A Study on the correlations among IRAT, GRAT, problem solving, communication, learning motivation, and learning satisfaction after team-based learning in nursing students

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Abstract

Background/Objectives: This study investigated the correlations among the scores of individual readiness assurance test(IRAT), the scores of group readiness assurance test(GRAT), problem solving, communication, learning motivation, and learning satisfaction after team-based learning(TBL) in nursing students.

Methods/Statistical Analysis: A descriptive correlational research design was used. The second grade nursing students who took adult health nursing were invited to participate in the study. TBL was applied to the 2-hour
lessons of respiratory system in adult health nursing course in 2015. The data were collected from 123 participants using self-report questionnaires and analyzed using R version 3.3.2. Pearson’s correlation coefficients were calculated for correlation analysis.

Findings: This study showed that the scores of GRAT and IRAT were in weak positive correlation ($r=.17$, $p<.01$). IRAT scores were positively correlated with problem solving ($r=.22$, $p<.05$) and learning motivation ($r=.21$, $p<.05$). GRAT scores were positively correlated with problem solving ($r=.28$, $p<.05$) and communication ($r=.22$, $p<.05$). In particular, there were strong positive relationship between problem solving and communication ($r=.73$, $p<.05$), and moderate positive relationship between learning motivation and communication ($r=.42$, $p<.05$), between learning motivation and problem solving ($r=.36$, $p<.05$), and between learning motivation and learning satisfaction ($r=.59$, $p<.05$). And there were weak positive relationship between learning satisfaction and problem solving ($r=.26$, $p<.05$) and between communication and learning satisfaction ($r=.20$, $p<.05$).

Improvements/Applications: The findings indicate that TBL is an effective teaching and learning method by increasing learning motivation through IRAT and problem solving ability and communication skills through GRAT in nursing students.

Key Words: Team-Based Learning (TBL), Problem-Solving, Communication, Learning Motivation, Learning Satisfaction, Nursing Students.

1 Introduction

Team-based learning (TBL) is well-designed small group learning in which team members help each other and perform tasks to produce the best results through team learning. Team members are encouraged to share their vision and communicate effectively to achieve team’s goals. Outside the classroom, students need self-directed learning through prior learning. TBL is designed as learner-centered learning strategy that seek answers to problems
together as a member of a small group in the classroom \(^1-^2\). In TBL, learning and teaching from peers encourages learning and promotes academic achievement\(^3\). Unlike traditional lectures, TBL can lead to curiosity and to stimulate students’ interest on learning content and thus to enhance various learning abilities. In addition, TBL is an effective way to demonstrate the merits of small-group instruction even in a large number of students, for example, the ratio of students to professors is about 200 to 1 \(^4-^5\).

The model of TBL consists of three stages. The first is the stage where the students study the precedent learning tasks presented by the instructor. In the second stage, the individual readiness assessment test (IRAT) and the group readiness assessment test (GRAT) are sequentially performed, and the same multiple choice questions are provided at this time. The results of the evaluation of IRAT and GRAT are released within the class and the professor provides feedback. In the third stage, professor presents a scenario-based case on the learning topic, and the student develops problem solving through team-specific discussions \(^2\).

A review of the literature on TBL has two major implications. As the result of applying TBL, first of all, we could see a big improvement in academic achievement compared to traditional learning method \(^6\). Vasan and colleagues said that after applying the TBL at medical schools, they achieved 100% success rate of doctor’s national examination \(^3\). Second, the TBL showed various improvements in learning outcomes. Through various studies, it has been suggested that TBL leads to improvement of communication \(^7\), problem solving \(^8\), learning motivation \(^9-^10\), and learning satisfaction \(^7\), as well as improvement of critical thinking \(^11\), leadership \(^6\) and teamwork \(^12\). However, it is difficult to find a study about correlations between the outcome variables of TBL. We investigate the correlations between the IRAT, GRAT, problem solving, communication, learning motivation, and learning satisfaction after TBL. In particular, we want to examine how IRAT and GRAT scores are related to which outcome variables in TBL. This research finding will be used to determine what type of teaching-learning strategy needs to be developed to increase learning outcomes.
2 Methods

2.1 Samples

The subjects were the second grade students attending a 3-year nursing school. One hundred twenty three students among 136 students participated in the study voluntarily.

