

# A Study on the Learning Experience of Participating in a Collaborative Problem-Solving Learning Model from a Student's Perspective: Qualitative Analysis from Focus Group Interviews

<sup>1</sup>Sowon Lee, <sup>2</sup>Boyoung Kim, <sup>3</sup>Seonyoung Kim \*

<sup>1</sup>Research Assistant, College of Nursing, Chonnam National University., Gwangju , South Korea

<sup>2</sup>Associate Professor, College of Nursing, Chonnam National University, Gwangju, South Korea

<sup>3\*</sup>Research Nurse, Biomedical Research Institute, Hwasun Chonnam National University Hospital, Hwasun, South Korea

[sowonlecture@gmail.com](mailto:sowonlecture@gmail.com), [dasom7812@daum.net](mailto:dasom7812@daum.net), [senziosenzio@naver.com](mailto:senziosenzio@naver.com)

## Abstract

*This qualitative study aimed to investigate ways to improve effective cooperative learning from students' perspective by understanding and analyzing the learning experiences of nursing students who participated in a collaborative problem-solving learning model. Data were collected through focus group interviews and reflection journals of six second-year nursing students from G-university in J-city who participated in a collaborative problem-solving learning model course. The interview data were analyzed and divided into 3 categories and 10 subcategories according to the six-step thematic analysis method proposed by Braun and Clarke. The results of analyzing the interviews were considered based on three areas: preparation before learning, the process of collaborating as a cooperative learning experience, and solutions and expectations after learning. The participants felt frustrated because collaborative problem-solving took more time for individual learning than traditional methods did and would not allow them to check the correct answers immediately. However, they gained new experiences by solving problems and engaging in discussions within their learning community. The participants' expectations included material that could help their learning, measures to prevent free-riders, and consideration of the learning process in evaluation factors. Although this study has sample limitations by targeting nursing students in only one region, it can be used to help operate collaborative problem-solving classes, as it reflects the real experiences and opinions of students.*

**Keywords:** Collaborative Problem-Solving, students, Learning Experience, Qualitative

## 1. INTRODUCTION

Korea's educational environment changed dramatically during the COVID-19 pandemic. High school students attend school for in-person learning every other week, and universities use video-conferencing platforms for online non-face-to-face classes. In the past, instructors and teachers led the learning process, while students accepted or memorized what they were taught [1]. However, as the paradigm of university education shifts to "student-centered" learning and "educational competency development" [2], teaching

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Corresponding Author: [senziosenzio@naver.com](mailto:senziosenzio@naver.com)

Tel: +82-62-530-4936, Fax: +82-62-220-4544

Research Nurse, Biomedical Research Institute, Hwasun Chonnam National University Hospital, Korea

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methods are diversifying from traditional one-way learning to those to effectively achieve student learning goals. Learning methods are changing from teacher-centered to student-centered, and various studies are being conducted to apply new learning methods and validate their effectiveness. The manner of teaching is changing due to both changes in social circumstances, such as the COVID-19 pandemic, and changes in social values in a knowledge-based society [3]. The paradigm of education is also changing as the talent required by society is shifting to creative minds who find and acquire the necessary information and knowledge and improve their problem-solving skills [2].

Collaborative problem-solving learning is a student-centered education method that requires students to solve problems by sharing what they have learned. It is also a teaching-learning strategy that can help develop communication skills, interpersonal relationships, and collaboration [4,5]. It is used to solve problems through cooperative and collaborative processes between members within small groups, and is distinguished from learning groups or small group learning approaches in traditional learning processes [6]. In collaborative problem-solving learning, students' learning disposition, self-esteem, and self-efficacy have direct and indirect effects on learning outcomes [7,8]. Some studies report that collaborative problem-solving improves communication, interpersonal, and problem-solving skills [8-10].

Quantitative analysis has limitations in evaluating the effectiveness of the learning method because it is difficult to discern or understand individual opinions or details of participants. Even though teachers and students have different perceptions, if they are not revealed, it might be challenging to improve the learning experience. Australia conducts the Australasian Survey of Student Engagement (AUSSE) every year on students and faculty at Australian and New Zealand universities and higher education institutions, which integrates the Student Engagement Questionnaire (SEQ) and Staff Student Engagement Survey (SSES) [11]. In the AUSSE (SEQ-SSES), 54% of professors and 28% of students answered that they had high-quality educational experience, showing a significant difference in opinions between teachers and students [10]. A study that applied collaborative problem-solving learning reported inconsistent results depending on students' prior achievement in science subjects [12], and another study on college students reported that the results of collaborative problem-solving learning were not consistent between heterogeneous and homogeneous groups, even in small groups [11]. Although quantitative research has reported various positive effects of collaborative problem-solving learning, there is a need to examine its effectiveness by exploring the experience of students participating in actual classes and reflecting their perspective, which cannot be reflected in quantitative research.

