Influencing Factors of Online Course Learning Intention of Undergraduates Majoring in Art and Design: Mediating Effect of Flow Experience

Tian Hewei¹ and Lee Youngsook²

Abstract
Using technology to support learning is a major trend in the development of modern education. In the face of COVID-19, online courses play an important role. During the COVID-19 pandemic, a large number of online art design courses have been developed in China. Art design courses involve many practical investigation and skill operation links, which is a challenge of online learning. In order to explore the influencing factors of online course learning intention of art and design majors, this study compiled a questionnaire, conducted an online survey on 1,057 Chinese art and design majors through the Wenjuanxing questionnaire survey platform, and conducted structural equation analysis and hierarchical regression analysis on the sample data by using SPSS and AMOS analysis software. Based on Information Technology Acceptance Model and immersion theory, this study focuses on the relationship between information characteristics, immersion experience and learning intention of art and design online courses. The results show that the antecedent variables such as professionalism, interactivity, interest, and ease of use of online courses have a positive impact on College Students’ user immersion experience and learning intention; Immersion experience positively affects learning intention; Immersion experience plays a mediating role between online course information characteristics and learning intention.

Keywords
online learning, information characteristics, learning intention, flow experience

Introduction
Keegan (2002) divided distance learning into three stages according to different learning methods: D-learning, E-learning, and M-learning. D-learning stands for distance learning, and realizes the spatial separation of teachers and students. E-learning stands for electronic learning, and realizes remote face-to-face teaching, and M-learning stands for mobile learning, and realizes free learning anytime and anywhere (Desmond, 2002). With the advent of the information age, online learning has mushroomed, especially in the face of COVID-19 and other public crises. Online learning can effectively connect teachers and students through the Internet (Lackie et al., 2020). Online education has the advantages of breaking through time and space limitations, flexible learning methods, supporting synchronous or asynchronous teaching, reviewing learning content, and traceable learning process. High-quality resources such as MOOC (Massive Open Online Courses) and SPOC (Small Private Online Courses) provide new ways and opportunities to promote student learning, and gradually become a useful supplement to college classroom teaching.

Some early scholars usually describe online learning as gaining a learning experience through the use of a certain technology. For example, Alraimi et al. (2015) emphasized the technical media or technical background of online learning. Other researchers regard it as a tool for communication, interaction and collaboration. For example, Moore et al. (2011) regarded online learning as

¹Fuzhou University, Xiamen, China
²Tongmyong University, Busan, Korea

Corresponding Author:
Tian Hewei, Xiamen Institute of Arts and Crafts, Fuzhou University, No. 852, Ligong Road, Jimei District, Xiamen, Fujian 351000, China.
Email: thw1949@163.com

Creative Commons CC BY: This article is distributed under the terms of the Creative Commons Attribution 4.0 License (https://creativecommons.org/licenses/by/4.0/) which permits any use, reproduction and distribution of the work without further permission provided the original work is attributed as specified on the SAGE and Open Access pages (https://us.sagepub.com/en-us/nam/open-access-at-sage).
a relatively new type of distance education, and believed that it improved poor students’ access to education. However, distance education is very different from online learning. Compared with distance education, online learning has the characteristics of knowledge construction and interaction. For example, Chang and Tung (2007) focused on the availability of learning resources and emphasized that online learning is an information system. The European Union’s definition of online learning covers these two types of characteristics, stating that “e-learning uses new multimedia technologies and the Internet, and uses convenient facilities and services for remote communication and cooperation to improve the quality of learning” (Commission of the European Communities, 2001).

China has been trying different forms of online education, such as the high-quality curriculum plan in the early 20th century, which promoted the digital construction of a large number of curriculum resources under the leadership of the government. In recent years, China has made many breakthroughs in MOOC construction and other fields. A large number of online courses and online and offline hybrid courses have been launched on the MOOC platform. At the end of 2019, the sudden outbreak of COVID-19 swept the world. Educational institutions had to face the suspension of classes. Almost all courses were face-to-face, from face-to-face teaching to online teaching. The practical value of online teaching is being tested. Many elementary and middle school parents believe that after the full implementation of online teaching, the learning effect of elementary and middle school students cannot reach the expected goals because of their poor self-management ability. On the contrary, college students have strong self-management capabilities, can skillfully operate the equipment required for online courses, and have the basic conditions for accepting online teaching. However, there are few studies on the learning effect or learning intention of college students’ online courses, and it is impossible to scientifically measure the practical value of higher education online courses.

