

A Study on the Relationship Analysis between Online Self-regulated Learning (OSRL), Satisfaction, and Continuous Participation Intention of Online Courses in University

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The purpose of this study is to explore the structural relationship between COVID-19-induced sub-dimensions of Online Self-Regulated Learning (OSRL) and satisfaction in online courses conducted in the 'post-COVID-19 era,' as well as to investigate the moderating effects of situational variables such as 'course planning,' 'device type,' and 'course repetition.' To achieve this, the study constructs a measurement model with sub-dimensions of Environment Structuring, Learning Strategy, Help Seeking, and Self-Evaluation as components of OSRL. Participants in this study were selected from university students who enrolled in online courses offered by the Department of Education at University A in the metropolitan area. The research findings reveal several key insights. First, among the sub-dimensions of Online Self-Regulated Learning, Environment Structuring, Learning Strategy, and Self-Evaluation significantly influence satisfaction with online courses. Second, students' satisfaction with online courses significantly influences their intention to continue participating in such courses. Third, 'course planning' during online course hours and 'course repetition' play a moderating role in the relationship between sub-dimensions of Online Self-Regulated Learning and satisfaction. Based on the discussion of these research results, this study concludes by suggesting some future implications and challenges of online courses.

Keywords : Online Courses, Social media, Online Self-regulated Learning (OSRL), Satisfaction, Continuous Participation Intention

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Introduction

Owing to the impact of COVID-19, online courses at universities have seen a rapid increase. However, online education in the post-COVID-19 era has taken on a different form than before. Prior to COVID-19, online education was mainly used to supplement or partially replace traditional offline education, such as e-learning, blended learning, or flipped learning (Lee et al., 2020). However, due to the influence of the COVID-19 pandemic, online courses at universities has become widespread, and restrictions on the creation of online courses have been lifted (Korean Ministry of Education [MoE], 2021).

Nevertheless, online courses implemented extensively during the COVID-19 period have led to low satisfaction among learners due to inadequate course design, content, learner engagement, slow response to questions and inquiries, and a lack of communication (Jeong et al., 2020; Kim et al., 2021). Additionally, learner satisfaction has further decreased due to issues related to the quality of online courses, limited interaction, and system problems (Kim et al., 2021; Park & Heo, 2020). Of course, the low satisfaction with online courses can be considered an *unavoidable reality* resulting from the rapid transition from traditional offline classes to online classes within a short period due to COVID-19. Studies conducted after COVID-19 have primarily focused on the causes of low satisfaction with online courses, including the quality of online courses, the system, inadequate course design and teaching activities, or insufficient instructor competencies (Jeong et al., 2020; Ju, 2020; Kim et al., 2021; Park & Heo, 2020).

However, the quality of online courses, the system, and related teaching activities are considered major factors influencing satisfaction with online courses (Jeong, 2022). Furthermore, satisfaction, which is based on customer satisfaction theory (Cardozo, 1965), is a subjective perception closely related to individual physical and emotional situations. Therefore, concerning online courses, learner satisfaction is

closely related to learners' *online self-regulation skills* where learners establish their own learning strategies, evaluate their performance, create an optimal learning environment, and seek help when needed (Song & Kim, 2021; Wang et al., 2013).

In particular, for online courses conducted at universities, the same course content is provided to all students. However, learners' learning environments and strategies for online courses are not uniform. Therefore, learner satisfaction with online courses may vary depending on the learner's self-regulation skills. For instance, previous research has demonstrated a strong association between satisfaction with online courses and learners' online self-regulation skills (Joo & Eun, 2017). This suggests that learner satisfaction with online courses is influenced by learners' ability to regulate their own learning effectively.

However, previous research tended to focus on self-regulation skills as one of several sub-variables among various factors, rather than giving it central importance. For example, a prior study exploring the close relationship between satisfaction with online courses and learners' online self-regulation skills (Joo & Eun, 2017) primarily examined time management as one of the sub-variables and did not delve deeper into self-regulation skills.

Yet, recent research on satisfaction with online courses conducted after COVID-19 (Zhou et al., 2021) indicates a trend towards exploring the impact of online self-regulation skills on satisfaction. Given this trend, it is essential to study the relationship between learner satisfaction with online courses and their online self-regulation skills, rather than solely focusing on the quality of online course content. Thus, this study, based on relevant prior research, examined satisfaction with online courses offered by universities, focusing on the sub-variables of Online Self-Regulated Learning (OSRL). In particular, this study investigated the moderating effects of individual learner situational factors that influence the relationship between OSRL sub-variables and satisfaction.

Research questions

The research questions formulated for this study are as follows:

1. Do Environment Structuring, Learning Strategy, Help Seeking, and Self Evaluation, as practiced by learners participating in online courses offered by universities, significantly influence Satisfaction?
2. Does satisfaction with online courses significantly influence Continuous Participation Intention?
3. Are there moderating effects of ‘course attendance planning,’ ‘device type,’ and ‘repeat attendance’?
 - 3-1. Does ‘course attendance planning’ moderate the influence of Environment Structuring, Learning Strategy, Help Seeking, and Self Evaluation on Satisfaction?
 - 3-2. Does ‘device type’ moderate the influence of Environment Structuring, Learning Strategy, Help Seeking, and Self Evaluation on Satisfaction?
 - 3-3. Does ‘repeat attendance’ moderate the influence of Environment Structuring, Learning Strategy, Help Seeking, and Self Evaluation on Satisfaction?

Literature Review

COVID-19 and Online Courses in Korean Universities

COVID-19 pandemic-induced rapid changes in higher education had both negative and positive impacts on online education.