In particular, nurses have to interact with many people, such as patients and doctors; therefore, verbal communication and problem-solving skills are important [13]. However, nursing students must study a large amount of information in one semester because of block classes and mandatory courses for obtaining nurse licenses. In nursing, research on the development and effectiveness of various learning methods has been steadily conducted for major subjects, and many studies have reported positive results, but the results have been inconsistent for science subjects [14]. Therefore, understanding and analyzing what students experience in various teaching methods, such as collaborative problem-solving learning, has significant implications for applying and supplementing collaborative problem-solving learning in the future.

## **2. METHODOLOGY**

### **2.1 Study Design, Setting, and Sample**

This study collected data through focus group interviews with six nursing students (mean aged 22.5 years) who participated in a collaborative problem-solving learning model class and qualitatively analyzed the

collected data. This study was conducted after a 15-week, 3-credit collaborative problem-solving class evaluation and lecture evaluation by Lee and Kim [15]. The collaborative problem-solving learning model class was held seven times once every 2 weeks, excluding the mid-term and final exam periods, during the 15-week schedule. The participants were second-year nursing students at a university in G city, Korea, who understood the purpose of this study and voluntarily agreed to participate. The researchers posted a notice on the university website to recruit study participants in focus group interviews, which were conducted with students who volunteered to participate in the study. Written consent was obtained after explaining matters related to the purpose, method, voluntary participation, and withdrawal from the study. The students who participated in this study received gift certificates.

The researchers used open and semi-structured questions so that the participants could freely talk about their experiences during the interviews. The main questions were, “Tell us about your experience participating in the collaborative problem-solving learning model class”; “How is the collaborative problem-solving class model different from previous traditional methods?”; “What was the most difficult or most helpful aspect of participating in the collaborative problem-solving learning model class?”; and “What changes did you experience after the collaborative problem-solving learning model class?”

After the collaborative problem-solving learning model class was evaluated, the researchers informed the students that the interviews were not related to their grades to collect sufficient and appropriate data, and they carefully observed the participants’ actions, expressions, and tone during the interviews. The details and questions of the interviews, including non-verbal expressions, were recorded in an observation journal. The interviews were recorded according to the explanation and consent form, and the recordings were transcribed into text format. Details that were unclear were confirmed over the phone, and follow-up interviews were conducted if additional questions were needed during the analysis process. Data were collected until no new concepts emerged when comparing the interviews.

## **2.2 Collaborative Problem-Solving Learning Model**

This study applies the Collaborative Problem-Solving Learning Model [15] based on the Jigsaw I method developed by Elliott Aronson [16] to the physiological process. The learning process consists of a total of 5 stages, stage 1 is Organizing ‘home’ groups, stage 2 is distribution for expert learning, stage 3 is expert group learning, stage 4 is ‘Home’ group learning and stage 5 is evaluation. In step 1, in order to compose ‘Home’ groups similar to the level of learning 20 items related to biology were pre-tested. Based on the quiz results, team members were divided into 7 groups of 4 to 5 students for each level. In step 2 is the stage for expert learning. After receiving sub-topic and range were divide, team members studied materials related to the physiology. Learners who had previously studied formed an expert group by leaving their own home group and joining other team members assigned to the same sub-topic to form ‘expert’ groups. In step 3, the expert group conducted cooperative learning activities to solve the problems of the contents learned and the tasks presented based on the distributed the learning materials, and the contents of individual learning. In step 4, after group learning and learning exchange in the expert group, the learner returned to their own group and delivered what they had learned. In step 5, after the learning process in each ‘home’ group, all of the students completed tasks, all students were post-evaluated to check whether they understood the learning content well.

