Effect of Flipped Learning Simulation Practice Education: Posterior Neonatal Respiratory Distress Syndrome

Ju hee Hwang[1].

[1]*Professor,Kyungdong University, Wonju, Korea; E-mail: simplecode@kduniv.ac.kr*

Abstracts: This study aimed to verify the effectiveness of flipped learning simulation practice education for children with neonatal respiratory distress syndrome and to explore efficient practical education methods in pediatric nursing. The research design used a post-experimental design method with unequal groups and a time lag. The study participants consisted of 32 in the experimental group and 31 in the control group, a total of 63 participants. Data analysis was performed using IBM SPSS v. 21.0. The difference in baseline characteristics between the two groups was tested using t-tests, X2-tests, and Fisher's exact tests. There was no significant difference between the experimental and control groups in the homogeneity test. However, the group that participated in the flipped learning simulation practice education showed statistically significant results in terms of learning immersion (t=-4.083, p<.001) and problem-solving ability (t=-8.906, p<.001). However, there were no statistically significant differences in learning satisfaction (t=-1.581, p=.119) and self-efficacy (t=.144, p=.886). These results suggest that if various simulation programs applying flipped learning are developed and applied in future simulation practice education, it could potentially be utilized as an effective educational intervention. This is where the significance of this study lies.

Keywords: Flipped Learning, Simulation Practice, Immersion, Learning Satisfaction, Problem-Solving Ability.

1. INTRODUCTION

Recently, the healthcare field has been rapidly changing due to the increasing needs of patients and the development of science and technology. In order to respond appropriately to the changing healthcare environment, various efforts are being made to produce competent nurses necessary to improve the quality of healthcare and secure patient safety. In 2015, the Nursing Education Accreditation and Evaluation Act was passed by the National Assembly, which laid the legal foundation for ensuring the quality of nursing education [1], and the quality of nursing education is being managed through continuous program improvement [2]. However, in recent nursing education, there are limitations in preparing sufficient clinical performance capabilities through clinical practice due to the increase in patient rights awareness [3]. In particular, in the case of child health nursing practice, the opportunity for direct nursing practice is extremely limited due to the severe low birth rate, and most of the time only observation is performed [2]. Therefore, in domestic nursing universities, it has been suggested that clinical practice alone has obvious limitations, and teaching and learning methods using simulation have been proposed as an alternative to overcome them [5]. However, studies that have verified the effectiveness of simulation as a new teaching and learning method for nursing students by applying various educational media to simulation are lacking, and teaching and learning methods as a new approach that overcomes the limitations of teaching and learning methods using simulation are needed to improve the quality of nursing education in a changing healthcare environment [6]. Therefore, it is necessary to apply flipped learning, a method of acquiring knowledge through self-directed prior learning [7], to simulation as an alternative teaching and learning method to improve the quality of nursing education, reflect the needs of nursing practice sites, and prepare strategies to improve nursing students' nursing work in actual clinical practice sites.

A study that developed a curriculum that introduced a flipped learning model confirmed that it was effective in improving students' active problem-solving skills [8]. These findings suggest that flipped learning can change learners from passive students to active learners who search for materials on their own, and that it is also effective in terms of intrinsic motivation and self-efficacy. The application of flipped learning in problem-based learning for nursing students had an effect on leadership and self-confidence [9].

Therefore, this study incorporated a flipped learning education method centered on neonatal respiratory distress syndrome and possible health problems that are difficult to experience in child nursing practice, and conducted training among team members based on videos and provided educational materials before running the simulation, and then conducted simulation practice, which is believed to maximize the educational effect on learning and problem-solving ability in nursing. Therefore, this study attempted to identify the effects of

flipped learning-based simulation training on nursing students' learning engagement, learning satisfaction, problem-solving ability, and self-efficacy, and to provide basic data to enhance their adaptability to the clinical field.

2. RESEARCH CONTENT

2.1 Research Method

This study aimed to verify the effect of practical education using flipped learning by developing a clinical scenario of neonatal respiratory distress syndrome, informing the experimental group of the pre-practice content using video for self-study, then applying simulation, and applying the conventional simulation practice to the control group. The research design assigned third-year nursing students to the experimental and control groups in a post-design with a time-lagged unequal control group. To prevent contamination of the experimental intervention, the control group was surveyed and measured first (Figure 1). The sample size was calculated using the G* Power Program 3.1.9.2, with a total of 63 participants, 32 in the experimental group and 31 in the control group. The collected data were analyzed using the SPSS 21.0 statistical analysis program.

