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The Effect of Learners' Interactions on Learning Satisfaction in Non-face-to-face Classes

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Abstract

The effect on learning satisfaction was compared and analyzed according to the interaction of learners in non-face-to-face classes. 38 students enrolled in the Department of Chemistry Education at G University in Gyeongnam were selected for the study. As a result of analyzing the change in learning satisfaction according to learners' interactions, positive correlations between them were shown in non-face-to-face classes. The type of classes mainly consisted of non-face-to-face real-time classes, and despite the non-face-to-face classes environment, learners focused on classes and put a lot of effort to strengthen learning. Among learners' interactions, the effect of learner-content interaction on learning satisfaction was relatively the highest, while the effect of learner-learner interaction and learner-instructor interaction on learning satisfaction was low. It was found that learners' teaching-learning in non-face-to-face classes relied heavily on learning content, and interactions with fellow learners and instructors were very limited.

Keywords: *Non-face-to-face Classes, Interactions between Learners, Learner-Instructor Interactions, Learner-Content Interactions, and Learning Satisfaction*

1. INTRODUCTION

Due to the development of digital media and internet technology, school education could proceed smoothly in the form of 'non-face-to-face real-time teaching-learning' even in the 'social distancing' situation of COVID-19. Non-face-to-face real-time teaching-learning has several advantages, such as the convenience of time and space for learners to listen to lectures regardless of time and place, the possibility of customized learning to share and control knowledge and information between learners and instructors online, and the fidelity of learning to access desired materials immediately and repeatedly [1].

Due to these advantages, students have a positive perception that 'learning concentration is possible' in non-face-to-face real-time teaching-learning, while instructors have a negative perception such as lecture

quality management (difficulty in immediately confirming content understanding), lack of communication with students, etc. The educational effect of non-face-to-face real-time teaching-learning was found to be lower than that of traditional face-to-face classes because the interaction between instructors and learners was limited [2, 3].

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In non-face-to-face teaching-learning, it was found that learning satisfaction and academic achievement can be successfully achieved if learner-learner and learner-instructor interactions are actively and autonomously performed [4-6]. In other words, it was found that not only the degree of learner-learner interaction and learner-instructor interaction varies depending on the role of the instructor leading the teaching-learning activity and the willingness of the learner to actively participate, but also greatly affects learning satisfaction [7].

Learner-learner interaction and learner-instructor interaction were found to affect learning outcomes as well as learners' self-efficacy and learning commitment [8-10]. Therefore, it is more necessary to study the effect of learning satisfaction on learner-learner interaction, learner-instructor interaction, learner-content interaction, and learner-system interaction because the effect of various interactions is different depending on the role of the instructor, learner's willingness to participate in learning.

Problems such as difficulty in understanding content and communication difficulties in non-face-to-face teaching-learning were found to be overcome by learners' self-directed learning willingness and active learning participation activities [5]. Since these learners' learning will and learning participation activities promote interaction between learners, it was found that they eventually affected learning satisfaction [6, 7, 11]. On the other hand, since interactions with fellow learners are competitors to each other, class satisfaction with interactions with fellow learners was found to be low [12]. Therefore, it is necessary to study the effect of interaction between learners on learning satisfaction in non-face-to-face real-time classes.

The role of instructors in non-face-to-face classes was also important, and it was found that the influence on interaction with learners was large [7, 13]. Instructors desperately need to encourage learners to actively participate in class activities, and instructors' roles such as continuous provision of learning materials, checking your understanding of the contents of the lecture, feedback on learning activities, etc. are important [14, 15]. It was found that when learners are given positive perception (confidence and stability in class) after the instructor has sufficient interaction with the learner, learner-instructor interaction increases as well as learning satisfaction can be improved [12, 16, 17].

On the other hand, it was found that the learner-instructor interaction did not significantly affect the learner's self-directed learning will [18], and not only showed low learning effects but also did not affect learning satisfaction [19-21]. Therefore, it is necessary to study the effect of learner-instructor interaction on learning satisfaction in non-face-to-face real-time classes.

