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The Effect of Classes through Google Classroom due to COVID-19 on Nursing Education

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Abstract

This study was conducted to develop and evaluate the impact of education through Google Classroom on nursing education such as critical thinking, problem-solving ability, self-regulated learning ability and academic major satisfaction with the face-to-face instructional closure due to COVID-19. The methodology used in this research is a quasi-experimental study of a group of pretest-posttest design, which was designed to check for differences before and after the intervention through Google Classroom to the treatment group. For a total of six weeks from March 16, 2020 to April 24, 2020, H University, located in J city, has taught eight nursing courses in the first, second, third and fourth grades through Google Classroom. The collected data were analyzed with descriptive statistics and paired t-test using the SPSS WIN 23.0 program. The effects of education with Google Classroom on critical thinking ability, problem-solving ability, self-regulated ability and academic major satisfaction were statistically significant as follows; critical thinking ability (t =,-3.48 p =).000), self-regulating learning ability (t = -3.35, p = .001), problem-solving ability (t = -3.49, p = .001), and academic major satisfaction (t = -2.81, p = .016). The above findings confirmed that applying Google Classroom to nursing education can have a positive impact on critical thinking, problem-solving ability and self-regulated learning ability among nursing students, and increase academic major satisfaction.

Keywords: Google Classroom, COVID-19, Critical Thinking, Problem-Solving Ability, Self-Regulated Learning Ability, Academic Major Satisfaction

Introduction

1.1 Need For Research

The World Health Organization on March 11, 2020 declared COVID-19 a pandemic. A new type of COVID-19 pandemics has been issued worldwide to prevent mass infection [1]. School closures can be mainly divided into reactive closures, which are closed when an infected person is found in a school, and proactive closures, which are taken before an infected person is found in a school. School closures reduce the cumulative infection rate by about 25 percent and delay the peak of the epidemic by two weeks [2, 3]. Elementary, middle, and high schools in Korea also postpone the face-to-face opening of schools and offer online classes as an alternative. The action of school closures play an important role in preventing the spread of COVID-19 to students. Attempts to continue the classes by using Internet should be taken in order to communicate knowledge to students who cannot go to school, although the quality of these services cannot be alternated the face-to-face classes. In the midst of difficulties caused by the threat of Corona Virus, an attempt is needed to look at the direction of education differently from the perspective that the current crisis can be an opportunity for future education.

A variety of global IT companies and local Edu Tech companies are showcasing the Learning Management System (LMS) as an educational platform. Although Korea Educational Information Service produces and distributes online learning tools such as Edunet, e-learning site, and EBS class videos, these tools might not satisfy the desires to present, educate, evaluate and process through close communication between learners and professors as an LMS [4, 5]. Online classes tend to be simply throwing lessons and solving the

problems via the Internet. In this methodology, students may give up the learning if the quality of classes are not matched by students' level of learning and passion. However, the tool of Google Classroom, which is conducted through video so that a real-time interactive lecture is possible, can help students to encourage their studies. By using Google Classroom, teachers in charge of the classes are easily to present assignments, check students' attendances, evaluate assessments and feedback immediately. This tool can help to overcome the absence of face-to-face lectures caused by the epidemic, and enable normal classes to be achieved via the internet [6].

One of important learning outcomes required for the graduating class of nursing students is problem-solving, which is the ability to solve nursing problems in various nursing situations in an integrated manner. These students should be trained as competent nurses to achieve this learning outcome through nursing education to provide professional nursing services in the future [7]. Within the difficult situation of face-to-face classes due to the Corona Virus, it is able to develop students' capabilities through interactive Google Classroom classes.

Critical thinking ability is the most frequently presented ability among the learning outcomes of nursing education programs [8]. The Korea Nursing Education Evaluation Institute includes critical thinking skills as an essential component under the evaluation criteria of nursing college. This critical thinking improves the nurses' ability to reflective reasoning by improving participatory education and reflective thinking in clinical practice. In order to improve this critical thinking ability, nursing educators use lots of teaching methods including face-to-face lectures [6]. In these crises caused by COVID-19, the online platform teaching methods can improve critical thinking skills for students.

