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Learning Flow and Continuous Intention Toward Online Remote Learning: An Integrated Framework

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Abstract

During the COVID-19 pandemic, higher education institutions adopted several technology-driven platforms (such as Google Meet) as an alternative to traditional in-person classrooms. Researchers have been concerned about the evaluation of learning satisfaction and continuous learning intentions. As such, the purpose of this research was to investigate how the implementation of Google Meet affected the learning flow experience of Taiwan students amid the pandemic. The hedonic (perceived enjoyment, perceived vividness, perceived interactivity) and utilitarian (system quality, service quality, information quality) factors were integrated into the perspective of learning flow. Furthermore, this study also examined how flow experiences influence satisfaction and continuous learning intention. The structural equation modeling was employed to analyze the data gathered from a sample of 213 students. According to the findings, hedonic and utilitarian factors all significantly influenced flow experiences. As learning flow increased in remote learning, satisfaction and continuous learning intention were also increased. The results can provide significant implications for flow and learning theory, and offer concrete suggestions for teaching practices and education learning platforms.

Introduction

The 2020 COVID-19 epidemic has permanently changed the way we interact and communicate with each other, and our way of life has also changed tremendously (Denworth, 2020). Remote education and work are now the norms, and the industrial transformation is accelerating, gradually shifting to the new normal (Brouder et al., 2020). The widespread implementation of community lockdowns and isolation in some countries has led to prolonged periods of studying and working from home for students and teachers. Consequently, the adoption of online learning and communication platforms has become increasingly prevalent (Crawford et al., 2020; Sitar-Tăut, 2021). In response to the COVID-19 pandemic, colleges and universities have begun implementing remote learning as a measure to mitigate its potentially detrimental impacts. At this time, remote platform (such as Google Meet and Teams) has become prevalent. For example, Google Meet is one of the most widely used remote platforms, providing video, instant messaging, opinion surveys, and group discussions, and other features make it one of the indispensable tools for work and study. It should be noted that synchronous learning through remote platforms has presented several new challenges and issues for both instructors and students, particularly those in higher education (Bao, 2020). It is noteworthy that this study is motivated by the aim of enhancing learning

effectiveness and fostering continuous learning intention through remote platforms.

This study draws upon the learning flow. Learning flow refers to a state of being engrossed in a particular activity or event, achieving a sense of oneness, selflessness, and pleasure (Csikszentmihalyi & Csikzentmihaly, 1990). Previous studies suggested that students who achieve a state of flow are more inclined to engage in the learning process (Guo, Xiao, Van Toorn, Lai, & Seo, 2016). However, online learning is not only about the content and environment, but also needs to take into account the attitude of the teachers and students (Hamari et al., 2016). The challenge for remote education is getting students to use online platforms in a way that helps them experience learning flow easily online, and then enhance their learning intention.

According to previous studies, flow experience may be influenced by hedonic and utilitarian factors (Sharma, Tak, & Kesharwani, 2020). Several studies have already examined how hedonic and utilitarian factors as influential factors in learning (Hsiao, Chang, & Tang, 2016; Wang, Ngai, & Wei, 2012). For example, Van der Heijden (2004) has confirmed that users receive a sense of self-satisfaction from hedonic elements. The hedonic aspect is considered more subjective and individualized, primarily arising from the feelings of pleasure and enjoyment rather than simply completing a task. Utilitarian, on the other hand, is defined as the evaluation of all functional benefits and costs, as well as providing functional support (Van der Heijden, 2004). For example, L.-T. Huang, Chiu, Sung, and Farn (2011) mentioned that the utilitarian elements of technology play a crucial role in triggering flow experiences, and then to assess the overall effectiveness and reliability of the tool. Previous studies have confirmed that utilitarian factors have a significant impact on remote learning (Özgen & Reyhan, 2020), while hedonic factors have a strong relationship with behavioral intentions during action learning (Sitar-Tăut, 2021). Following previous studies (Dimitrijević & Devedžić, 2021), this study examined six dimensions of hedonic (perceived enjoyment, perceived vividness, perceived interactivity) and utilitarian (system quality, service quality, information quality) that may directly impact students' learning flow, and then further affect their satisfaction and continuous learning intention via Google Meet in an epidemic context.

