The Effect of the Delivery Format on Teaching Presence, Learning Presence, and Learning Outcomes in Distance Learning of Nursing Students: Synchronous versus Asynchronous Learning

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Purpose: This study was performed to explore the effect of the delivery format on teaching presence, learning presence, and learning outcomes in distance learning of nursing students. **Methods:** A descriptive survey was conducted to understand teaching presence, learning presence, and learning outcomes depending on the delivery format of distance learning. Quota sampling methodology was used to recruit 295 nursing students from all over the country, and data collection was done from July 27 to September 10, 2020. The first delivery format for distance learning was synchronous learning in which communication between the instructor and students occurred simultaneously. The second delivery format was asynchronous learning in which prerecorded videos were provided and communication did not occur simultaneously. **Results:** In synchronous learning, teaching presence (especially direct facilitation) and learning presence (especially emotional expression) had a statistical significance that was higher than in asynchronous learning. However, in learning outcomes, there was no statistically significant difference. There were significant positive correlations between teaching presence, learning presence, and learning outcomes, and there were significant positive correlations. **Conclusion:** It can be suggested that learning outcomes can be improved if presence is improved in the distance learning environment based on the results of this study. It is necessary to add contact with nursing students and instructors to improve teaching presence in the asynchronous learning, and it is necessary to help students express their emotions to improve learning presence.

Key Words: COVID-19; Distance learning; Nursing; Students; Education

INTRODUCTION

In March 2020, the World Health Organization declared COVID-19, also known as the coronavirus, a pandemic. Distance learning was proposed as an important educational paradigm to overcome the limitation of conventional face-to-face classes. As mutations of the coronavirus continue to develop, distance learning continues to be used for nursing education. It is essential to find more detailed and varying methods for distance learning, along with each method's effects. Distance learning is a form of education that uses the internet and web-connected communication tools as a strategy for the transfer of knowledge [1].

Words that refer to online classes have been used interchangeably with various terms such as online learning, online education, e-learning, and web-based instruction. However, as online and e-learning classes recently became active in general higher education institutions, as well as cyber universities, the terms have been unified into the catchall term of distance learning [2].

Distance learning can be divided into two modes: synchronous learning and asynchronous learning [3]. Synchronous learning is live, real-time (usually scheduled), facilitated instruction, and utilizes learning-oriented interaction. Asynchronous learning takes advantage of computer-mediated communication to achieve the promises

of learning anytime, and anywhere [3].

When the learner's sense of presence in distance learning is improved, active learning activities increase, which can lead to positive learning outcomes such as improved academic achievement and satisfaction [4]. The sense of presence refers to being there in a virtual space [4]. Presence is the subjective experience of being in one place or environment, even when physically situated in another [5]. In the learning situation, presence can be divided into teaching presence and learning presence [6].

The perception of the external learning environment recognized by the learner in the learning process is the teaching presence, and the learning presence is the perception of one's inner self [4]. Teaching presence is how the learner feels about the instructor's consideration [7]. To realize meaningful and educationally significant learning effects, teaching presence designs and promotes learners' cognitive and social processes [6].

Learning presence refers to the learner's intrinsic awareness and means of cognitive and emotional perception during the learning process, along with their learning contents in specific situations [8]. If the learner's presence is improved in distance learning, positive learning outcomes can be derived [9].

Learning outcomes result from learners' acquisition of changes and development levels, knowledge, and technology that emerge from that learning [10]. Metrics for measuring learning outcomes in distance learning can be broadly divided into academic satisfaction, academic achievement, and learning persistence [11]. Learning satisfaction is an important indicator of whether learners' needs are met [12]. When new media and teaching methods are introduced, it will have a significant impact on whether learners will accept them in the future or not [13].

One of the most actively used measurement variables of learning outcomes has traditionally been academic achievement [14]. Academic achievement is related to the interaction between teachers and learners and their willingness to participate in learning in distance learning [15]. Distance learning is more likely to deviate from learning than conventional face-to-face classes. Hence, learning persistence, an action taken to continue learning, is a crucial evaluation method in measuring learning outcomes in online education [16].