Self-regulated learning is a learning method in which learners perform effective learning through cognitive activities that identify and control the learning process on their own according to their self-regulated learning ability. This means that learners perform their learning activities by systematically adjusting their thoughts, feelings and behaviors to achieve their learning goals [9]. In the Google Classroom classes held on the Internet, learners' self-regulating learning skills are more important than face-to-face lectures.

Academic major satisfaction is the degree which students feel that they have achieved important goals in class and can efficiently adapt to the surrounding environments to meet individual needs in class situations emotionally and interactively [10]. The student satisfaction with classes can generally affect a student's academic performance, and it is also meaningful to find out the student's satisfaction with the classes in the Google Classroom.

LMS is being applied to classes through new teaching methods in various fields such as pedagogy, humanities and social studies, engineering and science [12-14], and although there are some differences in each study, problem-solving skills, self-directed learning, self-efficacy, and critical thinking skills have improved through flip-learning classes.[14,15,16].There are reports of LMS applied to nursing subjects, but not only are they limited to some subjects, but there are not many studies. Therefore, it is also necessary to identify the effects of LMS according to the characteristics of various nursing subjects and evaluate their appropriateness.

Among the Google Education services, Google Classroom is the representative LMS. The biggest advantage of this tool is sharing and collaboration. Simultaneous work among learners who participated in online classes in real-time is possible, and even if individual tasks are done, the professor can directly evaluate the submitted work and provide immediate feedback to students [17, 18]. Through this series of courses, students will receive direct guidance from the professors and professors will be able to process students'

grades through immediate evaluation in the Google Classroom. Looking at recent domestic and international studies through the online platform of Nursing, they were only partially applied in class and did not conduct the whole class [19,20]. Therefore, it is necessary to conduct classes through Google Classroom in performance-based nursing classes as an alternative to face-to-face lectures due to the COVID-19 incident.

In response, this study conducted eight nursing courses through Google Classroom to examine the impact on the nursing learning achievement of critical thinking ability, problem-solving ability, self-regulated learning ability and academic major satisfaction.

1.2 Purpose of Research

The purpose of this study is to investigate the impact of education through Google Classroom on critical thinking, problem-solving, self-regulated learning and academic major satisfaction of nursing school students, as follows:

- After classes through Google Classroom, to review the status of critical thinking, interpersonal relationship, self-leadership and academic major satisfaction.
- After classes through Google Classroom, to review the difference in critical thinking ability.
- After classes through Google Classroom to review the difference in problem-solving skills.
- After classes through Google Classroom, to review the difference in self-control learning ability.
- After classes through Google Classroom, to review the difference in class satisfaction level.
- After classes through Google Classroom, to review the correlation between critical thinking ability, problem-solving ability, self-regulated learning ability and academic major satisfaction.

2. Research Method

2.1 Research Design

This study is a quasi-experimental study of a group of pretest-posttest designs to identify the effects of nursing subjects on critical thinking ability, problem-solving ability, self-regulated learning ability and academic major satisfaction by education through Google Classroom.

2.2 Object of Study

The subjects of this study were the students in grades 1 to 4 of the Department of Nursing at H University located in Jeollabuk-do Province, where nursing classes were conducted through the Google Classroom as an alternative to face-to-face instruction due to school closures caused by the COVID-19 pandemic. 100 students understood the purpose of the study and agreed to participate voluntarily. Of those, 96 copies, not 100, were used as final statistical analysis data. By using the program of G-power 3.1.2, the minimum sample size required for t-test was obtained, and 9 samples in this study were appropriate based on a significant level of .05, power of .80 and effect size of .5.

2.3 Ethical Considerations

To help the understanding of participants' the following information was descripted on the first page of the questionnaire; the purpose of research, methods of research and research ethics. If participants agree to participate after reading the first page, they were instructed to mark the consent box. The contents of the information also provided freedom to follow their own will throughout the questionnaire, freedom to stop

during the questionnaire, and ensured anonymity after the questionnaire to participants. The representative student was made to collect questionnaire in order to ensure the autonomy of participation in the questionnaire.

