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Effects of Team-based Simulation Learning on Team Efficacy, Interpersonal Understanding, and Problem Solving Ability of Nursing Students

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Abstract: *The aim of this study was to determine effects of team-based simulation learning on team efficacy, interpersonal understanding, and problem solving ability of nursing students with a non-equivalent control group pretest-posttest design. Subjects were senior nursing students enrolled in a simulation course. A total of 91 participants were divided into an experimental group (n = 44) and a control group (n = 47). The former consisted of teams of three to four students who experienced 15 sessions of team-based simulation learning for 8 weeks, while the latter received sessions of individual simulation learning. A survey regarding team efficacy, interpersonal understanding, and problem solving ability was conducted for the two groups before and after the treatment. Collected data were analyzed using SAS 9.2. The experimental group with team-based simulation learning exhibited a significant improvement in team efficacy after learning compared to the control group with individual simulation learning (t = 3.63, p ≤ 0.001). The level of interpersonal understanding also increased after learning for both experimental and control groups. The between-group variation was insignificant. The level of problem solving ability was increased to a greater extent for the experimental group than the control group, while the increase for the experimental group was statistically significant (t = 3.43, p ≤0.001). Team-based simulation learning was shown to be an effective learning method to enhance the team efficacy, interpersonal understanding, and problem solving ability of nursing students.*

Keywords: Simulation; Team Efficacy; Interpersonal Understanding; Problem Solving; Nursing *S*tudents

1. Introduction

1.1 Necessity and Purpose

As it is uncertain whether the COVID-19 pandemic will cease and on the premise that a new strain of virus may emerge, the practice-related education in the field of public health care requires an entirely different alternative. The goals of nursing education is to nurture students to grow into nurses with key abilities of professional nursing. Clinical practice education is a process to enhance the problem solving ability that can be applied to real patients through integrating the knowledge and practice in clinical settings by combining theory and training [1]. In spite of this, numerous practice courses at the health care centers that mainly provide clinical practice education were either reduced or discontinued due to the spread of COVID-19 for the safety and prevention of the infection [2].

Practice education using simulation increases the effects of learning by providing repeated opportunities to the learners to train themselves against risk situations in the conditions without risk factors. Notably, the learners could experience the complex clinical situations as the simulation reproduces rare clinical settings in a safe manner [3]. At present, research interests regarding simulation are focused on the respective new changes in nursing education and training. The use of simulation learning increased continuously in nursing education worldwide [4].

Simulation education provides an environment in which nursing students could safely repeat the learning using a highly computerized simulator. In this way, simulation learning is a useful method for nursing students to acquire

the nursing performance abilities including essential nursing skills, while critical thinking, problem solving process, communication ability, communication confidence, and class satisfaction of the learners could also improve [5].

Compared to individual learning, team-based learning through which each team member has an assigned role based on their knowledge and experience leads to facilitated problem solving and consequent increase in confidence [6]. Hence, a long-term application of team-based simulation learning to nursing students could enhance their nursing performance to solve problems that may arise in actual clinical practice within the safety of the virtual environment [7].

The learning experience regarding the team roles and dynamics through the team-based simulation learning that has been set to produce optimal learning outcomes will contribute to the development of team competence for future nurses [8]. To ensure efficient performance of team nursing by the nurses within the hospital organization, nursing students should receive the training on interpersonal relationship formation and problem solving ability required in team nursing [9].

Team efficiency is a critical factor influencing the team outcome at schools. The key predictor of individual's learning achievement is self-efficacy. Through numerous studies, self-efficacy has long been known as the main predictor of individual's learning achievement [10]. Unlike self-efficacy, which is generally known to influence the learner's learning achievement, satisfaction, and motivation, team efficacy is the main predictor of team achievement and it may be viewed as a modified form of self-efficacy [11]. In designing the environment of team-based learning, the ways to enhance team efficacy among learners should be reflected in the class and team learning activities so as to achieve more outstanding team outcome.

Recent studies have reported on the team-based simulation learning method, and the research on team efficacy as a predictor of team performance in addition to individual learning outcomes is in its early stage. In a study where team-based simulation learning was applied to Year 4 nursing students [8], a significant increase in team efficacy after learning was found but the study was uncontrolled. In a study conducted on 228 Year 3 nursing students [7], a significant positive correlation was found between team efficacy and team performance. Yang (2016) [12] conducted a study on Year 3 nursing students and found the group that performed team-based simulation learning regarding delivery led to significantly higher team efficacy than the control group that performed case-based learning.

