

How to Cite:

Park, S., Kang, H., & Park, S. I. (2022). The effect of blood transfusion nursing practice education for nursing students by using educational media (blended learning). *International Journal of Health Sciences*, 6(S4), 74–89. <https://doi.org/10.53730/ijhs.v6nS4.5388>

The effect of blood transfusion nursing practice education for nursing students by using educational media (blended learning)

Shinyoung Park

Department of Nursing Science, College of Chosun Nursing, Korea

Hee Kang

Department of Nursing Science, College of Chosun Nursing, Korea

Song I Park

Department of Nursing Science, College of Chosun Nursing, Korea

Abstract--This study is a non-equivalence control groups pre- and post-similar experimental design study to find out an efficient practical education method by comparing the blood transfusion nursing practice education method applied with virtual reality and the blood transfusion nursing practice education method applying the traditional arm model. The subjects of this study were 53 students who were 3rd year nursing students at a university in G city and had no clinical practice experience. The test subjects were divided into experimental groups 1 & 2 and the control group, the mixed practice (VR + traditional arm model) was applied to the experimental group 1, the VR practice was applied to the experimental group 2, and the traditional arm model practice was applied to the control group. Data were analyzed by frequency and percentage, mean and standard deviation, chi-square test, and Kruskal Wallis using the SPSS Version 22.0 statistical program. As a result of the study, there were significant differences in performance confidence, performance ability, and learning immersion between students who received practical training that mixed virtual reality and traditional arm model(experiment group 1), students who only received virtual reality practice education(experiment group 2), and students who only received traditional arm model practice training(control group). In this study, mixed practice education was confirmed to improve nursing students' performance confidence, performance ability, and learning immersion in transfusion nursing. Therefore, It is expected that repeated research applying various educational effect variables and development of educational contents that can apply practical education other than blood transfusion nursing will be carried out using virtual reality.

Keywords---*nursing skill, blood transfusion, virtual reality, nursing students.*

Introduction

The nursing field is one of the rapidly changing areas among health care fields, which is becoming increasingly specialized and complex. Accordingly, there is a demand for nurses who can perform high-level nursing from the moment they enter the workplace (Kim 2021). Therefore, practical education to develop the ability to perform actual patient nursing is emphasized more and more in nursing education (Eom et al., 2010).

In the nursing education process in Korea, clinical practice education is compulsory to obtain a nurse's license (Korean Accreditation Board Of Nursing Education, 2020). Through clinical practice education, it is necessary to become acquainted with practical works in actual hospitals and to practice nursing for various patient cases. However, because awareness of patient safety and rights has improved more than before, clinical practice education is now replaced by observation rather than direct practice. Accordingly, it is very difficult to acquire not only the nursing competency required in the field after graduation, but also the ability to provide nursing care to the subject, using only the current clinical practice education format. Therefore, there is a need for a variety of safe and effective educational method that can improve nursing students' practical nursing skills and experience field-oriented practical education (Yang 2006).

As an alternative to solve this problem, simulation education is being conducted using a high-performance simulator, but there are limitations in space and cost (Sherwood et al., 2018). As interest in the possibility of using advanced technology increases, the use of virtual reality for practical education of nursing students is being proposed as an alternative.

Virtual reality (VR) is recognized as an important technology in the 4th industrial revolution (Kim et al., 2016) and is expected to have a great impact on nursing education (Wolf 2018). Since education using virtual reality is conducted without threatening patient safety in virtual reality, repeated training is more comfortable than practicing with real patients. This repeated training enables students to provide safe patient care as new nurses with skilled skills in the field after graduation (Kilmon et al., 2010).

When virtual reality technology was used in education, positive effects such as high immersion, academic achievement, and satisfaction were found in students (Park 2014; Choi 2002). Compared to traditional education, it has been reported that the education using virtual reality is highly preferred because it has the advantage of high concentration and effectiveness, and it is a customized education method for subjects (Choi 2006). In addition, in the case of using virtual reality in the nursing skill education program, an appropriate confirmation process was made for the purpose of the educational program (Kim et al., 2019). However, the use of virtual reality education in nursing education in Korea is at an early stage, and although it can increase concentration and immersion, it is

still in the introduction stage and a standardized framework has not been established (Park 2018).

