Effect of Projet-Based Learning on the Creative Personality, Teamwork Competence and Self-Regulated Efficacy of Undergraduate Nursing Students

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Abstract: This paper deals with learner-centered teaching methods according to the demand for improvement in university education. Project-based learning methods improve students' self- learning and creative problem-solving ability. In clinical practice, creative problem-solving ability and teamwork competence are important among nurses' competencies. This purpose of study was to apply a project-based learning method to curriculum to see changes in creative personality, teamwork competence, and self-regulated efficacy. This study conducted from September to December 2019 with 34 participants. To achieve this purpose, 34 students taking a health program development and evaluation course were tested for their creative personality, teamwork competence, and self-regulation efficacy. The analysis results showed that it is effective in creative personality, teamwork competency, and self-regulation efficacy ($p<.001$). It was found that teamwork competence and self-regulation efficacy had a positive correlation ($p=.002$). Therefore, the effect of project-based learning method used in nursing students was verified and indicates significance in increasing competency of undergraduate nursing students.

Keywords: project-based learning, nursing student

1. Introduction

Our society demands creative thinking and problem-solving skills. These social changes also occur in the hospital environment. Instead of simply delivering nursing knowledge, the field of nursing education must also train students to gain creativity, critical thinking, communication, and collaboration. For this reason, teacher-centered education needs to be shifted to learner-centered education [1], [2]. In the 21st century, faced with complex and diverse problems, not only the acquisition of knowledge, but the ability to newly combine and reconstruct knowledge is important. It is the creative problem-solving ability that is essential at this time. Among the core competencies of university students, creative problem-solving ability is suggested as a very important factor. Creative problem-solving ability is closely related to creative personality and creative thinking process. Creative personality refers to the personality traits of a creative person, and can be expressed by interest, interest, and attitude toward creativity.

The recent demand for a diversified and open society is shifting the focus of university education from the teacher-centered approach to the learner-based innovative approach. Innovative approaches include team-based learning, problem-based learning, project-based learning, and flipped learning. Project-based learning is receiving attention because of the growing importance of learner-centered learning environment.

Project-based learning is a learning method that involves the process of solving a project besides the acquisition of knowledge and practicing specific activities to express the project outcomes in various ways. Through this learning method, learners learn on their own by questioning and discussing with other students to solve problems they organized in a real-life situation [3].

Creativity contributes not only to personal growth but also to the development of society, so it has been recognized as an important task of education for the promotion of creativity of university students. Therefore, in the 21st century, creativity or creative problem-solving ability is the core competency of university students. Creative personality can be shown by the attention to creativity, interest, and creative attitude. In particular, creativity can be defined by the universal personality traits commonly shared by creative people [4]-[6]. Creativity education courses for undergraduates in Korea are mostly liberal arts, and previous studies report that creativity lectures have an effect on creative attitude and exchange relationship among team members. A study applying PBL to a learner-centered learning method in nursing major subject reports that creative thinking, creative motivation, and creative attitude are effective for the problem-solving ability [7]. A study applying the flipped classroom approach reports that the approach improves self-efficacy, critical thinking, and communication of undergraduate nursing students (Fig. 1).