Thus, it would be significant to analyze the effects of team-based simulation learning on team efficacy that can predict team performance, as part of a simulation course in this study. Furthermore, this study analyzed the effects of team-based simulation learning on team efficacy, interpersonal understanding, and problem solving ability that are necessary in efficient performance of team nursing. Furthermore, the basic data for developing a teaching-learning strategy to effectively measure and evaluate the team performance in addition to individual performance are provided.

1.2 Hypothesis

The following hypotheses verified the effects of team-based simulation learning on team efficacy correlated to team performance, interpersonal understanding, and problem solving ability of nursing students:

1.2.1 Hypothesis 1: The experimental group with team-based simulation learning will achieve a higher level of team efficacy than the control group with individual simulation learning.

1.2.2 Hypothesis 2: The experimental group with team-based simulation learning will achieve a higher level of interpersonal understanding than the control group with individual simulation learning.

1.2.3 Hypothesis 3: The experimental group with team-based simulation learning will achieve a higher level of problem solving ability than the control group with individual simulation learning.

2. Materials and Methods

2.1 Design

This study was a quasi-experimental study with non-equivalent control group pretest-posttest design, conducted to analyze the effects of team-based simulation learning on team efficacy, interpersonal understanding, and problem solving ability correlated to team performance of nursing students Table 1.

Table 1. Study design

	Pre-test	Treatment	Post-test
Experimental group	O1	X1	O2
Control group	O1	X2	O2

O1: General characteristics, team efficacy, interpersonal understanding, problem solving ability

X1: Team discussion+ team simulation practice+ team debriefing, 3 nursing cases

X2: Individual nursing process+ simulation practice + Individual debriefing, 3 nursing cases

O2: Team efficacy, interpersonal understanding, problem solving ability

2.2 Participants

The participants were Year 4 nursing students enrolled in the simulation course, who showed an understanding of the purpose of the study and agreed to participate. The representatives of four classes of the course drew straws to divide the classes into two for the experimental group and two for the control group. The representatives as well as other students in each class were blinded from knowing which group they belonged to. The final number of participants was 91; n=44 for the experimental group and n=47 for the control group.

G*power 3.1 program was used to estimate the minimum sample size required by independent t-test. Based on the following conditions:.05 significance level (a),.8 statistical power (1-β), and.5 effect size (d), the estimation was n=38 for one group.

2.3 Study Tools

2.3.1 Team Efficacy

Team efficacy refers to the personal belief in the ability of the team they belong to that the team members could together accomplish a given task [11].

The questionnaire on team efficacy consisted of eight items developed by [13] and translated and modified by [11] to be suitable for the study purpose and participants. The questionnaire was on a five-point scale from the lowest score of 8 to the highest of 40, where a higher total score indicated a higher level of team efficacy. Cronbach's alpha for the reliability of the tool was α =.96.

2.3.2 Interpersonal Understanding

Interpersonal understanding refers to the knowledge of one another's preferences, merits, and demerits among the team members with or without verbal descriptions [14]. It highlights the relationship among the team members rather than the team task to express the level of understanding among the team members [11].

The questionnaire on interpersonal understanding consisted of 11 items developed by [13] and translated and modified by [11] to be suitable for the study purpose and participants. The questionnaire was on a five-point scale from the lowest score of 11 to the highest of 55, where a higher total score indicated a higher level of interpersonal understanding. Cronbach's alpha for the reliability of the tool was α =.94.

2.3.3 Problem Solving Ability

Problem solving ability refers to the ability to deal with a question by first recognizing the problem through the search, selection, and organization of a given situation and then resolving the problem through systematic steps. It is the ability to seek a diversity of alternatives and apply them to choose the solution that maximizes the positive results and minimizes the negative ones [15].

The checklist of problem solving ability for undergraduates and adults as developed by [16] was used. It consisted of a total of 45 questions on a five-point scale from the lowest score of 45 to the highest of 225, where a higher total score indicated a higher level of problem solving ability. Cronbach's alpha for the reliability of the tool was α =.93.