As such, prior research has been conducted focusing on the sense of presence and learning outcomes in distance learning [14-16]. However, studies comparing distance learning differences according to delivery format were rare. Schoenfeld-Tacher and Dorman [17] reported that there was no difference in academic achievement accord-ing to a study targeting individuals studying veterinary medicine. Lin and Gao [18] found that active interaction is often stimulated through synchronous learning, while students can learn on their own pace in asynchronous learning in a study with Chinese university students. Challenges are also perceived in both formats, such as being distracted by classmates in synchronous learning or feeling social isolated in asynchronous learning.

Therefore, the purpose of the study was to explore the effects of the delivery format on teaching presence, learning presence, and learning outcomes and to identify the correlation among them in distance learning for nursing students during the COVID-19 pandemic in Korea. It is meaningful to have a foundation for building a post-coronavirus distance learning environment based on the most effective delivery format.

METHODS

1. Study Design and Participants

This study used a descriptive, cross-sectional design. Korea was split into four regions: the Capital region (Seoul, Gyeonggi and Incheon), Gangwon-Jungbu region (Gangwon, Daejeon, Chungnam and Chungbuk), Yeongnam region (Busan, Daegu, Gyeongbuk and Gyeongnam), and Honam region (Gwangju, Jeonnam, Jeonbuk and Jeju). The quota sampling was extracted depending on the ratio of students per region. The subjects of this study were current nursing students who attended online nursing classes within the last three months. The number of subjects was calculated using the G*Power 3.1.3 program. The significance level (α) was=.05, statistical power was (1-β)=.80, and correlation coefficient was .17 to compare the correlation between teaching presence, learning presence, and learning outcomes of nursing students based on the two-sided test [19]. A minimum of 266 students were needed. Considering the dropout rate of 10%, 300 nursing students were distributed proportionally by region. The final number of study subjects was 295, with 57 (19.3%) from the metropolitan area, 92 (31.2%) from the Gangwon/Joongbu area, 62 (21.0%) from the Yeongnam area, and 84 (28.5%) from the Honam area.

2. Data Collection

The data were in the form of an online survey due to concerns over the spread of group infections caused by COVID-19. The survey was conducted from July 27 to September 10, 2020. The purpose of this study was ex-

plained through wired contact to the student representatives of the nursing department through the professors in charge of the universities and notice of recruitment was posted for the subjects online. The URL was sent to subjects who expressed their intention to participate. A description of the purpose and method of this study, rights to discontinue during the survey, personal information protection, and the time required for the survey were added to the first page of the online survey, and a written consent from each subject was received. Those who agreed to participate in the study were required to fill out the questionnaire directly, and those who participated in the study were given mobile gift certificates.

3. Measurements

The study used a structured questionnaire composed of information about the delivery format (real-time video lecture and prerecorded voice or video), general characteristics, teaching presence, learning presence, and learning outcomes. Synchronous learning in which communication with the instructor and students occurs simultaneously defined real-time video lectures. Voice recordings or pre-recorded videos were defined as asynchronous learning in which communication does not occur simultaneously.

1) Teaching presence

Teaching presence was analyzed using the tool of Swan et al. [20], which was translated Korean by Kang et al. [19]. This section of the questionnaire consisted of eight questions with two subdomains, and a five-point scale to indicate the correlation between a higher the score and a higher level of teaching presence. The subdomain of instructional design and organization consisted of four questions. The content of the questions is about whether the instructor informed the students about the learning topic, learning goals, guidelines for learning activities, and information related to learning activities. The subdomain of direct facilitation consisted of four questions to measure learners' perception of being encouraged to participate in productive discourse, assignments, exploration of new concepts related to the learning topic, and help develop a sense of community. Cronbach's α of each subdomain was .89 and .86 in the previous study [19] and .87 and .82 in this study. In this study, Cronbach's α of teaching presence was .89.

2) Learning presence

(1) Cognitive presence

Based on a five-point scale adapted from Kang et al. [21] consisting of twelve questions to measure the learner's internal perception of being able to learn contents in class, organize thoughts in a notebook, organize what was learned, explain concepts to other students, discuss concepts with other students, find materials related to class, apply and practice what was learned, learn something new through class, get a new perspective through class, perform learning activities or tasks, know how to ask useful questions, and find an environment to focus and study alone, cognitive presence was analyzed [19]. Cronbach's α was .93 in the previous study [19] and .90 in this study