First, the shift to online learning due to COVID-19 has led to negative perceptions of online education. Despite the widespread adoption of online education during COVID-19, there was a tendency to focus more on simply converting offline courses into online formats rather than effective online course design (Kim et al., 2021). Both instructors and learners tended to view online courses as supplementary activities to

traditional offline courses (Jeong et al., 2020). Consequently, the widespread implementation of online education in universities raised concerns about a decline in the quality of higher education. Thus, while COVID-19 resulted in a quantitative increase in online courses, it also highlighted issues related to their low quality.

Second, the rapid transition to online learning prompted by the COVID-19 pandemic offered both positive opportunities and challenges in higher education. Despite concerns about the quality of online education and disparities in digital access, this transition positively impacted the flexibility and accessibility of educational methods (Hodges et al., 2020; Li & Lalani, 2020). Educational institutions also had the opportunity to explore innovative educational approaches such as asynchronous learning, personalized content delivery, and the use of new technological tools to enhance student engagement (Mahajan et al., 2023). Consequently, the surge in online courses due to the pandemic encouraged educators to use technology to enhance participation and collaboration in virtual classrooms, fostering educational innovation (Kim, 2021).

Given this context, it is meaningful to conduct research that explores the factors affecting learner satisfaction with online courses offered by universities.

Online Self-Regulated Learning

Online self-regulated learning (OSRL) refers to learners actively participating in learning activities and processes with the use of metacognition, motivation, and behavioral strategies to achieve specific learning goals (Zimmerman, 1989). Self-regulation in online learning, including aspects such as learning location, time management, and information retrieval, is considered crucial (Cunningham & Billingsley, 2003). However, previous research on the relative importance of OSRL strategies in online courses at universities has yielded inconsistent results (Zhou et al., 2021). Furthermore, there is a scarcity of research in the domestic context focusing on the subvariables of SRL in the context of university-level online courses.

To address these gaps, the current study first examined university-level online courses conducted after COVID-19 with a focus on OSRL. Drawing from prior research that explored university-level online courses with a focus on OSRL (Zhou et al., 2021), we identified four subvariables of OSRL. However, relying solely on the aforementioned prior research had its limitations. Hence, this study referred to existing relevant research (Barnard et al., 2009; Kramarski & Gutman, 2006; Kramarski & Mizrachi, 2006; Lan, 1996; McManus, 2000; Pintrich et al., 1993; Schunk, 2001; Steffens, 2006) that explored self-regulated learning in online contexts.

Based on the review of prior research, we derived four subvariables of OSRL in this study: *Environment Structuring*, *Learning Strategies*, *Help Seeking*, and *Self-Evaluation*. First, *Environment Structuring* in this study refers to the extent to which learners secure a conducive learning environment and examine their surroundings to effectively complete online courses. Second, *Learning Strategies* signify the establishment of strategies for effective participation in online courses, based on the importance, urgency, ease, and efficiency of course content. Third, *Help Seeking* entails proactive interaction with peers, sharing online issues, and maintaining continuous communication with instructors to enhance learning. Fourth, *Self-Evaluation* represents the degree to which learners self-assess what they have learned in online courses and engage in self-evaluation activities to identify and address areas of weakness or insufficiency.

Thus, the current study set *environment structuring*, *learning strategy*, *help seeking*, and *self-evaluation* as subvariables of OSRL and investigated their structural relationships with *satisfaction* and *continuous participation intention*.

Satisfaction

In general, satisfaction is grounded in the customer satisfaction Theory established by Cardozo (1965). In this context, satisfaction entails an individual's cognitive and affective evaluation triggered by the product or service acquired through financial

transactions (Ha & Jang, 2010). Furthermore, satisfaction denotes the subjective perception or assessment of the degree of personal contentment or fulfillment of one's needs (Tse & Wilton, 1998). Consequently, individuals who experience satisfaction through the attainment of their expectations or outcomes (Oliver & Swan, 1989) are inclined to sustain the use of specific goods or services, even with additional costs factored in (Huber et al., 2000).

This subjective characteristic of satisfaction manifests analogously in educational endeavors, such as online courses. However, in university-conducted online courses, as exemplified in this study, the uniform provision of content, assignments, and relevant materials is juxtaposed with heterogeneous learning environments and strategies among learners. As a result, satisfaction with online courses may fluctuate contingent on an individual's capacity for autonomous regulation. Within the context of online courses executed during the COVID-19 pandemic, Zhou et al.'s (2021) investigation explored the structural interplay between variables impacting satisfaction, demonstrating that satisfaction is subject to influence by variables related to online self-regulated learning.

Hence, satisfaction in the realm of learning activities through online courses intimately intertwines with a learner's online self-regulated learning. Accordingly, building upon Zhou et al.'s (2021) research, this study endeavors to scrutinize the nexus between learner-oriented satisfaction with online courses and the sub-variables of online self-regulated learning.

Measurement Model and Hypotheses

Measurement Model

We constructed the measurement model based on Barnard et al.'s (2009) research, which provided a scale for measuring OSRL sub-variables in online courses, Zhou et

al.'s (2021) research, which explored the structural relationships between OSRL sub-variables and satisfaction and Ye et al.'s (2023) research, which investigated the relationship between satisfaction and continuous participation intention in the post-COVID-19 era. Additionally, we explored moderating effects by considering three types of situational variables in the relationships between OSRL sub-variables and satisfaction. The measurement model established in this study is depicted in Figure 1.