2.4 Progress of Teaching by Google Classroom

The most effective platform for feedback in the curriculum is the Google Classroom. For a total of 6 weeks from March 16, 2020 to April 25, 2020, classes based on Google Classroom operated 8 nursing courses; including maternal nursing, mental nursing, basic nursing, spiritual nursing and critical care nursing. Three professors prepared lecture materials for their subjects, and gave lectures in the Google Classroom. The class proceeded as follows.

Step 1: Before proceeding with the Google Classroom, three professors explained the purpose, method and evaluation process of the class, and opened a Google Classroom for the subject.

Step 2: The contents of the online classes of the Google Classroom were set up to be uploaded at the relevant date and time so that professors could shoot and record lectures directly through videos they met in the Google Classroom. Students were able to access and participate in the class at that time.

Step 3: Students turned on Chromebook in their rooms, and entered the Google Classroom during classes where videos and assignments reserved by the professor were uploaded. Students watched videos and read instructions from professors. Then, when students selected the attached document, a Google document which was created by the professor opened. Classes ended when students solved, recorded and submitted questions in the form of a narrative. Upon receiving the assignment, the professor gave feedback to the students' writings in the form of narrative or correction. Students were notified immediately upon returning the problematic task or completing the grading.

2.4 Research Tool

2.4.1 Critical Thinking

In this study, “critical thinking” refers to personal propensity and cognitive impetus toward independent decision-making, with motivation for personal or professional work [8]. To measure critical thinking patterns, a critical thinking attitude measurement tool developed by Yoon Jin was used [21]. The tool comprises five questions of intellectual passion/attention, four questions of prudence, four questions of confidence, three questions of systematicness, four questions of intellectual fairness, four questions of sound skepticism and three questions of objectiveness, adding up to 27 questions and seven factors in total. Formulated into a questionnaire, this consists of 5 Likert measures from “not at all” (1 point) to “very yes” (5 points): the higher the score, the higher the likelihood of critical thinking. The reliability of the tool at the time of development was Cronbach's Alpha .94. The reliability of this study is Cronbach's Alpha .74.

2.4.2 Self-Regulated Learning Ability

The self-regulating learning ability was accomplished by revising the self-regulating learning questions of Pintrich to suit the study [22]. A total of 15 questionnaires are asked mainly about learning methods and learning attitudes, and the response form consists of a Likert 5 point scale from "very not" to "very much." The reliability of the tool at the time of development was Cronbach's Alpha .84. The reliability of this study is Cronbach's Alpha .64.

2.4.3 Problem-Solving Ability

Among the life ability measurement tools developed by the Korea Educational Development Institute [23], problem-solving skills measurement tools for college students and adults were used to measure problem-solving skills. The tool consists of 45 questions in nine sub-sections, such as problem recognition (5 questions), information collection (5 questions), analytical skills (5 questions), widespread thinking (5 questions), decision (5 questions), planning (5 questions), execution and adventure taking (5 questions), assessment (5 questions), and feedback (5 questions). This tool is very rare on a 5-point Likert scale. Very often from 1 point to 5 points. The higher the score, the higher the score, the higher the problem-solving ability. The reliability of the tool at the time of development was Cronbach's Alpha .72. The reliability of this study is Cronbach's Alpha .64.

2.4.4 Academic Major Satisfaction

Academic major satisfaction is the product of the judging process that evaluates the major to which one is currently affiliated [10] compared to the criteria for career or career established by an individual. In this study, the scores were measured by using the Majority Satisfaction Tool developed by Kim & Ha [24], comprising a total of 16 questions. It must be responded to on a 5-point Likert scale, from 1 point "not altogether" to 5 points "very much," meaning that the higher the score, the higher the academic major satisfaction. The reliability of the tool at the time of development was Cronbach's Alpha .86. The reliability of this study is Cronbach's Alpha .72.