2.2 Instruments

IRAT is composed of 15 multiple choice questions developed by the primary author based on the anatomy, physiology, diagnostic tests and assessment of the respiratory system in adult health nursing textbook. GRAT is the same items used in IRAT.

Problem solving was measured using the scale developed by Lee and his colleagues. Problem solving scale is 5-point Likert scale and it has 45 items, the higher the total score, the better the problem solving ability. The Cronbach’s $\alpha$ was .94 and .92 in this study.

Communication was measured using the scale developed by Lee and his colleagues as well. Communication scale has 49 items, the higher the total score, the better communication ability. Thirteen negative items were reversed to calculate communication ability. The scores ranged from 49 to 245. The reliability of this instrument was .80 at the time of development and was .88 in this study.

Learning motivation was measured using the Course Interest Survey. It has 31 items, the higher the total score, the higher level of learning motivation. The reliability was Cronbach’s $\alpha$ of .76 in Park’s study and was .92 in this study.

Learning satisfaction was measured using Ji’s learning satisfaction measurement tool. It has 7 items, the higher score, the higher learning satisfaction. The internal reliability was .89 in the study by Ji and was .92 in this study.

2.3 Ethical consideration

Ethical verification of research was obtained from the Institutional Review Board of Baekseok University in South Korea. In order to minimize the compulsory participation of the students, corresponding author, who is working in a different institution from
the study participants, explained the purpose and procedures of the research. She also emphasized that students could withdraw their participation at any time and it will not give them any disadvantage in their grades of adult health nursing. After all the explanation was over, students signed on the consent form if they want to participate in the study. Then the self-report questionnaire was distributed to only those who signed on the consent form. TBL classes were developed and provided directly by the first author and she was excluded from the data collection to minimize students’ forced participation in the research.

2.4 Procedure

TBL was applied to the 2-hour lesson of anatomy, physiology, and assessment of pulmonary systems in adult health nursing course. Eight teams per class were made based on the GPA of the last semester. Each team was composed of 4 to 5 students. TBL consists of three specific phases; preparation phase, readiness assurance test phase, and application phase 2. In the preparation phase, the professor explained the purpose, outline and method of TBL in advance and uploaded online prerequisite learning materials to cyber campus. The students were instructed to take the online course and read the textbook prior to participating in TBL. In the readiness assurance phase, students took IRAT and then each team completed GRAT using the same questions with IRAT. At GRAT, students found the answers to the questions through discussions, and each team described their answers on the board and gets feedback from the professors. In the application phase, scenario-based problems related to concepts they learn that day were presented, and the each team synthesized, interpreted, and inferred the given information through discussion and presented the results.

One week after TBL class, self-report questionnaire on communication skills, problem solving ability, learning motivation, and learning satisfaction were distribute to the students.

2.5 Data analysis

The data gathered from 123 nursing students were analyzed using R version 3.3.2. Descriptive statistics were used for means
and standard deviations. Pearson correlation coefficients were calculated for correlation analysis. The statistical significance level was set as p value less than 0.05.

3 Results

The mean (SD) age of the participants was 23.14(7.90) and 91.9% of them were female. 5.7% of the students answered that they had experienced TBL before.

The mean score of GRAT increased 35.2% higher compared to the mean score of IRAT as shown in Table 1.

Table 2 shows the correlations among dependent variables in the study. IRAT scores were in weak positive correlation with GRAT scores ($r=0.17$, $p<.01$). IRAT scores were positively correlated with problem solving ability ($r=0.22$, $p<.05$) and learning motivation ($r=0.21$, $p<.05$). And GRAT scores were positively correlated with problem solving ability ($r=0.28$, $p<.05$) and communication ($r=0.22$, $p<.05$). Particularly, there were strong positive relationship between problem solving and communication ($r=0.73$, $p<.05$), and moderate positive relationship between learning motivation and learning satisfaction ($r=0.59$, $p<.05$), between communication and learning motivation ($r=0.42$, $p<.05$), and between problem solving and learning motivation ($r=0.36$, $p<.05$). There were weak positive correlation between problem solving and learning satisfaction ($r=0.26$, $p<.05$) and between communication and learning satisfaction ($r=0.20$, $p<.05$).
Discussion

Although TBL is widely known as an effective teaching method in a variety of fields, the validity of the correlation between learning outcome variables has not yet been studied. This study showed the correlations among IRAT, GRAT, problem solving, communication, learning motivation, and learning satisfaction after TBL. The findings indicated that IRAT scores were positively correlated with problem solving as well as learning motivation, and GRAT scores were in weak positive correlation with problem solving and communication in nursing students. Therefore, nursing competencies such as problem solving ability and communication skills could be enhanced through TBL in nursing students.