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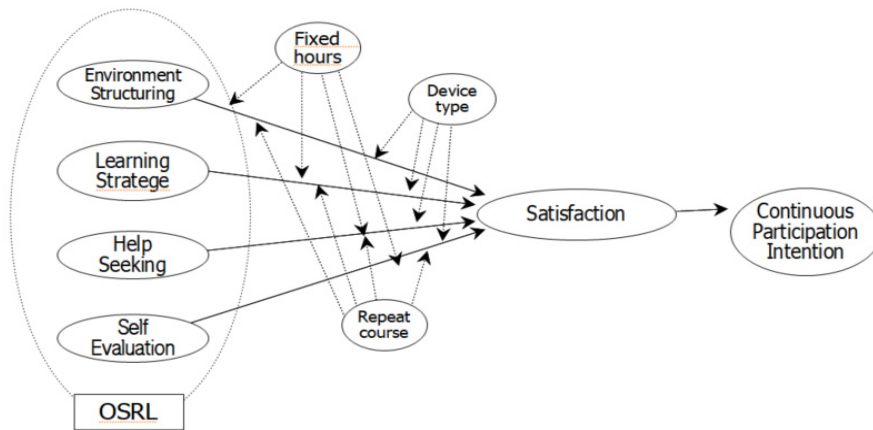


Figure 1. Measurement model

Measurement hypothesis

According to previous relevant studies (Kramarski & Gutman, 2006; Kramarski & Mizrachi, 2006; Lan, 1996; Orange, 1999), self-regulated learning has been shown to have a positive impact on academic achievement in various classroom environments. However, the application of self-regulated learning can vary depending on the learner's environment and context. In particular, Zimmerman (2008) emphasized the applicability of self-regulated learning in various learning environments, including online, face-to-face, and blended learning. Nevertheless, questions have been raised about whether self-regulated learning has the same impact in contexts where learners

manage their time and space, such as online learning. Despite this, if self-regulated learning plays an important role in offline learning, it may have an even greater impact in online learning, where internal control is crucial.

However, in online learning environments characterized by interactions between learners and instructors, self-monitoring, questioning of unknown content, and cognitive activities on various devices, OSRL has been identified as a key factor influencing learners' achievement of learning goals (Steffens, 2006). For example, a study by Lee et al. (2021) conducted in the online learning environment of Korean universities found that time management positively influences academic achievement. Additionally, Zhou et al. (2021) emphasized the importance of online self-regulated learning by investigating the relationship between subvariables of online self-regulated learning, perceived relevance, and academic achievement in university online courses. Through this, they could examine that the subvariables of OSRL are significant factors in determining the outcomes and sustainability of online learning.

The relationship between the subvariables of OSRL as defined in the current study and satisfaction, as well as continuous participation intention, can be partially explored through previous researches. Previous studies have empirically confirmed that the subvariables of OSRL influence satisfaction with online courses (Hamdan et al., 2021; Zhou et al., 2021) and simultaneously impact learners' continuous participation intention in online courses (Chiu et al., 2005; Ye et al., 2023). Furthermore, when expanding the scope to higher education, there is a tendency to consider satisfaction as a mediating variable rather than the final outcome in studies related to higher education. For instance, the influence of satisfaction on performance (Hoegl & Gemünden, 2001) and the close relationship between satisfaction and performance (Alshare et al., 2005) can be confirmed. Thus, satisfaction with online courses is regarded as a significant variable influenced by the subvariables of OSRL and as a key variable in determining continuous participation intention. Considering these realities, in the context of COVID-19 and the widespread adoption of online courses in higher education, exploring the

Table 1
Research hypothesis

Hypothesis	Hypothesis details	References
H1	Environment Structuring will have a positive and static impact on learners' Satisfaction with online courses.	
H2	Learning Strategy will have a positive and static impact on learners' Satisfaction with online courses.	Hamdan et al.(2021) Puzziferro(2008) Song & Kim(2020)
H3	Help Seeking will have a positive and static impact on learners' Satisfaction with online courses.	Wang et al.(2013) Zhou et al.(2021)
H4	Self-Evaluation will have a positive and static impact on learners' Satisfaction with online courses.	
H5	Learners' Satisfaction with online courses will have a positive and static impact on their Continuous Participation Intention.	Ajzen(1991) Chiu et al.(2005) Hayashi et al.(2004) Lee(2010) Taylor & Todd(1995) Smarkola(2008) Ye et al.(2023)
Adjustment effect 1	The planning of study time when taking online courses will moderate the relationship between OSRL sub-constructs and learners' Satisfaction with online courses.	Joo & Eun(2017) Kwon(2009) Lee et al. (2021)
Adjustment effect 2	The type of device used when taking online courses will moderate the relationship between OSRL sub-constructs and learners' Satisfaction with online courses.	Han et al.(2015)
Adjustment effect 3	The recurrence of taking online courses will moderate the relationship between OSRL sub-constructs and learners' Satisfaction with online courses.	Sung & Kwon(2021)

relationship between OSRL-related variables and satisfaction with online courses and the impact of satisfaction on continuous participation intention is meaningful. Accordingly, we structurally analyzed the relationships between the OSRL subvariables. Based on these previous studies, the current study has formulated

research questions and research hypotheses.

Method

Participants

In this study, a convenience sampling method was employed to select prospective teachers who participated in online courses offered by the Department of Education at University A located in the metropolitan area. The specific process for selecting the study participants is described as follows:

First, to minimize the potential influence of participants' major fields of study, the selection of research participants primarily focused on undergraduate and graduate students majoring in the same academic discipline. Second, to gain a clear understanding of the perceptions of learners who completed a four-term online course after the conclusion of COVID-19, participants who had successfully completed all four terms of the online course offered by the university were chosen as the research subjects. Third, to ensure the sincerity of responses to the survey questions, an online survey was designed such that participants had to complete all items sequentially, one by one, before submitting their responses.

Through the aforementioned sampling process, a final sample of 193 participants (141 females and 52 males) was ultimately selected as the study's research subjects.

Research Instruments

In this research, we endeavored to develop a research instrument tailored to the requirements of this study through a series of sequential steps.