Blood transfusion is one of the important actions in patient safety, and since the transfusion process is a complex process involving several steps and various medical personnel (Sellu et al., 2012), students who have learned transfusion nursing must be trained to be familiar with the procedure as a habit. In particular, errors in the transfusion process can have a fatal effect on the patient's life (Gray et al., 2005), so the procedure must be followed exactly. However, errors occur during the transfusion process due to inappropriate confirmation and non-compliance with practical guidelines during the transfusion process, which is reported as a major cause of transfusion accidents (Mounchili et al., 2014). In order to strengthen the patient safety competency of nursing students who will be in charge of transfusion nursing as future nurses, it is necessary to provide simulation education that is safe and can be repeated if necessary (Kim 2015). Therefore, the application of a nursing education program that maximizes the advantages of virtual reality technology is expected to improve the overall quality of nursing in the future by expanding students' learning opportunities and to be utilized as evidence to actively introduce virtual reality technology to nursing education.

Research Purpose

This study aims to investigate an effective practical education method by comparing the blood transfusion nursing practice education method applied with virtual reality (VR) and the blood transfusion nursing practice education method applying the traditional arm model.

- 1) Compare the method applying the VR transfusion nursing education medium, the method applying the arm model, and the method applying the two in parallel.
- 2) Compare the educational media with high knowledge, performance confidence, blood transfusion nursing performance, and educational satisfaction among the three methods.

Research Method

Research Design

This study used a non-equivalent control group pre- and post-similar experiment design to compare the effects of transfusion nursing education according to the method of using educational media for nursing students.

The study subjects were divided into experimental groups 1 & 2 and the control group, and theory and practical education were provided to all three groups. Mixed practice(VR + traditional arm model) for experimental group 1, VR practice for experimental group 2, and traditional arm model practice for the control group was performed. For all three groups, before nursing intervention, general characteristics, knowledge, and performance confidence were measured using a self-report questionnaire. and after nursing intervention, knowledge, performance

confidence, and educational satisfaction were measured using a self-report questionnaire. Transfusion nursing performance ability was measured and scored by the evaluator using the blood transfusion nursing performance evaluation.

In order to prevent the spread of the experiment in each group when the three groups were treated, the study was conducted in the order of the control group, the experimental group 2, and the experimental group 1.

Table 1
Research process

Group	Pretest	Treatment	Posttest
Experimental group 1		X1+X2	knowledge performance confidence
Experimental group 2	knowledge performance confidence	X2	Transfusion nursing performance ability educational satisfaction
Control group		X1	

X1: traditional arm model, X2: VR

Research Subject

The subjects of this study are students without clinical practice experience who are currently in the 3rd year of the Department of Nursing at University C located in G city. Subjects were assigned to the control group for the 1st period, the 2nd period for the experimental group 2, and the 3rd period for the experimental group 1 by allowing the subjects to directly select the period when they can participate in the education through the recruitment notice. Subjects did not provide information about each group so that they could not know which group they belonged to. In addition, the subjects were those who received sufficient explanation about the study and made a voluntary consent form for the study.

The G*power 3.1.9 program was used to select the number of samples. When the significance level was .05, the power was .80, and the effect size was .30, the required number of samples was 18 in each group. To compare the means of the three groups, 20 people were selected for each of the experimental groups 1 & 2 and the control group, considering the dropout rate. Among them, The final experimental group 1 had 18 patients, the experimental group 2 had 17 patients, and the control group had 18 patients, which was the final 53 patients, excluding subjects who were absent due to personal reasons and did not participate in the follow-up survey.

Research Instrument

VR Blood Transfusion Nursing Practice Education Medium

The VR transfusion nursing practice education media used the educational media developed by Hanaro System for transfusion therapy skill training for nursing

students. This practical training medium was produced based on the core basic nursing protocol for transfusion therapy presented by the Korean Accreditation Board of Nursing Education.

Blood transfusion nursing is at the upper level among the 20 core basic nursing skills presented by the Korean Accreditation Board of Nursing Education. Core Basic Nursing Skills is the most essential and basic practical skill among various competencies that a nurse should have, and it is the most essential skill in resolving the patient's health problems. Evaluating students' clinical skill competency at the time of graduation occupies a large proportion in nursing education certification evaluation (Kim et al., 2014).