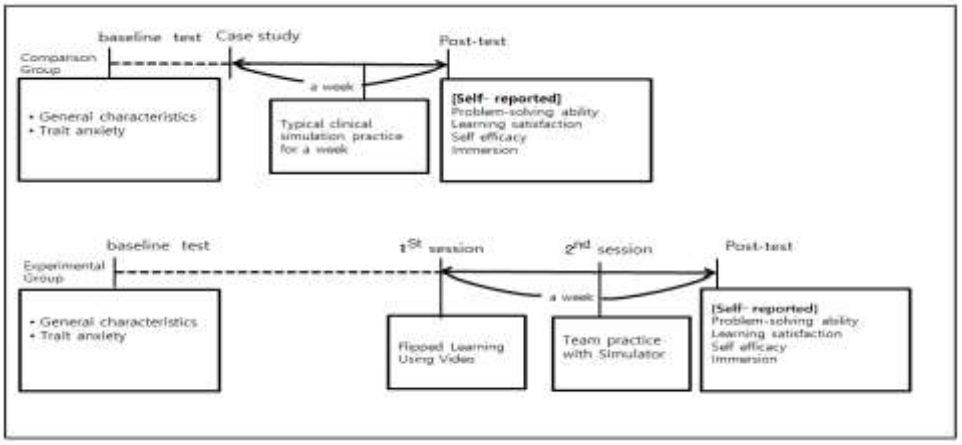

Figure 1. Research Design

2.2 Study Procedure

Scenario development for the study was conducted, and the post-neonatal respiratory distress scenario provided for the flipped learning-based simulation exercise was developed by a neonatal intensive care unit nurse and a researcher by reconstructing three medical records. The scenarios were validated for content validity by a group of experts consisting of three nursing professors, one NICU nurse, and one pediatrician at a general hospital.

A pre-survey was conducted with students who agreed to participate in the study (Figure 1). The pre-survey was conducted to verify the homogeneity of the experimental and comparison groups. Then, the intervention was conducted first in the comparison group. The 31 students in the control group were divided into 8 groups and received conventional simulation training, during which they experienced neonatal care after respiratory distress.

The intervention of the experimental group was conducted after the post-survey of the control group. Educational materials were provided to students who enrolled in the simulation practice course before the class, centered on the current clinical management of neonatal respiratory distress, and the students self-studied based on the provided educational materials and then conducted peer-to-peer training in the class to run the simulation based on the integrated neonatal respiratory distress scenario. The simulation lab course was run utilizing a neonatal simulator (Sim Baby) and teams of four were formed to run the simulation. It was conducted for 4 hours a week for 4 weeks. The flipped learning-based simulation training was conducted for 15 minutes per group, and after the simulation was completed, each team had 10 minutes of debriefing on the situation of neonatal respiratory distress syndrome

through the description stage, analysis stage, and application stage. Both the control group and the experimental group conducted a post-intervention survey after the end of the intervention.

2.3 Instrument

The evaluation tool for this study was a structured questionnaire.

2.3.1 Baseline Test

A pretest was conducted to verify the homogeneity of the experimental and comparison groups. The pre-survey included general characteristics and trait-anxietyfmf. General characteristics included gender, age, simulation training experience, and grades. Trait-anxiety was measured using Spielberger's [10] instrument. It consists of 20 items and is measured on a 4-point Likert scale, with higher scores indicating higher trait anxiety. In this study, Cronbach's α was .87.

2.3.2 Post-Test

To compare the effectiveness of the intervention between the experimental and comparison groups, a post-survey was conducted, which included learning engagement, learning satisfaction, problem-solving ability, and self-efficacy. Learning engagement was measured using the learning engagement instrument developed by Ko [11], which consists of 4 subfactors and 16 questions on a Likert 5-point scale (1 not at all, 5 very much). The Cronbach's α of this study was .91. The learning satisfaction scale is a learning satisfaction assessment tool developed by Lee [12] and modified and secured by Seong [13] and consists of 14 questions. It is a 5-point scale with four sub-factors (1 for not at all and 5 for very much), with higher scores indicating higher learning satisfaction. The Cronbach's α for this study was .94.

Problem solving ability was measured using an instrument developed by Woo [14], which consists of 25 items and is a 5-point Likert scale, with higher scores indicating higher problem solving ability. In this study, Cronbach's α was .92. Self-efficacy was measured by adapting the items of the Nuroscience Nursing Self-efficacy scale developed by Dilorio & Price [15] to the self-efficacy of children with respiratory distress syndrome. This tool is measured on a 14-item, 5-point Likert scale, with higher scores indicating higher self-efficacy in providing nursing care to children with respiratory distress syndrome. In this study, Cronbach's α was .87.

3. RESEARCH RESULTS

The baseline characteristics of the study subjects are shown in Table 1. The mean age of the experimental group was 21.13 years and the mean age of the comparison group was 21.87 years. There were no significant differences in gender, age, simulation training experience, grades, or temperamental anxiety between the two groups.