Learning content is the easiest for learners to access for teaching-learning in non-face-to-face class. The performance of teaching-learning mainly depends not only on the systematicity and familiarity of learning content, but also on the composition of learning content by level. When learning materials for each level that are easier to learn than difficult learning contents are provided to learners, learner-content interactions can be greatly increased. In other words, it is important to provide learning information that students can easily access and understand in non-face-to-face classes. Therefore, the content characteristics of learning content can greatly affect learning satisfaction.

Previous studies have shown that in order to improve learners' learning satisfaction [11], it is not only necessary to strengthen the learner-content interaction, but also to provide systematic and diverse content to achieve learning goals. In order to maintain learners' class concentration and curiosity, the composition of learning content, learning motivation for deep learning, creative learning materials, etc. were found to be important factors in learner-content interaction [1]. Therefore, research on learner-content interactions that can affect academic satisfaction is more urgent.

Through various media systems, non-face-to-face classes are conducted and content for teaching-learning is provided, so that the usefulness and effectiveness of the media system can determine the success of teaching-learning. That is, the technical and environmental aspects of the media system may increase the effectiveness

of learning that provides a non-face-to-face real-time class.

Previous studies have shown that functional problems such as system discomfort [11, 22], disruption of class flow, slow speed, etc. caused by network errors negatively affect learning satisfaction due to learners' loss of interest or concentration in class.

As such, the effect on learners' learning satisfaction is different according to various interactions in non-face-to-face real-time teaching-learning. Therefore, it is necessary to study the effect of various interactions on learning satisfaction.

2. RESEARCH METHODS

2.1 Object of Study

In non-face-to-face teaching-learning, the effects of learner-learner interaction, learner-instructor interaction, learner-content interaction, learner-system interaction, etc. on learning satisfaction were studied. In order to investigate the correlation between them, these four interactions were set as independent variables and learning satisfaction as dependent variables. 38 students enrolled in the department of chemistry education at G University in Gyeongsangnam-do were selected and questioned. The selected students conducted non-face-to-face real-time classes for five semesters from March 2020 to August 2022. Among a total of 38 questionnaires, 35 questionnaires excluding 3 questionnaires that were answered insincerely are compared and analyzed for learning satisfaction according to interaction.

2.2 Questionnaire Survey

Based on the previous test tools [7, 12, 15, 20, 21, 23], the questionnaire used was modified to suit the characteristics of students in the chemistry education department with various interactions, learning satisfaction, etc. in non-face-to-face real-time classes. In addition, the first preliminary survey was conducted on 30 students enrolled in the department of chemistry education. Based on the preliminary survey, the questionnaire of students was finally revised by synthesizing the opinions of professors and experts in the relevant area.

The survey contents consisted of four interactions, learning satisfaction, etc. There are 5 questions related to non-face-to-face class type, media used in class, interaction type, etc., and it consists of 25 questions, including 4 questions for learner-learner interaction, 5 questions for learner-instructor interaction, 5 questions for learner-content interaction, 5 questions for learner-system interaction, and 6 questions for learning satisfaction. In addition, the reason for the selection of these questions was to be described.

The 25 questions on interaction and learning satisfaction consisted of a 5-point Likert scale. The survey took 40 minutes. The students' survey was conducted in September 2022. The correlation between the four interactions and learning satisfaction was analyzed using the SPSS 25.0 statistical program. The overall reliability coefficient for the five variables was α=0.898.

2.3 Class Contents and Evaluation Contents

For 15 weeks in one semester, students in the chemistry education department took general chemistry courses. Units 1-13 of general chemistry textbook were taught for one semester and units 13-28 of general chemistry textbook for two semesters. The class form was conducted in non-face-to-face real-time.

The evaluation for academic achievement was divided into midterm and final exams per semester and paper-written tests were conducted. The paper-based evaluation focused on measuring scientific thinking and problem-solving skills, such as understanding scientific concepts, application to real life, etc. The test questions were presented by the professor in charge of general chemistry.

2.4 Research Questions

This study studied the effects of learner-learner interaction, learner-instructor interaction, learner-content interaction, learner-system interaction, etc. on learning satisfaction, and the research problems were set as follows.