Table 2
Demographic Characteristics of Study Participants

	Division	Frequency (count)	Percentage (%)
Gender	Female	141	73.1
	Male	52	26.9
Affiliation	College of Education	154	79.8
	Graduate School of Education	39	21.2
Age group	21years and younger	56	29.0
	22-24	71	36.8
	25-29	29	15.0
	30years and older	37	19.2
Major	Christian Education	34	17.6
	English Education	27	14.0
	History Education	33	17.1
	Early Childhood Education	99	51.3
Planned course attendance time	Attend primarily during scheduled times	81	42.0
	Attend without specific plans, based on availability	112	58.0
Type of device	Fixed type (desktop, laptop, etc.)	139	72.0
	Mobile type (smartphone, tablet, etc.)	54	28.0
Repetition of online course learning	Attend only once without repetition	102	52.8
	Repeat some content two or more times	91	47.2
Total		193	100.00

First, we organized the survey items from previous foreign studies by construct and made some modifications to adapt certain language to the Korean university context. Second, we received input on the validity of the items from two professors who have experience teaching online courses in Korean universities after the onset of COVID-19 (2020-2023). Based on their feedback, we made some modifications to the items. Third, we requested feedback from three university students who have

taken online courses, aiming to ensure that the wording and comprehensibility of the items were suitable for university students. We made additional revisions and improvements to the wording of the items based on their feedback.

The research instrument in this study uses a 5-point scale, and the results of the Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity were .914 and 6606.197 ($p=.000$), respectively. The detailed content and items of the research instrument by construct are as follows.

Online Self-Regulated Learning Constructs. We based our survey items for four constructs related to students' online self-regulated learning, namely environment structuring, learning strategy, help seeking, and self-evaluation, on Barnard et al.'s (2009) study. The items presented in Barnard et al.'s (2009) study were adapted and refined to fit the context of COVID-19-induced online courses experienced by university students. These items were also utilized in similar studies conducted by Zhou et al. (2021) in a Chinese university and Jeong (2022) in a Korean university. Thus, we modified and improved the items from Barnard et al.'s (2009) study to align with the context of our study.

Environment Structuring: For this construct, we formulated items such as “I am aware of the most efficient place to study for online courses”. This construct yielded a reliability coefficient (Cronbach's α) of .971.

Learning Strategy: To explore learning strategies, we composed items like “I record or summarize the main content covered in online courses”. The reliability coefficient for this construct was .969.

Help Seeking: Items for this construct included statements like “I seek help from relevant individuals when I need assistance with online course content”. The reliability coefficient for this construct was .949.

Self-Evaluation: For self-evaluation, items such as “I communicate with peers to identify differences between what I have learned and what my peers have learned”. This construct yielded a reliability coefficient of .941.

Satisfaction Constructs. To measure participants' satisfaction with the online courses, we referred to items from the previous study conducted by Shin and Chan (2004). However, the items used in that study may not fully align with the perception of students who experienced online courses during the post-COVID-19 era. Therefore, we referred to items from related studies that explored learner perceptions of online courses during the COVID-19 pandemic, such as Jeong (2022) and Zhou et al. (2021), to modify and enhance the items. The satisfaction measurement instrument consisted of four items, such as "I am satisfied with the content level of online courses offered after the end of COVID-19". The reliability coefficient for this construct was .971.

Continuous Participation Intention Constructs. For measuring participants' intention to continue using online courses, we referred to items from the previous study conducted by Alabdullatif and Velázquez-Iturbide (2020). However, those items may not fully reflect the situation of online courses during the post-COVID-19 era. To address this, we referred to a relevant study that considered the post-COVID-19 online course context, as done by Madani et al. (2023), to modify and enhance the items. The intention to continue using measurement instrument comprised four items, such as "Even though COVID-19 has ended, I will continue to take online courses offered by the university". The reliability coefficient for this construct was .976.

Data Analysis

In this study, we explored the normality of the measurement model through univariate normality analysis and verified the structural relationships between

variables using AMOS. Furthermore, in this study, to analyze the moderating effects of *planned course attendance time, device type, repetition of online course learning* on the causal relationships between the four variables constituting online self-regulated learning and satisfaction, we established both a free model and a constrained model to examine the moderating effects of situational variables.

Results

Validation of Measurement Model

Normality Verification. Through multivariate stationarity analysis, we explored the normality of the measurement model established in this study. Additionally, in this research, we confirmed the normality of the model based on the widely applied criteria for skewness absolute values less than 3 and kurtosis absolute values less than 8 (Kline, 2005). Analyzing the results, the range of skewness absolute values in this study ranged from a minimum of .859 to a maximum of 2.158. Based on these kurtosis values, it was determined that all variables in this measurement model met the assumption of normal distribution. The normality of the model was thus established.

Reliability and Validity Verification of the Measurement Model. First, the reliability of the measurement model was verified through the analysis of reliability coefficients for internal consistency. *Cronbach's a* analysis indicated that the reliability coefficients of all items ranged from a minimum of 0.941 to a maximum of 0.976, demonstrating an appropriate level of reliability. Second, the validity of the measurement model was verified based on convergent validity and discriminant validity. The analysis of convergent validity, using Composite Reliability and Average Variance Extracted (AVE), revealed that the composite reliabilities exceeded 0.70

Table 3
Participants Results of Inter-Variable Correlations, Skewness, and Kurtosis Analysis for Measurement Variables

