

# Effects of Applying Flipped Learning to Simulation Training in Nursing Students

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## Abstract

**Background/Objectives:** This study was conducted to confirm the effect of applying flipped learning to simulation training of nursing students.

**Methods/Statistical analysis:** The study was the experiment with pre and post design in single group. The subjects of this study were 88 nursing students who were taking the simulation training course of nursing college. The learning model was designed with a total of 11 programs based on the 'PRTNER' model. Collected data were analyzed using descriptive statistics and paired t-test using SPSS 22.0.

**Findings:** Although there was no statistically significant difference in the problem solving ability( $t=-1.342$ ,  $p=.183$ ) between before and after applying flipped learning to simulation training, the significant improvement was achieved in self-directed learning ability( $t=-2.187$ ,  $p=.031$ ), communication ability( $t=-5.316$ ,  $p<.001$ ), and satisfaction of instruction( $t=-2.830$ ,  $p=.006$ ). Therefore, using the teaching and learning method with flipped learning, the learning outcomes can be maximized by improving the core competencies that nursing students should have. These results are useful as basic data for the development of teaching and learning methods that can improve the core competencies of nursing students.

**Improvements/Applications:** Based on this results, we propose the follow-up study to confirm the effectiveness of various teaching and learning methods applying flipped learning to the theoretical curriculum in nursing science.s

**Keywords:** *Flipped Learning, Nursing Students, Communication Competency, Self-directed Learning, Problem Solving Ability*

## Introduction

Recently, due to changes in health care, patient safety is important and patient rights are guaranteed, so nursing students' nursing care during clinical practice is limited, making it difficult to acquire knowledge and in various and complex diseases in clinical practice. Also, because a lot of major knowledge should be delivered in a short time, and there are many lecture-oriented classes centered on teachers, it is difficult to strengthen the core competency required at graduation for nursing college students. The nursing education requires various method

of training that can experience on-the-job-oriented learning<sup>[1]</sup>, so flipped learning, team based learning, problem-based learning and simulation training have been used for several years, and effectiveness has been evaluated<sup>[2-3]</sup>.

Simulation exercise training provides nursing students with an opportunity, including safe environment<sup>[4]</sup>, to learn repeatedly through various scenarios in the situation similar to clinical practice based on high fidelity simulator. Flipped learning means 'learning backwards', and it is a teaching method that enables students to learn outside the classroom by changing the learning order and to experience the transfer of knowledge acquired before the class in various ways<sup>[5]</sup>. The flipped learning also has shown to improve

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critical thinking, communication, and self-directed learning through pre-learning, constant interaction and discussion with peers<sup>[5-7]</sup>. However, according to the amount of pre-learning and the method of teaching and learning, students' dissatisfaction and limited increase in satisfaction of the class have been reported<sup>[8]</sup>. Therefore, simulation and flipped learning can be the effective teaching and learning methods to enhance the learning outcomes. So, it is necessary to apply them to various curriculum subjects and confirm the effects including the limitations. After developing and applying flipped learning method which is the learner-centered teaching method in the course of simulation practice, we confirmed the effect and performed the study to provide the basic data in education.

The specific objectives of the research are as follows. First, it confirms the level of problem solving ability, self-directed learning ability, communication competency and class satisfaction before and after applying flipped learning to simulation training. Second, it compares the difference of problem solving ability, self-directed ability and communication competency before and after applying flipped learning to simulation training.

## Method

This study is an experimental study using pretest-posttest design in one group to investigate the effect of nursing student's simulation practice training, applied with flipped learning, on problem solving ability, self-directed ability, communication competency and instructional satisfaction.

The subjects were the students who participated in the simulation exercise course and agreed to participate in the research from department of nursing at D University in J city. The number of the subjects was 88 with the effect size of .30, significance level of .05, and test power of .90 using G\*power 3.1.9. However, 95 subjects were selected considering the dropout rate. The final analysis included 88 subjects.