In this educational medium, the situation of blood transfusion therapy (before blood transfusion – transfusion process – post transfusion) was implemented as an animation that expresses the situation as a three-dimensional graphic image. It was developed to enable the acquisition of transfusion therapy skills such as transfusion nursing procedure identification transfusion therapy experience and patient response method in virtual reality. By wearing an HMD(Head Mounted Display), students can perform step-by-step skill training in virtual reality according to the blood transfusion nursing scenario. At this time, it is possible to hold or operate it through the dedicated controller of the HMD, and it is possible to learn by observing and performing skills by rotating the same shape as the real object 360 degrees. The VR transfusion nursing practice took 10 minutes.

Transfusion Nursing Performance Ability

The transfusion nursing performance measurement tool evaluates the ability to care for patients before, during, and after blood transfusion. Three types, including the latest textbook on basic nursing, 'Fundamentals of Nursing Interventions and skills' (Sohng et al., 2014) and clinical performance ability checklist revised and supplemented by (Lee 2016) based on the transfusion therapy of the Core Basic Nursing Protocol (Korean Accreditation Board of Nursing Education 2018) was used. This tool consists of a total of 35 items, and each item was scored as "completely performed" 2, "partially performed" 1, and "not performed" 0. The total score is up to 70, and the higher the score, the higher the blood transfusion nursing performance ability.

The blood transfusion nursing performance ability score was calculated as the average of the scores measured by observation by two evaluators. The evaluator consisted of two nurses with at least 5 years of clinical experience with a master's degree or higher in nursing with experience in basic nursing practice and clinical skill evaluation. Two evaluator education were conducted. The reliability of this tool was Cronbach's $\alpha = .959$ at the time of development, and Cronbach's $\alpha = .947$ in this study.

Knowledge

To measure the knowledge necessary for clinical performance and clinical judgment required for transfusion nursing, the knowledge measurement tool developed by this researcher through expert content validation with one basic

nursing professor and two adult nursing professors based on the learning goals for transfusion nursing among the basic nursing learning goals (Korean Nursing Association. Nursing Learning Goals 2012) is used. This tool is a self-filling method consisting of a total of 10 questions: 1 question of pre-test, 2 questions of suitability of blood products, 2 questions of symptoms of side effects of transfusion, 2 questions of nursing care in case of side effects of transfusion, 2 questions of nursing activity during transfusion, and 2 questions of precautions for transfusion of the questionnaire. Each question was given 5 answers. For each question answered, 'I don't know' was inserted to control the guessing error. A correct answer to each question was scored as 1 point, and an incorrect answer and 'don't know' were scored as 0 points. It ranges from 0 to 10, with a higher total score indicating a higher knowledge of transfusion nursing.

Performance Confidence

Performance confidence is a tool measuring the degree to which one believes that one can confidently perform transfusion nursing skills. It was developed by this researcher through expert content validity verification by one professor of basic nursing and two professors of adult nursing. The items were centered on essential items designated by the Korean Accreditation Board of Nursing Education among the blood transfusion nursing handwriting checklists among the core basic nursing techniques presented by the Korean Accreditation Board of Nursing Education (Korean Accreditation Board of Nursing Education 2018). The questionnaire consisted of 10 items, including preparation for transfusion, explanation of the purpose of transfusion, blood confirmation, principle of administration, correct skill performance, and description of side effects & reporting when they occur. Each item is rated on a numeric scale ranging from 0 "not at all confident" to 10 "very confident", with higher scores indicating higher confidence. In this study, the reliability was Cronbach's $\alpha = .974$.

Education Satisfaction

For educational satisfaction, the tool of Lee Seong-shim and Kwon Mi-kyung Kwon, which the tool developed by (Lee 1996) was modified and supplemented (Lee et al., 2016) and the tool of (Park et al., 2019), which partially modified the Flow State Scale (FSS) test tool used in the study of (Noh 2010) was partially modified to fit the purpose of this study. The education satisfaction test consisted of 21 items in total, and was measured on a 5-point Likert scale, ranging from 0 points of "not at all" to 5 points of "strongly agree". Higher scores indicate higher educational satisfaction. The reliability of this tool was Cronbach's $\alpha = .971$ at the time of development, and Cronbach's $\alpha = .941$ in this study.