(2) Emotional presence

Emotional presence was analyzed using a five-point scale [21] used by Kang et al. [19]. It consisted of nine questions with three subdomains that indicated a correlation between a higher score and a higher level of emotional presence. The subdomain of the recognition of one's emotional state consisted of three questions to measure learners' internal perception of feeling comfortable, friendly, and interesting in class. The subdomain of emotional expression consisted of three questions to measure the learners' internal perception of being able to present objections without hesitation, easily express feelings in class, and have varied expressions of feelings during class. The subdomain of emotional management consisted of three questions to measure the learners' internal perception of their ability to express feelings clearly during class, avoid frustration when learning activities or tasks went poorly, and ask for help when experiencing psychological difficulties. Cronbach's α of each subdomain was .77, .86 and .63 in the previous study [19] and .74, 90 and .74 in this study. In this study, Cronbach's α of emotional presence was .87.

3) Learning outcome

(1) Learning satisfaction

Learning satisfaction means general satisfaction with the overall online learning program. It was analyzed using a five-point scale consisting of nine questions from Shin [22] that were modified and supplemented by Gu [23] to make them suitable for the online learning environment and target learners. It utilized a five-point scale as follows: one point meant the participant strongly disagreed, and five points meant the participant strongly agreed. The higher the score, the higher the learning satisfaction. Cronbach's α was .90 in the previous study [23] and .95 in this study

(2) Perceived achievement

Perceived achievement was measured on a five-point scale consisting of three modified and supplemented sections [23]. Gu's [23] tool was used after being validated by two experts in educational engineering with reference to the measurement items of perceived achievement and subject characteristics used by Shin [22]. Cronbach's α was .85 in the previous study [23] and .64 in this study.

(3) Learning persistence
A tool was used for measuring the learning persistence of Park and Yu [24]. It was a five-point scale consisting of four questions. Cronbach's α was .90 in the previous study [24] and .85 in this study.

4. Data Analysis

The statistical processing of the collected materials was analyzed using the SPSS 23.0 program. The participants' characteristics were analyzed by descriptive statics and a chi-squared test. Concerning general characteristics, the study variables were analyzed by a t-test and an analysis of variance, and the post-test was analyzed by a Scheffé test. The study variables concerning the delivery format were analyzed by a t-test. Correlations between study variables were analyzed by Pearson's correlation coefficients.

5. Ethical Consideration

The study was approved by the IRB of Mokpo National University (Approval no. MNUIRB-200721-SB-008-01).

RESULTS

1. Characteristics of the Participants

The percentage of subjects who participated in asynchronous learning was 70.2%, with more than 29.8% participating in synchronous learning. 3rd year students were the most common subjects, and the types of classes taken differed significantly depending on the grade level (x^2= 8.27, p=.015). In synchronous learning, 40.9% had previous experience learning online, and a significant difference of 54.6% existed in asynchronous learning. Asynchronous learning was the preferred delivery format at 76.5%, with more than 23.5% preferring synchronous learning (Table 1).

2. Study Variables according to the General Characteristics

1) Teaching and learning presence
The teaching presence of male students was 4.36 points, significantly higher than that of female students (t=2.06,

Table 1. Delivery Format according to the General Characteristics
(N=295)

Characteristics	Categories	Total	Synchronized learning (n=88)	Asynchronized learning (n=207)	x^2	p
		n (%)	n (%)	n (%)		
Sex	Male	48 (16.3)	9 (10.2)	39 (18.8)	3.36	.066
	Female	247 (83.7)	79 (89.8)	168 (81.2)		
Grade	2nd year	63 (21.4)	20 (22.7)	43 (20.8)	8.27	.015
	3rd year	152 (51.5)	54 (61.4)	98 (47.3)		
	4th year	80 (27.1)	14 (15.9)	66 (31.9)		
Course equipment	Computer or laptop	260 (88.4)	75 (86.2)	185 (89.4)	0.60	.438
	Smartphone or tablet PC	34 (11.6)	12 (13.8)	22 (10.6)		
Need for online class	Need	255 (88.8)	75 (88.2)	180 (89.1)	0.04	.830
	Not need	32 (11.2)	10 (11.8)	22 (10.9)		
Previous online class experience	Yes	149 (50.5)	36 (40.9)	113 (54.6)	4.62	.031
	No	146 (49.5)	52 (59.1)	92 (45.4)		
Disadvantage	Course equipment problem	34 (11.5)	8 (9.1)	26 (12.6)	2.87	.578
	Network environment problem	79 (26.8)	27 (30.7)	52 (25.1)		
	Evaluation problem	55 (18.6)	18 (20.4)	37 (17.9)		
	Class comprehension problem	105 (35.6)	27 (30.7)	78 (37.7)		
	Other	22 (7.5)	8 (9.1)	14 (6.7)		
Preferred type of class	Synchronize online classes	69 (23.5)	45 (51.1)	24 (11.7)	53.52	<.001
	Asynchronized online classes	225 (76.5)	43 (48.9)	182 (88.3)		

