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Do Jigsaw Cooperative learning-based Nursing Simulation Classes Influence Nursing Students' Learning Competencies?

Eunju Seo[1], Inhee Park[2]

[1]Professor, Dept. of Nursing Science, Pai Chai University, 155-40, Baejae-ro, Seo-gu, Daejeon, Republic of Korea, 35345

*[*2]Professor, Dept. of Nursing Science, Shinsung University, 1, Daehak-ro, Jeongmi-myeon, Dangjin-si, Chungcheongnam-do, Republic of Korea, 31801*

*eunjuseo@pcu.ac.kr[1], park0200@shinsung.ac.kr[*2]*

Corresponding author: Inhee Park:mobile phone +82-010-5208-9788, park0200@shinsung.ac.kr*

Abstract

Background/Objectives: The present research objective is to evaluate its effectiveness by applying Jigsaw cooperative learning to simulation practice as a way to enhance learning competencies.

Methods/Statistical analysis: The design of this study is an experimental study of design pre- and post-non-equivalence controls. The subjects are 129 nursing students who are in their third year in a nursing college in South Korea and are taking simulation practice courses. The difference test between the experimental and control groups was analyzed using independent t-test, and the pre-post difference comparison was analyzed using paired t-test.

Findings: The experimental group was 68 and the control group was 61. Pre-intervention learning competencies were measured to verify the homogeneity of the control and experimental groups. The learning competency of the experiment group is 317.4±25.02 (t=-1.526, p=.130), the control group had a learning competency of 310.5±26.39. After the intervention, competency of the experimental group scored higher than the control group, which was statistically significant (t=-2.144, p=.034). This confirmed that the homogeneity of the experimental and control groups was secured. Cognitive domain is concerned, which is a sub-region of learning competence, the difference between the two groups after the experiment was not statistically significant (t=-0.564, p=.574). The learning motivation domain is divided into emotion and motivation, and in the motivation domain, both control and experimental groups had higher after intervention than base-line, and were statistically significant (t=-2.298, p=.025). Learning behavior domains are separated into in-class and out-of-class domains, with high scores from experimental groups in-class and out-of-class learning behavior domains, which were statistically significant (t=-2.100, p=.038).

Improvements/Applications: Based on these results, we hope that it is helpful to develop a teaching and learni ng program that can improve the quality of nursing education, nursing quality.

***Keywords*:** Jigsaw cooperative learning, Simulation, Nursing students, Learning competency, Teaching learning program

1. Introduction

Nursing practice in hospitals plays an important role for the field of nursing. Therefore, nursing education must be combined with not only theoretical but practical education[1]. Practical training encourages nursing students to be equipped with the knowledge, theoretical concepts, nursing courses, and nursing practices they need as nurses[2]. However, the current practice education environment has many obstacles to whole nursing education. One of the obstacle factors is the patient rights protection policies, namely patients are reluctant to receive care by less skilled nursing students. Because of these factors, nursing students experiences lack of the opportunity to give a firsthand care to patients firsthand[3].

Various teaching strategies are being applied to compensate for this problem. A typical

teaching learning strategy is simulation-based learning[4].

Simulation-based learning consists of lectures, technical exercises, and simulation practice. Simulation practice reproduces cases in hospitals, providing opportunities for students to perform nursing in person. It then moves on to the debriefing stage, where it reviews nursing performance on its own and receives immediate feedback[4, 5]. If the cooperative learning process is applied at this time, effective simulation training can be conducted.

Jigsaw cooperative learning are classes in which students of different learning abilities work together to achieve the common goal[6]. Through this method, students can help each other and achieve learning outcomes as much as possible. Many studies have demonstrated the effectiveness of jigsaw cooperative learning. A review of the theme of jigsaw cooperative learning reveal its effectiveness on nursing students with regard to their problem-solving skills, self-directed learning skills, learning task-solving skills, and learning satisfaction[7]. However, little research efforts exist on learners' learning competencies. Learning competency is a concept that encompasses the domains of cognition, learning motivation, and learning behavior. The present research objective is, therefore, to evaluate its effectiveness by applying jigsaw cooperative learning to simulation practice as a way to enhance learning competencies.

2. Materials and Methods

2.1. Setting and participants

The subjects of the present study are nursing students who are in their third year in a nursing college in South Korea and are taking simulation practice courses. The G-power 3.1 program was used to calculate the number of participants suitable for the study. The significance level(α)=0.05, power(1-β)=0.8 and effect size=0.5 were set, and a total of 140 participants were recruited in consideration of the dropout rate. Among them, 129 subjects were included in the final results analysis.