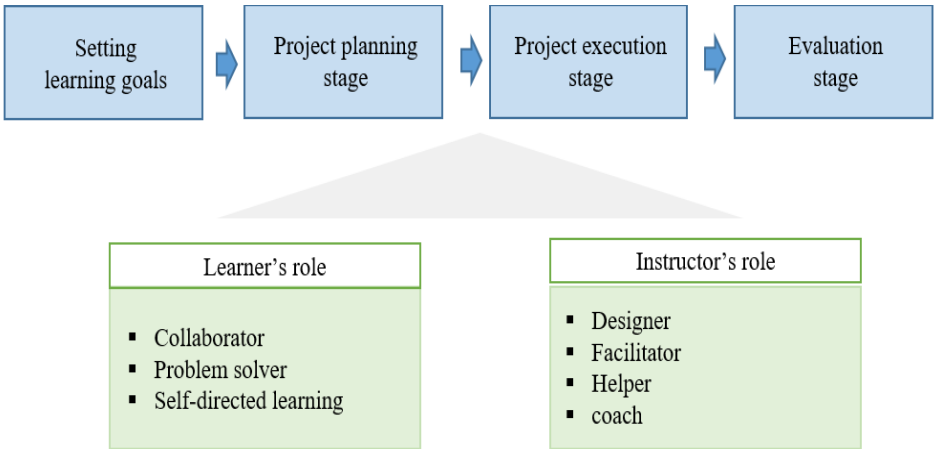

Fig. 1 Project-based learning process

Creative problem-solving classes improve the creative ability and creative problem-solving leadership of undergraduate nursing students [8]. The action-learning approach is effective in developing and improving the creative problem-solving ability of nursing students [7], and project-based classes enhanced creative thinking, creative tendency, and problem-solving ability of undergraduates [1], [2], [9].

It is essential to have the ability to approach and solve problems that occur during diverse and complicated nursing practices creatively by breaking away from the norms. Nurses must be able to solve problem by interacting with their coworkers and experts in other fields.

The word teamwork represents the 'ability to do accomplish a task together.' Teamwork competence refers to the competence of team members to take responsibility according to the given role, cooperate, and behave to attain a common goal. Teamwork competence is drawing increasing attention as a factor that improves problem-solving ability. Teamwork competence refers to the core educational ability in the 21st century for team members to take responsibility for their roles and cooperate to attain a common goal [10]. Project-based classes offer positive learning experiences by improving the ability to operate and execute teamwork, problem-solving ability, and cooperative spirit [11]. Project-based learning of undergraduates has direct and indirect effects on team leadership, team process, and team effectiveness [12], and project-based learning experience improves teamwork competence of students [13].

Self-regulated efficacy is an individual's expectation about the efficacy of how one can execute self-regulatory mechanisms such as self-observation, self-judgment, and self-response [14], [15]. Project learning is a systematic instruction method that enhances the knowledge, skill, and cooperative attitude of learners through an intensive exploration of complicated and practical problems. It fosters the creative personality and improves teamwork competence and self-regulated efficacy of undergraduate nursing students.

Accordingly, the purpose of this study is to examine the effect of project-based learning on the creative personality, teamwork competence, and self-regulated efficacy by applying project-based learning to nursing education as a means to increase teamwork competence of students for solving problems together through creative thinking.

2. Design Of Study

This study has a single-group, quasi-experimental design that measures differences before and after project-based learning to examine the effect of project-based learning of nursing student.

3. Methods.

3.1. Participants

G*Power 3.1 was used to calculate the number of samples. The number of samples for the one-tailed independent t-test calculated using the significance level (α=.05), power (1-β=.95), and effect size (f=.5) was 34. Before conducting this study, students were informed that the course for the development and assessment of health programs is based on project-based learning, and only the students who agreed were selected as the participants. Participants were 71.5% female and 28.6% male, with an average of 22.6 years old. An orientation was held before class started to explain the teaching process, learning method, assessment method, and roles of the professor and students to the participants.

3.2. Measurements

- Creative Personality

Creative personality refers to the motivation, attitudes, values, and cognitive styles that facilitate creative thinking and behavior, general characteristics shown by creative persons, and the stable and core attitude of an individual needed to manifest creativity.

The Creative Personality Scale-Revised (CPS-R) is used to measure creative personality [16]. This tool comprises eight sub-factors (Table 1) and 30 questions total. The tool had Cronbach's α of .82

- Teamwork Competence

This tool has 17 questions total, including eight questions about human-related teamwork and nine questions about functional teamwork [17]. All questions are measured on a Likert's five-point scale. The tool had Cronbach's α of .90.