This study used the survey method and measures based on the scales developed in previous studies, so as to obtain more accurate and complete data. Based on the results, this study extends the learning flow from the traditional classroom to remote education through Google Meet. Ultimately, this study is beneficial for understanding the factors that enhance the flow experiences in online learning, as well as useful for future related teaching design or for improving students' learning satisfaction.

Literature Discussion

Learning Flow

Csikszentmihalyi and Csikzentmihaly (1990) suggested that flow experience is characterized by both enjoyment and focused engagement in a challenging activity. This flow state of motivation is particularly suited to learning (Rodríguez-Ardura & Meseguer-Artola, 2021). As a concept, flow experience can be used to describe human-computer interaction, which can affect behavioral intentions and moderate the relationship between attitude factors and behavioral intentions (Novak, Hoffman, & Yung, 2000). The flow experience occurs when one faces

a challenging task and the skills to handle it (Liao, 2006), and this further enhances academic performance (Rodríguez-Ardura & Meseguer-Artola, 2021), learning satisfaction and continuous learning intention (Kim, Oh, & Lee, 2005). Previous studies have mainly focused on the curriculum aspect (Fakhruddin, 2018; Septantiningtyas, Juhji, Sutarman, Rahman, & Sa'adah, 2021) and the use of technology (Al-Maroof, Salloum, Hassanien, & Shaalan, 2020) of remote education. In fact, people who have flow experiences are more engaged in learning and tend to perform better (Rodríguez-Ardura & Meseguer-Artola, 2021). This is because, particularly in online courses, students who have learning flow perform better and are more satisfied than those who do not. Therefore, this study explores the perspective of flow theory and summarizes how hedonic and utilitarian factors may influence students' learning flow.

Hedonic Factor

The hedonic factor refers to the factors that provide users with a sense of self-realization (Van der Heijden, 2004), and technologies incorporating hedonic factors are designed so that a positive experience is provided for users (Huang, 2020; Van der Heijden, 2004). This study divides the hedonic factors into perceived enjoyment, perceived vividness, and perceived interactivity that may impact the learning flow in remote learning.

The concept of **perceived enjoyment** pertains to the extent to which individuals perceive using a technology as intrinsically enjoyable (Van der Heijden, 2004). This implies that users use the technology because the action of performing it is perceived as enjoyable in and of itself. Wang et al. (2012) and Hamari et al. (2016) found that perceived enjoyment significantly affects usability and satisfaction since perceived enjoyment leads to flow experiences. People will concentrate and feel that time passes faster when they perceive enjoyment is present, which makes achieving flow experiences easier (Ha, Yoon, & Choi, 2007). Accordingly, this study stated that when students are accessed Google Meet platform as the remote education, they appear to be situated in a comfortable learning environment, and then experience enjoyment and persist in learning. Once students perceive enjoyment, it may positively relate to students' learning flow. Thus, this study proposed the following hypothesis:
H1: Perceived enjoyment is positively related to students' learning flow in remote learning.

Perceived vividness is considered to be an important factor that exists within the student, mediates cognitive and emotional functioning, and affects academic performance. Work-related literature suggests that perceived vividness appears to promote work-related flow experiences (Salanova, Bakker, & Llorens, 2006). In learning-related research, Gore Jr (2006) highlighted that perceived vividness can be divided into high vividness and low vividness, and it has been confirmed that perceived vividness is related to the flow experience in learning. It is possible to acquire vivid knowledge in several ways, including audio, images, and visual elements that evoke a variety of practical and physical characteristics. Additionally, Hosseini and Fattahi (2014) mentioned that students with high vividness can also experience more flow, since flow occurs when students are required to stretch their abilities to new levels through remote learning activities. By increasing the number of sensory inputs, vivid knowledge can enhance the perception of material quality, thereby improving cognitive abilities and enhancing learning outcomes such as GPA and participation (Rodríguez-Ardura & Meseguer-Artola, 2021). Therefore, this study suggested that the enhance of perceived vividness will more easily trigger the flow state of students in

Google Meet platform, and it was proposed that:

H2: Perceived vividness is positively related to students' learning flow in remote learning.

