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Effects of team-based learning on perceived teamwork and academic performance in a health assessment subject

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Summary The purpose of this study was to examine the effectiveness of team-based learning (a well-recognized learning and teaching strategy), applied in a health assessment subject, on nursing students' perceived teamwork (team-efficacy and team skills) and academic performance (individual and team readiness assurance tests, and examination scores). A prospective, one-group, pre- and post-test design enrolled a convenience sample of 74 second-year nursing students at a university in Suwon, Korea. Team-based learning was applied in a 2-credit health assessment subject over a 16-week semester. All students received written material one week before each class for readiness preparation. After administering individual- and team-readiness assurance tests consecutively, the subject instructor gave immediate feedback and delivered a mini-lecture to the students. Finally, students carried out skill based application exercises. The findings showed significant improvements in the mean scores of students' perceived teamwork after the introduction of team-based learning. In addition, team-efficacy was associated with team-adaptability skills and team-interpersonal skills. Regarding academic performance, team readiness assurance tests were significantly higher than individual readiness assurance tests over time. Individual readiness assurance tests were significantly related with examination scores, while team readiness assurance tests were correlated with team-efficacy and team-interpersonal skills. The application of team-based learning in a health assessment subject can enhance students' perceived teamwork and academic performance. This finding suggests that team-based learning may be an effective learning and teaching strategy for improving teamwork of nursing students, who need to collaborate and effectively communicate with health care providers to improve patients' health.

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Introduction

Health assessment is a systematic and timely method for collecting and interpreting clients' health information; therefore, it is an essential subject for undergraduate nursing programs (American Association of Colleges of Nursing, 2008; Jarvis, 2011). However, many nursing students perceive a health assessment subject as difficult due to the emphasis on developing their integrative capacity, such as logical learning or effective problem solving skills for clinical applications (Giddens & Eddy, 2009; Jarvis, 2011). In recent years, integrating knowledge and skills in health assessment subjects has required innovative educational methods to increase nursing students' active participation with the aim of them developing interpersonal relationships in clinical nursing practice (Chung, Rhee, Baik, & A, 2009; Clark, Nguyen, Bray, & Levine, 2008).

Team-based learning (TBL) is a group-based and student-centered learning and teaching strategy that uses a structured format of preclass preparation, individual and group readiness assurance tests, and application exercises (Michaelsen, Parmelee, McMahon, & Levine, 2008). Accordingly, TBL is an active educational strategy to help students interact with their team members for achieving subject objectives (Sisk, 2011). Compared with traditional lectures, it promotes self-directed learning, student engagement in class, and interpersonal interaction through preparation and teamwork (Clark et al., 2008). Due to a high student-to-lecturer ratio, it is also relatively more cost-effective than problem-based learning (Sibley & Parmelee, 2008). Previous study suggests that TBL would be an appropriate educational method for preclinical subjects (Haidet & Fecile, 2006) such as health assessment. This learning and teaching strategy can help develop a variety of students' abilities and attitudes, particularly in terms of interpersonal and teamwork skills, as well as evidence-based performance, including problem solving skills (Cheng, Liou, Tsai, & Chang, 2014; Opdecam & Everaert, 2012).

Many recent studies have reported that TBL increases student satisfaction and engagement, and improves academic performance, especially in the case of academically at-risk students (Cheng et al., 2014; Chung et al., 2009; Clark et al., 2008; Michaelsen et al., 2008; Nieder, Parmelee, Stolfi, & Hudes, 2005). In addition to these positive, individual findings, the literature about TBL emphasizes the significant impact of team learning on social skills. Relatively few studies, however, have demonstrated the enhanced collaborative teamwork skills such as cooperative interaction, communication skills, and team-based problem solving skills, which are necessary in a variety of clinical settings (Johnson, 2009; Sibley & Parmelee, 2008).

Purpose

The primary purpose of this study was to evaluate the effectiveness of TBL in developing students' perceived teamwork such as team-efficacy and team skills. The secondary purpose was to examine the relationship between perceived teamwork and academic performance (individual and team readiness assurance tests, and examination scores) in a health assessment subject.

Methods

Design and participants

This study was conducted using a prospective, one-group, pre- and post-test design with the intervention of TBL. A convenience sample was obtained from 74 second-year nursing students enrolled in a health assessment subject, in the fall semester of 2012, at a university in Suwon, South Korea. The sample size of 74 participants in this study reached 99.9% power ($1-\beta$) with an effect size of .81, which was the lowest effect size among primary variables in this study, and an alpha value of .05 on a post-hoc paired *t*-test (Faul, Erdfelder, Lang, & Buchner, 2007).

Procedure and TBL intervention

The TBL intervention applied in this health assessment subject consisted of fundamental nursing related knowledge and skills and was required to be taken before the start of major subjects and clinical practicum. The 50-min lecture and 100-min laboratory practice was taught by a subject instructor and two teaching assistants, weekly, over a 16-week semester. The lecture topics were respiratory, cardiovascular, abdominal, and neurologic body systems.

Pre-test: On the first day of class, participants completed a demographic survey and questionnaires regarding students' perceived teamwork including team-efficacy and team skills before class began.

Intervention: Steps of TBL intervention was based on the guidelines of TBL activities in health sciences education (Haidet et al., 2012). Each step can enable students to master desired content by promoting interpersonal communications and improving engagement in the team (Clark et al., 2008). The detailed flow of each step shown in Fig. 1 briefly summarizes as follows.

(a) *Team formation*: According to the guideline of Michaelsen et al. (2008), the team should be formed by criteria such as attitudes or performance in previous subject work. To randomly assign small groups, the subject instructor used the students' preferences for previous subjects (anatomy, physiology, and nursing process), which are interrelated components of health assessment. The sorting process was not transparent to the participants. There were 16 groups with 4—5 students in each.
(b) *Readiness preparation*: All readiness content was based on the learning outcomes of each class topic, including anatomy, physiology, and normal and abnormal findings of health assessment. The topic's core content was summarized concisely and clearly on one double-sided sheet of paper. The total time required for pre-class preparation was approximately 30—45 min. Written material on the relevant topic was provided to all students one week before the lecture for readiness preparation.
(c) *Readiness assurance*: The individual readiness assurance test (iRAT) and team readiness assurance test (tRAT) were consecutively administered with the same core content questions in each class. For a period of 5 min, a paper-based iRAT, consisting of five multiple-choice