- Self-Regulated Efficacy

The academic self-efficacy scale developed in the study of Kim & Park on scale development and validation [18] is used to measure self-regulated efficacy. This scale has 28 questions total, including eight questions about confidence, ten questions about self-regulated efficacy, and ten questions about ask difficulty preference. Only the ten questions about self-regulated efficacy were used in this study. The tool had Cronbach's α of .84.

Table 1. Composition Of Creative Personality

Sub-factors	**Definition**	**Number of questions**
Curiosity	Curiosity refers to the tendency to question and pay attention to surrounding objects and phenomena	4
Self-confidence	Self-confidence refers to the tendency to think positively about one's creative capability and existence	5
Imagination	Imagination refers to the tendency to enjoy imaginary situations	4
Patience	Patience/attachment refers to the tendency to finish a given task despite any hardships	5
Humor	Humor refers to the tendency to generate funny actions or thoughts	4
Independence	Independence refers to the tendency to solve problems alone regardless of what other people think and assess	2
Adventure	Adventure refers to the tendency to challenge tasks at risk of failing	2
Openness	Openness refers to the tendency to accept new experiences and thoughts	4

3.3. Data Analysis

The collected data were analyzed using the SPSS WIN 23.0 program. The reliability of tools was confirmed using Cronbach's α value. Descriptive statistical analysis was performed to identify teamwork competence, creative personality, and self-regulated efficacy of the participants. Changes in teamwork competence, self-regulated efficacy, and creative personality of the participants were analyzed to verify the effect of project-based learning by performing a paired t-test. The correlation among variables was analyzed using the Pearson correlation coefficient.

4. Intervention

The experimental treatment of this study is the 'Development and Evaluation of Health Programs' course that applied project-based learning. This three-credit courses for fourth-year nursing students was operated for 15 weeks. Among three hours every week, one hour was spent on learning themes for project team activities, and two hours were used to engage in team activities led by team leaders. The learning objective of this course is to write a health project proposal. The participants were provided with basic data related to the local community. They worked as a team of four or five members to conduct 15 sessions of team activities such as data collection, field surveys, and discussions. The learning themes and team activities for the 15 sessions are as follows (Fig 2) (Table 2).