p=.040). The learning presence of male students was 4.06 points, which was significantly higher than the 3.79 points of female students (t=3.00, p=.002). The teaching presence and learning presence of 2nd year students were significantly higher compared to other grades (p=.006, p=.007) (Table 2).

2) Learning outcomes

The learning satisfaction of 2nd year students was 4.39 points, which was significantly higher compared to other grades (F=5.09, p=.006). The learning satisfaction of students who preferred online classes was significantly higher compared to students did not prefer online classes (t=2.39, p=.017). The perceived achievement and learning persistence of 2nd year students was significantly higher than those in 3rd year (p=.031, p=.010, respectively). The perceived achievement and learning persistence of students who preferred online classes was significantly higher compared to students did not prefer online classes (p=.048, p=.002, respectively)(Table 3).

Table 2. Teaching Presence and Learning Presence according to the General Characteristics (*N*=295)

Characteristics	Categories	n (%)	Teaching presence		Learning presence	
			M±SD	t or F (*p*)	M±SD	t or F (*p*)
Sex	Male	48 (16.3)	4.36±0.62	2.06 (.040)	4.06±0.66	3.00 (.002)
	Female	247 (83.7)	4.16±0.59		3.79±0.55	
Grade	2nd year[a]	63 (21.4)	4.33±0.58	5.08 (.006)	3.97±0.51	4.92 (.007)
	3rd year[b]	152 (51.5)	4.09±0.61	a>b[†]	3.73±0.58	a>b[†]
	4th year[c]	80 (27.1)	4.29±0.57		3.94±0.58	
Course equipment	Computer or laptop	260 (88.4)	4.17±0.61	-1.66 (.098)	3.82±0.58	-0.46 (.648)
	Smartphone or tablet PC	34 (11.6)	4.36±0.54		3.87±0.57	
Need for online class	Need	255 (88.8)	4.21±0.60	1.27 (.204)	3.86±0.57	1.90 (.058)
	Not need	32 (11.2)	4.07±0.62		3.65±0.57	
Previous online class experience	Yes	149 (50.5)	4.20±0.61	0.10 (.921)	3.83±0.58	0.08 (.937)
	No	146 (49.5)	4.19±0.60		3.83±0.57	
Advantage	No space constraints	69 (23.5)	4.31±0.56	1.86 (.064)	3.92±0.56	1.08 (.716)
	No time constraints	225 (76.5)	4.15±0.61		3.80±0.58	

[†]Scheffé test.

Table 3. Learning Outcomes according to the General Characteristics (*N*=295)

Characteristics	Categories	n (%)	Learning satisfaction		Perceived achievement		Learning persistence	
			M±SD	t or F (*p*)	M±SD	t or F (*p*)	M±SD	t or F (*p*)
Sex	Male	48 (16.3)	4.12±0.80	-0.21	4.37±0.58	0.19	4.25±0.66	0.19
	Female	247 (83.7)	4.14±0.68	(.830)	4.35±0.52	(.849)	4.23±0.65	(.852)
Grade	2nd year[a]	63 (21.4)	4.39±0.65	5.09	4.48±0.50	3.50	4.42±0.64	4.62
	3rd year[b]	152 (51.5)	4.07±0.70	(.006)	4.28±0.53	(.031)	4.13±0.66	(.010)
	4th year[c]	80 (27.1)	4.08±0.73	a>b, c[†]	4.40±0.54	a>b[†]	4.26±0.61	a>b[†]
Course equipment	Computer or laptop	260 (88.4)	4.13±0.70	-0.34	4.35±0.53	-0.34	4.21±0.65	-1.07
	Smartphone or tablet PC	34 (11.6)	4.17±0.77	(.737)	4.39±0.56	(.734)	4.34±0.63	(.286)
Need for online class	Need	255 (88.8)	4.17±0.70	2.39	4.38±0.53	1.98	4.27±0.64	3.07
	Not need	32 (11.2)	3.86±0.70	(.017)	4.18±0.51	(.048)	3.90±0.66	(.002)
Previous online class experience	Yes	149 (50.5)	4.14±0.66	0.03	4.36±0.54	0.03	4.22±0.66	0.33
	No	146 (49.5)	4.14±0.61	(.977)	4.36±0.53	(.978)	4.24±0.64	(.742)
Advantage	No space constraints	69 (23.5)	4.19±0.76	0.67	4.32±0.56	-0.63	4.28±0.61	0.80
	No time constraints	225 (76.5)	4.12±0.68	(.501)	4.37±0.52	(.526)	4.21±0.66	(.425)