1. What is the degree of interaction of students according to non-face-to-face real-time classes?
2. What is the effect of students' interactions on learning satisfaction in non-face-to-face real-time classes?
3. Which interaction has the greatest influence on learning satisfaction in non-face-to-face real-time classes?

3. RESEARCH RESULTS

3.1 Correlation between Variables

As a result of analyzing the correlation between the variables included in this study, it was statistically significant between them and showed a positive correlation. The correlation coefficient between learner-content interaction and learning satisfaction was relatively the highest, while the correlation coefficient between learner-learner interaction and learning satisfaction was the lowest.

As a result of previous studies [12, 15], the higher the interaction in non-face-to-face classes, the higher the correlation coefficient with class satisfaction. In non-face-to-face classes, learners interact with learning materials a lot, so learner-content interaction was high, and the correlation with class satisfaction was relatively high [20].

On the other hand, the results were different depending on the situation of non-face-to-face classes. In some studies, the correlation coefficient between learner-instructor interaction and class satisfaction was high [12, 17], while in other studies, the correlation coefficients between learner-learner interaction or learner-instructor interaction and class satisfaction were relatively low, respectively [8, 10, 22].

Table 1. Correlation between variables such as four interactions, academic satisfaction, etc. in non-face-to-face teaching-learning

interaction variables	learner-learner interaction	learner-instructor interaction	learner-content interaction	learner-system interaction	class satisfaction
learner-learner interaction	1				
learner-instructor	.450***	1			
learner-content interaction	.432***	.540***	1		
learner-system interaction	.564***	.507***	4.99**	1	
class satisfaction	.460***	.485***	.574**	.488**	1

p***<0.01

The class type used in non-face-to-face classes and the degree of learners' efforts for class concentration were analyzed, and the results are shown in Figures 1-a and 1-b, respectively. The class type was mainly conducted as 'non-face-to-face real-time class'. In terms of the degree of effort for class concentration, positive responses such as 'very yes' and 'yes' were relatively high at 77.1%. Despite the non-face-to-face classes, it was found that students were focusing on the contents of the class and making considerable efforts to strengthen their learning capabilities.

As a result of previous studies on class types [12, 17, 24], in the case of non-face-to-face real-time video lectures, simultaneous interactions such as learner-learner interaction, learner-instructor interaction, etc. are possible, so the effect on class satisfaction is relatively high. On the other hand, in the case of recording classes and mixed classes, these interactions were low because they were separated in time and space between them, so class satisfaction was low.

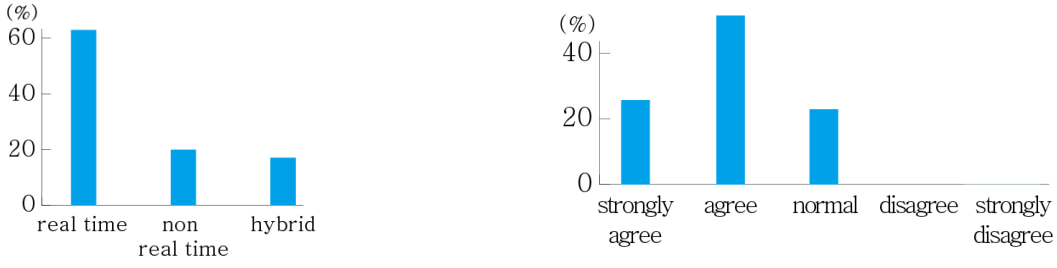


Figure 1. Class type (1-a) and degree of effort to concentrate class (1-b) in non-face-to-face real-time classes

3.2 Learner-Learner Interaction

After analyzing the types and detailed items of the learner-learner interaction, the results are shown in Figures 2-a and 2-b, respectively. In the learner-learner interaction, 'discussion and debate' was the highest.