	ES1	ES2	ES3	ES4	LS1	LS2	LS3	LS4	HS1	HS2	HS3	HS4	SE1	SE2	SE3	SE4	ST1	ST2	ST3	ST4	CP11	CP12	CP13	CP14	
ES1	-.886**																								
ES2	.066*	-.878**																							
ES3	.066*	.076**	-.886**																						
ES4	.019*	.009*	.009*	-.892**																					
LS1	.505*	.430*	.450**	.400*	-.898**																				
LS2	.474**	.421**	.418**	.438**	.900**	-.898**																			
LS3	.564**	.454**	.478**	.403**	.900**	.956**	-.898**																		
LS4	.547**	.443**	.481**	.496**	.948**	.956**	.962**	-.898**																	
HS1	.503**	.503**	.503**	.503**	.408**	.416**	.432**	.423**	-.898**																
HS2	.505**	.532**	.554**	.542**	.398**	.399**	.409**	.399**	.821**	-.898**															
HS3	.502**	.503**	.524**	.503**	.371**	.348**	.375**	.362**	.782**	.777**	-.898**														
HS4	.519**	.557**	.547**	.559**	.396**	.393**	.422**	.410**	.946**	.883**	.814**	-.898**													
SE1	.519**	.489**	.502**	.492**	.404**	.481**	.489**	.496**	.477**	.456**	.476**	-.898**													
SE2	.522**	.496**	.496**	.502**	.399**	.396**	.396**	.417**	.481**	.480**	.509**	.783**	-.898**												
SE3	.585**	.509**	.536**	.534**	.461**	.401**	.450**	.474**	.491**	.468**	.472**	.468**	.749**	-.898**											
SE4	.509**	.492**	.495**	.507**	.472**	.421**	.478**	.493**	.483**	.439**	.467**	.455**	.949**	.781**	-.898**										
ST1	.575**	.469**	.507**	.527**	.578**	.536**	.578**	.576**	.466**	.434**	.433**	.448**	.448**	.507**	.479**	-.898**									
ST2	.541**	.437**	.479**	.499**	.510**	.530**	.570**	.568**	.478**	.421**	.388**	.443**	.471**	.440**	.409**	.504**	.910**	-.898**							
ST3	.562**	.490**	.530**	.525**	.509**	.517**	.590**	.602**	.479**	.445**	.419**	.472**	.527**	.467**	.517**	.499**	.099**	.062**	-.898**						
ST4	.561**	.470**	.510**	.514**	.504**	.511**	.576**	.592**	.456**	.431**	.360**	.444**	.487**	.460**	.474**	.494**	.000**	.002**	.065**	-.898**					
CP11	.524**	.450**	.482**	.505**	.518**	.515**	.530**	.540**	.501**	.462**	.472**	.464**	.470**	.411**	.440**	.481**	.574**	.500**	.623**	.632**	-.898**				
CP12	.407**	.434**	.440**	.478**	.505**	.503**	.483**	.484**	.477**	.460**	.446**	.452**	.522**	.394**	.471**	.440**	.566**	.556**	.619**	.604**	.676**	-.898**			
CP13	.534**	.460**	.478**	.507**	.505**	.524**	.521**	.534**	.489**	.459**	.473**	.450**	.491**	.396**	.464**	.478**	.572**	.577**	.623**	.622**	.941**	.903**	-.898**		
CP14	.473**	.407**	.451**	.467**	.549**	.523**	.507**	.545**	.474**	.442**	.441**	.439**	.474**	.407**	.468**	.477**	.530**	.534**	.608**	.608**	.981**	.900**	.912**	-.898**	
M	4.01	4.34	4.38	4.38	4.70	4.75	4.74	4.73	4.12	4.01	3.92	3.97	4.03	4.38	4.38	4.35	4.70	4.71	4.30	4.32	4.47	4.51	4.45	4.47	
Std	.605	.609	.604	.606	.606	.606	.606	.606	.606	.606	.606	.606	.606	.606	.606	.606	.606	.606	.606	.606	.606	.606	.606	.606	
Skew	-1.878	-1.762	-1.931	-1.823	-1.423	-1.423	-1.423	-1.423	-1.423	-1.423	-1.423	-1.423	-1.423	-1.423	-1.423	-1.423	-1.423	-1.423	-1.423	-1.423	-1.423	-1.423	-1.423	-1.423	
Kurt	4.132	3.288	3.865	3.904	1.701	1.940	1.395	1.751	.726	.251	-.156	.014	3.566	2.790	2.793	2.346	1.351	1.286	2.569	2.360	4.271	5.334	3.488	4.104	

ES(Environment Structuring), LS(Learning Strategy), HS(Help Seeking), SE(Self Evaluation), ST(Satisfaction), CP(Continuous Participation Intention)

* $p < .05$, ** $p < .01$

Table 4
Reliability and concentrated validity analysis results

Variable	Item	Factor Loading (λ) (>.70)	Reliability (λ^2) (>.50)	Composite Reliability (>.70)	AVE (>.50)	Cronbach's α
Environment Structuring (ES)	ES1	.827	0.684	.905	.704	.971
	ES2	.839	0.704			
	ES3	.848	0.719			
	ES4	.841	0.707			
Learning Strategy (LS)	LS1	.856	0.733	.915	.730	.969
	LS2	.865	0.748			
	LS3	.858	0.736			
	LS4	.839	0.704			
Help Seeking (HS)	HS1	.820	0.672	.902	.698	.949
	HS2	.846	0.716			
	HS3	.814	0.663			
	HS4	.861	0.741			
Self Evaluation (SE)	SE1	.837	0.701	.891	.671	.941
	SE2	.791	0.626			
	SE3	.816	0.666			
	SE4	.832	0.692			
Satisfaction (ST)	ST1	.811	0.658	.893	.675	.971
	ST2	.833	0.694			
	ST3	.811	0.658			
	ST4	.831	0.691			
Continuous Participation Intention (CPI)	CPI1	.844	0.712	.910	.717	.976
	CPI2	.838	0.702			
	CPI3	.852	0.726			
	CPI4	.854	0.729			

and the AVE values exceeded 0.05, both surpassing the criteria established by Fornell and Larcker (1981). Third, the analysis of discriminant validity, based on the

comparison between the square roots of AVE and inter-variable correlation coefficients (Anderson & Gerbing, 1988), showed that the square roots of AVE for all measurement variables exceeded their respective correlation coefficients. This confirmed the reliability and validity of the measurement model.