In this study, the effectiveness of the simulation practice education using the flipped learning in nursing students was verified by using the life ability measurement tool<sup>[9]</sup> for college students and general adults and the class satisfaction<sup>[10]</sup> tool.

For problem solving ability, we used the life ability measurement tool developed by Lee, Jang, Lee, and

Park<sup>[9]</sup>. There are 45 questions in total, consisting of the Likert scale. The higher the score, the higher the problem solving ability. In the reliability of problem solving ability, Cronbach's  $\alpha$  was .94 at the time of development and .96 in this study.

In evaluation self-directed learning ability, we also used the life ability measurement tool developed by Lee, Jang, Lee, and Park<sup>[9]</sup>. There are a total of 40 questions, which are composed of the Likert scale, the higher the self-directed learning ability. In the reliability of self-directed learning ability, Cronbach's  $\alpha$  was .95 at the time of development and .95 in this study.

In evaluate communication competency, we used the life ability measurement tool developed by Lee, Jang, Lee, and Park<sup>[9]</sup>. A total of 49 questions, which are composed of the Likert, the higher score means better communication competency. In the reliability of communication competency, Cronbach's  $\alpha$  was .80 at the time of development and .89 in this study.

In order to evaluate class satisfaction, we used the class satisfaction tool developed by Choi<sup>[10]</sup>. There are a total 12 questions indicating the higher the score, the higher class satisfaction. In the reliability of class satisfaction, Cronbach's  $\alpha$  was .89 at the time of development and .91 in this study.

In order to improve the learning outcomes of nursing college students through simulation training with flipped learning and to strengthen core competencies, the 'PARTNER' model, the flipped learning teaching and learning model developed by Choi and Kim was used<sup>[11]</sup>. In the study, 'PARTNER' model was applied to 6 revised levels of 'Preparation', 'Relevance', 'Team activity', 'Nub lecture', 'Evaluation', and 'Reflection' and the program was performed 11 times in total. First, We analyzed the learner, subject, and simulation practice environment for the learner-centered class in the preliminary stage(pre-class) and developed the simulation practice guide applying the flipped learning. In addition, we have developed preliminary learning materials such as video and handout to help self-directed learning. Second, the pre-learning linkage(In-class) enables quizzes and question-and-answer on the pre-learning so that cooperative learning can be achieved. Third, in the team activity, nursing process and debriefing were applied to simulation exercises according to scenarios to improve learner's problem solving ability, critical thinking ability and communication competency.

The instructor acted as facilitators to help learners collaborate to solve problems and share the knowledge to make up and improve what is lacking. Fourth, at the end of the lesson, the key summary lecture was used to accurately convey the main goal and the core contents on weekly basis. Fifth, various scenarios were applied to perform the mid-term evaluation and the overall evaluation for each team. Finally, in post-reflection, after the weekly lecture was finished, the reflection diary was made to be able to reflect on the contents on team-by-team basis or individually, and the professor gave feedback on it[Table 1].