[†]Scheffé test.

3. Study Variables according to the Delivery Format

The average direct facilitation was 4.08 points in the teaching presence of the subjects who participated in synchronous learning, which was significantly higher than the 3.88 points of those who participated in asynchronous learning (t=2.17, p=.030). The average emotional expression of the subjects who participated in synchronous learning was 3.20 points in the learning presence. This was significantly higher than the 2.94 points of asynchronous learners (t=2.01, p=.045, respectively). In terms of learning outcomes, learning satisfaction, and learning persistence were high in synchronous learning, and they were not statistically significant (Table 4).

4. Correlation between Teaching Presence, Learning Presence and Learning Outcomes

A significant positive correlation was present between teaching presence and learning presence (r=.74, p<.001). Teaching presence had a significant positive correlation with learning satisfaction (r=.66, p<.001), perceived achievement (r=.56, p<.001), and learning persistence (r=.60, p<.001). Learning presence had a significant positive correlation with learning satisfaction (r=.76, p<.001), perceived achievement (r=.64, p<.001), and learning persistence (r=.69, p<.001). There was also a significant positive correlation between each subdomain (Table 5).

DISCUSSION

As face-to-face learning is no longer possible due to the COVID-19 outbreak, attention is being given distance learning globally. In Korea, a lot of confusion existed at the beginning of the semester. Most universities nationwide planned to run distance learning programs for the first semester of 2020 [25]. This study was carried out after the lockdown of universities took place as an emergency response to the COVID-19 pandemic. It aims to improve the quality of distance learning by identifying the differences between teaching presence, learning presence, and learning outcomes according to the delivery format. In synchronous learning, teaching presence (especially direct facilitation) and learning presence (especially emotional expression) had a higher statistical significance compared to asynchronous learning. However, in the learning outcomes, no statistically significant difference was observed.

There was a significant positive correlation between teaching presence, learning presence, and learning outcomes, and there was also a significant positive correlation between each subdomain. This supports the meta-analysis results, demonstrating that the higher the learner's presence level, the more positive the effect was on learning satisfaction and academic achievement in digital learning environments [4,9]. The sense of presence in the distance learning environment had a positive effect on the learning outcomes. Based on this result, it can be suggested that learning outcomes can be improved if presence is improved in distance learning environments.

No statistically significant difference existed in the learning outcomes according to the delivery format (synchronous versus asynchronous learning). However, there was a statistically significant difference in the teaching presence and learning presence subdomains.

Table 4. Teaching Presence, Learning Presence, and Learning Outcome according to the Delivery Format (*N*=295)

Variables	Total	Synchronized learning	Asynchronized learning	t	*p*
	M±SD	M±SD	M±SD		
Teaching presence	4.19±0.60	4.26±0.56	4.16±0.62	1.31	.192
Instructional design and organization	4.45±0.58	4.44±0.57	4.45±0.58	-0.04	.969
Direct facilitation	3.94±0.74	4.08±0.64	3.88±0.77	2.17	.030
Learning presence	3.83±0.57	3.86±0.55	3.82±0.58	0.62	.535
Cognitive presence	4.12±0.56	4.13±0.54	4.12±0.58	0.16	.869
Emotional presence	3.44±0.74	3.51±0.73	3.42±0.74	0.96	.337
Emotional state recognition	4.06±0.71	4.06±0.71	4.06±0.72	0.08	.939
Emotional expression	3.02±1.02	3.20±0.97	2.94±1.03	2.01	.045
Emotional management	3.25±0.90	3.25±0.85	3.25±0.93	0.05	.956
Learning outcome					
Learning satisfaction	4.14±0.70	4.25±0.62	4.09±0.73	1.80	.072
Perceived achievement	4.36±0.53	4.32±0.50	4.37±0.54	-0.67	.503
Learning persistence	4.23±0.65	4.28±0.58	4.21±0.68	0.86	.390