2.4 Team-based Simulation Learning

Team-based simulation learning was performed via 15 sessions for the period of eight weeks. For both experimental and control groups, the clinical situation reproduced by simulation was a case of nursing of an

arthroplasty patient, a bowel obstruction patient, or a patient with COVID-19 infection. The case was selected based on the contents of the courses completed by the participants. For the experimental group, the team composition was via randomization and the jigsaw match-up among the activities in [17]'s Collaborative Learning Technique was performed. First, the logos of companies in South Korea were made into a three to four piece puzzle, then the students came up to the front of the classroom to choose a piece at random. Next, the complete logo was shown on the screen, and the students moved around to find those holding the pieces with which the presented logo could be completed. The experimental group was guided to analyze the problem in the given nursing case among the team members and have the team discussion for problem solving. The simulation practice was recorded, and the members of the team watched the recorded video together to communicate and analyze the reflected contents, followed by the team presentation. The control group did not form a team and performed the nursing individually. Only when it came to the recording of simulation practice, three to four students performed together. At every three nursing cases, the student roll was used to guide the students to perform the practice with different students. The reflective study was also performed individually Table 2.

Table 2. Team-based Simulation Learning

Week	Experimental Group	Control Group
1 ~ 2	Orientation and pre-test Team assign: 3 to 4 students per team Instruction and nursing skill practice	Orientation and pre-test Instruction and nursing skill practice
3 ~ 7	Team discussion and presentation of each team Simulation practice of each team Reflective study and presentation of each team	Individual nursing process and presentation Simulation practice Individual reflective study and presentation
8	Evaluation and Post-test	Evaluation and Post-test

2.5 Data Collection and Analysis

Each participant was given an adequate explanation of the purpose of the study and procedures and privacy protection prior to the experiments. The participants were also informed of their right to discontinue the experiments at any time without any disadvantage and that the results of the questionnaires would not be reflected in the course grade. Written consent was obtained from each participant, while ethical considerations were made as the consent clearly stated that the questionnaire data would be used solely for the study purpose, while anonymity and privacy protection were guaranteed. To ensure ethical protection of the study participants, this study was approved by the institutional review board at University D (IRB accept number: 1040621-202101-HR-031). The researcher in charge of the simulation course distributed and collected the questionnaires, while they were prevented from identifying the student who had completed the questionnaire that was coded.

The collected data were analyzed using the SAS 9.2. The general characteristics of participants were analyzed as integers and percentages. The pretest-posttest within- and between-group variations for the team efficacy, interpersonal understanding, and problem solving ability were analyzed using paired and independent t-tests. The homogeneity of the team efficacy, interpersonal understanding, and problem solving ability between the control and experimental groups was tested using the t-test.

3. Results

3.1 Participant Characteristics

The characteristics of the participants are presented in Table 3.

Table 3. Characteristics of Participants

Categories		Experimental Group	Control Group
		N(%)	N(%)
Age (years)	≥21	22(50.00)	21(44.69)
	22	17(38.64)	17(36.17)

	23≤	5(11.36)	9(19.16)
Sex	Female	42(95.45)	40(85.11)
	Male	2(4.55)	7(14.89)

3.2 Homogeneity test of Team Efficacy, Interpersonal Understanding, and Problem Solving Ability

The result of homogeneity test of team efficacy, interpersonal understanding and problem solving ability for the control and experimental groups are shown in Table 4. The homogeneity was verified for the two groups as all tested variables of team efficacy, interpersonal understanding, and problem solving ability showed no variation between the control and experimental groups.

Table 4. Homogeneity test of Team Efficacy, Interpersonal Understanding and Problem Solving Ability

Variables	Experimental	Control	t(p)
	M±SD	M±SD	
Team Efficacy	3.94±0.54	4.10±0.70	-1.22 (.225)
Interpersonal Understanding	4.35±0.50	4.20±0.69	1.14 (.256)
Problem Solving Ability	3.61±0.44	3.63±0.40	-0.15 (.884)

3.3 Pre-Post Test of Team Efficacy, Interpersonal Understanding, and Problem Solving Ability

3.3.1 Hypothesis 1: The experimental group with team-based simulation learning will achieve a higher level of team efficacy than the control group with individual simulation learning.

Team efficacy showed an improvement after learning for both the experimental group (t=9.95, p=<.0001) and the control group (t=3.84, p=<.0001). The pretest-posttest between-group variation was also shown to be significant with a larger degree of variation in the experimental group than in the control group (t=3.63, p=.0005). Hypothesis 1 was thus accepted Table 5.