## **2.3 Data Analysis**

The in-depth interview data of the participants were analyzed according to the six-step thematic analysis method proposed by Braun and Clarke [17]. In Step 1, the interviews were transcribed, and each researcher

selected meaningful statements. In Step 2, 69 codes were extracted for each content. Step 3 involved searching for themes by grouping each code into similar concepts, observing whether they matched the themes, and comparing how each theme was conceptualized and interconnected until the saturation point of data. A total of 26 sub-themes were derived during this process, and the participants reviewed the interviews until they reached the saturation point of the data. In Step 4, the themes were reviewed, and three categories and 10 subcategories were derived from 26 provisional themes according to common attributes. Step 5 involved defining and naming themes. The researchers identified themes that were clearly distinguished from others by comparing the derived themes and generating clear definitions by reflecting the opinions of the participants. Two participants reviewed the final analysis results to check for misunderstanding or misinterpretation. Step 6 involved producing the report, and the meanings of the themes were stated by citing the statements implied by each theme.

### 3. RESULTS

Table 1 shows the results of analyzing the interviews with nursing students on their collaborative problem-solving learning experiences, which are divided into three areas: before engaging in cooperative learning, the process of collaboration as a cooperative learning experience, and the expectations after completing cooperative learning.

**Table 1. Experience of Participating in a Collaborative Problem-Solving Learning Model from a Student's Perspective**

Theme	Sub-theme
Before Engaging in Cooperative Learning	Need to balance the learning volume and difficulty level as experts
	More time required for individual learning than traditional learning methods
Process of Collaboration through Cooperative Learning	Free-riders relying on the efforts of other students
	Superficial learning without understanding the context
	Frustration about not being able to check the answers right away
	Wanting the instructor to intervene on unresolved problems
	Improving problem-solving skills through continuous discussions on unsolved problems
Expectations after Completing Cooperative Learning	Adjusting the number of team members to prevent free-riders
	Separate make-up devices required according to the difference in prior knowledge
	Reinforcement of factors to evaluate the learning processes as well as outcomes

#### 3.1 Before Engaging in Cooperative Learning

The participants reported differences in the amount and time of individual learning, and that they had to invest a lot of time in individual learning, because the difficulty for each participant was not adjusted in the pre-learning process for expert group activities before the class.

### 3.1.1 Need to balance the learning volume and difficulty level as experts

The participants reported that the difficulty of the content or scope to learn differed depending on the chapter or content assigned to each team or member in the learning process, and that it took more time to prepare learning materials when they were assigned difficult chapters.

*“The people assigned to heart structure continued to cover heart structure, and I was the last one. So, those assigned to mechanisms kept on covering the same part, and it was very difficult. I shouldn’t be saying these things, but there was a big difference in the difficulty level of each part. I covered heart structure and kidney structure, and honestly, there wasn’t much to do. So, I had to think about whether to prepare the learning material. In some cases, you need to know about structure to come to class, so I think I would have to prepare some materials.”*

### 3.1.2 More time required for individual learning than traditional learning methods

The students were burdened because collaborative problem-solving learning took more time than traditional learning methods in which teachers deliver relevant knowledge through lectures. The participants also said that they had to spend more time studying on their own for tests if other people did not prepare sufficient or appropriate learning materials.

*“There were so many things to prepare for this class from the beginning. Other courses end with just listening to the lectures, but this class requires pre-study, preparing for quizzes, and so many other things.”*

## 3.2 Process of Collaboration through Cooperative Learning

The participants returned to their home group after their expert group meetings and shared thoughts about the learning process, such as free-riders who did not prepare what they were assigned to and relied on the efforts of other group members, superficial learning by summarizing and reading handouts without learning the details, focusing on merely checking the answers rather than the problem-solving process, and absence of immediate intervention by the teacher during group activities.

### 3.2.1 Superficial learning without understanding the context

In cooperative learning, students learn based on their understanding of the parts assigned to them in the learning process and share the content with group members. However, some students tried to replace this process by simply reading what they summarized about their respective assignments, rather than understanding the content accurately.

*“If cooperative learning is done properly, I can save time by listening to what other people prepared and just reading the book once. However, if other people cannot explain what they have prepared properly, it is very difficult to prepare for the mid-term exam because I have to study from the beginning.”*

### 3.2.2 Frustration about not being able to check the answers right away

The participants relied more on what the instructor summarized at the end rather than on the contents they learned or the contents of their peer groups prepared during the course of learning. They also tended to seek answers from the instructor rather than have confidence in what they had learned during the learning process or searching for it.

*"You have to know to ask questions, and you need to know whether this is because I didn't read the materials or whether I really don't understand this part to see if it's worth asking questions..."*

### **3.2.3 Wanting the instructor to intervene on unresolved problems**

In the process of group learning, students reported difficulties in not being able to seek answers from the instructor when questions arose because no co-worker was involved in the class, and one instructor circulated several groups.