Table 5. Correlation between Teaching Presence, Learning Presence, and Learning Outcomes (*N*=295)

Variable	1	1-1	1-2	2	2-1	2-2	3	4	5
	r (*p*)	r (*p*)	r (*p*)	r (*p*)	r (*p*)	r (*p*)	r (*p*)	r (*p*)	r (*p*)
1. Teaching presence	1.00	.88 (<.001)	.93 (<.001)	.74 (<.001)	.72 (<.001)	.61 (<.001)	.66 (<.001)	.56 (<.001)	.60 (<.001)
1-1. Instructional design and organization		1.00	.66 (<.001)	.63 (<.001)	.68 (<.001)	.45 (<.001)	.62 (<.001)	.53 (<.001)	.56 (<.001)
1-2. Direct facilitation			1.00	.71 (<.001)	.64 (<.001)	.64 (<.001)	.59 (<.001)	.50 (<.001)	.54 (<.001)
2. Learning presence				1.00	.90 (<.001)	.89 (<.001)	.76 (<.001)	.64 (<.001)	.69 (<.001)
2-1. Cognitive presence					1.00	.61 (<.001)	.78 (<.001)	.67 (<.001)	.72 (<.001)
2-2. Emotional presence						1.00	.58 (<.001)	.48 (<.001)	.52 (<.001)
3. Learning satisfaction							1.00	0.80 (<.001)	0.85 (<.001)
4. Learning achievement								1.00	0.78 (<.001)
5. Learning persistence									1.00

Based on the distance learning delivery format, the mean of teaching presence in synchronous learning was higher compared to asynchronous learning, but there was no statistically significant difference. In the subdomain of the teaching presence, a higher statistical significance was found for direct facilitation in synchronous learning. This is consistent with the results of the study, which mentioned that synchronous learning has the potential to facilitate learner-centered classes based on interactions [7]. In a study by Dzubinski [26], it was reported that feedback online and personal communication through e-mail, phone, and office visits improved the teaching presence in the asynchronous delivery format. This can be considered as an effective method for improving direct facilitation, which had lower statistical significance in this study for asynchronous learning.

The subdomains of instructional design and organization had higher statistical significance in asynchronous learning, but no statistically significant difference was observed. This is consistent with the results, which showed that the provision of asynchronous learning presented clear educational goals and increased the organic linkage between classes and the appropriate length of class [27].

In learning presence, the subdomain of emotional expression belonging to emotional presence had a higher statistical significance in synchronous learning. This re-

sulted because synchronous learning can allow students to express feelings and opinions. In a study of Chinese university students, Lin, and Gao [18] stated that interaction is often stimulated in synchronous learning, while students can learn at their own pace in asynchronous learning environments. Challenges are also perceived in both delivery formats, such as being distracted by classmates in synchronous learning or feeling socially isolated in asynchronous learning. Kang et al. [19] reported that enhancing emotional presence in distance learning may improve learner satisfaction. For online instructors, it is challenging to understand the affective experiences of online learners. Instructors provide detailed examples under each theme and pay attention to students' affective domain, particularly in asynchronous learning [28]. Meanwhile, the subdomain of cognitive presence was higher in synchronous learning, but no statistically significant difference existed.

Learning satisfaction belonging to learning outcomes was higher in synchronous learning, but no statistically significant difference existed. This made a difference, described by Cooke et al. [29], that showed learning satisfaction in synchronous learning (live lecture) to be overwhelmingly higher compared to asynchronous learning (optional lecture capture) in a study targeting nursing students. Although it is a slightly different point of view, differing study results were seen on learning satisfaction in distance

learning and campus-based learning. Additionally, Choi [26] reported that the evaluation of basic medical subjects conducted by distance learning for the 1st year medical students were better based on all scales, such as overall satisfaction, the organic linkage between classes, and appropriateness of class length, compared to the previous year of campus-based learning.

Among the learning outcomes, the only perceived achievement was higher in asynchronous learning, but no statistically significant difference was present. This supported the study's result that showed no difference in academic performance according to the delivery method in the Schoenfeld-Teacher and Dorman [17] study of veterinary college students.