3.3.2 Hypothesis 2: The experimental group with team-based simulation learning will achieve a higher level of interpersonal understanding than the control group with individual simulation learning.

Interpersonal understanding showed an improvement after learning with a significant pretest-posttest variation for both the experimental group (t=5.80, p=<.0001) and the control group (t=5.76, p=<.0001). However, the between-group variation was not significant (t=-0.92, p=.3626), and Hypothesis 2 was rejected Table 5.

3.3.3 Hypothesis 3: The experimental group with team-based simulation learning will achieve a higher level of problem solving ability than the control group with individual simulation learning.

Problem solving ability (total) showed an improvement after learning with a significant pretest-posttest variation for both the experimental group (t=7.31, p=<.0001) and the control group (t=3.97, p=.0003), and the between-group variation was also significant with a larger degree of variation in the experimental group than in the control group (t=3.43, p=.0009). Hypothesis 3 was thus accepted Table 5.

Among the subcategories of problem solving ability, the issue specification showed a significant improvement after learning in the experimental group (t=4.04, p=.0002), but no pretest-posttest variation was found in the control group (t=0.45, p=.6569). The between-group variation was shown to be significant with a larger degree of variation in the experimental group (t=2.89, p=.0048).

Among the subcategories of problem solving ability, the cause analysis showed a significant improvement after learning for both the experimental group (t=5.60, p=<.0001) and the control group (t=2.45, p=.0181). The between-group variation was also significant with a larger degree of variation in the experimental group (t=3.04, p=.0031).

Among the subcategories of problem solving ability, the counter proposal development showed a significant improvement after learning for both the experimental group (t=4.11, p=.0002) and the control group (t=2.85, p=.0066). The between-group variation, however, was not significant (t=1.29, p=.1999).

Among the subcategories of problem solving ability, the plan and practice showed a significant improvement after learning for both the experimental group (t=5.74, p=<.0001) and the control group (t=3.47, p=.0011). Also, the between-group variation was significant with a larger degree of variation in the experimental group (t=2.34, p=.0215).

Among the subcategories of problem solving ability, the performance assessment was significantly improved after learning in the experimental group (t=4.45, p=<.0001), but no pretest-posttest variation was found in the control group (t=1.90, p=.0631). Also, the between-group variation was not significant (t=1.85, p=.0680).

Table 5. Pre-Post Test of Team Efficacy, Interpersonal Understanding, and Problem Solving Ability

Variables		Group	Pre-test	Post-test	t or Z	p	Difference	t or Z	p
			M ± S D	M ± S D			M ± S D		
Team Efficacy		Exp.	3.94±0.54	4.77±0.39	9.95	<.0001***	0.83±0.55	3.63	.0005***
		Cont.	4.10±0.70	4.47±0.45	3.84	<.0001***	0.37±0.65		
Interpersonal Understanding		Exp.	4.35±0.50	4.60±0.36	5.80	<.0001***	0.25±0.28	-0.92	.3626
		Cont.	4.20±0.69	4.52±0.49	5.76	<.0001***	0.31±0.37		
Problem Solving Ability	Issue Specification	Exp.	3.81±0.60	4.15±0.51	4.04	.0002***	0.34±0.55	2.89	.0048**
		Cont.	3.90±0.58	3.93±0.46	0.45	.6569	0.03±0.07		
	Cause Analysis	Exp.	3.31±0.39	3.72±0.50	5.60	<.0001***	0.40±0.48	3.04	.0031**
		Cont.	3.38±0.35	3.51±0.42	2.45	.0181*	0.13±0.37		
	Counter Proposal Development	Exp.	3.66±0.49	3.99±0.48	4.11	.0002***	0.33±0.52	1.29	.1999
		Cont.	3.58±0.53	3.77±0.44	2.85	.0066**	0.19±0.46		
	Plan and Practice	Exp.	3.54±0.60	3.99±0.58	5.74	<.0001***	0.45±0.52	2.34	.0215*
		Cont.	3.64±0.55	3.86±0.54	3.47	.0011**	0.22±0.43		
	Performance Assessment	Exp.	3.85±0.52	4.17±0.46	4.45	<.0001***	0.33±0.48	1.85	.0680
		Cont.	3.77±0.49	3.91±0.52	1.90	.0631	0.14±0.49		
	Total	Exp.	3.61±0.44	3.99±0.40	7.31	<.0001***	0.37±0.34	3.43	.0009***
		Cont.	3.63±0.40	3.78±0.39	3.97	.0003***	0.15±0.27		