In order to recruit research participants, a research participation notice was announced on the online bulletin board to third-year students who are taking nursing university simulation practice courses. The public notice included the contents and purposes of the study, the period of participation, methods and procedures for participation, matters concerning the consent for using their personal information, and the risks and benefits. Those who wish to participate in the research were able to access the URL specified in the notice and participated in the self-survey online. The information of the study subjects was used for research purposes only and was treated in a secure manner. Data collection period was from September 2019 to December 2019.

2.2. Design

The design of this study is an experimental study of design pre- and post-non-equivalence controls attempted to confirm the effect of nursing simulation classes applied with jigsaw cooperative learning on nursing students' learning competencies (Figure 1).

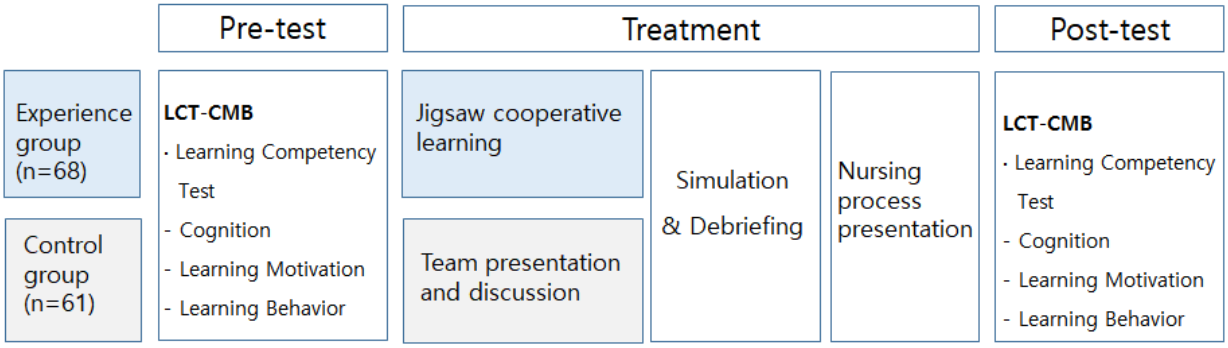

Figure 1. Study design

2.3. Intervention

Participants conducted a preliminary survey of general characteristics and learning competencies prior to taking simulation practice courses. The simulation practice course operation was offered for a total of six classes. One class consists of six groups, consisting of three to four members per group. The experimental and control groups were randomly divided by computer program, and participants proceeded without knowing which group they belonged to.

The simulation practice curriculum provided students with four scenarios, each in the order of pre-learning, simulation and debriefing, and nursing process case presentation, respectively.

2.3.1. Experience group

For jigsaw cooperative learning, the experimental group divided the pre-learning topics according to the number of group members and gave different learning topics to each group member. To minimize the difference between each member's knowledge of pre-learning and teaching methods, the professor in charge of the class provided teaching methods and key words. Each member studied the assigned topic and formed a special-list group of experts who chose the same topic to discuss and study the topic for about 40 minutes. Afterwards, the members of the special-list group returned to their original group to train other members of the same group for 20 minutes on the subject. After this process, nursing care activities were conducted in groups through simulation and debriefing. During the debriefing phase, the professor allowed learners to perform nursing care activities through simulation and express them in their acquired knowledge and attitudes. The professor also explained to the learners the area they were good at and what they needed to improve themselves. Learners had time to organize their overall nursing care activities by presenting examples of nursing courses. In this way, we proceeded with a total of four scenarios in the simulation practice curriculum.

2.3.2. Control group

In the same way as the experimental group, the control group was provided with the pre-learning topics for each scenario and assigned different learning topics for each group. They presented and discussed the topics for each group in class. After pre-learning, simulation and debriefing and nursing case presentation were conducted in the same way as the experimental group.

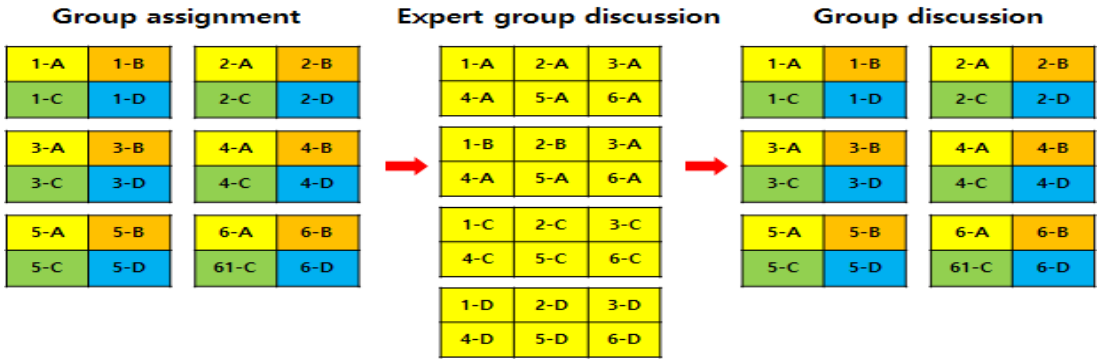

Figure 2. Jigsaw cooperative learning

2.4. Assessment

Student Competency Test (LCT-CMB)

The Learning Competency Test-Cognition · Learning Motivation · Learning Behavior(LCT-CMB) is a tool developed by Lee Kyung-hwa (2011), and the author adopted this tool for the purpose of this study[8].