Based on this, this paper studies the impact of the information characteristics of online courses on College Students’ learning intention, pays attention to the information characteristics of online courses, such as professionalism, interactivity, entertainment and availability, and explores the relationship between the information characteristics, immersion experience, and learning intention of online courses. The organizational structure of this paper is as follows. First, review the literature background of each variable, and put forward conceptual models and hypotheses on this basis. Secondly, it expounds the research methods adopted in this research and discusses the research results. Finally, the conclusions, recommendations and limitations of this study are introduced.

**Literature Background**

**The Benefits and Hinderances of Online Learning**

Elshami et al. (2021) studied the satisfaction of teachers and students with e-learning under the COVID-19. The student satisfaction rate is 41.3%, and the teacher satisfaction rate is 74.3%. Technical problems are an important factor leading to the decline of student satisfaction, and communication and flexibility are important factors to improve student satisfaction (Elshami et al., 2021). The research of Theerapong, Chun and Yi (2021) shows that the richness and flexibility of online learning can meet the curriculum needs or interest needs of college students and enable them to better participate in various learning activities (Binali et al., 2021). Al-Hunaiyyan et al. (2021) studied the acceptance of online learning by teachers and students. The results show that teachers are more receptive to online learning than students. Individuals, technology and systems are the key factors affecting the acceptance of online teaching (Al-Hunaiyyan et al., 2021). Mahyoob (2021) compares the effects, tasks and activities of traditional face-to-face teaching and online learning. The research results show that compared with traditional education, students are more inclined to learn online in terms of their learning preferences. The learning efficiency and effective participation of online learning can be effectively improved, but the homework and exams of online learning make it a burden (Mahyoob, 2021). On the contrary, Amir et al. (2020) show that when learning online, more students feel less satisfied with their studies and have more difficulty communicating with teachers or peer students. This means that internal factors such as student readiness, time management, and difficulty staying focused during long online learning are highlighted as challenges (Amir et al., 2020).

Chang et al. (2021) believe that there are differences in the effects of online learning and offline learning. Teachers who undertake courses have different personal performance and different attraction to students. The special skills of communicating with students are crucial because the lack of personal contact may affect the communication between teachers and students (Chang et al., 2021). In a study by Maria et al. (2021), 37.5% of students said they could adapt to online learning. These students think they can also interact well with teachers when they study online, but 38.6% of students said they have negative emotions about online learning. They think that the online learning process lacks the support of teachers and equipment technology, and they even
express that they are only willing to accept face-to-face teaching or mixed teaching in the next semester (Flores et al., 2022).

Under the normalization of COVID-19, the frequency of online teaching has continued to increase. Many domestic scholars have conducted research on the problems existing in online teaching and proposed methods and strategies to improve the effect of online teaching. Teräs et al. (2020) believed that during novel coronavirus pneumonia, online learning has been much more developed than before. Many online learning platforms have been supported by advanced technology and free of charge. However, the gap between online learning and teaching practice needs to be emphasized (Liu & Hu, 2021). According to Jiang and Wang (2020), they used analytic hierarchy process to determine the weight of each subsystem and index in the online teaching quality evaluation system, and establish the online teaching quality evaluation system, but focus on the personal charm of teachers in online courses (Teräs et al., 2020). Justine et al. (2020) studied the attitude, motivation and participation of 574 business college students in Australia. The results show that the attitude of online learning affects the participation, and the online learning environment can improve the learning experience (Jiang & Wang, 2020). These studies on online courses are carried out for teachers and students respectively. There are few studies on the information characteristics of online courses themselves. Therefore, this paper studies the information characteristics of online courses and their impact on immersion experience and learning intention.

Flow Experience
The flow theory was first proposed by Csikszentmihalyi, a psychologist at the University of Chicago. He believes that people who are on the flow will be deeply attracted by what they do. Full participation of individuals in activities is an immersive feeling, so it is also called “immersive experience” (Ferrer et al., 2022). Inma and Antoni (2017) believed that the streaming experience of virtual education environment refers to the feeling that online learners control the virtual learning environment. It is not only the attention of online learners to online learning, but also the physical feeling of online learners to the virtual education environment (Csikszentmihalyi & MacAlloon, 1975). The flow experience of online teaching refers to the immersive experience generated by students in the learning process of using the online teaching platform, which is mainly manifested by paying attention to browsing online teaching content and generating a sense of pleasure. From the perspective of human-computer interaction, the flow experience is the perception of the user during the interaction with the computer. Attention will be completely focused on the interaction, curiosity will be fully mobilized, and the interaction process will be very interesting. As a state of subjective perception, immersion experience mainly includes the complete integration of behavior and consciousness, the disappearance of the sense of time, the enhancement of perceptual control and the disappearance of self-awareness.