Table 5
Discriminant Validity

Variable	AVE	EC	LS	HS	SE	ST	CPI
EC	.704	<i>.839</i>					
LS	.730	.517**	<i>.854</i>				
HS	.698	.593**	.446**	<i>.835</i>			
SE	.671	.574**	.504**	.554**	<i>.819</i>		
ST	.675	.558**	.605**	.490**	.545**	<i>.821</i>	
CPI	.717	.512**	.566**	.514**	.510**	.643**	<i>.847</i>

ES(Environment Structuring), LS(Learning Strategy), HS(Help Seeking), SE(Self Evaluation),

ST(Satisfaction), CPI(Continuous Participation Intention)

* $p < .05$, ** $p < .01$, *** $p < .001$, The values indicated in italics are the square roots of AVE.

Fit Assessment of the Measurement Model. To verify the fit of the measurement model, we conducted an analysis of representative indices such as χ^2/df , NFI, IFI, TLI, CFI, and RMSEA (Doll et al., 1994). The analysis results yielded the following values: $\chi^2/df=2.394$, NFI=0.917, IFI=0.950, TLI=0.942, CFI=0.949, and RMSEA=0.085. Based on these verification results, we were able to confirm the adequacy of the model fit.

Validation of Research Hypotheses

The results of hypothesis testing indicate that out of the five hypotheses proposed in this study, four were accepted, and one was rejected. The specific findings for each

hypothesis are as follows. First, when analyzing the variables that significantly influence satisfaction, it was found that environment structuring, learning strategies, and self-evaluation had statistically significant positive effects. Specifically, environment structuring ($\beta=0.202, p<0.01$), learning strategies ($\beta=0.365, p<0.001$), and self-evaluation ($\beta=0.193, p<0.05$) were found to have a significant positive impact on satisfaction. However, help seeking did not have a statistically significant impact on satisfaction. Consequently, hypotheses H1, H2, and H4 were accepted, while H3 was rejected. Second, when examining the relationship between continuous participation intention and satisfaction, it was observed that satisfaction significantly influences continuous participation intention. Satisfaction ($\beta=0.670, p<0.001$) was found to have a statistically significant positive effect on continuous participation intention. Thus, hypothesis H5 was accepted.

Table 6
Results of Hypothesis Testing

Path				Estimate		S.E.	t-value	p	Results
				Unstandardized	Standardized				
H1	ST	←	ES	.241	.202	.091	2.640	.008	○
H2	ST	←	LS	.376	.365	.070	5.390	***	○
H3	ST	←	HS	.101	.107	.069	1.463	.144	×
H4	ST	←	SE	.251	.193	.097	2.580	.010	○
H5	CPI	←	ST	.502	.670	.045	11.068	***	○

ES(Environment Structuring), LS(Learning Strategy), HS(Help Seeking), SE(Self Evaluation), ST(Satisfaction), CPI(Continuous Participation Intention)

* $p<.05$, ** $p<.01$, *** $p<.001$

Furthermore, the path analysis and standardized coefficient results in the model are presented in Figure 2.

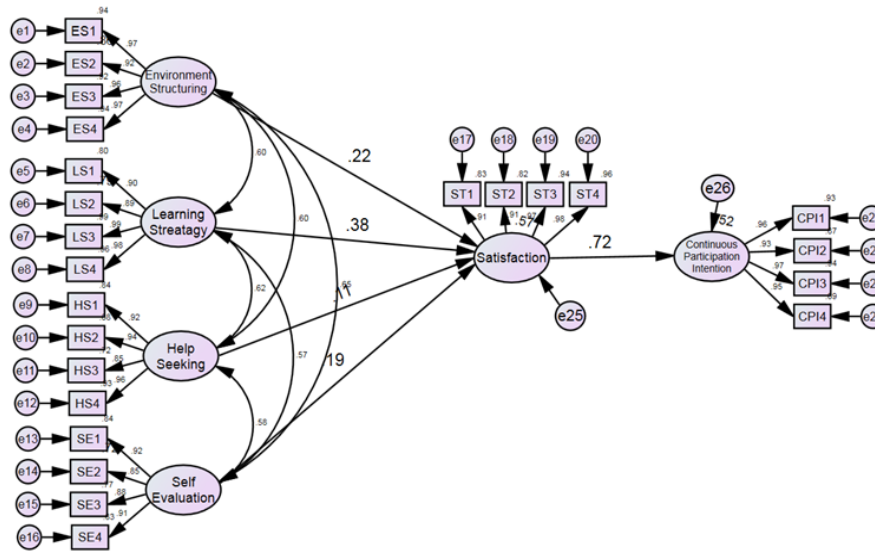


Figure 2. The path analysis results and standardized coefficients of the model

Verification of Moderation Effects

Plannedness of Online Course Study Time (Planned vs. Unplanned). The analysis of fitness based on the plannedness of study time for online courses, with the constraint model assuming that all path coefficients are equal and the unconstrained model, showed a difference in degrees of freedom of 4 and a change in the χ^2 value of 11.187. Furthermore, the difference in p-values between the constrained

Table 7
Comparison of Fit Indices Based on the Planned Timing of Online Course Attendance

	<i>df</i>	χ^2	χ^2 / df	NFI	IFI	TLI	CFI	RMSEA
Free Model	166	1081.691	2.244	.854	.913	.900	.912	.081
Constrained Model	162	1092.878	2.249	.852	.912	.899	.911	.081
	4	11.187	.005	.002	.001	.001	.001	.000

and unconstrained models was found to be 0.025, indicating statistical significance. This suggests that moderation effect verification is possible.