The competency test consists of a cognitive area, a learning motivation area, and a learning behavior area. The cognitive domain consists of knowledge, thinking, creativity, and problem solving. The cognitive domain consisting of three sub-categories consisting of higher thinking, super-cognitive, creative ability, creative tendency, problem solving process, manipulation and practice. The area of learning motivation consists of emotion and motivation. The learning motivation domain consists of two sub-variants consists of depression, test-anxiety, learning stress, self-determination, learning goal orientation, and self-efficacy. The area of study learning behavior consists of in and out of classes. The learning behavior area consists of two sub-variants consists of seven measurement variables. intensive strategy, note organization, memory strategy, effort control, learning environment management, help and resource utilization, and career preparation. Each question was measured using a Likert 5-point scale, and the higher the score, the higher the cause of the variables in each category. Cronbach's α in this tool was as follows: the cognitive domain α=0.887, and the learning motivation domain α=0.761, learning behavior area α=0.897. Cronbach's α for cognitive domain, the motivational domain, and behavior area was α=0.887, α=0.761 and α=0.897 respectively.

2.5. Statistical Analysis

The data collected in this study were analyzed using the SPSS/WIN 23.0 program. General characteristics between the experimental and control groups are analyzed by descriptive statistics (frequency, percentage, mean, standard deviation). The homogeneity verification of the characteristics and dependent variables of the experimental and control groups was analyzed using chi-square tests, independent-test after cross-analysis. The difference test between the experimental and control groups was analyzed using independent t-test, and the pre-post difference comparison between the experimental and control groups was analyzed using paired t-test.

3. Results and Discussion

3.1. Participants

The general characteristics of the subject are as shown in Table 1. The experimental group was 68 (females=56, males=12) and the control group was 61 (females=53, males=8). Pre-intervention learning competencies were measured to verify the homogeneity of the control and experimental groups. As a result, the learning competency of the experiment group is 317.4±25.02 (t=-1.526, p=.130), the control group had a learning competency of 310.5±26.39. Cognition which is a sub-region of the learning competency (t=-0.263, p=.793), learning motivation (t=-1.982, p=.050) and learning behavior (t=-0.989, p=. 324) was revealed that there was no statistically significant difference between the two groups in all areas. This confirmed that the homogeneity of the experimental and control groups was secured.

Table 1. Characteristics of study participants

(n=129)

Parameters	C (N or M±SD)	E (N or M±SD)	χ2 or t	p
Sex (female/male)	53/8	56/12	0.504	.627
Age (years)	24.7±6.1	23.8±3.9	1.022	.309
Cognition	106.8±13.11	107.4±13.37	-.263	.793
Learning motivation	89.4±11.29	93.2±10.39	-1.982	.050
Learning behavior	114.3±13.29	116.8±15.31	-.989	.324
Total	310.5±26.39	317.4±25.02	-1.526	.130

* C: Control group, E: Experimental group

3.2. Learning competency

The difference between the learning competencies before and after jigsaw cooperative learning between the control group and the experimental group are shown in Table 2 and Table 3. Both the experimental and control groups had higher overall learning competence scores after intervention than baseline. After the intervention, the experimental group scored higher than the control group, which was statistically significant (t=-2.144, p=.034).

So far as the cognitive domain is concerned, which is a sub-region of learning competence, the difference between the two groups after the experiment was not statistically significant (t=-0.564, p=.574). Looking at prior research using jigsaw cooperative learning s, we see that the application of this method has improved learners' understanding, memory ease, and problem-solving skills[9, 10]. These conflicting results may be attributed to differences in subjects. In the preceding study, it was a class that emphasized knowledge acquisition, such as statistics and chemistry classes, liberal arts classes, and basic nursing classes. However, in this work, the conjecture is that the characteristics of simulation practice classes, which require solving not only

knowledge but also a variety of suddenly occurring nursing problems, may be reflected. Critical thinking ability refers to the ability to understand and efficiently judge presented problems through analysis, synthesis, and reasoning. To improve this ability, teaching methods such as problem-driven learning rather than lecture-based teaching is recommended[11]. The jigsaw cooperative learning is used by a professional student to deliver content to other students. Thus, while the professional student helps to fully understand the topic, other students are similar to taking traditional lecture classes. In sum, jigsaw cooperative learning s do not seem to help improve critical thinking skills.