This study showed the GRAT scores increased 35.2% higher compared to the IRAT scores. In the previous study, there were improvement of about 16% \(^{17}\) to 20% \(^{18}\). The results that the mean scores of GRAT were higher than those of IRAT indicate the benefit of peer learning after IRAT \(^{5,19}\). Also, students performed better as a group than the most competent student in the group when they worked together in a well prepared lessons \(^{17}\).

IRAT scores showed a significant correlation with learning motivation and problem solving ability. TBL emphasizes self-directed learning to watch online lessons and prepare class materials before class, ability to collaborate with small group members during class, and ability to reach consensus in areas where disagreements arise through discussions \(^{20}\). In the group discussion, students also try to solve the problems of the subjects presented in actual clinical cases \(^{19}\). It is considered that the students’ motivation to learn improved

<table>
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<th>IRAT</th>
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<th>Communication</th>
<th>Learning Motivation</th>
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<td>0.26*</td>
<td>0.26*</td>
<td>0.59*</td>
<td>1.00</td>
</tr>
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</table>

* Correlation is significant at \(p<0.05\)  
** Correlation is significant at \(p<0.01\)
through the benefits of team discussion. Learning motivation stimulates students to engage into class more enthusiastically. Learning motivation also gives influences on students’ school adaptation.

In this study, GRAT scores showed a significant positive correlation with communication and problem solving abilities. This is the result from the team activities in the classroom. It was reported that team members improved their ability to understand other people’s thoughts and problems and solved the problems together, affecting communication ability by forming bonds and trust. Team members have to analyze data and negotiate to reach a consensus within a limited time. After teams give out their consensus, each team has to explain the evidence or reasoning to support their decisions. Through the process of drawing consensus, students could acquire listening, teaching, and vigorous negotiation skills.

There are various assessments of the effectiveness of TBL. Among them, positive attributes is that a lot of learning for a short time is possible in TBL. The other positive attribute is that learning contents in TBL tend to be memorized for a longer time and wrong concepts are corrected through discussions with peers. As this positive learning experience builds up, learning motivation and learning satisfaction could be increased.

Taking IRAT at the beginning of TBL class motivates students to prepare well for the class, therefore, students independently master the knowledge contained in the uploaded lecture before TBL class. Poor understandings are corrected as peers explain evidence and reasoning related to specific answer to questions to their teammates during the GRAT.

Learning motivation in TBL affects not only well-prepared students but also less prepared students. Well-prepared students solidify their own knowledge by expressing verbally and negotiating with teammates. And they are rewarded with good grades for their individual achievement and contribution to team, and they usually don’t spend additional time on accomplishing tasks other than the class hours. However, the knowledge of students who are less prepared is not just improved with the help of teammates’ knowledge. They could be motivated by two elements: their internal desire to accomplish better on the IRAT, and the external expectations from their peers that they will contribute to the team. Peer pressure to prepare well for the class could motivate the underachievers.
Problem solving ability showed a significant correlation with both IRAT and GRAT. Problem solving ability in TBL leads to mastery of knowledge and skills in specific areas through IRAT and GRAT. And independently learned knowledge prior to the class has also helped solving problems interactively in team activities. The activity of analyzing and evaluating the nursing case scenario at application phase contributes improving problem solving ability.

Overall, TBL is shown to be effective in promoting diverse learning outcomes such as communication skills, problem solving, and learning motivation in addition to simple knowledge acquisition. These learning effects are all interconnected.

5 Conclusion

This study showed that IRAT was correlated with problem solving and learning motivation, and GRAT was correlated with problem solving and communication, and there was strong positive correlation between problem solving and communication. We suggest that nurse educators, who need to develop effective and student-centered teaching strategies, utilize TBL in their class. We conclude that TBL can boost up problem solving ability and communication skills in nursing students.

References


