IJIBC 23-1-24

Analysis of learning flow and learning satisfaction according to the non-face-to-face class operation method

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Abstract

This study is a comparative survey study conducted to explore the differences in learners' learning flow and learning satisfaction according to the non-face-to-face class operation methods implemented at universities. After implementing different class management methods for the same subject taught by the same instructor non-face-to-face for 15 weeks, each learning flow and learning satisfaction were compared and analyzed, and the collected data were analyzed with IBM SPSS 21.0. As a result of the study, learning flow was high in the order of lectures using real-time ZOOM and recorded lectures using self-studio(3.41±0.91, 3.28±1.01), and learning satisfaction was high in the order of lectures using real-time ZOOM and lectures using the automatic recording system of classes(3.40±0.80, 3.30±0.74). The item with the lowest score was the PPT audio recording lecture in both areas of learning flow and learning satisfaction(2.72±1.04, 1.73±1.04). Considering that system errors such as sound in the smart lecture environment operated for the first time in this study affected the research results, it is suggested that future research should be conducted by supplementing the corresponding part.

Keywords: :*University, Non-Face-to-Face class, Class operation methods, Learning flow, Learning satisfaction*

1. Introduction

1.1 Need for Research

Non-face-to-face classes have been conducted selectively for some subjects in universities even before the COVID-19 outbreak. However, non-face-to-face classes were enforced and held for all subjects, including electives and major subjects from the academic year 2020 due to the pandemic. Instructors and students familiarized with the traditional teaching methods were faced with the sudden implementation of non-face-to-face online classes that leads to a limitation in both educational effectiveness and learning efficacy [1]. Since then, the pro-longed COVID-19 pandemic has led many universities to prepare systems and online contents to improve the quality of non-face-to-face classes and to minimize the lack of

communication and interaction between instructors and students.

Based on the results of previous studies comparing non-face-to-face and face-to-face classes, it appears that face-to-face classes are generally more effective in terms of educational effectiveness. However, given the result of the score difference from face-to-face class differs depending on the type of non-face-to-face online class [2-6], it is necessary to consider the type of operating non-face-to-face classes that was selected for the study.

Online non-face-to-face classes can be categorized into recorded classes and live classes. Recorded classes have the advantage of repeated learning but show very poor results in the communication satisfaction. On the other hand, live classes came out high [7-10] in terms of communication satisfaction. Furthermore, most of the studies are related to online education contents but there are very scarce studies on the establishment and operation of online educational system and effects from the online education environment's perspective [11].

Therefore, this study aims to provide preliminary data to develop a basic non-face-to-face online class operation method. This is achieved by maximizing the educational effect through a detailed comparison, including the educational environment, with respect to the non-face-to-face online class method that can maximize the advantages of the recorded video class, which can be re-watched, and the real-time video class, where seamless interaction can be achieved.

1.2 Research Objective

The purpose of this study is to compare and analyze the academic immersion and learning satisfaction of the subjects according to the educational environment as various methods are suggested to improve the quality of non-face-to-face education in universities currently.

Firstly, the difference in academic immersion for each lecture using PPT audio recording lectures, professor appearance audio recording lectures, self-studio recording lectures, real-time ZOOM lectures, and lectures using automatic class recording system is identified.

Secondly, the difference in learning satisfaction for each lecture using PPT voice recording lectures, professor appearance voice recording lectures, self-studio recording lectures, real-time ZOOM lectures, and lectures using automatic class recording system is identified.

2. Methodology

2.1 Research subject

In this study, questionnaires were distributed to 162 students out of 198 nursing students from a university in the area K who agreed and took the major elective course A in the second semester of 2021. Excluding 15 incomplete responses, the total of 147 of the students was the final research subjects.

2.2 Research methods and procedures

This study was conducted in the second semester of 2021 with the same teaching materials, the same lecture materials, and the same evaluation for subject A's non-face-to-face lectures. After that, study immersion and learning satisfaction were investigated and analyzed for comparison.

The five non-face-to-face classes were: 1) lectures with only the PPT screen and the recorded professor's voice 2) lectures with teaching materials and the recorded professor's face together 3) recorded lectures of professors in self-recording studio, where electronic blackboards and various recording devices are set in the

same way as in-person lectures 4) lectures using PPT and real-time ZOOM with the instructor's face 5) in a classroom equipped with an Auto Face Tracking System that enables lecture recording. While professor conducts the actual face-to-face class in the classroom where social distancing is observed, 50% of students attends the class face-to-face and the remaining 50% of the students attends the class at home through the video system in real time via ZOOM. It consisted of a mixed lecture (two groups of students attended the class in alternate weeks). The explanation of the non-face-to-face class method is shown below in Table 1, and the class operation method by week is shown in Table 2.