Data Collection Methods and Procedures

This study was performed with data collected from February 18 to February 21, 2021. The subjects were those who gave consent after the researcher explained the purpose and method of the study directly to the subjects. It was explained that withdrawal is possible at any time if not desired and that there will be no disadvantages, and that the data will be used for pure research purposes only,

and that all personal matters are statistically processed anonymously and confidentiality is guaranteed. Participants were given a small gift in return.

Table 2
Contents of nursing intervention program

	Contents of Nursing Intervention Program	Times
	Blood transfusion nursing theory educatio	30
	Blood transfusion nursing skills training	30
1ST DAY	Self-study in practice education media for each group Experimental group 1 : VR+ traditional arm model Experimental group 2 : VR Control group : traditional arm model	90
2ND DAY	Follow-up investigation	30

Preliminary Investigation

In order to verify the homogeneity between the three groups, the general characteristics and the dependent variables, knowledge and performance confidence, were measured before the experimental treatment, and it was confirmed that there was no difference in the homogeneity.

Blood Transfusion Nursing Theory Education 30 Minutes

The lead researcher gave lecture-style education for 30 minutes using audio-visual materials (Power Point) in the form of summarizing and arranging lecture contents on the role & responsibilities of a nurse in transfusion, procedures for performing transfusion nursing and side effects & nursing care during blood transfusion, etc. It was referred to the 3 latest basic nursing textbook based on the achievement goal of the core basic nursing protocol for transfusion therapy presented by the Korean Accreditation Board of Nursing Education.

Blood Transfusion Nursing Skills Training 30 Minutes

In the simulation lab, the structure of the lab and the use of materials were explained. In addition, by using the partial skill training model, the training method was explained so that the blood preparation required for the subject, identification & administration of blood products & subjects, conversation with the subject, initiation of transfusion, medication related to transfusion and management of side effects during transfusion, etc. could be performed according to the procedure.

Self-Study in Practice Education Media for Each Group 90 Minutes

The control group practiced using the traditional arm model, experimental group 1 practiced using mixed practice (VR + traditional arm model), and experimental group 2 practiced using VR. It took 90 minutes in total.

Follow-Up Investigation

Each group's knowledge, performance confidence, and educational satisfaction were evaluated after the completion of the individual blood transfusion nursing performance evaluation.

Experimental Group 2, Control Group Post-Training

Experimental group 2 and the control group were also provided with the opportunity of education that was applied to experimental group 1 after the data collection of the post-mortem survey was completed.

Data Analysis

The data collected in this study were analyzed using the SPSS Version 22.0 statistical program, and the analysis method is as follows.

- 1) The general characteristics of the study subjects were analyzed by frequency and percentage, mean and standard deviation. The prior homogeneity verification of the experimental group and the control group was analyzed by the chi-square test and Kruskal Wallis according to the characteristics of the variables.
- 2) The pre-homogeneity verification of the knowledge and performance confidence of the experimental group and the control group before education was analyzed by Kruskal Wallis.
- 3) The comparison of differences in knowledge, performance confidence, performance ability, and educational satisfaction between the experimental group and the control group after education was analyzed by Kruskal Wallis.
- 4) The reliability of the measurement tool was analyzed with Cronbach's alpha coefficient.

Research Result

Homogeneity Test for General Characteristics

The result of analyzing the homogeneity of the experimental group and the control group for general characteristics according to age, gender, academic achievement, major satisfaction, job hope, and personality, there was no significant difference between experimental groups 1 and 2 and the control group ($p > .05$), and homogeneity was confirmed between the three groups (Table 3).

Homogeneity Test for Dependent Variable

As a result of performing Kruskal Wallis to analyze the differences in knowledge and performance confidence of the three groups, there was no significant difference ($p > .05$), and the homogeneity of the three groups was confirmed (Table 4).

Comparison of Dependent Variables after Education among Three Groups

As a result of the difference test of the three groups after education, there were significant differences in performance confidence, performance ability, and learning immersion (Table 5).