Perceived interactivity has been proven to be one of the important factors in remote education (Saba, 2000), because of the interactivity between students and teachers, as well as the instant feedback they provide (Volery & Lord, 2000). In fact, the learning flow can easily triggered by online interactions between students, between teachers and students, and when these interactions are aggregated (Van Noort, Voorveld, & Van Reijmersdal, 2012). This is because flow is a psychological phenomenon that occurs when people concentrates on solving a problem or participating in a particular activity (Rodríguez-Ardura & Meseguer-Artola, 2021). If the platform is more interactive, and the learning process is enjoyable, students will be satisfied with remote learning and intend to continue to use such a method of learning. Thus, this study proposed that students' flow states are more likely to be triggered when they have more learning interaction through Google Meet, and proposed that:

H3: Perceived interactivity is positively related to students' learning flow in remote learning.

Utilitarian Factors

The utilitarian factors provide users with instrumental value and define a goal to achieve (Anderson, Knight, Pookulangara, & Josiam, 2014; Van der Heijden, 2004), which are defined as task orientation, instrumentalization, rationality, and high performance (Sharma et al., 2020). Therefore, in the context of online learning, this study applies the concept and investigates three utilitarian factors: system quality, service quality, and information quality.

System quality, one of the determinants of technology adoption, pertains to the quality of hardware and software, including but not limited to computers, internet networks, and security systems that students use (Alsabawy, Cater-Steel, & Soar, 2016; Van der Heijden, 2004). It has been suggested that when users perceive system quality as high, they will adopt it more easily (Y.-M. Huang, 2020). When students remote learning through Google Meet, they need to deal with sound latency, image quality instability, and the interface smoothness. Signal problems and Internet quotas were the most common problems the students encountered, so the enhancement of system quality can significantly improve the online learning flow states (Obadă, 2014). Therefore, it was showed that the enhancement of system quality will lead more easily to students' flow state toward remote education platforms, especially in COVID-19. It was proposed that:

H4: System quality is positively related to students' learning flow in remote learning.

Service quality pertains to the level of support and management of operations furnished by the provider of the service in question (Grunert, 2005). Aaker (2009) indicated that service quality will have significant differences in products or services, and become an important factor for consumers to choose brands and use services. Kan (2002) defined service quality as the consumers' ability to evaluate the overall effectiveness, functionality, durability, technology, and reliability of a product based on their own experience and knowledge. Similarly, Liaw and Huang (2013) indicated that when individuals perceive service quality from technology is high, they are more willing to experience learning flow and enhance user participation. Therefore, this study indicated that service

quality is positively related to the learning flow in remote learning.

H5: Service quality is positively related to students' learning flow in remote learning.

Information quality plays a crucial role in helping educators and students achieve their instructional design and learning objectives through the effective use of multimedia resources and interfaces (Bourgonjon, Valcke, Soetaert, & Schellens, 2010). Ibrahim, Yusoff, Khalil, and Jaafar (2011) and Wu, Liu, and Huang (2022) proposed that the essence of educational technology is to enhance the information quality for students, which is a crucial aspect of how it helps students learn. Through the COVID-19 epidemic and rapid technology development, people can learn online through digital devices, giving them a greater number of Information quality (Crawford et al., 2020). To optimize learning outcomes, it is crucial for educational materials to consider various factors, such as students' individual traits, learning schedules, and instructional designs that encourage self-directed learning. Additionally, interactions and assessments must also align with the learning context and level (Liu, Liao, & Pratt, 2009). Flow experiences are commonly described as the pleasurable feelings that students experience when they are completely engaged in a challenging educational activity (Rodríguez-Ardura & Meseguer-Artola, 2021). Accordingly, Google Meet may increase students' Information quality, which may enhance concentration and then stimulate flow experiences.