Table 1. Description of non-face-to-face class operation methods

classifications	description of non-face-to-face class operation methods
Method 1	VOD(only PPT screen and voice)
Method 2	VOD(with lecture materials and professor's face)
Method 3	VOD(in a self-studio where electronic blackboards and various recording devices are set up)
Method 4	A real-time ZOOM lecture
Method 5	Actual face-to-face classes with 50% of the students attending classes equipped with the Auto Face Tracking System & the remaining 50% of students participate in the class through real-time ZOOM.

Table 2. 2021-2 A Curriculum's Syllabus

week	class operation method		Remarks	week	class operation method		Remarks
	1hr	1hr			1hr	1hr	
1	M 1	M 4		9	M 3	M 4	
2	M 1	M 4		10	M 3	M 5	
3	M 2	M 4		11	M 3	M 5	
4	M 2	M 4	small group discussion	12	M 3	M 4	group presentation
5	M 2	M 4		13	M 3	M 4	group presentation
6	M 2	M 4	small group discussion	14	M 3	M 4	group presentation
7	M 2	M 4		15		a supplementary lecture	
8	M 3	mid-term test		16	M 3	final test	

2.3 Research tools

As for academic immersion, a suitable questionnaire shown in Table 3 was extracted from the learning immersion tool [12] developed by Seok Im-bok (2007) which was reconstructed and modified to Jina Yoon (2011)'s questionnaire [13] for college students. The items were composed on a Likert 5-point scale, and the Cronbach's α value for learning immersion in this survey was .97.

Table 3. Learning Flow Items

indicate	Learning Flow Items	
1(F)	I concentrate and participate in the class.	
2(F)	I accurately recognize the learning goals and follow the contents of the class.	
3(F)	I understand what I've learned	.97
4(F)	I don't feel bored and the time passes quickly.	
5(F)	I know what to do to solve a given task.	
6(F)	I am not affected by other situations during the class.	

For learning satisfaction, the tool developed by Hyeseung Jeong [14] was modified and supplemented to suit this study, and the content validity and reliability were verified, and the final 8 items were selected as shown in Table 4. For content validity, only items with content validity index of .80 or higher were selected by testing content validity in a group of three experts: one professor of basic nursing, one professor of maternal nursing, and one professor of adult nursing. Each item is measured on a Likert scale ranging from 5 points of 'strongly agree' to 1 point of 'not at all', with a higher score indicating higher learning satisfaction. At the time of development of this tool, the reliability of the Cronbach α was .75, and the Cronbach α in this study was .93.

Table 4. Learning Satisfaction Items

indicate	Learning Satisfaction Items	
1(S)	I am satisfied with the class in general.	
2(S)	I am satisfied with the way the class is conducted.	
3(S)	The presentation of learning materials and supplemental materials is appropriate.	
4(S)	It is appropriate to provide opportunities for interaction between faculty and students. (Through the bulletin board or 1:1 chat)	.93
5(S)	It is appropriate to provide opportunities for interaction between students. (Through the bulletin board or 1:1 chat)	
6(S)	It provides opportunities for students to actively participate in classes	
7(S)	The student's motivation for learning is encouraged.	
8(S)	Various learning activities (discussions, quizzes, tests, assignments, etc.) are well carried out.	

2.4 Data collection and ethical considerations

This study conducted a questionnaire survey on 162 subjects who agreed to participate in the study from December 11th to December 19th, 2021, which was the study week (week15) after the end of the 2nd semester of 2021 class. Prior to the survey, the purpose and method of the study were explained during the lecture class, and after explaining that there will not be any disadvantage to students who did not agree, the survey was conducted through the Naver Form. A small token of appreciation was given to the participants.

2.5 Research analyzing method

The collected data was analyzed using IBM SPSS 21.0 program. For general characteristics of the subjects, frequency analysis and descriptive statistics were used. For the analysis of academic immersion and learning satisfaction of non-face-to-face online class type, equal variance test was first performed, followed by t-test and One-way analysis of variance (One-Way ANOVA) were carried out.