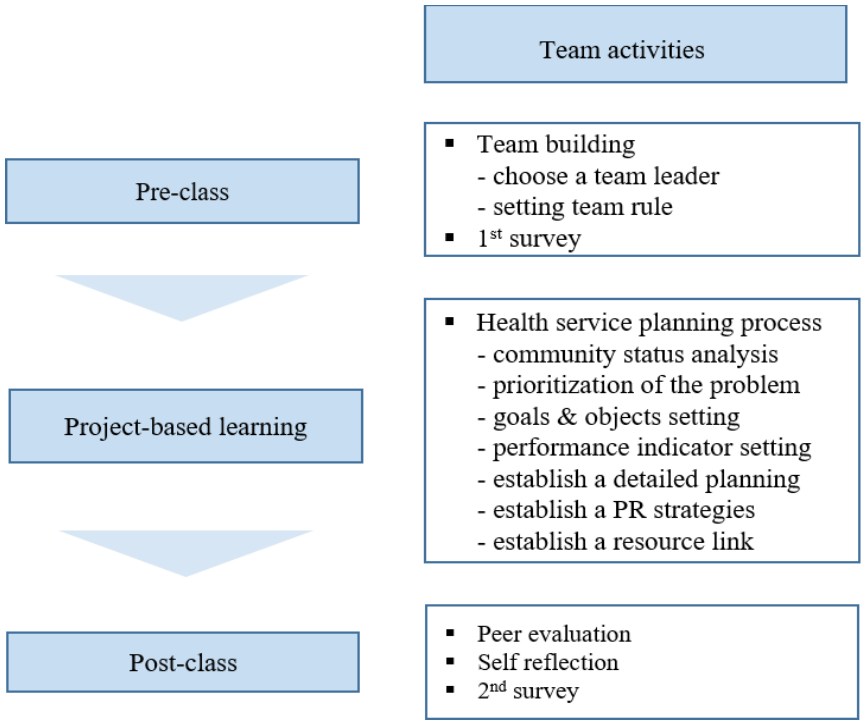

Fig. 2 Project-based Learning process

Table 2. Project-Based Learning Topics And Team Activities

time	learning topics	team activities
pre-classes	■ orientation - project-based learning OT - learning contents and evaluation - role of students and faculty	■ team building - choose a team leader - set team rules ■ 1st survey
1 ~ 2	■ health service planning process	■ explore topic
3 ~ 4	■ health service planning - status analysis	■ community status analysis -1st & 2st survey and analysis - SWOT analysis
5 ~ 7	■ health service planning - prioritization	■ prioritization
8 ~ 9	■ health service planning -goals & objectives	■ goals & objectives setting ■ performance indicator setting
10 ~ 14	■ health service planning -strategies -detailed planning	■ establish a detailed planning ■ establish a PR strategies ■ establish a resource link
15	■ health service planning-presentation	■ team presentation ■ Q&A ■ peer evaluation
post-classes	■ general review	■ self-evaluation ■ 2st survey

5. Results

5.1. Effect of Creativity Personality

When project-based learning was applied to undergraduate nursing students, changes in the creative personality was as shown in Table 3 and Fig 3.

Before applying 15 sessions of project-based learning, the mean score was 2.92 for creative personality, 3.75 for teamwork competence, and 3.61 for self-regulated efficacy. After application, the mean score was significantly

improved on the significance level of p<.01 to 3.77 for creative personality (t=10.587, p=.000). For the sub-factors of creative personality before applying 15 sessions of project-based learning, the mean score was 3.40 for curiosity, 3.67 for self-confidence, 3.69 for imagination, 3.14 for patience/attachment, 3.20 for humor, 3.50 for independence, 3.13 for adventure, and 3.68 for openness. After application, the mean score was 3.74 for curiosity, 4.01 for self-confidence, 3.93 for imagination, 3.52 for patience/attachment, 3.61 for humor, 3.89 for independence, 3.61 for adventure, and 3.82 for openness. The score was significantly improved for curiosity (t=2.883, p=.006), self-confidence (t=2.999, p=.005), patience/attachment (t=3.998, p=.000), and independence (t=2.963, p=.005).

Table 3. The Change Of Creative Personality

Items	**pre-test M±SD**	**post-test M±SD**	**t**	***p***
Curiosity	3.40±.59	3.77±.31	10.587	.000
When I see a machine for the first time, I want to find out how to use it	3.31±.92	3.81±.77	2.979	.005
I am curious about bizarre and mystical animals	3.48±.91	3.50±.94	.101	.920
I am a curious person	3.60±.79	3.93±.67	1.894	.065
I doubt every little thing that is taken by others as natural	3.24±.79	3.74±.62	3.344	.002
Self-confidence	**3.67±.60**	**4.01±.39**	2.999	.005
I am a very important person in the world	3.79±.84	4.24±.53	2.883	.006
I am confident about accomplishing my big dreams and hopes	3.64±.79	3.95±.73	1.799	.079
I am willing to challenge anything, though it may turn out to be a failure.	3.79±.78	3.93±.67	.882	.383
I believe in my capabilities, and I am proud of myself	3.50±.91	4.00±.49	3.110	.003
I trust myself, no matter what other people say	3.64±.79	3.93±.74	1.776	.083
Imagination	**3.69±.71**	**3.93±.52**	1.592	.119
I want to have friends from other countries	3.57±.90	4.29±.67	3.809	.000
I love to imagine myself being the protagonist of a story	3.74±.62	3.71±.77	.117	.907
I want to find out about the lifestyle of people in other countries	3.93±.92	3.86±.68	.374	.710
I often think, 'How did people live in the past?'	3.53±.80	3.86±.75	1.766	.085
Patience	**3.14±.47**	**3.52±.38**	3.998	,000
.I tend to dig deep into problems I do not know about	3.33±78	3.69±.84	1.802	.079
.I prefer difficult problems over easy ones	2.83±.93	3.57±.76	4.018	.000
Once I make the decision, I finish everything regardless of how difficult it is	3.40±.88	3.76±.53	2.297	.027
I tend to give up quickly	3.00±.98	2.95±.96	.224	.824
I enjoy difficult tasks	3.12±.80	3.64±.66	3.417	.001
Humor	**3.20±.78**	**3.61±.63**	**2.494**	.017
I can make people laugh by saying random things	3.38±.82	3.67±.72	1.667	.103
People tell me that I can become a comedian	2.69±.79	3.14±.64	1.501	.141