*"We finish studying for the exam one week before the exam date, so we can ask the professor about everything we don't understand the week before the exam, open our books, ask questions, and listen to the professor and study together...and the students repeat the same questions over and over again. I think it would have been better if the professor had actively intervened for more efficiency."*

*"It would be nice if the professor gave a lecture. I hope we can have a brief lecture and then proceed to (cooperative learning)."*

### **3.2.4 Improving problem-solving skills through continuous discussions on unsolved problems**

The participants attempted to draw appropriate conclusions by sharing different opinions about unsolved problems during the learning process. In particular, they made rational decisions through discussions on contents that they did not understand or did not agree with in the learning process and reported that the process helped them.

*"After the quiz, the instructor asked each group to guess the answer. But I couldn't say anything when they argued about acid-base equilibrium because I didn't understand. I was in the same group. A few people had an active discussion. That part is really good for solving problems."*

*"If there are only a few people, I need to participate as much as possible in my team to get good results. So, I engaged in the discussions, and it really helped me a lot, because I had to question what I thought was right. Other people tried to explain in more detail what I did not understand, so it was easier for me to understand. I got upset because I was wrong, but it was good to learn and understand through this process."*

## **3.3 Expectations after Completing Cooperative Learning**

The participants reported solutions and expectations, such as the need for additional materials to facilitate cooperative learning, consideration of the number of team members to prevent free-riders, organizing teams according to the students' prior achievement level, and reorganizing evaluation factors to evaluate the learning process as well as the results.

### **3.3.1 Adjusting the number of team members to prevent free-riders**

The participants wanted to reduce the number of team members to prevent free-riders from receiving good grades because of the efforts of other members. If there are too many people in each team, some may become free-riders because there is no difficulty in learning without contributing to the team.

*"I think there are too many people in a team. We would work hard if there were four or five people in the expert group and four or five people in each team, but we usually have six people."*

*"I think we can solve this problem if we have fewer people. If we have only a few people, each of us must participate as much as possible in each team to get good results. I really engaged in many discussions, and it helped me a lot."*

### 3.3.2 Separate make-up devices required according to the difference in prior knowledge

The participants believed that the difference in prior knowledge between students who completed prerequisites, such as biology in high school and those who did not, would affect the scope of understanding in nursing. Students with insufficient prior knowledge had difficulties understanding during class, and they also took time to explain what they did not understand. Therefore, it would be better to match the learning level through elements that could compensate for matters that require prior knowledge.

*“They spend much time explaining overlapping parts or what we have already learned, and I know that these parts are important because they keep coming out again...But, I think we just pass or overlook the parts we don't understand in the expert groups...”*

### 3.3.3 Reinforcement of factors to evaluate the learning processes as well as outcomes

The participants reported that students did not put much effort into group activities and devoted more energy to individual evaluations, such as reports, because class activities were determined by scores on tests, and so on. Therefore, factors that can evaluate the learning process, such as contribution to group activities, should be incorporated to promote active participation.

*“Some people only focus on preparing materials (because we have to submit them), so they think about how to make it prettier than understanding the contents.”*

*“Cooperative learning is not something the professor can see, but she can see the materials we submitted and our test scores. It's kind of hard because people think that they just need to make this pretty.”*

## 4. DISCUSSION

This study explored whether collaborative problem-solving is an effective new learning method for students based on their experiences. Prior to this study, quantitative research had verified the effectiveness of collaborative problem-solving learning and had reported that the approach was effective in improving the problem-solving skills and self-efficacy of students. However, the results of interviewing participants show that they have a negative perception of collaborative problem-solving learning.

In the pre-preparation process for collaborative problem-solving learning, the students reported that the difficulty level differed according to the learning quota or chapter in the expert groups, and the time required for pre-learning varied depending on each student. Cooperative learning is a student-centered teaching method that requires students to form learning communities and share what they have learned through pre-learning and expert group activities through interaction in groups [18]. During this time, the learning of each student and the interactions between students are significant factors. However, second-year nursing students must take basic medical courses, such as physiology, pharmacology, and microbiology, which require a large amount of learning per unit time. Collaborative problem-solving learning requires more self-directed learning than traditional learning methods during this period [18], and thus, students are highly likely to be burdened with learning. In addition, students who are accustomed to one-way traditional learning methods may experience difficulties in collaborative problem-solving due to difficulties in self-directed learning, because they are more comfortable accepting information than questioning and exploring answers for themselves.