*p<.05, **p<.01, ***p<.001

4. Discussion

This study analyzed the effects of team-based simulation learning on team efficacy, interpersonal understanding, and problem solving ability of nursing students that are necessary in performing team nursing efficiently. The intention was to provide the basic data for developing teaching methods that effectively measure and evaluate team performance. The results suggested that team efficacy and problem solving ability were significantly improved in the experimental group with team-based simulation learning compared to the control group with individual simulation learning, while interpersonal understanding was significantly improved in both groups although no between-group variation was found.

The experimental group showed a large improvement in team efficacy from 3.94 before learning to 4.77 after learning. The control group showed an improvement after learning but with a significantly smaller degree of improvement than the experimental group. The results are in line with [8]. They conducted a study involving 41 Year 4 nursing students and revealed a significant improvement in team efficacy after team-based simulation learning. In [12], where team-based family simulation practice was applied regarding delivery, a significant improvement in team efficacy from 3.74 before learning to 4.36 after learning was found, which agreed with this study. The effects of team-

based simulation learning on team efficacy in nursing students have been verified in recent studies. [18], team efficacy was identified as a key predictor of satisfaction among the learning outcomes. In [7], team efficacy had a significant positive correlation with team performance. These findings are presumed to be because the simulation learning using team learning enabled each individual learner to actively engage in learning with other members of the team and to reinforce the trust in other members as the course progressed through continuous interaction and communication, which contradicted the lecture-based learning or the conventional simulation learning where one or two students led the entire group. The members of the experimental group remained unchanged after the initial organization and continuously interacted and communicated with one another so that the level of improvement in team efficacy was greater than that in the control group. On the contrary, the members of the control group could not maintain continuous interaction as only transient teams were organized in simulation practice, resulting in a lower level of improvement in team efficacy. In a study conducted on 37 undergraduate students regarding team project [11], team efficacy was shown to be positively correlated with the score of the team test where problems had to be solved through collaboration among team members. These results indicated that higher levels of faith and trust regarding the team ability could lead to higher levels of team learning outcome and satisfaction. Therefore, in the design of team learning to enhance the team performance and learning satisfaction, it is necessary to measure the team efficacy of learners and provide a method of improvement to the learners with a low level of team efficacy. In addition, for the purpose of enhancing the team performance and efficiency, the learning should be performed with the team members and activities maintained, and the team organization should not be altered frequently, especially in the conventional simulation class. In previous studies, self-efficacy was found to have a positive correlation with problem solving ability [19, 20]. Self-efficacy is a known influencing factor of academic achievement, satisfaction, and motivation in individual learners, while team efficacy is a key predictor of team performance and a modified form of self-efficacy [11]. In [18], team efficacy did not predict problem solving ability with significance although it was shown to influence the prediction of problem solving ability through other factors. In the field of education, team learning activities have been actively performed recently, and for such team-based learning, there is insufficient data regarding the influence of team efficacy on problem solving ability. Further studies should thus be conducted in this perspective.

Both the experimental group with team-based simulation learning and the control group with individual simulation learning showed an improvement in interpersonal understanding after learning. In [9], the experimental group with team-based simulation learning showed a significantly larger improvement than the control group with case-based learning and clinical practice. Similarly, in an uncontrolled study on 41 Year 4 nursing students, the use of team-based simulation learning led to a significant improvement in interpersonal understanding after learning [8], which coincided with this study. The control group performed simulation practice in a transient team regarding a patient case rather than performing case-based learning, which is presumed to have led to an improvement in interpersonal understanding after learning. The ability to understand others seems to have been enhanced as the learners performed team discussions and presentations as they listened to others and expressed their opinions to accomplish a common goal through team activities. As neither experimental nor control groups participated solely in lecture-based classes or nursing skill practice through individual learning activities, the learners could experience a positive interpersonal relationship during the simulation practice with communications among team members, which is presumed to have improved the level of interpersonal understanding.