I have a good sense of humor	3.29±.83	3.64±.75	2.243	.030
My friends are entertained by what I do and say	3.45±.80	3.98±.68	3.001	.005
Independence	**3.50±.68**	**3.89±.50**	**2.963**	.005
I clean my room before someone tells me to	3.36±.93	3.86±.56	2.760	.009
I can take care of my job	3.64±.72	3.93±.74	1.861	.070
Adventure	**3.13±.91**	**3.61±.81**	**3.61±.81**	.022
I want to travel to new places alone, even if I can get lost	3.57±.90	3.93±.89	1.601	.117
I want to live alone on a deserted island for a month	2.69±.82	3.29±.77	2.102	.042
Openness	**3.68±.47**	**3.82±.37**	**1.478**	.147
It is okay to change game rules sometimes	3.50±.74	3.62±.88	.658	.514
I can talk to people whom I do not like	3.59±.91	3.88±.80	1.576	.123
I can accept any thoughts and ideas that are better than mine	3.98±.64	3.95±.62	.178	.860
I often think, 'What would happen if~?'	3.67±.78	3.83±.65	1.124	.267
Total score of Creative personality	**2.92±.39**	**3.77±.31**	**10.587**	.000

***: *p*<.05**

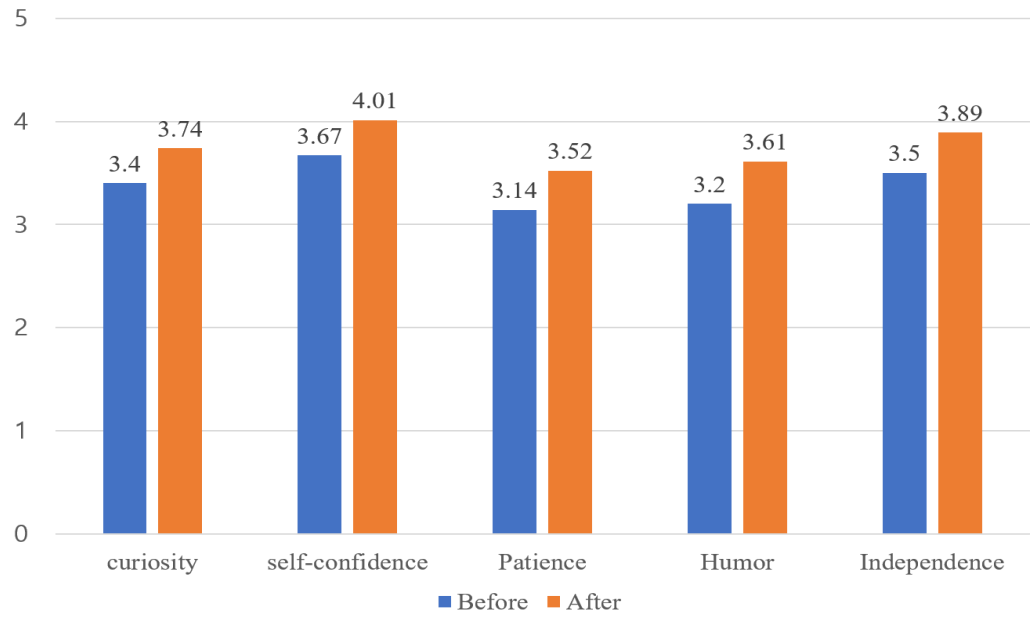

Fig. 3 Change of sub-factors of creativity personality

5.2. Effects of Teamwork Competence And Self-Regualated Efficacy

When project-based learning was applied to undergraduate nursing students, changes in the creative personality was as shown in Table 4 and Fig. 4-5.

The mean teamwork competence score before applying 15 sessions of project-based learning was 3.72 for human-related teamwork and 3.77 for functional teamwork. After application, the mean score was significantly improved in all domains to 4.08 for human-related teamwork competence (t=4.144, *p*=.000) and 4.21 for functional teamwork competence (t=4.605, *p*=.000).

Table 4. The Change Of Teamwork Competence And Self-Regulated Efficacy

Variables	pre-test M±SD	post-test M±SD	t	*p*
Teamwork Competence	3.75±.49	4.15±.34	4.701	.000*
Human-related teamwork	3.72±.51	4.08±.31	4.144	.000*
Functional teamwork	3.77±.55	4.21±.40	4.605	.000*
Self-Regulated Efficacy	3.61±.46	4.08±.32	6.185	.000*

*: $p<.01$

Fig. 4 Change of teamwork competence

Fig. 5 Change Of Self-Regulated Efficacy