Flow experience is a concept in the field of psychology. With the development of this theory, scholars gradually introduce it into the behavioral and attitude system. Lu et al. (2009) used the theory of planned behavior (TPB), technology acceptance model (TAM) and flow theory to study the internal and external motives that affect Chinese users' acceptance of instant messaging (Rodriguez-Ardura & Meseguer-Artola, 2017). Yang and Lee (2018) studied the relationship among flow experience, perceived usefulness and product related features. The results showed that the two mediating variables of flow and perceived usefulness had a significant impact on use intention (Lu et al., 2009). In order to understand whether these factors will affect the player loyalty of game users through traffic experience, Su et al. (2016) investigated 394 game players, the results show that human-computer interaction (HI), social interaction (SI), skill (s), and challenge (c) independently positively affect the traffic experience and further positively affect the loyalty of mobile game users. These studies show that flow experience does have an impact on behavior and attitude. Therefore, this study attempts to explore the impact of flow experience on learning intention (Yang & Lee, 2018).

Many scholars have also introduced flow experience into pedagogy to explore the impact of flow experience on learners. Irene et al. (2013) explored the effect of immersion experience on the behavior process of students in virtual learning environment. They believed that time distortion and concentration are the direct antecedents of immersion experience, which can have a positive impact on students’ learning (Su et al., 2016). Hong et al. (2017) designed a Chinese learning game to explore students' internal motivation related to online learning self-efficacy and flow experience, so as to predict the degree of learning progress. The results show that the intrinsic motivation of Chinese learning can predict the self-efficacy of online learning, and the flow experience is related to students’ learning progress (Esteban-Millat et al., 2014). Shin (2006) studied the flow experience of online learners and proposed a flow model for the virtual teaching environment of the University. The results show that the flow experience is intuitive and important to the satisfaction of online learning, and individual differences will have significant differences in the flow experience of online learning (Hong et al., 2017).
Learning Intention

With the continuous development of network technology, modern educational technology is widely used in the field of higher education. The study of learning intention mainly focuses on learners’ continuous use of MOOC learning, online learning platform and autonomous learning platform. Researches on learning intention are mainly based on the expectation confirmation theory, which was first proposed by the American scholar Anol (2001) (Shin, 2006). Due to its highly predictive ability of users’ willingness to use, it has become the most commonly used theoretical model for exploring the sustainable development of information systems. Fred (1989) absorbed the reasonable core of related theories such as expectation theory model and self-efficacy theory, and proposed the Technology Acceptance Model (TAM), pointing out that user behavior comes from the user’s wishes, which depends on the user’s attitude toward technology (Bhattacherjee, 2001). The user’s attitude toward technology depends on its usefulness and ease of use. Perceived usefulness is the degree to which a particular system improves job performance. Ease of use perception refers to the degree to which users subjectively believe that no effort is required to use a particular system. In response to specific research questions, the researchers improved the expectation confirmation model and the technology acceptance model. The research of Dai et al. (2020) showed that learners’ perceived usefulness experience and learning satisfaction can have a positive impact on the continuous learning willingness of MOOC (Davis, 1989). The research results of Wu (2021) showed that the variables that have a significant positive impact on the willingness of MOOC learners to continue to use include satisfaction, perceived usefulness, immersive experience, and expectation confirmation (Dai et al., 2020). Zhu et al. (2021) found that perceived usefulness, perceived ease of use, and sense of community belonging directly affect college students’ SPOC learning intentions, while interactive environment design, curriculum design, and perceived resources all affect college students’ SPOC learning through the above three intermediaries Intention (Wu, 2021). According to Fu et al. (2020), college students are more satisfied with online English learning and willing to continue learning. The perceived usefulness and expectation confirmation of online English learning will directly affect the willingness to continue learning. At the same time, they can also indirectly affect college students’ online English learning willingness through learning satisfaction (Yunxian et al., 2021).