During the collaborative learning process, some participants were free-riders relying on the efforts of other students, engaged in superficial learning by simply scratching the surface, tended to seek answers rather than understand the process, or wanted the instructor's intervention. The participants said that some members received good grades, even if they did not contribute to group activities and did not look favorably on these free-riders. They also reported various difficulties in the learning process, such as simply preparing handouts

and then reading them without exploring conceptual details. Some students wanted to solve problems quickly and easily through the instructor's intervention rather than through the learning process. Collaborative problem-solving learning requires the formation of learning communities and solving problems through exchanges between students, even if there is no instructor. However, the participants in this study wanted help from the instructor rather than solving difficulties that occurred during the learning process on their own. This is a dilemma faced by students who are accustomed to one-way learning methods rather than solving problems through a deliberation process when loose guidelines are provided. In particular, some participants said that it would be easier to engage in cooperative learning after listening to a lecture, and this reaction also reflects the dilemma of cooperative learning. Actively engaging in learning situations independently based on the student's initiative and active learning is a value pursued by new interactive teaching methods, such as collaborative problem-solving [19]. However, students who are accustomed to one-way traditional learning methods, which mostly consist of one-sided teaching rather than questions because the education system is focused on entrance exams, may be frustrated when exposed to teaching methods that require active learning.

One notable difference is that some participants experienced a rational decision-making process to solve problems by deriving results through discussions on what they did not understand or agree with during the collaborative problem-solving learning process. These discussions provided them with opportunities to check what they understood and to correct incorrect information by sharing opinions with other students based on what they learned during the learning process.

The students who participated in the interviews after taking the cooperative learning class reported the following solutions and expectations: the need for additional materials to facilitate cooperative learning, adjusting the number of team members to prevent free-riders, separate catch-up devices to match the level of prior knowledge, and modifying the evaluation factors to evaluate the learning processes and outcomes. Among the participants, some students arrived at nursing college without having taken a science course, such as biology and chemistry, in high school, and this caused a small but significant difference in completing related subjects. Some students who took the prerequisites said that they had to go over what they already knew because of people who did not take them, and that an equal level of prior knowledge would be helpful for learning. In addition, having too many members in each group led to students not fulfilling their respective roles, as their responsibilities were dispersed owing to the bystander effect. Therefore, it is necessary to reduce the number of people in each group.

Finally, the evaluation factors should be modified to evaluate the learning processes, because the participants said that most of the solutions and supplements in collaborative problem-solving learning were related to the final evaluation and grades rather than the learning method itself. For most subjects, grades were given based on the student's test scores or reports rather than evaluating the activity or process, so students spent more time on individual assignments than on group activities to obtain good grades. Most nursing students obtain their nursing licenses and jobs in hospitals, and their grades are a significant factor in obtaining jobs at tertiary hospitals. However, in recent years, hospitals have reduced the rate of reflecting factors, such as grades, in their recruitment process and have started to use blind interviews to focus on individual competencies. In the long run, the ability to adapt within a group, such as teamwork and interaction skills, will become a significant factor in the hiring process. Therefore, it is necessary to enhance cooperative communication through learning team interactions such as cooperative learning.

This study involved only those who wanted to participate in interviews with nursing students who took a physiology course that applied collaborative problem-solving learning. Therefore, the results should not be generalized because the study was conducted with nursing students from only one local university. More studies on students and instructors who participate in cooperative learning in various subjects should be



conducted in the future to help develop cooperative learning and improve its effectiveness.

## 5. CONCLUSION

This study explored the learning experiences of students who participated in a collaborative problem-solving learning program. The results showed the following trends: the students were burdened with a large amount of learning; there were free-riders owing to the large number of group members; and the course focused on evaluation rather than the process, although participants learned to solve problems through discussions within their learning communities. These results are meaningful as they show how students engage in cooperative communication and that there is a need to improve learning elements, reducing the number of students, and evaluation factors in classes using cooperative learning. Research on the effectiveness of teaching methods has mostly been conducted in the form of quantitative studies, even though students are the target audience. Quantitative studies have limitations in reflecting the needs or desires of students. Therefore, it is necessary to expand research to qualitative analysis, which reflects students' opinions. We hope that this study can be used as supplementary data for the development and improvement of teaching methods.

## CONFLICT OF INTEREST

The authors declared no conflict of interest.

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