5.3. Correlation Among The Variables

Looking at the correlation among creative personality, teamwork competence, and self-regulated efficacy, self-regulated efficacy showed a significant positive correlation with creative personality (r=.379, *p*=.013) and teamwork competence (r=.463, *p*=.002). Between self-regulated efficacy and the sub-factors of creative personality, a significant positive correlation was shown by self-confidence (r=.390, *p*=.011), imagination (r=.482, *p*=.001), and humor (r=.371, *p*=.015). Between self-regulated efficacy and the sub-factors of teamwork competence, a significant positive correlation was shown by both human-related teamwork (r=.399, *p*=.009) and functional teamwork (r=.465, *p*=.002) (Table 5).

Table 5. Correlation Between Variables

Scale	TC			SRE	CP						
		TC_H	TC_F			CP_C	CP_S	CP_I	CP_P	CP_H	CP_In	CP_A
TC	1											
TC_H	.920**											
TC_F	.963**	.781**										
SRE	.463**	.399**	.465**									
CP	.286	.215	.309*	.379*								
CP_C	.186	.089	.236	.036	.692**							
CP_S	.310*	.259	.317*	.390*	.701**	.309*						
CP_I	.365*	.305*	.373*	.482**	.866**	.541**	.598**					
CP_P	.036	.071	.107	.181	.490**	.360*	.246	.260				
CP_H	.162	.099	.191	.371*	.723**	.420**	.400**	.555**	.333*			
CP_In	.098	.116	.077	.232	.272	.056	.351*	.260	.044	.040		
CP_A	.087	.160	.028	.031	.539**	.256	.234	.421**	.020	.292	.361*	
CP_O	.165	.143	.166	.160	.672**	.534**	.382*	.676**	.154	.300	.009	.374*

****: *p*<.01 *: *p*<.05**

TC: Teamwork Competence TC-H: human-related teamwork TC_F: functional teamwork
SRE: Self-Regulated Efficacy
CP: Creative Personality CP_C: Curiosity CP_S: Self-confidence CP_I: Imagination
CP_P: Patience/Attachment CP_H: Humor CP_Ind: Independence CP_A: Adventure
CP_O: Openness

6. Discussion

This study examined changes in creative personality by applying a project-based learning method as a way to improve the creative problem-solving ability of preliminary nurses. As a result, the project-based learning method significantly improved in all of the creative personality.