**Table 1. Flipped learning model based on PRTNER model**

Process		Details	
Learner Activity		Instructor Activity	
Class preparation	Analysis, design and development	<ul style="list-style-type: none"> <li>• Analysis of learner, subject and simulation practice environment</li> <li>• Lesson design for flipped learning</li> <li>• Development of simulation training guide</li> <li>• Development of scenarios, videos, handout</li> </ul>	
Pre-class	Preparation	<ul style="list-style-type: none"> <li>• Self-directed pre-learning regardless of time and space through videos and handouts for each team or individual</li> </ul>	<ul style="list-style-type: none"> <li>• Notice of weekly learning contents through smartphone app on a weekly basis</li> <li>• Equipment of video and handouts for pre-learning</li> </ul>
In-class	Relevance (30 mins)	<ul style="list-style-type: none"> <li>• Quiz and Q &amp; A about pre-learning though collaborative learning</li> </ul>	<ul style="list-style-type: none"> <li>• Feedback on pre-learning and questions</li> </ul>
	Team activity (2 hours & 30 mins)	<ul style="list-style-type: none"> <li>• Application of nursing process to simulation practice through various situation scenarios by team</li> <li>• Debriefing</li> </ul>	<ul style="list-style-type: none"> <li>• Role as a facilitator of simulation practice in different scenarios of various situations</li> <li>• Provision of environment for debriefing</li> </ul>
	Nub lecture (30 mins)	<ul style="list-style-type: none"> <li>• Summary of weekly learning goals and core contents through Q &amp;A</li> </ul>	<ul style="list-style-type: none"> <li>• Lecture of weekly learning goals and core contents through Q &amp;A</li> </ul>
	Evaluation (30 mins)	<ul style="list-style-type: none"> <li>• Mid-term and overall evaluation</li> <li>• Peer evaluation by team</li> </ul>	<ul style="list-style-type: none"> <li>• Instructor evaluation by team</li> </ul>
Post-class	Reflection	<ul style="list-style-type: none"> <li>• Post-reflection writing</li> <li>• Student’s opinion writing</li> <li>• Q &amp; A</li> </ul>	<ul style="list-style-type: none"> <li>• Provision of feedback by checking post-reflection logbook</li> <li>• Re-reflection on next week after checking Q &amp; A</li> </ul>

This study was conducted from March to April, 2019, and the preliminary survey was carried out by online questionnaires after the orientation of simulation exercise course, and the post-test was carried out by post-question in the same way after the 11th program. To analyze the collected data, the reliability of each tool was measured using the SPSS WINDOW 22.0 program. The general characteristics of the subjects were described using descriptive statistics of frequency, percentage, mean

and standard deviation, and paired t-test was to analyze differences between pre-and-post-experiment.

Considering the ethical side of the subject, this study was reviewed and approved by the Institution Review Board(IRB No: D\*\*-2019-02-002-01), D University at J city, and data were collected. In addition, approval for using the tool in the study was obtained from its developer. The research assistant without conflict of interest explained

the purpose, the method, the outcome, and the potential problems of the study to the subjects and explained that they may wish to remain anonymous and refuse to participate if they do not. The survey was conducted after obtaining the informed consent from subjects who agreed to participate in the study and the complimentary product was provided in return.

## Result

In general characteristics of the subject, the average age of the subjects was 22.85( $\pm$ 2.93), and the number of female students was 78(88.6%). In terms of average grades for all semesters, the number of students who received less than 3.0-3.5 points was the highest with 33 students(37.5%), and the number of students with the score below 3.5-4.0 was 30 students(34.1%) [Table 2]. From the effects of simulation training practice

using flipped learning of nursing students, the results of the preliminary survey showed the problem solving ability of 3.53( $\pm$ 0.46), self-directed learning ability of 3.51( $\pm$ 0.45), communication competency of 3.37( $\pm$ 0.33), and class satisfaction was 3.79( $\pm$ 0.63). The results of the follow-up were improved to 3.63( $\pm$ 0.52) for problem solving ability, 3.66( $\pm$ 0.53), for self-directed ability, 3.66( $\pm$ 0.38), for communication competency and 4.05( $\pm$ 0.61) for class satisfaction. Although there was no statistically significant difference in the problem solving ability( $t=-1.342$ ,  $p=.183$ ) of nursing students, before and after applying flipped learning in the simulation training, there were statistically significant difference in self-directed learning ability( $t=-2.187$ ,  $p=.031$ ), communication competency ( $t=-5.316$ ,  $p<.001$ ) and class satisfaction( $t=-2.830$ ,  $p=.006$ ) [Table 3].