As a result of analyzing detailed items, the positive response in the 'relevance of learning tasks' was the highest at 88.8%. This is because learners have relatively high interactions with fellow learners in relation to learning tasks. The interaction of 'relevance of class content' was relatively low, which was found to be very limited because it was difficult to interact with low-profile learners in non-face-to-face class. Therefore, the effect of learner-learner interaction on learning satisfaction was also low.

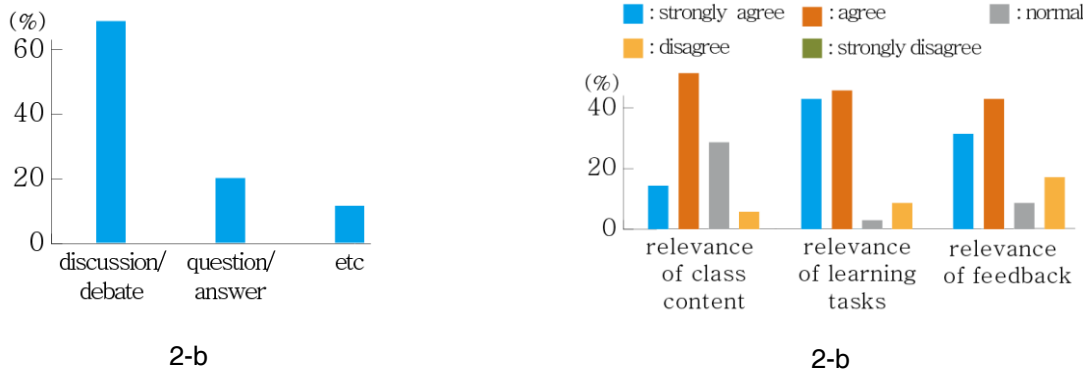


Figure 2. Analysis of the type of learner-learner interaction (2-a) and detailed items (2-b)

As a result of previous studies [17, 18, 25], the learner-learner interaction in non-face-to-face classes was relatively low, and the effect on lecture satisfaction and learning satisfaction was also low. It was interpreted that learner-learner interaction acted as a negative perception in learning activities due to competition for entrance exams. Meanwhile, as a result of Moon's study [21], the effect of learner-learner interaction on lecture satisfaction was not found in subjects that were difficult, but in interesting subjects.

3.3 Learner-Instructor Interaction

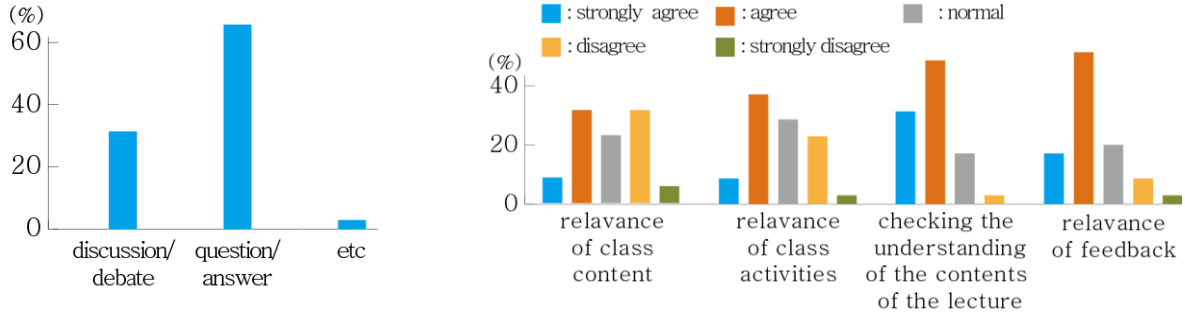
After analyzing the types and detailed items of the learner-instructor interaction, the results are shown in Figures 3-a and 3-b, respectively. In the types of learner-instructor interaction, the 'question and answer' was the highest.

As a result of analyzing the detailed items, positive responses were high in the order of 'checking the understanding of the contents of the lecture' and 'relevance of feedback'. The highest positive response (80.0%) in ‘checking the understanding of the contents of the lecture’ was found to be that during non-face-to-face classes, instructors ask a lot of questions to check the degree of students' understanding of lecture contents. It was found that students who chose 'relevance of feedback' received a lot of feedback from instructors such as question and answer, assignments, and test results.