2.5 Data Analysis

The collected data were analyzed by using SPSS version WIN 23.0. The specific analysis method obtained the average, standard deviation, frequency and percentage of the subject's general characteristics, critical thinking, problem-solving ability, self-regulated learning ability and academic major satisfaction level. Also these data were analyzed the difference between critical thinking, problem-solving ability, self-control learning ability and class satisfaction before and after classes through the Google Classroom as a pair-test. Cronbach's alpha was calculated to measure the reliability of the measuring tool.

3. Results of the Study

3.1 General Characteristics

In general, the number of female students was 63 (65.2%), and the number of age 21-24 was with 81 (84.8%).

Table 1. General Characteristics (N=96)

Characteristics		n(%) or M(±SD)
Sex	M	33(34.8%)
	F	63(65.2%)
Age	20 or less	9(0.9%)
	21-24	81(84.8%)
	over 25	6(0.6%)

3.2 Differences in Critical Thinking, Self-Regulated Learning Ability, Problem-Solving Ability, and Academic Major Satisfaction after Applying Teaching Method Through Google Classroom.

After playing Google Classroom, the average score of critical thinking ability increased by 5.23 points from 89.02±5.37 before the intervention to 94.25±11.11 after the intervention(t =,-3.48 p = .000). That of Self-Regulated Learning Ability increased by 4.1 points from an average of 50.45±15.16 before the intervention to 54.56±20.81 after the intervention(t = -3.35, p = .001); Problem-Solving Ability increased 4.5 points from 152.21±23.14 before the intervention to 156.91±21.98 after the intervention(t = -3.49, p = .001); major satisfaction increased by 3.8 points from 57.56±9.03 before the intervention to 61.37±7.98 after the intervention, and the difference was significant (t = -2.81, p = .016). The six-week Google Classroom class, conducted as a non-face-to-face lecture due to Covid-19 in performance-based nursing education, was shown to improve the critical thinking, problem-solving skills, self-regulation ability and major satisfaction of nursing students. The results after classes through the Google Classroom are as shown in the table below [Table 2].

Table 2. Differences in Critical Thinking, Self-Regulated Learning Ability, Problem-Solving Ability, and Academic Major Satisfaction after applying teaching method through Google Classroom. (N=96)

Variables	Pretest M±SD	Posttest M±SD	Paired Differences M±SD	t	p
Critical thinking	89.02±5.37	94.25±11.11	-5.23±15.05	-3.48	.000***
Self-Regulated Learning Ability	50.45±15.16	54.56±20.81	-4.11±5.65	-3.35	.001***
Problem-Solving Ability	152.21±23.14	156.91±21.98	-4.52±10.54	-3.49	.001***
Academic Major Satisfaction	57.56±9.03	61.37±7.98	-3.81±10.96	-2.81	.016**

unit: cm, ***: p<0.005, **: p<0.05

3.3 Difference of Critical Thinking after Applying Teaching Method through Google Classroom

After Google Classroom, objectivity (t = -2.56, p = .014), healthy skepticism (t = -2.17, p = .035) and Intellectual eagerness/Curiosity(t = -3.29, p = .002) showed significant differences. There were no differences in Intellectual fairness (t = .899, p = .478), prudence (t = -.51, p = .656) and Systematicity (t = -.12, p = .905) [Table 3].