Performance confidence was out of 100 points, with an average of 90.00 points for experimental group 1 (S.D.=12.537), 82.71 points for experimental group 2 (S.D.=9.231), and an average of 81.89 points (S.D.=14.572) for control group. Performance was out of 70 points, with an average of 44.44 points (S.D. = 1.381) for experimental group 1, 42.00 points (S.D. = 0.9701) for experimental group 2, and an average of 41.18 points (S.D. = 2.007) for control group. Among educational satisfaction, the state of immersion was out of 5 points, with an average of 4.36 points (S.D.=0.329) for experimental group 1, 4.24 points (S.D.=0.514) for experimental group 2, and an average of 3.93 points (S.D.=0.456) for the control group.

Table 3
Homogeneity test of general characteristics between groups (N=53)

Variables	Categories	Total (n=53)	Exp1.(n= 18)	Exp2.(n= 17)	Cont.(n=1 8)	χ^2	P
		n (%) or M±SD	n (%) or M±SD	n (%) or M±SD	n (%) or M±SD		
Age(yr)		23.40±3.8 25	23.61±4.6 16	23.00±3.0 82	23.56±3.7 76	0.18 8	.91 0
Gender	Male	6(11.3)	2(11.1)	3(17.6)	2(5.6)	0.43 0	.80 6
	Female	47(88.7)	16(88.9)	14(82.4)	16(94.4)		
GPA	2.0≤~<3.0	15(28.3)	5(27.8)	6(35.3)	4(26.7)	4.52 2	.63 1
	3.0≤~<3.4	15(28.3)	4(22.2)	4(23.5)	7(46.7)		
	3.5≤~<4.0	15(28.3)	6(33.3)	6(35.3)	3(16.7)		
	4.0≤	15.1	3(16.7)	1(5.9)	4(22.2)		
Admission	Considered employment	26(49.1)	9(50.0)	8(47.1)	9(34.6)	7.19 4	.35 9
motivation	With aptitude	9(17.0)	2(11.1)	1(5.9)	6(33.3)		
	Considering high school GPA	6(11.3)	2(11.1)	3(17.6)	1(5.6)		
	Encouragem ent by parents or other	12(22.6)	5(27.8)	5(29.4)	2(11.1)		
Satisfactio n	Very satisfied	6(11.3)	1(5.6)	2(11.8)	3(16.7)	10.1 11	.29 8
with major	Satisfied	23(43.4)	5(27.8)	10(58.8)	8(44.4)		
	Fair	18(34.0)	9(50.0)	3(17.6)	6(33.3)		
	Unsatisfied	4(7.5)	1(5.6)	2(11.8)	1(5.6)		
	Very unsatisfied	2(3.8)	2(11.1)	0(0.0)	0(0.0)		
Job-hope	Advenced hospital	28(25.8)	11(61.1)	10(58.8)	7(38.9)	16.0 56	.18 3
	General hospital	8(15.1)	1(5.6)	2(11.8)	5(27.8)		
	Hospital	3(5.7)	0(0.0)	0(0)	3(16.7)		
	Health teacher	2(3.8)	1(5.6)	0(0)	1(5.6)		
	Public	7(13.2)	2(11.1)	4(23.5)	1(5.6)		

	health nurses						
	Community hospital	2(3.8)	1(5.6)	0(0)	1(5.6)		
	Other	3(5.7)	2(11.1)	1(5.9)	0(0)		
Personality	Extrovert	12(22.6)	4(22.2)	1(5.9)	7(38.9)	5.979	.204
	Introvert	15(28.3)	5(27.8)	5(29.4)	5(27.8)		
	Mixed	26(49.1)	9(50.0)	11(64.7)	6(33.3)		

M±SD= Mean ± Standard deviation; Exp.=experimental group; Cont.=control group; GPA=grade point average

Table 4
Homogeneity test for dependent variable between three groups (N=53)

	Exp1.(n=18)	Exp2.(n=17)	Cont.(n=18)	$\chi^2(p)$
	M±SD	M±SD	M±SD	
Knowledge	4.61±1.883	5.88±1.654	5.83±1.425	4.744(.093)
Performance Confidence	65.28±10.802	69.35±11.958	68.94±12.173	1.316(.518)