The experimental group showed an improvement in problem solving ability from 3.61 before learning to 3.99 after learning. The problem solving ability was also improved in the control group with individual simulation learning based on pretest-posttest variation although the improvement was significant only in the experimental group. Among the five subcategories of problem solving ability, a significant between-group variation was found for issue specification, cause analysis, and plan/practice. In a study on Year 3 nursing students, where a major theory-based course was run through team-based learning [6], a significant variation in problem solving ability was found between the experimental group with team-based learning and the control group with lecture-based learning. Notably, among the subcategories of problem solving ability, a significant improvement was found for cause analysis and plan/practice to lend support to the results in this study. These findings were in line with previous studies applying team-based simulation practice [8, 9, 12], where the problem solving ability increased in the experimental group who experienced the simulation practice through team activities compared to the control group who performed case-based learning. In this study, the experimental group performed active communications among team members to discuss the problem in nursing and devise plans related to the cause and solution of the problem as well as priorities. The learners then watched the recorded video of the performance of the planned team activities to analyze the results together and share reflective learning. Through a series of such activities, the team-based learners could share more knowledge and experience than would be possible in individual learning toward an accurate understanding of the patient's problem

and an active performance of the resolution. In this way, the learners could increase the self-confidence in problem solving, and the repetition of this process is likely to have increased the level of improvement in problem solving ability. The control group did not show a significant pretest-posttest variation for issue specification and performance assessment among the subcategories of problem solving ability. This is presumed to be because the learners in this group analyzed the cause of the problem and searched for the solution individually, while experiencing the simulation practice through a randomly organized transient team at the step of performing the problem solving, with the subsequent reflective learning also being performed individually. As can be seen, the method of team-based simulation learning is more effective in allowing nursing students to acquire the problem solving ability to ensure professional responses to the diversity of patient situations in actual clinical settings. Further studies should develop numerous complex patient cases to apply in simulation learning in future.

5. Conclusions

The results collectively indicated that the team-based simulation learning had enhanced the team efficacy, interpersonal understanding, and problem solving ability of nursing students. During team-based simulation learning, the nursing students could increase the faith and trust in the team ability as they communicated among team members to share their knowledge and experience so as to directly perform the nursing on the patient in a simulated situation, while they also analyzed the performance outcome and repeated the accomplishment of shared goals. This learning process was shown to be highly effective in promoting the enhancement of the team efficacy, interpersonal understanding, and problem solving ability of nursing students.

Recently, simulation learning with team activities have been actively performed. For enhanced team performance and efficiency, the learning should be designed in a way to prevent frequent changes in team organization or the entire team to be led by one or two members. The limitation in this study lies in generalizing the results as it was conducted on nursing students at a single university to ensure homogeneity. In addition, the data regarding the influence of team efficacy on problem solving ability are insufficient and further studies should be conducted in this perspective, considering that team efficacy is an indicator of team performance for team-based simulation learning. To enable nursing students to acquire the problem solving ability so that they may respond more professionally to various patient-related situations in actual clinical settings, the method of team-based simulation learning is more effective, and further studies should develop numerous complex patient cases to apply in simulation learning in future.

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References

[1] Y. A. Song and Y. J. Son, "Effect of Simulation-based practice education for core skill of maternity nursing," Korean Parent Child Health, vol. 16, no. 1, pp. 37-44, 2013, [Online] Available: https://www.koreascience.or.kr/article/JAKO201304962317705.pdf

[2] J. Y. Kang, "Simulated nursing practice education in the ontact age: A mixed methods case study," Journal of Learner-Centered Curriculum and Instruction Nurse Educ., vol. 20, no. 18, pp. 937-957, 2020. doi: http://dx.doi.org/10.22251/jlcci.2020.20.18.93

[3] W. Eppich, V, Howard, J. Vozenilek, and I. Curran, "Simulation-based team training in healthcare," Simulation in Healthcare, vol. 6, no. 7, pp. S14-19, 2011. doi: http://dx.doi.org/ 10.1097/SIH.0b013e318229f550

[4] S. Lapkin, and T. Levett-Jones, "A cost-utility analysis of medium vs. high-fidelity human patient simulation manikins in nursing education," J. Clin. Nurs., vol. 20, no. 23-24, pp. 3543-3552, 2011. doi: http://dx.doi.org/10.1111/j.1365-2702.2011.03843.x

[5] D. A.Y. Levis, and A. D. Ciak, "The impact of a simulation lab experience for nursing students," Nurs. Educ. Perspect., vol. 32, no. 4, pp. 256-258, 2011, doi: https://dx.doi.org/10.5480/1536-5026-32.4.256

[6] J. H. Seo, Impact of team-based learning on nursing students' learning performance, Ph.D. Dissertation, Dept. Nursing, Seonam Univ., Namwon, South Korea, 2012.