Analysis of moderation effects based on the plannedness of Online Course Study Time revealed that there is a moderation effect between the group that takes online courses at scheduled times and the group that does so without a set schedule.

Table 8
Results of the Analysis of Differences Based on the Planned Timing of Online Course Attendance

Path	Attending Lectures According to Planned Timing				Attending Lectures Without Planned Timing				
	Standardized Estimate	<i>t-value</i>	<i>p</i>	Results	Standardized Estimate	<i>t-value</i>	<i>p</i>	Results	
H1 ST ←	ES	.494	3.728	***	○	.071	.740	.459	×
H2 ST ← LS	.240	2.317	.021*	○	.455	5.102	***	○	
H3 ST ← HS	.069	.631	.528	×	.132	1.350	.177	×	
H4 ST ← SE	-.018	-.142	.887	×	.234	2.550	.011*	○	

ES(Environment Structuring), LS(Learning Strategy), HS(Help Seeking), SE(Self Evaluation), ST(Satisfaction)

* $p < .05$, ** $p < .01$, *** $p < .001$ $\chi^2 = 1081.691$, $df = 166$, $\chi^2/df = 2.244$, NFI=.854, IFI=.913, TLI=.900, CFI=.912, RMSEA=.081

Analysis of Moderation Effects Based on Device Type Used for Online Course Enrollment (Fixed vs. Mobile). The results of fitness analysis based on the type of device used for online course enrollment, where the constrained model assuming equal path coefficients and the unconstrained model were compared, showed a difference in degrees of freedom of 4 and a change in the χ^2 value of 1.422. Furthermore, the difference in *p*-values between the constrained and unconstrained models was found to be 0.840, indicating no statistical significance. This suggests that there is no significant difference based on device type.

Table 9
Comparison of Fitness Indices Based on the Type of Device Used for Online Course Enrollment

	<i>df</i>	χ^2	χ^2 / df	NFI	IFI	TLI	CFI	RMSEA
Free Model	166	1064.153	2.208	.860	.918	.905	.917	.080
Constrained Model	162	1065.575	2.193	.859	.918	.906	.918	.079
	4	1.422	.0015	.001	.000	.001	.001	.001

Furthermore, it was found that there is no difference in moderation effects based on whether individuals use mobile devices like smartphones or tablets, or fixed devices like desktops or laptops when taking online courses. However, the analysis of whether there are differences in the details between the two groups is presented in Table 10.

Table 10
Results of the Difference Analysis Based on the Type of Device Used for Online Course Enrollment

Path	Fixed Devices (Laptop, Notebook)				Mobile Devices (Smartphone, Tablet)			
	Standardized Estimate	<i>t-value</i>	<i>p</i>	Results	Standardized Estimate	<i>t-value</i>	<i>p</i>	Results
H1 ST ← ES	.247	2.700	.007**	○	.093	.618	.536	×
H2 ST ← LS	.374	4.942	***	○	.362	2.363	.018*	○
H3 ST ← HS	.118	1.402	.161	×	.151	1.030	.303	×
H4 ST ← SE	.159	1.654	.098	×	.219	1.761	.078	×

ES(Environment Structuring), LS(Learning Strategy), HS(Help Seeking), SE(Self Evaluation), ST(Satisfaction)

p*<.05, *p*<.01, ****p*<.001 $\chi^2=1064.153$, *df*=166, $\chi^2 / df=2.208$, NFI=.860, IFI=.918, TLI=.905, CFI=.917, RMSEA=.080

Repetition of Online Course Learning (No Repetition vs. Repetition

Based on Content). The results of fitness analysis based on the repetition of content in online courses showed a difference in degrees of freedom of 4 and a

change in the χ^2 value of 17.745 when comparing the constrained model, assuming equal path coefficients, with the unconstrained model. Furthermore, the difference in *p-values* between the constrained and unconstrained models was found to be 0.001, indicating statistical significance. This suggests that moderation effect verification is possible. The results of comparing other fitness indices are presented in Table 11.

Table 11
Comparison of Fitness Indices Based on the Repetition of Online Course Learning

	<i>df</i>	χ^2	χ^2/df	NFI	IFI	TLI	CFI	RMSEA
Free Model	166	1034.998	2.147	.860	.920	.907	.919	.078
Constrained Model	162	1052.743	2.166	.857	.918	.906	.917	.078
	4	17.745	-.019	.003	.002	.001	.002	.000

Through moderation effect analysis, it was possible to identify the moderation effect between the group that repeats online course enrollment and the group that does not repeat. The results of the group difference analysis are presented in Table 12.

Table 12
Results of the Difference Analysis Based on the Repetition of Online Course Learning

Path				No repetition				Repeating based on content			
				Standardized Estimate	<i>t-value</i>	<i>p</i>	Result	Standardized Estimate	<i>t-value</i>	<i>p</i>	Result
H1	ST	←	ES	.044	.450	.653	×	.466	3.912	***	○
H2	ST	←	LS	.577	5.964	***	○	.133	1.395	.163	×
H3	ST	←	HS	-.025	-.265	.791	×	.078	.658	.510	×
H4	ST	←	SE	.261	2.615	.009**	○	.172	1.522	.128	×

ES(Environment Structuring), LS(Learning Strategy), HS(Help Seeking), SE(Self Evaluation), ST(Satisfaction)

* $p < .05$, ** $p < .01$, *** $p < .001$ $\chi^2=1034.998$, $df=166$, $\chi^2/df=2.147$, NFI=.860, IFI=.920, TLI=.907, CFI=.919, RMSEA=.078

Discussion and Conclusion

Discussion of the Results

The results of the current study can be discussed as follows.

