based on the posted correct answers. The learning evaluation involved discussions among groups that were guided by the instructor. At that time, students checked the correct answers for each question, asked questions about wrong answers, and discussed the different opinions on these questions, whereas the professor provided feedback on the questions and on difficult parts of the prior reading material.

In the third stage (application of course contents), group discussions were completed in the last 30 minutes. Diabetic patient scenarios, which were developed based on actual hospital cases, were distributed to each team member, and then the class progressed with group discussions and presentations to the class utilizing concept maps, feedback among groups, and feedback by the instructor. During this time, the instructor took on the roles of both facilitator and

information provider. Finally, peer evaluations were performed to assess the contribution of each member to the team.

Each team was composed of six to seven members, and each class had eight teams, thus totaling 16 teams for the two classes. The participants were randomly assigned to each group by drawing lots. The same groups were maintained through the end of the course.

### Lecture-style classes

Lectures addressing the nursing care of diabetic patients, the same topic as the TBL, were administered by the researcher for 6 hours (2 hours per week for 3 weeks) in a traditional lecture format.

## Data Analysis

The collected data were analyzed using SPSS 21.0 (IBM, Inc., Armonk, NY, USA). Descriptive statistics were calculated, including numbers and percentages for the general characteristics of both groups and means and standard deviations (SDs) for core competencies, including clinical competence skills, problem-solving ability, communication competence, critical thinking ability, and self-leadership. Homogeneity tests were conducted before the intervention using  $\chi^2$  test and independent t test for the general characteristics and core competencies of the two groups. The differences between the two groups after the intervention were tested using an independent t test. Changes in core competencies before and after the intervention in each group were determined using a paired t test.

## Ethical Considerations

Before completing this study, permission from the institutional review board of our affiliated university was obtained (No. 40525-201404-HR-13-02). The study was completed only after explanations on the purpose, method, and expected effects of the study were given to potential participants and their written informed consent was obtained. In the explanation and agreement forms, we assured participants that the personal information that was obtained for this study would not be used for any other purpose, that there were no disadvantages to not participating, and that participants could withdraw at any point during the study.

## Results

### General Characteristics and Homogeneity Tests Between the Two Groups

The mean age of participants was 23.57 (SD = 1.81) years for the experimental group and 23.48 (SD = 1.74) years for the control group, with no significant difference between the groups. Most of the participants in both groups were female. Furthermore, both groups were relatively homogeneous in terms of personal relationship status, degree of

satisfaction with academic major, academic performance, and preferred learning method. In terms of the preferred learning method, it should be noted that 97.9% of the experimental group and 96.6% of the control group expressed a preference for lecture-style classes (Table 1).

### Homogeneity Tests of Core Competencies Between the Two Groups Before the Intervention

There were no significant differences between the two groups before the intervention (pretest) in terms of clinical competence skills, problem-solving ability, communication competence, critical thinking ability, or self-leadership. Thus, the two groups were homogenous (Table 2).

### Differences in Core Competencies Between the Two Groups After the Intervention

After the intervention, the mean scores for clinical competence skills, communication competence, and self-leadership in the experimental group were significantly higher than those in the control group, with all differences meeting statistical significance. Although problem-solving ability and critical thinking ability were also higher in the experimental group than in the control group, these differences did not meet statistical significance (Table 3).

### Changes in Pretest/Posttest Core Competencies for the Two Groups

In the experimental group, the mean posttest scores for clinical competence skills, communication competence, critical thinking ability, and self-leadership were significantly higher than the respective pretest scores. By comparison, in the control group, only the posttest scores for clinical competence skills and critical thinking ability were higher than the respective pretest scores (Table 4).

Both groups achieved improvements in all of the core competencies after the intervention, with degree of score improvement higher in the experimental group than in the control group for each core competency category (Figure 1).

## Discussion

This study was conducted to assess the effects of TBL on the core competencies that nursing students must master as a prerequisite to graduation. After applying TBL and lecture-style classes, the core competencies including clinical competence skills, problem-solving ability, communication competence, critical thinking ability, and self-leadership were evaluated.

There were no significant differences between the two groups at pretest in terms of general characteristics or core competencies. However, we noted improvements in both groups in all core