On the other hand, the learner-instructor interaction was relatively low in detailed items such as 'relevance of class activities' and 'relevance of class content'. The positive response rate of students was low due to learners' self-consciousness (obstruction of class flow, object of attention according to questions), passive characteristics of preferring instructor-centered classes, etc. Therefore, the effect of learner-instructor interaction on learning satisfaction was also relatively low.

Previous studies showed a low effect of learner-instructor interaction on lecture satisfaction in non-face-to-face classes [18-20], while Kwon and Ryu's research showed that learner-instructor interaction was the most influential factor in learning satisfaction [17]. Therefore, according to the environment of non-face-to-face classes and the learner's learning situation [12, 21], the effect of learner-instructor interaction on lecture satisfaction was different.

Meanwhile in non-face-to-face classes, various mediating effects such as active class participation [7], learning attitude [22], learning commitment [9, 10, 19], etc. have a positive effect on learner-instructor interaction. As a result, it was found that it had a significant effect on learning satisfaction. In particular, factors such as learners' active participation in learning, learners' commitment to learning, etc. were found to have a great influence on this interaction.



3-a 3-b

Figure 3. Analysis of the type of learner-instructor interaction (3-a) and detailed items (3-b)

3.4 Learner-Learning Content Interaction

After analyzing the learning content used by learners, the results are shown in Figure 4. In the analysis of learning content, more than 60% of positive responses were found in five factors such as 'providing additional materials on learning content', 'appropriateness of the amount of learning materials', 'systematicity of learning materials', and 'providing in-depth/supplementary learning materials'.

In order to understand the learning content well, it was found that in non-face-to-face teaching-learning, instructors provided learning contents and systematic learning materials for various levels to learners. In addition, it was found that learners also focused on teaching-learning by selecting learning content appropriate for their level. As a result, it was found that these learning contents had the greatest influence on academic satisfaction.

As a result of previous studies [11, 18, 20], it was found that learners had the most interaction with learning content in non-face-to-face classes, thereby greatly affecting lecture satisfaction. This was found to be because students' teaching-learning in non-face-to-face classes relied heavily on learning content.

In other research results [1, 26], it was found that learning satisfaction with learning content used in non-face-to-face teaching-learning was not high. Therefore, it was found that it is important to provide optimized learning content to understand the class content well according to the learner's level and academic field in non-face-to-face teaching-learning.

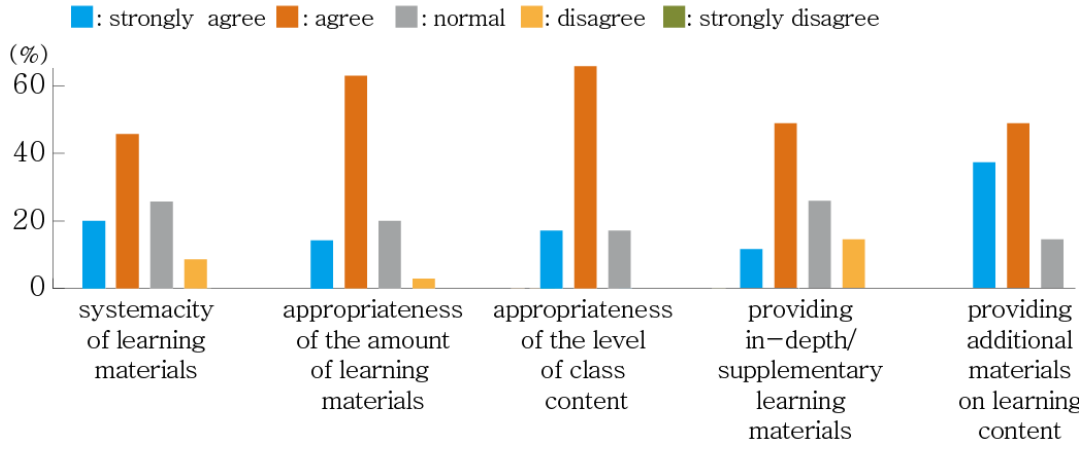


Figure 4. Analysis of learning content used by learners in non-face-to-face teaching-learning

3.5 Learner-System Interaction

After analyzing the systems used by learners for the three interactions in non-face-to-face teaching-learning, the results are shown in Figure 5. The type of medium used for ‘non-face-to-face real-time video lectures’ had the highest frequency of use of the zoom system. Since learners have a very high desire for real-time classes, it is judged that they have used a lot of zoom systems that can be conveniently and easily accessed as a means of communication. These results were similar to those of previous studies [12].