First, among the subvariables of OSRL, namely environment structuring, learning strategy, and self-evaluation, it was found that they had a significant impact on satisfaction with online courses among university students. The current study results indicated that learning strategy exerted the most substantial influence on the satisfaction of university students attending online courses, followed by environment structuring and self-evaluation. Especially, the current study revealed that learning strategy had the most significant impact, highlighting the importance of formulating learning strategies for effective participation in online courses. However, help seeking did not exert a significant influence on satisfaction. These results align, to some extent, with previous research exploring the overall impact of OSRL on satisfaction. However, this study offers a unique perspective by directly investigating the relationship between OSRL and satisfaction, as well as delineating the individual influence of its subvariables. In contrast to prior studies (Jeong, 2022; Zhou et al., 2021), which introduced learning gains as a mediating variable between OSRL and satisfaction, the current research elucidated the direct impact of OSRL subvariables on satisfaction. Furthermore, this study's findings were based on the perceptions of learners who had experienced online courses opened during the *post-COVID-19 era*. Considering that these learners had mostly encountered online courses opened in the *pre-COVID-19 era*, the significance of these findings is noteworthy.

Second, satisfaction with online courses among university students was found to have a significant influence on their intention to participate continuously in online courses. These results imply that students' satisfaction significantly affects their personal intent to continue participating in online courses and their willingness to participate in future courses, representing continuous participation intention. The

strong relationship between university students' satisfaction and their intent to participate continuously in online courses, as demonstrated in the current study, supports previous researches (Chiu et al., 2005; Hayashi et al., 2004; Lee, 2010). Particularly noteworthy is the fact that most of the university students who participated in this study had taken online courses during the COVID-19 period and faced associated challenges. In this context, the current study's results hold great significance. For example, given the prevalent dissatisfaction among domestic university students regarding online course aspects such as inadequate design and content, insufficient engagement in online activities, a lack of communication, and issues related to course quality, as evidenced by previous researches (Kim et al., 2021; Park & Heo, 2020), the finding that Satisfaction significantly influenced students' continuous participation intentions in online courses is substantial. Considering that satisfaction had a direct impact on OSRL, the fact that it also exerted a significant influence on continuous participation intention implies that future course design and operational support in universities must consider students' self-regulated learning abilities. In particular, academic authorities should design and operate online courses optimized for learners' environment structuring, learning strategy, and self-evaluation.

Third, it was found that the 'planned duration of online course participation' and 'repeated course participation' in online courses serve as moderators in the relationship between 'online self-regulated learning subvariables and satisfaction.' However, the 'device type' used by university students when taking online courses was not found to moderate the relationship between 'online self-regulated learning subvariables and satisfaction.' First of all, the current study identified the significance of the moderating effect of university students' 'planned duration of online course participation.' Especially, even in cases where courses were taken without prior planning or without repeating them, some effects in regulating the sub-elements of self-regulated learning ability were ultimately observed. For example, university students who took online courses in accordance with a pre-established schedule of study hours were able to increase satisfaction by creating an effective learning

environment and devising learning strategies for online learning. In contrast, university students who freely took online courses without prior planning were able to increase satisfaction by engaging in activities such as systematically establishing learning strategies and monitoring and evaluating their course participation. Furthermore, the current study also demonstrated the significance of the moderating effect of university students' 'repeated course participation' in online courses. For instance, university students who repeated their online course content demonstrated increased satisfaction by formulating effective learning strategies and engaging in self-assessment. Conversely, students who did not repeat courses but completed them in a single attempt were able to increase satisfaction by building an effective learning environment.

Additionally, the current study found that the moderating effect of 'device type' used for online course participation was not statistically significant. Although overall moderating effects based on 'device type' were not observed, it was noted that when students accessed online courses while on the move using smartphones or tablets, there was a need to systematically establish learning strategies.

Implications and Limitations of the Study

In light of the findings of the current study, certain implications for university-level online courses can be identified. First, practical measures need to be put in place to support self-regulated learning among students taking online courses. The study underscores the demand for support strategies that can aid in structuring the online learning environment, establishing effective learning strategies, and facilitating self-monitoring and evaluation. It is important to note that self-regulated learning can manifest differently based on individual capacities and environments, making it challenging to provide universal guidance and supervision.

Second, there is a pressing need to devise practical measures that can enhance satisfaction with online courses. Universities should provide support to enable

students to develop and implement effective learning strategies. To achieve this, university authorities should consider establishing communication channels that can assist students in devising their own learning strategies when designing and offering online courses.

Third, it is imperative to provide guidance and support for both learners and instructors regarding essential aspects of online courses. Learners should be equipped with a recognition of the importance of systematic online learning and repetitive study methods. Therefore, educational institutions should emphasize the significance of developing learning plans and repeating course participation for students engaged in online courses, along with providing practical support measures.

The current study has provided valuable insights into online courses at universities; however, there are certain limitations to the interpretation and application of the findings. First, there is a limitation in not considering various variables. Therefore, it is difficult to exclude the possibility of different research outcomes based on other variables (e.g., course characteristics, instructor and learner attributes). Therefore, future research should consider a wide range of variables. Second, there are limitations in the collected data. This study was conducted with prospective teachers attending universities in the metropolitan area, which may restrict the generalizability of the results and pose limitations for interpreting and applying the research findings. Third, there are limitations associated with survey-based research tools. Particularly, this study's research tools were based on learners' self-reports, potentially introducing subjective biases. We look forward to ongoing research in this field that can provide practical assistance for online courses in universities.

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Received: September 3, 2023 / Peer review completed: September 17, 2023 / Accepted: October 10, 2023