The learning motivation domain is divided into emotion and motivation, and in the motivation domain, both control and experimental groups had higher after intervention than base-line, and were statistically significant (t=-2.298, p=.025). These results in this study were consistent with prior findings that jigsaw cooperative learning have a high impact on intrinsic motivation. Prior research has shown that team learning methods also have a positive impact on learning motivation[7, 12]. This suggests that there is no difference between the two groups, as both jigsaw cooperative learning and team learning have helped improve learning motivation. Therefore, in future studies, the effectiveness of the jigsaw cooperative learning can be clearly confirmed if the difference in learning motivation is added to the pure instructional method.

Learning behavior domains are separated into in-class and out-of-class domains, with high scores from experimental groups in-class and out-of-class learning behavior domains, which were statistically significant (t=-2.100, p=.038). In the case of jigsaw cooperative learning, learners have a habit of pre-preparing and explain to their friends, so the contents of the study are reviewed once more[13]. Therefore, it is believed that these learning methods may have influenced out-of-class learning behavior.

Table 2. Changes in the LCT-CMB

(n=129)

Categories	Group	Pre (M±SD)	Post (M±SD)	t (p)
Total	C	310.5±26.39	320.2±22.20	-2.404(.019)
	E	317.4±25.02	328.0±18.95	-3.024(.004)
	t(p)	-1.526(.130)	-2.144(.034)	
Cognition	C	106.8±13.11	109.2±11.29	-1.235(.221)
	E	107.4±13.37	110.3±11.97	-1.472(.146)
	t(p)	-0.263(.793)	-0.564(.574)	
Learning motivation	C	89.4±11.29	90.9±10.11	-1.084(.283)
	E	93.2±10.39	93.7±9.98	-0.341(.734)
	t(p)	-1.982(.050)	-1.610(.110)	
Learning behavior	C	114.3±13.29	120.2±10.99	-2.826(.006)
	E	116.8±15.31	124.0±10.86	-3.502(.001)
	t(p)	-0.989(.324)	-1.951(.053)	

*LCT-CMB:Learning Competency Test-Cognition, Learning Motivation, Learning behavior

* C: Control group, E: Experimental group

Table 3. Changes in the LCT-CMB of Subcategories

(n=129)

Categories	Sub-categories	Group	Pre(M±SD)	Post(M±SD)	t (p)
Cognition	Knowledge & Thinking	C	40.1±5.03	41.5±4.13	-1.820(.074)
		E	40.8±5.65	42.1±4.77	-1.588(.117)
		t(p)	-0.652(.515)	-0.816(.416)	
	Creativity	C	35.9±5.99	36.6±5.72	-0.861(.393)
		E	35.9±5.99	36.9±5.45	-1.067(.290)
		t(p)	0.003(.998)	-0.292(.771)	
	Problem solving	C	30.7±4.74	31.1±4.49	-0.488(.627)
		E	30.7±5.33	31.3±5.08	-0.680(.499)
		t(p)	0.001(.999)	-0.269(.788)	
Learning motivation	Emotion	C	41.9±11.03	41.0±10.31	0.606(.547)
		E	44.3±11.91	42.2±11.52	1.101(.275)
		t(p)	-1.178(.241)	-0.641(.523)	
	Motivation	C	47.4±6.67	49.9±6.50	-2.298(.025)
		E	48.8±6.41	51.5±5.76	-2.512(.014)
		t(p)	-1.211(.228)	-1.495(.137)	
Learning behavior	In class	C	51.9±7.09	54.4±6.55	-2.349(.022)
		E	53.4±7.98	55.9±6.91	-2.328(.023)
		t(p)	-1.165(.246)	-1.260(.210)	
	Out class	C	62.4±7.85	65.8±6.60	-2.690(.009)
		E	63.4±8.26	68.0±5.62	-3.904(.000)
		t(p)	-0.671(.504)	-2.100(.038)	

*LCT-CMB:Learning Competency Test-Cognition, Learning, Motivation, Learning behavior

* C: Control group, E: Experimental group

4. Conclusion

This study was conducted to confirm the effectiveness of nursing simulation classes applying jigsaw cooperative learning on learning competencies of nursing college students. As a result, jigsaw cooperative learning was effective in improving learning competencies. Therefore, utilizing jigsaw cooperative learning in nursing simulation classes seems to help improve learning competence, and this study is meaningful in that it can be used as a foundation material for the development and application of learner-centered teaching learning methods. This study has some limitations. First, since this study used only one year of a university, one has to be cautious about generalizing the

results, and thus follow-up studies are needed to identify differences by comparing effects on learning competencies through several forms of learner-centered learning method controls. It is also suggested to check whether jigsaw cooperative learning affects not only learning competencies but also other variables. It is hoped that this will improve the quality of nursing education and further improve the quality of nursing.

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