Table 5
Comparison of knowledge, performance confidence, performance ability, and educational satisfaction among the three groups after education (N=53)

Variable	Categories	Exp1.(n=18)	Exp2.(n=17)	Cont.(n=18)	$\chi^2(p)$
		M±SD	M±SD	M±SD	
Knowledge		7.83±1.581	8.06±1.144	7.67±0.970	0.989 (.610)
Performance confidence		90.00±12.537	82.71±9.231	81.89±14.572	6.211 (.045)
Nursing skill		44.44±1.381	41.18±2.007	42.00±0.970	26.258 (<.001)
Educational satisfaction	Practice satisfaction	4.60±0.512	4.54±0.395	4.43±0.436	2.232 (.328)
	Flow experience	4.36±0.329	4.24±0.514	3.93±0.456	6.735 (.034)

Discussion

The purpose of this study is to evaluate the educational media with high knowledge, performance confidence, blood transfusion nursing performance, and educational satisfaction of nursing students and to investigate effective practical training methods by comparing the blood transfusion nursing method applied with virtual reality (VR) and the blood transfusion nursing method applying the traditional arm model. Among the preceding studies that applied virtual reality simulation education, it was difficult to find a study comparing only the contents related to blood transfusion. Therefore, the discussion was focused on the results of previous studies applying the same variables.

In the results of this study, in terms of performance confidence, experimental group 1 to which VR training and arm model were applied had the highest score, and in the results of this study, in terms of performance confidence, experimental group 1 to which VR training and arm model were applied had the highest score, and experimental group 2 to which VR training was applied had the next highest score. In a study that conducted virtual reality simulation training for nurses (Park 2018), the confidence in nursing performance increased significantly compared to before the training. In this study, it was difficult to compare with the control group because a control group was not set, but it was found that education using virtual reality is an effective means to increase the confidence to perform nursing for nurses and nursing students who are prospective nurses.

In terms of performance, experimental group 1 had the highest score, followed by experimental group 2 and the control group. In a study examining the effects of intravenous injection education on nursing students (Jung 2012), the experimental group that practiced both the VR simulator and the arm model together reduced the venipuncture execution time compared to the experimental group using only the VR simulator. Although the educational content of this study is not the same, it is similar in that it is a study in which virtual reality and the traditional arm model were combined and the performance ability was compared. Also, in both studies, nursing students showed the highest performance in the experimental group that combined the two educational methods. Therefore, it is judged that this study supported the results of this study.

Another study that measured clinical performance ability is a study using a web-based virtual reality simulation (Lim et al., 2020). It was done online, and it was found that clinical performance ability improved significantly after education compared to before education. Although it was not the same content of blood transfusion education, it is meaningful in that it can increase students' performance ability to become nurses by using virtual reality.

In terms of the state of immersion among educational satisfaction, experimental group 1 had the highest score, followed by experimental group 2 and control group. In a study in which students were asked about their satisfaction with practical education after intravenous injection training by combining virtual reality and arm model (Jung 2012; Lopez 2021), the overall educational effect item score among the satisfaction with practical education was the highest in the

combined group, followed by experimental group using only arm model and virtual reality group. Also, in the procedure learning item, the combined group and the experimental group using only the arm model showed higher scores than the virtual reality group. In this study, the virtual reality group showed higher satisfaction than the control group using only the arm model, so the study results were different. However, both studies showed that the satisfaction level of the experimental group that combined the two teaching methods was the highest. Therefore, it can be said that it is important to provide opportunities for students to experience all the various methods through the improvement of the practice environment.

There was also a study in which the experimental group who received virtual reality-applied intravenous training had higher academic self-efficacy and learning motivation than the control group who received practical training using only the manikin model (Kim et al., 2020; Nam et al., 2019; Penaflor-Espinosa 2018). This was not a comparison of the same variables as in this study, but it was a study showing that not only the traditional arm model was used to help nursing students' learning, but also the application of virtual reality had a significant effect. It may be difficult when the first attempt to change the practice environment by merging various educational methods is attempted, but if it is possible to bring about positive changes to students, it is necessary for the instructor to have an attitude to change actively. As a limitation of this study, virtual reality simulations limited to third-year nursing students in one area were applied, and care should be taken in generalizing the results of this study in that it is a one-time post-survey study.