**Table 2. General characteristics of the subjects**

Characteristics	Categories	n(%)	Mean $\pm$ SD
Age	<20-25	78(88.6)	22.85 $\pm$ 2.93
	<25-30	7(8.0)	
	>30	3(3.4)	
Sex	Male	10(11.4)	
	Female	78(88.6)	
Average of all semesters	<2.0-2.5	3(3.4)	
	<2.5-3.0	20(22.7)	
	<3.0-3.5	33(37.5)	
	<3.5-4.0	30(34.1)	
	>4.0	2(2.3)	
Major satisfaction	Not at all	2(2.3)	
	Not satisfied	11(12.5)	
	Satisfied	55(62.5)	
	Very satisfied	20(22.7)	
Preferred teaching method	Instructor-centered lecture	75(85.2)	
	Learner-centered lecture	13(14.8)	

**Table 3. Comparison of difference before and after applying flipped learning in simulation exercise course**

Variable	Reliability	Pre-test	Post-test	t	p
Problem solving ability	.96	3.53±0.46	3.63±0.52	-1.342	.183
Self-directed learning ability	.95	3.51±0.45	3.66±0.53	-2.187	.031
Communication competency	.89	3.37±0.33	3.66±0.38	-5.316	<.001
Class satisfaction	.91	3.79±0.63	4.05±0.61	-2.830	.006

### Discussion

Based on the results of this study, the problem solving ability increased with flipped learning in the simulation training program, but it was not statistically significant. This was different from the one that 5-6 team members could improve their problem solving ability by constant interaction while thinking about what is right and best, what should be improved in order to solve the problem through critical thinking<sup>[5]</sup>. Therefore, repeated studies are needed to verify the effect after analyzing other factors influencing problem solving ability.

The self-directed learning ability was significantly improved by flipped learning. It is the same result as Choi and Kim that self-directed ability improved with flipped learning in the basic nursing practice course<sup>[5]</sup>. In addition, flipped learning can be the most effective teaching method for self-directed learning ability which is supported by previous researches.<sup>[12-13]</sup> Furthermore, it is the result of self-directed pre-study to achieve the learning goal by the members in the preliminary stage and the pre-learning link of the flipped learning method, and active learning based on the learner such as continuous interaction with the peers and discussion. In addition, it seems that the learner performed self-directed nursing process and debriefing to solve the problem of various situation in team activity.

The Communication competency statistically improved after application of flipped learning method to the simulation training. This result is consistent with previous studies that have improved communication competency by flipped learning applied to other curriculums, such as health assessment and adult nursing<sup>[7,14]</sup>. This result seems to be attributed to the fact that learners applied continuous cooperative learning and therapeutic communication

method with members to solve the problem of various scenario situations in the simulation practice education using flipped learning.. In addition, as a facilitator, the instructor has been able to make continuous interaction among the members, and the communication competency has been improve by experiencing what was well done, the improvement and the debriefing about what is important in the scenario situation. Therefore, it is necessary to apply the teaching method of flipped learning to the theoretical subject.

The class satisfaction increased significantly after application of the flipped learning which appeared to be ineffective in the study of Choi<sup>[10]</sup> college students, but the results of our study are consistent with those of Lee, Han and Je, Nam<sup>[8,15]</sup>. The results showed that the learner created the self-directed environment to solve the problem of subjects, and through the class design using the 'PRTNER' model, the continuous interaction with in pre-class, in-class and post-class. However, there were various results in the previous research, so it is necessary to develop various contents about the control of pre-learning amount and the pre-learning method which can be the negative factor in the learning satisfaction.

### Conclusion

The study was conducted to confirm that application of flipped learning is effective in the problem solving ability, self-directed ability, communication competency, and class satisfaction in the simulation training of nursing students. The results showed that self-directed learning ability, communication competency, and satisfaction of class were improved after applying simulation training practice with flipped learning. These results, which is meaningful as the basic data, proved that the simulation practice

education applied with flipped learning is effective as the learner-centered teaching and learning method in nursing science and is a learning strategy for strengthening the core competency of nursing students.

The follow-up study is necessary to develop the teaching and learning methods applying flipped learning to various theoretical curriculums besides the practice subjects in nursing while confirming its effect.

**Ethical Clearance:** Not required

**Source of Funding:** Self

**Conflict of Interest:** Nil

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