H6: Information quality is positively related to students' learning flow in remote learning.

Satisfaction and Continuous Learning Intention

Satisfaction can be defined as the degree to which an individual's wants and needs are fulfilled (Zhonggen, Ying, Zhichun, & Wentao, 2019). Hansemark and Albinsson (2004) and Liaw and Huang (2013) noted that satisfaction reflects a users' overall attitude toward services. Csikszentmihalyi, Larson, and Prescott (2014) found that flow experience can effectively improve user experience, thus improving satisfaction. Experiencing a state of flow while learning can lead to increased engagement and a sense of enjoyment, fulfillment, and accomplishment among students (Hamari et al., 2016; Rodríguez-Ardura & Meseguer-Artola, 2021). Furthermore, learning flow can not only reduce learning time and promote active participation in learning activities, but they can also improve achievement levels (Bernardo, Esteban, Cervero, Cerezo, & Herrero, 2019; Guo et al., 2016). This study suggested that students feel more satisfied when they experience a flow state on the Google Meet platform, particularly in an uncertain and unpredictable environment like COVID-19, and proposed:

H7: Learning flow is positively related to students' satisfaction in remote learning.

The investigation of **users' continuous intention** towards educational technologies has become crucial (Y.-M. Huang, 2020), and it serves as a critical indicator for measuring user loyalty (Li & Shang, 2020). There has been an increasing focus on persistent intent in various contexts, including new technologies, online learning, and shopping (Wu et al., 2022), especially in COVID-19 environment. Guo et al. (2016) confirmed that flow state will enable students to lose time awareness and concentrate on the current task, enhancing their intentions to learn continuously. Flow experiences can motivate learners to actively engage in the learning process, leading to more collaboration and a greater focus on continuous learning. This study also claimed that when students have the learning flow in Google Meet platform, they are more likely to continuous learning toward remote education.

H8: Learning flow is positively related to students' continuous intention in remote learning.

Method

Research Model and Procedures

For the purpose of this study, the research structure was used to examine the relationship between independent variables (perceived enjoyment, perceived vividness, perceived interactivity, system quality, service quality, and information quality), mediation variable (flow state), and dependent variables (learning satisfaction and continuous learning intention). (see Figure 1)