Research Model and Hypotheses

Compared with traditional teaching, online teaching has differences in stimulating students’ interest in learning, browsing information, and focusing on objects. First of all, in the process of online learning of students, great changes have taken place in the objects of attention. Secondly, students’ interests have changed, and teachers’ personal charm and verbal persuasion ability have been greatly reduced. In addition, the sources of information for students are more diverse (Fu et al., 2020). In the process of online learning, students are more likely to ask questions and comments. For example, students can ask questions at any time when they encounter problems, which will be recorded and solved in time. However, in traditional face-to-face learning, such questions are not encouraged because they will break the normal teaching process. At this time, the information characteristics of online courses play an important role. Taking into account the importance of the information characteristics of online courses, this research takes the professionalism, interactivity, entertainment and usability of online courses as independent variables, learning willingness as the dependent variable, and mobile experience as the intermediate variable, and constructs a conceptual model (as shown in the Figure 1), and take college students who have received online learning as the survey object to explore the influence of the information characteristics of online courses on college students’ learning intention.

The Impact of Information Characteristics

Professionalism refers to the professional knowledge attribute of the online course. For example, whether the online course teaches professional theoretical knowledge or professional skill knowledge to online learners is the professional attribute of the online course content. During the popularity of COVID-19, many professional courses had to carry out online teaching, online learning instead of offline learning, and the professionalism of
online courses was very important. McAndrew et al. (2012) believed that the professionalism of online courses provides important support for online learners. On the premise of ensuring accessibility, professionalism has a positive impact on the flow experience (Kitsantas & Chow, 2007). Khtere and Yousef (2021) studied the professionalism of online teaching in Arab universities. They believed that professionalism has a positive impact on Online Learners’ learning intention (McAndrew et al., 2012). Professionalism makes it easier for students to have a sense of trust. Based on this, this study puts forward the following hypotheses:

H1: The professionalism of online courses has a significant positive impact on College Students’ flow experience.

H2: The professionalism of online courses has a significant positive impact on College Students’ learning intention.

Teaching interaction refers to the process in which learners interact with the learning environment to pursue their own development. In the teaching interaction tower, interaction is divided into three levels from low to high: operational interaction, information interaction, and conceptual interaction. Among them, operational interaction affects other interactions of learners through the system interface. Information interaction includes the interaction between people and between people and information resources. Conceptual interaction is the interaction between new and old concepts in the learner’s mind, and is an extension of the interaction between people and content (Khtere & Yousef, 2021). Croxton (2014) believed that the number of online course registrations is increasing, but the turnover rate is very high, and interactivity is an important factor affecting online learners’ continuous learning (Dzakiria & Idrus, 2003). Based on this, this research proposes the following hypotheses:

H3: The interactivity of online courses has a significant positive impact on College Students’ flow experience.

H4: The interactivity of online courses has a significant positive impact on College Students’ learning intention.

In the teaching process, the teacher’s personal charm will have a great impact on the student’s learning effect. If the course is interesting, it is easy to attract students’ attention and improve students’ willingness to learn. According to Ulrich and Karvonen (2011), they tested the influencing factors of online learning environment, and the results showed that the interest of online courses had a positive impact on Online Learners’ learning attitude (Croxton, 2014). In the process of online learning, the personal charm of teachers is greatly reduced due to the isolation of time and space. If online courses can guarantee students’ interest and entertainment value to a certain extent, it can obviously have a positive impact on the immersive experience of online learning and improve students’ willingness to learn. Based on this, this research proposes the following hypotheses:

H5: The entertainment of online courses has a significant positive impact on College Students’ flow experience.

H6: The entertainment of online courses has a significant positive impact on College Students’ learning intention.

In TAM theory, perceived ease of use is a very important concept. In the model, it can significantly predict the user’s intention. In meta-analysis, perceived ease of use has a significant impact on usage intention. According to Yousef et al. (2015), they believed that online courses in higher education still have some limitations, especially the availability and effectiveness of online courses. Advanced technology and reliable platforms can improve the availability and effectiveness of online courses and enhance the learning intention of online learners (Ulrich & Karvonen, 2011). Since online learning is restricted by network and other information technology, playback equipment and other hardware devices, as well as user operation technology, the convenience of use and operation can increase the willingness of online learning. Based on this, this research proposes the following hypotheses:

H7: The usability of online courses has a significant positive impact on College Students’ immersion experience.

H8: The usability of online courses has a significant positive impact on College Students’ learning intention.