Based on the results of this study, I would like to make the following suggestions. First, in future research, we suggest a study that expands the scope of subjects, such as not only nursing students, but also health care works such as new clinical nurses. Second, research on the development and application of virtual reality programs that can improve students' nursing performance ability by combining virtual reality with various class contents in addition to transfusion nursing is suggested.

Conclusion and Suggestions

This study is different from the research methods of previous studies targeting nursing students. The educational effect of the simulation was evaluated by dividing into 3 groups. The group was divided into a group that combined education using virtual reality and education using a traditional arm model, a group trained using only virtual reality, and a group educated through a traditional arm model. The education that applied virtual reality and arm model together improved the nursing performance ability of students, increased their performance confidence, and the state of immersion was measured high among educational satisfaction. In particular, rather than using only VR simulation, it seems that the performance ability was improved by performing repetitive learning by performing the technique on the arm model again after VR training, and also the confidence and satisfaction level increased.

Also, in order to help nursing students learn, it was a study that showed significant effects not only by using the traditional arm model, but also by applying various methods in parallel, such as applying virtual reality. This study shows that in order to help nursing students learn, not only the traditional arm model is used, but also various methods such as virtual reality are applied in parallel to have a significant effect and it is meaningful to try new attempts by combining various fields and nursing education. A new change in the practice environment can affect the positive development of students, which can help to change the general practice method in a new way. In addition, since it can induce concentration by increasing the students' immersion, effective practical training can be achieved within a short period of time. Also, it is expected that various teaching methods will be shared among professors and that effective learning methods will be developed. It is expected that various teaching methods will be shared among instructors and that effective learning methods will be developed.

References

- Kim, M.H. (2021). Nursing students' experience of visiting the National Institute for Scientific Investigation. *The Journal of the Convergence on Culture Technology*. 7(3), 35-41.
- Eom, M. R., Kim, H. S., Kim, E.K., & Seong, K. (2010). Effects of teaching method using standardized patients on nursing competence in subcutaneous injection, self-directed learning readiness, and problem solving ability. *Journal of Korean Academy of Nursing*. 40(2), 151-160.
- Korean Accreditation Board Of Nursing Education. (2020). Nursing education certification evaluation university.
- Yang, J. J. (2006). Effects of web-based multimedia contents for mechanical ventilator practice on knowledge and clinical competence of nursing students. *Korean Journal of Adult Nursing*. 18(2), 231-239.
- Sherwood, R. J., & Francis, G. (2018). The effect of mannequin fidelity on the achievement of learning outcomes for nursing, midwifery and allied healthcare practitioners: Systematic review and meta-analysis. *Nurse Education Today*. 69, 81-94.
- Kim, M.S., Kang, J.H., & Jun, M.S. (2016). Market and technical trends of VR technologies. *Review of Korea Contents Association*. 14(4), 14-16.
- Wolf, A. B. (2018). The impact of web-based video lectures on learning in nursing education: An integrative review. *Nursing Education Perspectives*. 39(6), E16.
- Kilmon, C. A., Brown, L., Ghosh, S., & Mikitiuk, A. (2010). Immersive virtual reality simulations in nursing education. *Nursing education perspectives*. 31(5), 314-317.
- Park, M. J. (2014). Extract details for clinical performance evaluation in the curriculum of students of the Graduate School of Dentistry Medicine. *Unpublished master's thesis*. The Graduate School of dentistry, Seoul National University, Seoul.
- Choi, J. K. (2002). Problems and development direction of korea's dental university education. *The journal of the Korean dental association*. 40(3), 224-226.
- Choi, J. H. (2006). Education through virtual reality and the future of the cultural industry. *Future Horizon*. (29), pp. 20-23.