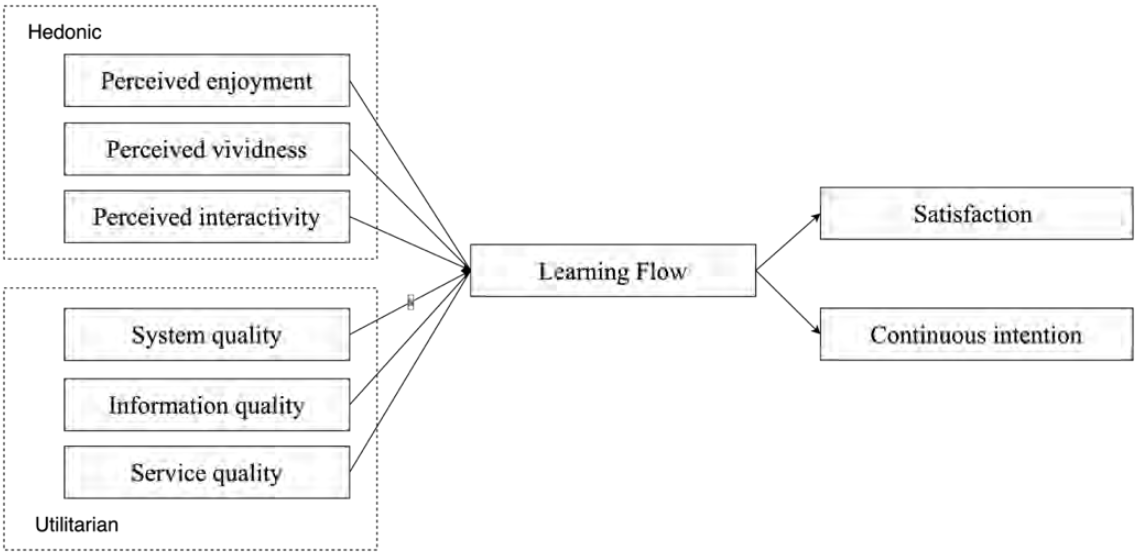

Figure 1 Conceptual Model of This Study

Since this study primarily examined students' personal feelings, opinions, attitudes, and behaviors, as well as the impact of the pandemic on avoiding in-person interactions, an online questionnaire was utilized for data collection. The questionnaire was designed using Google Forms, and participants were prompted to recall their most positive experience with a Google Meet course before completing the survey. The recall was designed to help students more easily recall the feelings and states they actually experienced during their online learning course. Additionally, previous studies have shown that a good learning flow occurs when there is a good learning effectiveness (Hamari et al., 2016; Rodríguez-Ardura & Meseguer-Artola, 2021). The questionnaire was composed of four distinct sections: hedonic and utilitarian factors, learning flow, satisfaction, and continuous learning intention. Once participants finished answering these questions, they proceeded to complete the demographic section and concluded with a debriefing message.

Measurements

The scales in this study were adapted from previous research and assessed using a 7-point Likert scale, where respondents rated their agreement level from strongly disagree (1) to strongly agree (7). First, in hedonic factors,

perceived enjoyment was measured using the three-item scale established by Hsiao et al. (2016), Y.-M. Huang (2015) and Y. M. Huang (2017) (α =.93 in this study), and perceived vividness was mainly used the three-item established by Barhorst, McLean, Shah, and Mack (2021) (α =.81), and perceived interactivity was used the three-item established by Volery and Lord (2000) (α =.87). Second, utilitarian factors were divided into system quality (α =.82 in this study), service quality (α =.81), and information quality (α =.84), and measurement items were modified and adopted from the study of Jung and Shin (2021). Third, this study adopted the learning flow scale established by Novak et al. (2000) (α =.93), whereas the items for satisfaction (α =.82) and continuous learning intention (α =.84) were taken and modified from Hsiao et al. (2016) study.

Participants

To investigate the impact of hedonic and utilitarian factors on learning flow and learning intentions, this study received a total of 213 participants for research and analysis. All the subjects were mainly college students and graduate students from all over Taiwan, with an average age of 22.04 years.

Results

Measurement Model

In the present study, structural equation model (SEM) analysis was used to test the hypothesis and analyze each aspect. Maximum likelihood combined with Bootstrapping estimation was utilized in this study as the estimation method. This approach is commonly recommended when data does not demonstrate multivariate normality. Specifically, joint confirmatory factor analysis of all measurement scales yielded satisfactory results, suggesting a good model fit (X^2/df = 2.93; GFI = .87; AGFI = .91; RMSEA = .08; CFI = .90; TLI = .90; NFI = 0.92; IFI = 0.93).

To examine the measurement model, assessments of reliability and validity were performed. Confirmatory factor analysis was utilized to assess the composite reliability (CR) with all outcomes exceeding 0.7. Convergent validity was established by analyzing the average variance extracted (AVE) and factor loadings. The findings showed that the values of AVE were all higher than 0.50, and factor loading were greater than 0.70 in this study. It is an acceptable value for convergence (Fornell & Larcker, 1981), so the questionnaire in this study has acceptable convergent validity. (see Table 1)