Mediating Effect of Flow Experience

According to Pelet et al. (2017), Flow experience is an important feature of internet user behavior. In the media environment of human-computer interaction, flow experience can change user behavior and enhance users’ willingness to use (Yousef et al., 2015). This research defines the flow experience of online learning as a pleasant sense of selflessness when learners use an online teaching platform. In the process of online learning, they are not disturbed by the outside world, attracted by the content of online courses, and attach great importance to them. Ho and Kuo (2010) believed that the determinants of e-
learning results of IT professionals are self perceived flow experience and learning results. Their findings confirm that computer attitudes and flow experience have a positive and direct impact on learning outcomes (Pelet et al., 2017). According to Abu et al. (2018), they believed that a large number of online courses provide more learning opportunities for students, but the participation rate of students is declining. Adding game components to online courses can help students improve their immersion experience and provide solutions to the challenges faced by online courses (Ho & Kuo, 2010). Ip et al. (2018) believed that improving the immersion experience of online courses is very meaningful and can improve the learning intention and learning effect. They combine online courses with virtual technology to improve the immersion experience of learners in order to improve the learning intention of online learners (Abu Bakar et al., 2018).

Based on this, this research proposes the following hypotheses:

H9: The flow experience of online courses has a positive impact on learning intention.

H10: The flow experience plays an intermediary role in the influence of online course information characteristics on learning intention.

**Materials and Methods**

**Questionnaire Design**

In this paper, a standardized scale was developed as a measurement tool, and the data were collected by questionnaire survey. The questionnaire mainly includes three parts: research introduction, user demographic characteristics survey, and scale. In the research introduction part, the purpose, significance and privacy protection of the research project are briefly stated. The user demographic characteristics survey part includes the user’s gender, major and educational background. The scale part adopts Likert’s 5-point scale for processing. Options 1 to 5 respectively mean from “disagree” to “agree.” The scale design of Professionalism variables refers to the scale of Lin (2021) and Aisha et al. (2019) (Fu et al., 2020; Ip et al., 2019). The scale design of interactivity variables refers to the scales of Yousef (2015) and Mejia and Phelan (2014) (Aisha, 2019; Ip et al., 2019). The six potential measurement items refer to the existing research to ensure the reliability and validity of the scale theme to the greatest extent. All measurement variables correspond to 18 observed variables.

**Results and Discussion**

**Reliability and Validity Test**

SPSS21.0 and LISREL8.7 were used to test the reliability and validity of the scale data.

In order to test the homology deviation problem, Harman’s single factor analysis method is used to analyze all the measurement terms of each latent variable. It is found that the variation explained by the first common factor is 31.4%, which is lower than the critical value of 50%, indicating that the common method deviation problem of the data in this study is not serious and can be studied in the future.

Cronbach alpha coefficient and combined reliability CR value are used as indicators to test the reliability of data. As shown in Table 2, the CR values of all variables are greater than 0.7, indicating that the scale data have good internal consistency.

As shown in Table 2, the factor loadings and AVE values of the measurement items of all variables are
greater than 0.5, indicating that the scale has good convergent validity. Meanwhile, as shown in Table 3, the arithmetic square root of ave of the variable is greater than the correlation coefficient between the variable and other variables, indicating that the scale has good differential validity. In addition, confirmatory factor analysis showed that $\chi^2/DF = 2.283 < 3$, CFI = 0.974 > 0.9, IFI = 0.977 > 0.9, NFI = 0.962 > 0.9, NNFI = 0.983 > 0.9, RFI = 0.965 > 0.9, SRMR = 0.037 < 0.08, RMSEA = 0.042 < 0.08. All goodness of fit indexes are within the recommended range. Therefore, the variables proposed in this study have good convergent validity and differential validity.

**Hypothesis Test**

AMOS is used to conduct structural equation model analysis on the collected data to obtain the path coefficient between various variables to verify the hypothetical relationship. The results are shown in Table 4. The path diagram is shown in Figure 2. Due to the good fitting of the hypothetical model, it can be judged from the path coefficient in Table 4 that the information characteristics of online courses, Professionalism, interactivity, entertainment and usability have a significant positive impact on flow experience and learning intention (the standardized path coefficients are .338, .356, .452, .414, .516, .486, .447, and .375 respectively, $p < .001$), hypothesis H1, H2, H3, H4, H5 H6, H7, and H8 are established. The flow experience of online course has a significant positive impact on learning intention (the standardized path coefficient is .318, $p < .001$). Hypothesis H9 is supported.