- Kim, S. K., Eom, M. R., & Park, M. H. (2019). Effects of nursing education using virtual reality: A systematic review. *The Journal of the Korea Contents Association*. 19(2), 661-670.
- Park, S. J. (2018). Development and evaluation of a virtual simulation program on nursing care for patients with acute upper gastrointestinal bleeding. *Unpublished master's thesis*. Graduate School of Kyung Hee University, Seoul.
- Sellu, D. H., Davis, R. E., & Vincent, C. A. (2012). Assessment of blood administration competencies using objective structured clinical examination. *Transfusion Medicine*. 22(6), 409.
- Gray, A., Howell, C., & Pirie, E. (2005). Improving blood transfusion: a patient-centred approach. *Nursing Standard (through 2013)*. 19(26), 38.
- Mouchili, A., Leduc, S., Archibald, C., Miller, J., & Hyson, C. (2014). Blood, cell and tissue transplant surveillance: A summary of the transfusion error surveillance system: 2008-2011. *Canada Communicable Disease Report*. 40(18), 374.
- Kim, E. J. (2015). Nursing students' error and recovery in transfusion simulation for safety competency. *Journal of Korean Academy of Fundamentals of Nursing*. 22(2), 180-189.
- Kim, Y. H., Hwang, S. Y., & Lee, A. Y. (2014). Perceived confidence in practice of core basic nursing skills of new graduate nurses. *The Journal of Korean academic society of nursing education*. 20(1), 37-46.
- Sohng, K. Y. et al. (2014). Fundamentals of nursing interventions & skills. *Paju: Soomoonsa*.
- Lee, S. H. (2016). Effects of simulated blood transfusion nursing education in accordance with structured debriefing methods. *Unpublished master's thesis*. Graduate School of Mokpo National University, Muan.
- Korean Accreditation Board of Nursing Education. (2018). Regulations for the Accreditation of Nursing Education.
- Korean Nursing Association. (2012). Nursing Learning Goals. *Korean Nurses Association: Seoul*.
- Lee, E. K. (1996). Development and evaluation of internet-based distance learning system for health science. *Unpublished master's thesis*. Graduate School of Yonsei University, Seoul.
- Lee, S. S., & Kwon, M.K. (2016). Effects of self-directed fundamental nursing practice using smartphone videos on self-efficacy, practice satisfaction, and skill competency. *The Journal of Korean Academic Society of Nursing Education*. 22(3), 255-263.
- Park, J. T., Kim, J. H., Kim, M. Y., & Lee, J. H. (2019). Effects of educational content for dental extraction using virtual reality technology on dental extraction knowledge, skill and class satisfaction. *The Journal of the Korea Contents Association*. 19(2), 650-660.
- Noh, K. H. (2010). Influence of augmented reality based instruction on learning flow and learning effect. *Doctoral thesis*. Graduate School of Chungnam National University, Daejeon.
- Jung, E. Y. (2012). Evaluation of practical exercises using an intravenous simulator incorporating virtual reality and haptic technologies. *Doctoral thesis*. Graduate School of Ajou University, Suwon.
- Lim, S. M., & Yeom, Y. R. (2020). The effect of education integrating virtual reality simulation training and outside school clinical practice for nursing students. *Journal of Convergence for Information Technology*. 10(10), 100-108.

- Lopez, E.. (2021). Perceived effectiveness of high-fidelity simulation in the acquisition of the cognitive, psychomotor and affective learning in a department of nursing in South Korea. *International Journal of Advanced Nursing Education and Research*. 6(2), 31-40, doi:10.21742/IJANER.2021.6.2.03
- Kim, Y. J., & Chae. M. J. (2020). The effects of intravenous injection training using virtual IV simulator on academic-self efficacy, learning attitude and learning motivation of nursing students,” *Journal of Learner-Centered Curriculum and Instruction*. 20(3), 147-163
- Nam, A. -N., Lee, D. -Y., & Jung, G. -H. (2019). Study on knowledge of intravenous injection, self-confidence, competence and critical thinking disposition in nursing student. *International Journal of Advanced Nursing Education and Research*. 4(3), 25-30, doi:10.21742/IJANER.2019.4.3.05.
- Penaflor-Espinosa, M. J. B. (2018). Extent of utilization of the available technology resources and facilities of nursing faculty and the extent of benefits to students in the teaching and learning process. *International Journal of Advanced Science and Technology*. NADIA, ISSN:2005-4238 (Print); 2207-6360 (Online). 110, 99-112. <http://dx.doi.org/10.14257/ijast.2018.110.10>.