As a result of analyzing the use of the system by interaction, the positive response was the highest in 'learner-content interaction' (85.7%), while the positive response was relatively the lowest in 'learner-instructor interaction'. It was found that learners used the system the most to use learning materials and lecture materials in non-face-to-face teaching-learning, while the frequency of use for learner-instructor interaction was low.

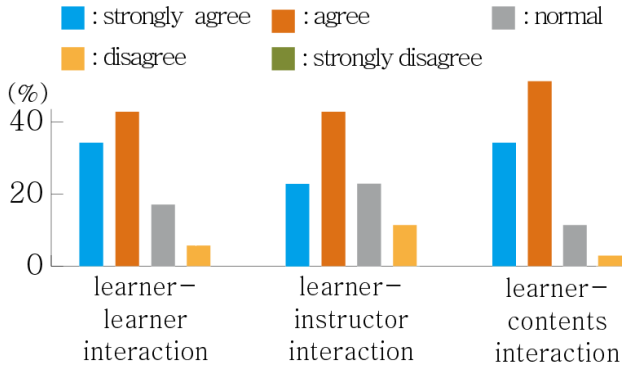


Figure 5. Analysis of the system used by learners for each of the three interactions in non-face-to-face teaching-learning

3.6 Learning Satisfaction

After analyzing the interactions affecting learning satisfaction in non-face-to-face teaching-learning, the results are shown in Figure 6. In learner-content interaction (providing additional materials on learning content, providing in-depth/supplementary learning materials), the proportion of positive responses was the highest. This is because learners' teaching-learning relies heavily on learning materials provided by instructors. With the development of digital media and Internet technology, it has been shown that it not only provides various information related to learning content, but also provides teaching-learning materials (illustrations, diagrams, conceptual diagrams) for each level. As a result, it was found that students understood the learning content and concepts more easily.

On the other hand, positive responses were relatively low in learner-learner interaction and learner-instructor interaction, respectively. In non-face-to-face classes, it was found that it was difficult for students to interact with instructors and fellow learners with low interactions, and the effect on learning satisfaction was limited.

As a result of previous studies [18, 20, 21], learner-content interaction in non-face-to-face classes showed the greatest learning effect as well as improving the quality of the class [1, 27]. On the other hand, it was found that the effect of learner-learner interaction or learner-instructor interaction on learning satisfaction was low. This was interpreted because learners mainly learn by learning content in non-face-to-face classes.