Learning persistence was higher in synchronous learning, but there was no statistically significant difference. In a study focused on developing a tool to measure the continuity of online education for nursing students, Hart [30] found the following four constructs: connectedness, perceived stress and support, self-motivation, and goal attachment. It is thought that various approaches, including the results of this study, will be needed in future studies on learning continuity related to online nursing education.

The new normal era of post-coronavirus nursing education will combine distance learning and face-to-face learning, and synchronous learning and asynchronous will work harmoniously. At a time when the importance of distance learning is gaining more attention, this research is significant in that it has become a foundation for building a distance learning environment based on delivery format.

CONCLUSION

Distance learning is emerging due to the COVID-19 pandemic. In this study, we identified the presence and learning outcomes by dividing distance learning into synchronous and asynchronous learning. In asynchronous learning, teaching presence (especially direct facilitation) and learning presence (especially emotional expression) had a lower compared to synchronous learning. As the study results show, the difficulty in direct facilitation and emotional expression is a weakness of asynchronous learning. Therefore, it is necessary to add contact with nursing students and instructors and to help students express their emotions to improve presence in the asynchronous learning. It can be suggested that instructors and students can increase the presence via direct interaction, such as chatting and e-mail. There were significant positive correlations between teaching presence, learning presence, and learning outcomes. It can be suggested that learning out-

comes can be improved if presence is improved in the distance learning environment. In order to increase the presence, it is worth considering the use of a distance learning platform. In the future it is necessary to identify whether various communication channels, feedback, and real-time course status confirmation through the distance learning platform can enhance learning outcomes.

REFERENCES

1. Bainbridge WS. Berkshire encyclopedia of human-computer interaction. 1st ed. Great Barrington, MA U.S.A.: Berkshire Publishing Group; 2004. 520 p.

2. Han SL, Lee GY. Comparative analysis of instructors' perception of synchronous online classes: A case study of a university. Culture and Convergence. 2020;42(7):395-418. https://doi.org/10.33645/cnc.2020.07.42.7.395

3. Shahabadia MM, Uplaneb M. Synchronous and asynchronous e-learning styles and academic performance of e-learners. Procedia-Social and Behavioral Sciences. 2015;176(20):129-138. https://doi.org/10.1016/j.sbspro.2015.01.453

4. Kim JS, Kang MH. Structural relationship among teaching presence, learning presence, and effectiveness of e-learning in the corporate setting. Asian Journal of Education. 2010;11(2): 29-56. https://doi.org/10.15753/aje.2010.11.2.002

5. Witmer BG, Singer MJ. Measuring presence in virtual environments: A presence questionnaire. Presence: Teleoperators and Virtual Environments. 1998;7(3):225-240. https://doi.org/10.1162/105474698565686

6. Garrison DR, Anderson T, Archer W. Critical thinking, cognitive presence, and computer conferencing in distance education. American Journal of Distance Education. 2001;15(1):7-23. https://doi.org/10.1080/08923640109527071

7. Cha MJ. Investigation on how teacher and learner behaviors affect teaching presence in higher education e-learning [dissertation]. [Seoul]: Korea University; 2018. 135 p.

8. Kang MH, Jung JY, Park MS, Park HJ. Impact of learning presence on learner interaction and outcome in web-based project learning. Computer Supported Collaborative Learning Practices. 2009;2:62-64. https://doi.org/10.3115/1599503.1599524

9. Garrison DR, Arbaugh JB. Researching the community of inquiry framework: review, issues, and future directions. The Internet and Higher Education. 2007;10(3):157-172. https://doi.org/10.1016/j.iheduc.2007.04.001

10. Astin AW. Assessment for excellence: the philosophy and practice of assessment and evaluation in higher education. 2nd ed. New York: American Council on Education and Macmillan Publishing Company; 2012. 367 p.

11. Kim NY, Joo YJ. The structural relationship among learner mo-

tivation, program, organizational support, interaction, flow and learning outcome in cyber education. Journal of Education Technology. 2010;26(2):53-82.
https://doi.org/10.17232/KSET.26.2.53

12. Tan JA, Hal RJ, Boyce C. The role of employee reactions in predicting training effectiveness. Human Resource Development Quarterly. 2003;14(4):397-411.
https://doi.org/10.1002/hrdq.1076

13. Chung JS, Lim KY. Effect analysis of factors related to the leaner participation, achievement, and satisfaction in the web-based online discussion. Journal of Education Technology. 2000;16(2):107-135.