2.6 Research limitations

This study includes the online educational facilities installed at the specific university and the set educational environment, and there is a limitation in extending the interpretation of the research results to all universities and college students because the study subjects were also extracted from the nursing department.

3. Results

3.1 General characteristics of subjects

Table 5 shows the general characteristics of the study subjects. Among the 147 subjects, 24 were male (16.3%) and 123 (83.7%) were female, 139 (94.6%) were sophomores, and 8 (5.4%) were juniors. There were 2 (1.4%) repeaters, and all 147 of them answered 'experienced' for the non-face-to-face class experience, and the experienced period was in the first semester of the 2020 and 2021 semesters. In the result analysis, the results of the non-face-to-face class experience were the same as the results of all subjects, thus no separate remark was made.

Table 5. General Characteristics of Subjects (N=147)

Characteristics	Categories	N	%
Gender	male	24	16.3
	female	123	83.7
Grade	2nd	139	94.6
	3rd	8	5.4
Have heard of non-face-to-face class?	Yes	147	100.0
	No	0	0

3.2 Results of learning flow and satisfaction from non-face-to-face class operation

Table 6 shows the results of sub-items of academic immersion according to the non-face-to-face class operation method, and each result was found to be statistically significant. In the six sub-item questions, the lecture using real-time ZOOM (3.41±0.91) showed the highest academic immersion, and the PPT audio recorded lecture (2.72±1.04) showed the lowest degree of academic immersion.

The results of sub-items of academic satisfaction according to the non-face-to-face class operation method are shown in Table 7, and these results were also found to be statistically significant. In the eight sub-item questions, the lecture using real-time zoom (3.40±0.80) showed the highest academic immersion, and the PPT audio recording lecture (2.73±1.04) showed the lowest degree of academic immersion, showing the same results as academic immersion.

Table 6. Learning Flow: Results of sub-item according to the non-face-to-face class operation method

Items	Method 1 (M±SD)	Method 2 (M±SD)	Method 3 (M±SD)	Method 4 (M±SD)	Method 5 (M±SD)	F
1(F)	2.76±1.15	3.07±1.21	3.32±1.12	3.50±0.92	3.26±1.06	9.85
2(F)	2.81±1.07	3.13±1.15	3.34±1.05	3.36±1.01	3.31±1.02	6.93
3(F)	2.69±1.06	2.94±1.16	3.19±1.06	3.17±1.00	3.20±1.06	6.23
4(F)	2.69±1.05	2.91±1.19	3.25±1.07	3.33±0.92	3.08±1.03	8.70
5(F)	2.63±1.08	3.04±1.08	3.20±1.11	3.33±1.14	3.15±1.05	8.65
6(F)	2.76±1.15	3.10±1.25	3.40±1.10	3.74±0.89	3.33±1.02	16.41
total	2.72±1.04	3.03±1.12	3.28±1.01	3.41±0.91	3.22±0.95	

$**p<.005$

Table 7. Learning Satisfaction:
Results of sub-item according to the non-face -to-face class operation method

Items	Method 1 (M±SD)	Method 2 (M±SD)	Method 3 (M±SD)	Method 4 (M±SD)	Method 5 (M±SD)	F
1(S)	2.75±1.14	3.07±1.21	3.33±1.12	3.50±0.92	3.26±1.06	10.13
2(S)	2.81±1.07	3.13±1.15	3.34±1.05	3.36±1.01	3.31±1.02	6.93
3(S)	2.69±1.06	2.94±1.16	3.20±1.06	3.17±1.00	3.20±1.06	6.30
4(S)	2.69±1.05	2.91±1.19	3.25±1.07	3.33±0.92	3.08±1.03	8.70
5(S)	2.63±1.08	3.04±1.08	3.21±1.12	3.33±1.14	3.15±1.05	8.73
6(S)	2.76±1.15	3.10±1.25	3.41±1.10	3.74±0.89	3.33±1.02	16.46
7(S)	2.81±1.07	3.07±1.12	3.27±1.06	3.39±1.06	3.72±1.01	15.25
8(S)	2.71±1.14	3.13±1.15	3.33±1.09	3.36±1.01	3.31±1.07	9.12
total	2.73±1.04	3.05±0.81	3.29±0.88	3.40±0.80	3.30±0.74	

**p<.005

3.3 Comparison of different non-face-to-face class operation methods

The overall average results of the five non-face-to-face classes are as followed, lectures using real-time ZOOM (3.40±1.00), self-studio recording lectures (3.29±1.08), lectures using automatic class recording system (3.26±1.05), voice recording lectures with professor appearance (3.04±1.17), PPT voice recorded lectures (2.73) ±1.10) in the descending order.