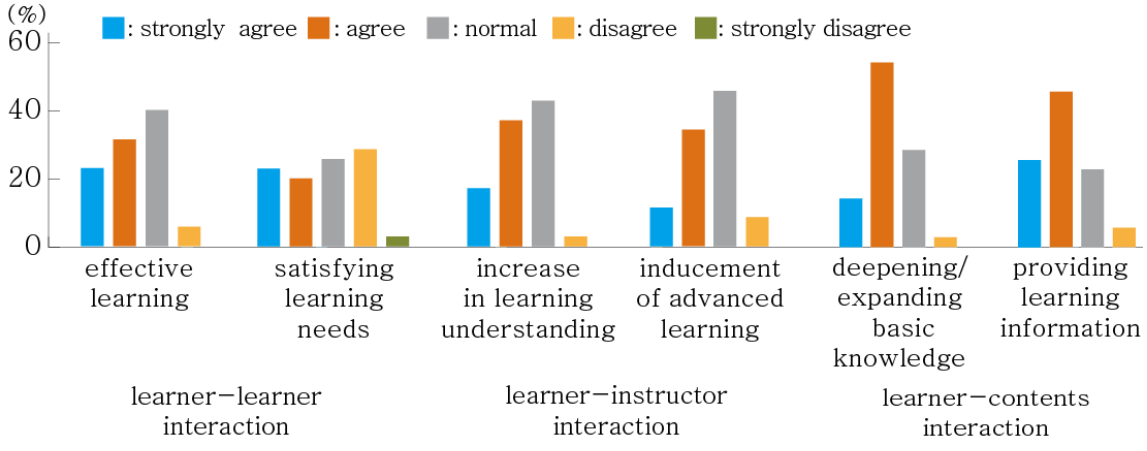


Figure 6. The effect of three interactions on learning satisfaction in non-face-to-face teaching-learning

Meanwhile, the results were different depending on the non-face-to-face class situation. Several research results [17, 25], showed that learner-learner interactions or learner-instructor interactions were high in non-face-to-face classes. As a result, learning satisfaction and class satisfaction were also high. In addition, since learner-learner interaction or learner-instructor interaction affects mediating factors such as learner's learning attitude [22], cooperative efficacy [8], learning commitment [10, 19, 27], and learning motivation [28], these mediating factors eventually affected class satisfaction.

As such, the higher the learner-learner interaction, learner-instructor interaction, and learner-content interaction in non-face-to-face classes, the higher the learning satisfaction, and the results were different depending on the non-face-to-face class situation and the learner's learning situation. In addition, it was found that the learner-instructor interaction or the learner-instructor interaction led to a mediating effect and eventually affected learning satisfaction [29].

4. CONCLUSIONS

In the situation of non-face-to-face instruction, the type of classes mainly consisted of 'non-face-to-face real-time video lectures', which was found to be at the request of students. In order to increase the understanding of the class content, it was found that students were focusing on the class content and making considerable efforts to strengthen their learning capabilities.

As a result of analyzing the correlation between the four interactions and learning satisfaction, positive correlation was shown between them, and it was statistically significant. The correlation coefficient between learner-content interaction and learning satisfaction was the highest, and the correlation coefficient between learner-learner interaction and learning satisfaction was low.

The effect of the four interactions on learning satisfaction was analyzed, and the learner-content interaction showed the highest positive response compared to other interactions. In other words, it was found that learner-content interaction had the highest effect on students' learning satisfaction.

Learners were found to rely heavily on learning content provided by instructors for non-face-to-face teaching-learning. Instructors were found to provide learners with various learning contents by level and field. It was found that learners focused on teaching-learning by selecting learning content appropriate for their level and field. As a result, it was found that the learner-content interaction had the greatest influence on academic satisfaction. Therefore, it was found that it is important to present learning contents by level and field as well as familiar materials that can be motivated to learn and concentrated in classes.

In the learner-learner interaction, the interaction in the form of 'discussion and debate' was the highest. In detailed items, the interaction of 'relevance of learning tasks' was relatively the highest, and the interaction of 'relevance of class content' was the lowest. It was found that the interaction of learning tasks among fellow students in non-face-to-face classes was high, but the interaction with understanding the contents of the class was low.

In the learner-instructor interaction, the type of 'question and answer' was the highest, and the positive response was high in detailed items such as 'checking the understanding of the contents of the lecture' and 'relevance of feedback'. This is for instructors to check the degree of understanding of students' lecture contents, and it was found that feedback occurred relatively much, such as assignments, test results, etc.

On the other hand, positive responses were relatively low in detailed items such as 'relevance of class activities' and 'relevance of class content', respectively. Due to the passive characteristics of students who prefer explanatory classes, learner-learner interaction and learner-instructor interaction were low. As a result, the effect of these interactions on learning satisfaction was relatively low.

As a result of this study, it was found that the more interactions there are in non-face-to-face classes, the

higher the academic satisfaction. And the results were different depending on the roles of learners and instructors. It was found that the role of learners and instructors in non-face-to-face real-time classes and the interaction between them were very important. In addition, it is judged that the results of this study will greatly contribute to non-face-to-face real-time classes

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