Table 1. General Characteristics of Subjects (N=63)

Characteristics	Division	Experimental group (n=32)	Comparison group (n=31)	χ2 or t	p
		M(SD) or n(%)	M(SD) or n(%)		
Age+		21.13 (2.03)	21.87(0.66)	6.783	.055
Gender	Male	1(3.1)	3 (10.0)	0.346	.282
	Female	31(96.9)	27 (90.0)		
Self-expression	Good	5(15.6)	9 (30.0)	0.071	.310
	Average	18 (56.3)	16 (53.3)		
	Poor	9(28.1)	5(16.7)		
Personal relationship	Good	10 (31.3)	5(16.7)	1.899	.387
	Average	20 (62.5)	22 (73.3)		
	Poor	2(6.3)	3 (10.0)		
GPA	Under 3.0	2(6.3)	1(3.3)	0.306	.959
	3.0~below 3.5	9(28.1)	9 (30.0)		

	3.5 to below 4.0	14 (43.8)	13(43.3)		
	Over 4.0	7 (21.9)	7(23.3)		
Trait anxiety		2.26 (0.31)	2.27 (0.27)	0.16	0.894

There was no difference between the experimental group and the control group in the homogeneity test. As a result of the research, the experimental group participating in the practical education using the simulator showed statistically significant results in learning immersion (t=-4.083, p<.001) and problem-solving ability (t=-8.906, p<.001), but there was no difference in learning satisfaction (t=-1.581, p=.119) and self-efficacy (t=.144, p=.886).

Table 2. Comparison between Experimental and Comparison Groups (N=63)

Category	Experimental group (n=32) M(SD) or n(%)	Comparison group (n=31) M(SD) or n(%)	t	p
learning immersion	4.17 (0.51)	3.84 (0.60)	4.083	.000
self-efficacy	3.89 (0.87)	3.91 (0.94)	.144	.886
Problem-solving ability	2.80 (0.72)	2.64 (0.09)	8..906	.000
learning satisfaction	3.97(0.48)	3.71 (0.49)	1.581	.119

4. Discussion

This study aimed to compare the effectiveness of conventional simulation training and simulation training with flipped learning in educating nursing students about nursing care after neonatal respiratory distress.

This study investigated the advantages of flipped learning as a teaching method to improve confidence in integrated knowledge and practice nursing, which is a characteristic of nursing education, and simulation practice education that drives simulation based on scenarios similar to clinical sites. The results showed that simulation education using flipped learning was more effective than conventional simulation practice in terms of learning immersion and problem-solving ability, and there was no difference in self-efficacy and learning satisfaction.

First of all, in the case of learning engagement, it was difficult to directly compare the results of existing studies because it is difficult to find a study that compares simulation practice education with flipped learning in previous studies, but the results were similar to the results of the previous study [16] that showed an improvement in learning engagement with flipped learning and simulation, and the results of Choi's study [17] showed an improvement from 39.90 to 42.93 points, but there was no significant difference. These results confirm that prior learning based on flipped learning and then simulation practice education have an effect on learning immersion, which is considered a necessary teaching method for nursing education.

There was also a significant difference in problem-solving ability between the experimental and comparison groups, which is consistent with studies showing that flipped learning-based education is effective in increasing problem-solving ability [18-20]. Although Oh's [18] study applied flipped learning in general subjects rather than simulation classes, it is considered a meaningful result in terms of a learning model that led to active class participation through prior learning. These results confirm that simulation classes that apply flipped learning are necessary to improve clinical skills and enhance problem-solving skills necessary for clinical adaptation, so it is necessary to expand the application of flipped learning in simulation practice education in the future.

However, for learning satisfaction and self-efficacy, there was no difference between the experimental and comparison groups. This is different from Cho & Kim's [21] study, which showed that preparation for prior learning positively influenced self-efficacy by inducing learning satisfaction and learning motivation, but the higher learning satisfaction score of the experimental group in this study suggests that future instructors should apply flipped learning teaching and learning methods that consider learners' characteristics through specific lesson design.

However, this study differs from previous studies in that it compares the effectiveness of traditional simulation training with flipped learning, as these studies compared a control group with no control or no intervention.

Limitations of this study include The participants in this study were selected from one nursing school, which limits the generalizability of the findings to other schools. Also, this study used a quasi-experimental design with no random assignment of participants.

Nevertheless, this study has the following implications While most of the previous studies are single-group before-and-after designs without a control group, this study was able to compare the effects of flipped learning-based simulation training by applying the existing simulation training to a comparison group. The results show that flipped learning-based simulation training improves learning engagement and problem-solving skills, which in turn improves clinical performance. Therefore, it is considered that flipped learning-based simulation training is very effective as a teaching method to increase clinical adaptability.

CONCLUSION

This study is an attempt to confirm the effect of simulation practice education based on flipped learning targeting nursing college students. The results of the research confirmed that the simulation practice education based on flipped learning significantly improved learning immersion and problem-solving ability after education. Based on these results, it can be applied as an effective educational intervention in nursing education, and ultimately, it can contribute to nurturing competent nurses with professionalism.

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