Table 8 shows the results of the analyzed correlation between the results of each method. There was no significant difference in the results of the PPT audio recorded lecture and the professor appearance audio recorded lecture, and the self-studio recorded lecture showed a significant difference from the PPT audio recording lecture. In the lecture using real-time ZOOM, there was a significant difference between the PPT audio recorded lecture and the professor appearance audio recorded lecture.

Table 8. Average by non-face-to-face teaching method

	Method 1	Method 2	Method 3	Method 4	Method 5
Method 1	-				
Method 2	.010	-			
Method 3	.000	.034	-		
Method 4	.000	.001	.278	-	
Method 5	.000	.044	.809	.157	-

*P<.05

3.4 Freedom-To-Operate (FTO) analysis on non-face-to-face class operation methods

In the last item, a question was asked to the participants to write their opinions freely on the operation of non-face-to-face classes for the subject in the second semester of 2021 and there were 10 responses excluding simple greetings. The number of respondents and the content of the responses are inappropriate for statistical analysis, but the content itself is meaningful, so I would like to address them.

First of all, it expressed the ambiguity of the evaluation of the lecture using the automatic recording of the class. On the first day of using the actual classroom, the audio could not be delivered to the students attending at home due to the technical issue, which lead to delaying in the start of the class. There was an opinion that it was difficult to evaluate because it had both the characteristics of a non-face-to-face class and face-to-face class.

The opinion of the class using real-time ZOOM is positive, there was an opinion that it is good because it

is a learning method that I have experienced the most, and it is convenient because it is convenient for both teachers and learners to use things like small meeting room activities.

In addition, in the 15th week of the semester, the number of non-face-to-face classes was not evenly distributed, so the PPT audio recording lectures experienced about twice immediately after the start of the semester seemed to have an effect on emotional tension immediately after the start of the semester, and it was operated about twice. Compared to other methods, there was an opinion that the evaluation itself was difficult because the lectures were not fully utilized despite the unfamiliar environment and equipment.

In addition, there were extreme contents that described it as stress enough to give up studies for students who were not prepared for difficult and self-directed learning because the forced non-face-to-face class itself was difficult and not a matter of choice due to the COVID-19 situation. Among the students who expressed that they liked the VOD-type class rather than the raw real-time class, it is possible to take the class at a desired time, and above all, it is possible to repeat learning. There were also positive comments about this being good.

4. Conclusion

This study investigated and analyzed the effectiveness of non-face-to-face class operation on students' academic immersion and learning satisfaction. The study was carried out by the same instructor who conducted various methods of non-face-to-face classes of a same subject to nursing students. In this study, real-time video(using ZOOM) lectures showed the highest score in both areas of academic immersion and learning satisfaction, and PPT audio recording lectures showed the lowest score in both areas of academic immersion and learning satisfaction. This result is consistent with other previous studies [2,7,8,10] which indicate that the more interaction between professor and learner results in better learner's academic immersion and higher learning satisfaction. Therefore, as the interaction between professor and learners is a very important factor in non-face-to-face classes, it is necessary to develop various class formats and education support systems which enhance the sense of realism of learning through real-time lectures rather than recorded lectures or mixed lectures.

5. Discussion

Based on the results of the study, discussion is as followed.

Firstly, recorded video lectures with no form of interactive communication resulted in very low academic immersion and learning satisfaction from students. To enhance immersion and satisfaction, variety of contents and additional forms of communication such as LMS and SNS that able students to discuss and inquire are necessary to get learner's attention.

Secondly, real-time video(using ZOOM) lectures are the most familiar non-face-to-face class operation method for both instructors and learners, but there was no significant difference in self recorded classes and automatic recorded classes. This shows that even real-time online lectures are not significantly different from recorded video lectures if immediate feedbacks are not properly utilized during online classes.

Thirdly, while utilizing universities' facilities and equipment for online non-face-to-face class, it is important to develop online self-learning and nursing skills training materials for nursing majors.

Lastly, since this study is a result of a specific lecture conducted using various non-face-to-face class operation methods during a semester and followed by respond to the questionnaire, further research is suggested to draw more accurate conclusions by placing an experimental group and a control group.

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