14. Muller T. Persistence of woman in online degree-completion programs. The International Review of Research in Open and Distributed Learning. 2008;9(2):1-18.
https://doi.org/10.19173/irrodl.v9i2.455

15. Agudo-Peregrina AF, Iglesias-Pradas S, Conde-Gonzalez MA, Hernandez-Garcia A. Can we predict success from log data in VLEs? Classification of interactions for learning analytics and their relations with performance in VLE-supported F2F and online learning. Computers in Human Behavior. 2014;31:542-550. https://doi.org/10.1016/j.chb.2013.05.031

16. Martinez M. High attrition rates in e-Learning: Challenges, predictors, and solutions. The E-Learning Developers' Journal. 2003;14:1-9.

17. Schoenfeld-Tacher RM, Dorman DC. Effect of delivery format on student outcomes and perceptions of a veterinary medicine course: Synchronous versus asynchronous learning. Veterinary Sciences. 2021;8(2):13.
https://doi.org/10.3390/vetsci8020013

18. Lin Xi, Gao Li. Students' sense of community and perspectives of taking synchronous and asynchronous online courses. Asian Journal of Distance Education. 2020;15(1):169-179.
https://doi.org/10.5281/zenodo.3881614

19. Kang MH, Kim NY, Kim MJ, Kim JY, Lim HJ. A structural relationship among teaching presence, learning presence, and learning outcomes of e-learning in cyber university. Journal of Korean Association for Educational Information and Media. 2011;17(2):153-176.

20. Swan K, Richardson JC, Ice P, Garrison DR, Cleveland-Innes M, Arbaugh JB. Validating a measurement tool of presence in online communities of inquiry. E-mentor. 2008;2(24):1-12.

21. Kang MH, Kim JS, Park MS. Investigating presence as a pre-

dictor of learning outcomes in e-Learning environments [Internet]. Vienna: Association for the Advancement of Computing in Education, c2008 [cited 2022 March 1]. Available from:
https://www.learntechlib.org/primary/p/28965/

22. Shin NM. Transactional presence as a critical predictor of success in distance learning. Distance Education. 2003;24(1):69-86.
https://doi.org/10.1080/01587910303048

23. Gu H. Examination on difference in cognitive presence, achievement and learning satisfaction depending on tutor delivery modes in online lectures [master's thesis]. [Seoul]: Ewha Womans University; 2006. 114 p.

24. Park HJ, Yu BM. An analysis of the structural relationships among learning presence, learning flow, learning satisfaction, and learning persistence with the use of SNS in university classes. Journal of Korean Association for Educational Information and Media. 2014;20(4):649-674.
https://doi.org/10.15833/KAFEIAM.20.4.649

25. Han SL, Nam YO. Faculty competency factor needs analysis to improve the quality of online classes for higher education. The Journal of Learner-Centered Curriculum and Instruction. 2020;20(13):1129-1149.
https://doi.org/10.22251/jlcci.2020.20.13.1129

26. Dzubinski LM. Teaching presence: Co-creating a multi-national online learning community in an asynchronous classroom. Journal of Asynchronous Learning Networks. 2014;18(2):150-154. https://doi.org/10.24059/olj.v18i2.412

27. Choi KS. What is the evaluation of Seoul medical students and professors who are satisfied with non-face-to-face classes? Youth doctor. 2020 July 2; Sect. 01.
https://www.docdocdoc.co.kr/news/articleView.html?idxno=2000540

28. Reilly JR, Gallagher-Lepak S, Killion C. "Me and My Computer": Emotional factors in online learning. Nursing Education Perspectives. 2012;33(2):100-105.
https://doi.org/10.5480/1536-5026-33.2.100

29. Cooke M, Watson B, Blacklock E, Mansah M, Howard M, Johnston A, et al. Lecture capture: First year student nurses' experiences of a web-based lecture technology. Australian Journal of Advanced Nursing. 2012;29(3):14-21.

30. Hart C. Development of a persistence scale for online education in nursing. Nursing Education Perspectives. 2014;35(3):150-156. https://doi.org/10.5480/12-993.1