Structural Model

To analyze the causal relationships in the structural model, this study employed structural equation modeling. Each path represents a causal relationship between the two connected factors. First, hypotheses 1 to 3 proposed the influence of hedonic factors on students' learning flow. The results showed that perceived enjoyment (β = .23, $p < .001$), perceived vividness (β = .31, $p < .001$), and perceived interactivity (β = .21, $p < .01$) were all positively related to students' learning flow. The results indicated that the standardized estimation of the path coefficients for all the three measurement variables are ranging from 0.21 to 0.31. According to the findings, hedonic factors

can easier trigger the flow states in remote education, so H1-H3 were all supported. Second, hypotheses 4 to 6 indicated that utilitarian factors were positively related to students' learning flow in remote education. The findings showed that system quality ($\beta = .30$, $p < .01$), service quality ($\beta = .16$, $p < .01$), and Information quality ($\beta = .24$, $p < .05$) were significantly affect the learning flow through Google Meet platform. Accordingly, the causal relationship between flow and the three utilitarian factors is of a reasonable magnitude, and for this reason, H4-H6 were supported. Moreover, the findings also suggested that learning flow was significantly affected satisfaction ($\beta = .42$, $p < .001$) and continuous learning intention ($\beta = .47$, $p < .001$). To a certain extent, when students experience flow states, they become more focused and immersed in remote learning, and their satisfaction and continuous learning intentions are met. Hence, H7 and H8 were also supported.

Table 1. Results of the Confirmatory Factor Analysis

Constructs	**Items**	**Loading**	**Alpha**	**CR**	**AVE**
Perceived Enjoyment	PE1	.87	.93	.93	.81
	PE2	.91			
	PE3	.96			
Perceived Vividness	PV1	.84	.81	.91	.80
	PV2	.81			
	PV3	.77			
Perceived Interactivity	PI1	.86	.87	.88	.74
	PI2	.86			
	PI3	.87			
System Quality	SQ1	.83	.82	.91	.81
	SQ2	.81			
	SQ3	.84			
Service Quality	SE1	.80	.81	.90	.76
	SE2	.77			
	SE3	.85			
Information Quality	IQ1	.81	.84	.95	.84
	IQ2	.85			
	IQ3	.82			
Flow Experience	FE1	.91	.93	.93	.81
	FE2	.94			
	FE3	.90			
Satisfaction	SA1	.87	.82	.84	.71
	SA2	.81			
	SA3	.77			
Continuous Intention	CI1	.88	.84	.85	.72
	CI2	.85			
	CI3	.82			

Discussion

People use online platforms (such as Google Meet) in daily life, from business meetings to classrooms, especially the COVID-19 pandemic. Despite the many conveniences, there is still questions about their effectiveness, especially when it comes to remote education (Fakhruddin, 2018; Sitar-Tăut, 2021). The use of flexible times and places enhances students' interest in learning (Septantiningtyas et al., 2021), but there are still issues with the learning process and attitude perception of students (Al-Maroof et al., 2020). As a result, it is imperative to understand what factors students experience while learning, and whether these factors affect their learning flow, satisfaction, and continuous learning intention. The results of this study are described below.

First, according to previous studies (Y.-M. Huang, 2020; Sitar-Tăut, 2021), as hedonic factors are affected by subjective feelings, so when students perceived higher degrees of hedonic factors, their flow experiences might be trigger. The results indicated that perceived enjoyment, perceived vividness, and perceived interactivity positively affect students' learning flow. Consequently, when students experience perceived enjoyment in the classroom, their levels of pleasure may be increased and lead to a learning flow. Furthermore, when perceived vividness is engaged, it will also effectively improve academic performance, resulting in enhanced learning effectiveness, which is consistent with Hosseini and Fattahi (2014). Second, as utilitarian factors can provide students with a goal to accomplish (Dimitrijević & Devedžić, 2021; Van der Heijden, 2004), the impact of system quality, service quality, and information quality on learning flow in remote education was examined in this study. The findings indicated that remote learners can improve their flow experiences by having better system quality, service quality, and information quality, which is consistent with Jung and Shin (2021) research. That is to say, if more utilitarian factors can be provided in remote learning, it will be easier to trigger the learning flow of students. Third, this study confirmed that in the context of remote learning in Google Meet, the learning flow improved learning satisfaction and continuous learning intention, which is consistent with previous research in traditional classroom settings (Bourgonjon et al., 2010). In contrast to the perception that online learning lacks efficiency and learning effect, the results in this study showed that students' flow needs to be stimulated so that learning satisfaction and a desire for continuous learning can be increased. That is, after students gained more learning flow in remote education, the Google Meet platform does not show any difference in their learning results.