[7] H. Y. Kang, E. Y. Choi, and H. R. Kim, "Nursing students' team capability and performance in simulation education using team-based learning," J. Korea Soc. Simulation Nurs., vol. 1, no. 1, pp. 29-41, 2013, [Online] Available: http://db.koreascholar.com/article.aspx?code=411427

[8] H. R. Kim, E. Y. Choi, and H. Y. Kang, "Simulation module development and team competency evaluation," J. Korean Acad. Fundam. Nurs., vol. 18, no. 3, pp. 392-400, Aug. 2011, [Online] Available: https://j.kafn.or.kr/current/index.php?vol=18&no=3

[9] H. R. Kim, Developement and effect of team-based simulation learning program on undergraduate nursing students, Ph.D. Dissertation, Dept. Nursing, Chosun Univ., Gwangju, South Korea, 2012.

[10] W. K. Kim, and E. J. Kim, "The structural relationship among Self Efficacy, major satisfaction and career decision efficacy of sports related majoring students", J. Korean Society for the Study of Physical Education, vol. 17, no. 2, pp. 65-77, 2012, [Online] Available: https://www.dbpia.co.kr/journal/voisDetail?voisId=VOIS00123967, Feb. 10, 2023.

[11] E. M. Kwon, The correlation among team efficacy, interpersonal understanding, proactivity in problem solving and team performance, M. S. thesis, Dept. Educational Technology, Ewha Womans Univ., Seoul, South Korea, 2010.

[12] S. H. Yang, Development and effect of team-based family simulation practice program, M.S. thesis, Dept. Nursing, CHA Univ., Seoul, South Korea, 2016.

[13] L. C. Marshall, "The relationship between efficacy, teamwork, effort and patient satisfaction," Ph.D. Dissertation, Dept. Education, Southern California Univ., California, USA, 2003, [Online] Available: https://scholar.google.com/scholar_lookup?hl=en&publication_year=2003&author=Marshall+L.C.&title=The+relationship+between+efficacy%2C+teamwork%2C+effort+and+patient+satisfaction

[14] V. U. Druskat, and D. C. Kayes, "Learning versus performance in short-term project teams," Small Group Research, vol. 31, no. 3, pp. 328-353, 2000, doi: http://dx.doi.org/10.1177/104649640003100304

[15] M. R. Eom, H. S. Kim, and E. K. Kim, and K. Y. Seong, " Effects of teaching method using standardized patients on nursing competence in subcutaneous injection, self-directed learning readiness, and problem solving ability," J. Korean Acad. Nurs., vol. 40, no. 2, pp. 151-160, 2010, doi: http://dx.doi.org/10.4040/jkan.2010.40.2.151

[16] S. J. Lee, Y. K. Jang, H. N. Lee, and K. Y. Park, "A study on the development of life-skills: Communication, problem solving, and self-directed learning," KEDI(RR2003-15-03), Seoul, 2003. [Online] Available: https://www.kedi.re.kr/khome/main/research/selectPubForm.do?plNum0=3847

[17] E. F. Barkley, K. P. Cross, and C. H. Major, Collaborative learning techniques: A handbook for college faculty, San Francisco, CA: Jossey-Bass John Wiley & Sons Inc. San Francisco, 2005.

[18] J. M. Lee, S. H. Yoon, and H. S. You, "Identifying, predictability of team efficacy, metacognition on problem-based learning outcomes," Asian J. Educ., vol. 13, no. 1, pp. 105-123, 2012, [Online] Available: https://s-space.snu.ac.kr/bitstream/10371/89362/1/13-1-05

[19] M. J. Sim and H. S. Oh, "Influence of self-efficacy, learning motivation, and self-directed learning on problem-solving ability in nursing students," J. Korea Contents Association., vol. 12, no. 6, pp. 328-337, 2012, doi: http://dx.doi.org/10.5392/JKCA. 2012.12.06.328

[20] S. H. Yang and I. O. Sim, "Relationship between problem solving ability, critical thinking, creativity, self-efficacy and nursing process competence of nursing students," J. Korea Contents Association., vol. 16, no. 5, pp. 612-622, 2016, doi: http://dx.doi.org/10.5392/JKCA. 2016.16.05.612