Table 3. Difference of Critical Thinking after applying teaching method through Google Classroom (N=96)

Variables	Pretest M±SD	Posttest M±SD	Paired Differences M±SD	t	p
Intellectual fairness	8.02±1.06	7.98±1.03	.04±1.53	.899	.478
prudence	11.61±1.39	11.73±1.51	-.12±2.10	-.51	.656
Objectivity	13.15±1.68	13.96±1.89	-.82±2.60	-.2.56	.014**
healthy skepticism	13.80±2.26	14.75±2.37	-.84±3.18	-2.17	.035**
Systematicity	6.86±1.45	6.89±1.57	-.03±2.05	-.12	.905

Intellectual eagerness/Curiosity	6.18±1.42	7.01±1.47	-.83±2.06	-.3.29	.002***
Self Confidence	7.35±1.35	7.47±1.25	-.12±1.84	-.534	.585

unit: cm, ***: p<0.005, **: p<0.05

3.4 Difference of Problem-Solving Ability after Applying Teaching Method through Google Classroom

After classes through Google Classroom, Problem clarification (t = -2.56, p = .014), Information gathering (t = -2.16, p = .015), Divergent thinking, Planning abilities(t = -2.17, p = .035), (t = -2.16, p = .015) Planning abilities (t = -3.29, p = .002), Assessment(t = -2.56, p = .014) and Feedback(t = -2.17, p = .035) showed significant differences. There were no differences in Analysis skill (t = .899, p = .378), and Execution& Risk-taking (t = .756 p = .585) [Table 4].

Table 4. Difference of Problem-Solving Ability after applying teaching method through Google Classroom (N=96)

Variables	**Pretest M±SD**	**Posttest M±SD**	**Paired Differences M±SD**	**t**	**p**
Problem clarification	14.31±2.65	18.32±3.66	-4.01±1.01	-.2.56	.014**
Information gathering	16.05±2.50	17.74±3.00	-1.02±2.10	-2.16	.015**
Analysis skill	15.4±2.44	15.66±3.59	-.17±1.53	.888	.378
Divergent thinking	15.7±2.51	16.8±3.13	-.84±3.18	-2.17	.035**
Decision making	19.0±2.98	19.0±2.9	-.03±2.05	.905	.465
Planning abilities	15.3±3.22	16.8±3.67	-1.35±2.06	-.3.29	.002***
Execution& risk-taking	15.5±3.17	16.1±3.32	-.12±1.84	.756	.585
Assessment	17.1±2.81	18.9±3.31	-1.82±2.60	-.2.56	.014**
Feedback	16.4±3.46	17.9±3.84	-1.44±3.18	-2.17	.035**

unit: cm, ***: p<0.005, **: p<0.05

3.5. Correlations among Critical Thinking, Self-Regulated Learning Ability, and Academic Major Satisfaction after Applying Teaching Method through Google Classroom

After classes through Google Classroom, the correlations among the variables were found. Critical thinking and Problem-Solving Ability (r = 352, p = .002), critical thinking and Self-Regulated Learning Ability (r = .370, p = .003), Critical thinking and major satisfaction (r = .514, p = .000), Problem-Solving Ability and Self-Regulated Learning Ability (r = .661, p = .000), Problem-Solving Ability and major satisfaction (r = .523, p = .000), Self-Regulated Learning Ability and major satisfaction (r = .594, p = .000) showed significant positive correlations [Table 5].

Table 5. Correlations among Critical Thinking, Problem-Solving Ability, Self-Regulate Learning Ability, and Academic Major Satisfaction after applying teaching method through Google Classroom (N=96)

Variables	Critical thinking	Problem-Solving Ability	Self-Regulated Learning Ability	Major satisfaction
Critical thinking	1			
Problem-Solving Ability	.352***(.002)	1		
Self-Regulated Learning Ability	.370***(.003)	.661***(.000)	1	
Academic Major Satisfaction	.514**(.000)	.523***(.000)	.594***(.000)	1