In summary, remote education contributes to education and is always one step ahead of the system used (Özgen & Reyhan, 2020; Traxler, 2018). The prevalence of remote education has attracted the attention of many experts and academics, but it is still in its infancy on a theoretical and practical level, especially the COVID-19 outbreak. Even so, the discussion of remote education is still an important issue for both teachers and students. While this research is exploratory, it still contributes to theoretical and practical understanding, so that future studies can investigate whether the research point of view is relevant to remote education.

Conclusion

This study has several theoretical implications. First, the flow experience was mainly discussed from the perspective of shopping behaviors, and game attitudes in previous studies (Nah, Eschenbrenner, Zeng, Telaprolu,

& Sepehr, 2014), but it has rarely been examined whether the learning flow plays a significant role in learning, especially in remote education. In the COVID-19 pandemic, remote learning may become the norm, so this study begins from the perspective of flow experiences and how they may impact satisfaction and intention to continuous learning. The results were consistent with previous research (Rodríguez-Ardura & Meseguer-Artola, 2021). Second, a number of studies have already examining the effectiveness of remote education (Fakhruddin, 2018; Traxler, 2018). In light of the pandemic outbreak, Google Meet is considered a secure environment for online teaching, and has been highly recommended. However, the actual effect of learning has not yet had a perfect theoretical result. This study synthesized the previous contributions to identify six novel factors that may impact the learning flow in online education, highlighting the unique aspects of remote learning. Third, this study aimed to investigate the relationship between flow experiences, satisfaction, and continuous remote learning intentions. The findings of this research were in line with previous studies (Bernardo et al., 2019; Rodríguez-Ardura & Meseguer-Artola, 2021). As a result of this finding, we are able to find out the advantages of remote education as well as creating a better learning environment. The relevant results are helpful to provide references and suggestions, and can serve as a foundation for future studies.

Several recommendations for practice can be made based on the results of this study. First, enhancing interaction states may increase the effectiveness of remote education, which can in turn have a positive impact on students. This is why teachers may benefit from Kahoot! website or digital whiteboards to enhance discussions and perceived interactivity between students in remote learning. By increasing interaction, the flow state of the students will also improve. Furthermore, platform providers can provide students with more simple stickers or emojis to make their remote learning experiences more engaging, especially in an uncertain and unpredictable environment such as COVID-19. Second, additionally to providing platforms to facilitate communication and interaction between teachers and students in remote learning, platform providers must also improve the perception quality of both parties. The findings showed the overall learning environment becomes smoother when the service quality is improved. For example, providers of learning platforms should make the sound low-latency, stabilize the image quality, and improve the smoothness of the interface, so teachers and students will not be delayed or paused in the classroom and can focus on learning. Third, students should remember that self-discipline is essential to achieve perceived vividness in remote learning. They should refrain from swiping at their phones and fiddling around in class, and try to increase their motivation, curiosity, and focus. Overall, despite the current epidemic situation in Taiwan having slowed and physical classroom teaching having resumed, we should all speed up the development of remote education given the uncertain future.

Recommendations

There are several limitations to this study that should be acknowledged. First of all, the studies on remote education conclude that synchronous and asynchronous situations are encountered, and the combination of these situations within a platform allow for a new dimension of learning. It would be interest in examining not only what the pandemic has done to Google Meet, but how it has affected other teaching-based technology that has been used during this time. Second, due to the COVID-19 pandemic, many teachers have moved to remote education. This is a relatively new concept, and scholars should clarify the current situation. A more rigorous

investigation of these issues is required to enhance generalization of the results. For example, teaching style and methods may influence students' learning effectiveness, which was not mentioned in this study. Typically, the samples are students who have used Google Meet for remote education at colleges and universities. However, students of different groups experience remote education in different ways. To make research results more comprehensive, it is suggested that future research may analyze different groups or use more samples to increase the diversity.

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