The results of this study agree with the results of previous studies [10], [19]. Creative personality refers to the motivation, attitudes, values, and cognitive styles that facilitate creative thinking and behavior, general characteristics shown by creative persons, and the stable and core attitude of an individual needed to manifest creativity [8]. The results of this study showed that persons with a creative personality accept challenges to solve new problems and have a deep interest in and curiosity about their surroundings. They were also found to have a tendency to finish difficult tasks with patience and maintain independence instead of being affected by the opinions of others.

In the sub-area of creative personality, curiosity, self-confidence, patience, humor, and independence were significantly improved. A creative person has a good sense of humor, confidence, and independence. In addition, he has excellent ability to cope with crises, and he is very curious and patient. A person who is open to new experiences, willing to take risks, and above all, has confidence and appetite for himself.

In this study, it was found that the project-based learning method is effective in improving teamwork competency. Among the teamwork competencies, it was found to be effective in both human relational teamwork and technical team competencies. In hospital organizations of today, teamwork competence is prioritized over individual competence because of the tendency to solve problems or tasks as a team. The demand for improvement

of university education is growing gradually with the changing social environment. The conventional education method focused on delivering knowledge is transforming into learner-centered education that can recognize and solve practical problems.

The results of this study agree with previous studies [20] in that it is more effective to solve problems faced by an organization based on ideas shared among members than relying on the competence or leadership of some members. As hospital organizations are attempting to solve problems as a team, it would be meaningful for universities to attempt efficient and executable learning activities that can enhance learning performance through sharing among learners.

Self-confidence refers to the tendency to think positively about one's creative capability and existence. In particular, self-confidence is a tendency to think positively about one's creativity. The participants felt satisfied with turning the team project into an actual product.

As a result of this study, the person who wants the future is a person who can solve problems with openness and confidence when facing new problems. In that respect, the nursing education method needs to be changed. It is believed that there is a need to change from the level of delivering simple knowledge to the level of having creative problem-solving skills for new things and capable of teamwork.

7. Conclusion

In hospital organizations of today, teamwork competence is prioritized over individual competence because of the tendency to solve problems or tasks as a team. The demand for improvement of university education is growing gradually with the changing social environment. The conventional education method focused on delivering knowledge is transforming into learner-centered education that can recognize and solve practical problems.

The effectiveness of learning activities practiced through cooperation and sharing among learners has been posed, and there is an increasing interest in the learning method to increase self-directed learning ability by enhancing the interaction and involvement of learners. Accordingly, this study aimed to examine the effect of a project course based on team activities on the creative personality, teamwork competence, and self-regulated efficacy. A project course with 15 sessions of weekly team activities was designed and applied to the 'Development and Assessment of Health Programs' subject. The results are as follows.

First, the 15-session project-based learning method significantly improved creative personality, teamwork competence, and self-regulated efficacy. Among the sub-factors of creative personality, curiosity, self-confidence, patience/attachment, and independence were significantly improved. Among the sub-factors of teamwork competence, both human-related teamwork competence and functional teamwork were significantly improved.

Second, for the correlation among creative personality, teamwork competence, and self-regulated efficacy, self-regulated efficacy showed a significant positive correlation with creative personality and teamwork competence. Between self-regulated efficacy and the sub-factors of creative personality, self-confidence, imagination, and humor showed a significant positive correlation. Between self-regulated efficacy and the sub-factors of teamwork competence, human-related teamwork competence and functional teamwork competence showed a significant positive correlation.

The results of this study verified that cooperative learning that solves problems based on discussions and ideas of members is effective in increasing teamwork competence and creative personality. Since clinical nursing practice stresses teamwork over individual competence, it would be necessary to apply project-based learning to nursing education courses so that students can foster the competence to solve problems with a creative personality.

Acknowledgments

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