4. Discussion

In this study, eight nursing subjects were processed through Google Classroom, which is a method of non-face-to-face education due to the closure of face-to-face education caused by the COVID-19. In performance-based nursing education, this study was conducted after six weeks of classes to examine the effects of nursing learning on critical thinking, problem-solving ability, self-regulating learning ability and academic class satisfaction. The main points of discussion about the findings are as follows: first, after class through Google Classroom, the average score of critical thinking ability was increased by 5.23 points to 94.25±11.11 after arbitration at 89.02±5.37, which was significantly improved after arbitration (t = -3.48, p = .000). These results are consistent with studies showing that flat-form classes targeted at college students have improved critical thinking ability [2]. Critical thinking has three basic frameworks: analysis, reasoning and evaluation. Based on the student's cognitive abilities, the active participation and interaction of learners seem to improve the students' critical thinking skills when they integrated the various functions of Google Classroom, hang-out, Google Drive, etc. on the platform. Thus, the Google Classroom for nursing students confirmed that they could improve critical thinking similar to the effects of face-to-face classes. In traditional teaching method, classes tend to be leaded by professors rather than by students. Contrast to the traditional method, the roles of professors have been changed from leading to assisting students. In these situations, students can study new learning positively without giving up easily. Professors support students with open learning opportunities. Besides, when students try to solve assigned tasks in the classes, they can enhance their thinking skills with adapting lots of approaches by using their prior learning. In this process, activated communication between professors and students can promote students' achievement.

Second, after class through Google Classroom, the average score of problem-solving ability was increased by 4.5 points to 156.91±21.98 after arbitration in 152.21±23.14, a significant improvement after arbitration (t = -3.49, p = .001). This is a similar study in the preceding study [4, 14] that platform-based classes have a positive effect on problem-solving ability since students can participate in classes through the Google Classroom wherever the Internet is connected, they can overcome the limitations of time and space, so they can participate repeatedly in classes that are not understood, which is believed to have improved their ability to solve problems.

Third, after the Google Classroom class of nursing students, self-regulating learning ability was improved significantly to 54.56±20.581 (t = -3.35, p = .001) in 50.45±15.16. This is consistent with the findings in the preceding study [12, 13], that flip-learning classes have a positive effect on university students' self-control abilities. In order to enhance self-regulating learning ability when designing a Google Plus based learning environment, the role of a professor is important to constantly update his or her reflective diary to Google

Plus so that learners can manage the learning process at each stage of learning in terms of cognition, motivation and behavior. Also, to allow learners to manage their learning is important.

Fourth, after a nursing student's Google Classroom class, the satisfaction level of the major was found to be 3.64 points (t = -2.81, p = 016) after arbitration at 57.56±9.03, before arbitration, at 61.37±7.98, and significantly improved after arbitration.

These results are believed that the satisfaction of the class can be improved by designing the learning environment and actively interacting with the professor using the features to enable learners to actively participate in the classes through hang-out, meet, Google Docs documents, YouTube video materials, etc. Therefore, the professor should be able to give the learner feedback immediately regardless of time.

In conclusion, the result of the six-week Google Classroom class, conducted as a non-face-to-face lecture due to COVID-19 in performance-based nursing education, has been shown to be meaningful to improve the critical thinking, problem-solving skills, self-regulation ability and major satisfaction of nursing students [25]. It is believed that a study on the effect of applying flip learning using media convergence will be needed as a teaching method for various nursing subjects.

However, this study has limitations because it is a single group experimental study with convenience only for nursing college students at an university. Therefore, it is difficult to compare and analyze the control group or other teaching methods.

5. CONCLUSION AND SUGGESTION

This study was conducted to develop and evaluate the impact of education through Google Classroom on performance-based nursing education such as critical thinking, problem-solving ability, self-regulated learning ability and academic major satisfaction with the face-to-face instructional closure due to COVID-19. The methodology used in this research is an experimental study of a group of pretest-posttest design, which was designed to check for differences before and after the intervention through Google Classroom to the treatment group.

The generalization of the results of this study is limited because they were targeted at students in the Department of Nursing at University. Therefore, it is suggested that its effectiveness should be verified through repeated studies to confirm its effectiveness.

Based on the results of this study, I would like to make the following suggestions.

First, in the domestic nursing class field, a continuous repetitive study of intelligent checks on the effectiveness of classes made through non-face-to-face classes is needed.

Second, a qualitative study related to the experiences of students and instructors in non-face-to-face classes such as Google Classroom is needed.

Third, it is suggested to develop measurement tools for non-face-to-face classes such as Google Classroom.

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