**Mediator Effect Test**

This study further explores whether immersion experience plays a mediating role between online course
information characteristics and college students’ online learning intention. As shown in Table 5, referring to Barron and Kenny’s three-step method (Mejia & Phelan, 2014), first control the demographic trait variables. Then observe whether and how the antecedent variables affect the outcome variables, and then introduce the intermediary variables. Observe whether the path coefficient and significance of the antecedent variables on the outcome variables change after the introduction of the intermediary variables, so as to judge whether the intermediary variables play an intermediary role in the antecedent variables and the outcome variables.

Taking models M2 and M3 as examples, after controlling the demographic characteristic variables, it is found that professionalism has a positive impact on College Students’ online learning intention (β = .325, p < .001). On the basis of model M2, immersive experience is introduced into model M3 to find professionalism (β = .117, p < .001) and immersion experience (β = .243, p < .001) still had a significant impact on the willingness to continue to use, but the impact of the two decreased. Models m2 and M3 show that immersion experience plays a partial mediating role between professionalism and online learning intention. Similarly, the mediation effect test results in Table 5 show that immersion experience plays a partial mediating role between interactivity, interest, ease of use and online learning intention, and after adding immersion experience, the impact of online course information characteristics on College Students’ online learning intention is reduced. Therefore, hypothesis H10 is supported.

Further, using the mediation effect value calculation formula $a^*b/C$, calculate the average mediation effect value of all paths and its proportion in the total effect. It is found that the average mediation effect value is .172, accounting for 63.8% of the total effect, indicating that flow experience plays an important role in explaining the relationship between antecedent dependent variables and outcome variables.

In order to verify the reliability of mediating effect, bootstrap resampling was carried out with spss21.0 to test the mediating effect of flow experience between
antecedent and outcome variables. Through 1,000 bootstrap resampling analysis of 1,057 valid sample data, the path coefficient, 95% confidence interval and significance level of the mediation effect of flow experience in different paths are obtained. It is found that the 95% confidence interval of all paths does not contain zero, so the mediation effect of flow experience is significant.

Discussion of Results

The purpose of this study is to explore the impact of online course information characteristics on College Students' online learning flow experience and learning intention, and to explore the mediating effect of immersion experience in the impact of online course information characteristics on learning intention. All research hypotheses have passed the test, and the specific research conclusions are as follows:

The information characteristics of online courses have a positive impact on the flow experience of College Students' online learning. Professionalism of information characteristics of online courses ($\beta = .338$, $p < .001$), interactivity ($\beta = .452$, $p < .001$), entertainment ($\beta = .516$, $p < .001$), and usability ($\beta = .447$, $p < .001$).

The information characteristics of online courses have a positive impact on College Students' learning intention of online learning. Professionalism of information characteristics of online courses ($\beta = .325$, $p \leq .001$), interactivity ($\beta = .407$, $p \leq .001$), entertainment ($\beta = .472$, $p \leq .001$), and usability ($\beta = .413$, $p \leq .001$).

Flow experience plays a partial mediating role in the influence of online course information characteristics on learning intention. This result is consistent with the research of Chang (2013) (Baron & Kenny, 1986). Before the outbreak of COVID-19, although many scholars paid attention to online learning, online learning was not popularized. On the one hand, it was limited by technology and on the other hand, it was due to the characteristics of education. Since the COVID-19 epidemic, all parts of the world have been trying to promote online learning. For art course systems that require action operations in many parts, online learning has to be carried out on a large scale. Online learning requires high autonomy. If students cannot achieve flow experience in the learning process, the effect of online learning will be greatly weakened. Contrary, when students can achieve flow experience, during online learning, college students can freely learn professional knowledge through teachers' teaching videos and course digital resources, and interact with teachers and other students through online comments and reviews. The pleasant and selfless experience they can get in this process is an important driving force to promote college students to continue to use online courses.

The information characteristics of online courses have a positive impact on the flow experience of College Students' online learning. Professionalism of information characteristics of online courses ($\beta = .338$, $p < .001$), interactivity ($\beta = .452$, $p < .001$), entertainment ($\beta = .516$, $p < .001$), and usability ($\beta = .447$, $p < .001$).

The information characteristics of online courses have a positive impact on College Students' learning intention of online learning. Professionalism of information characteristics of online courses ($\beta = .356$, $p < .001$), interactivity ($\beta = .414$, $p < .001$), entertainment ($\beta = .486$, $p < .001$), and usability ($\beta = .375$, $p < .001$) and so on.

The flow experience of online courses has a positive impact on learning intention. This result is consistent with the research of Chang (2013) (Baron & Kenny, 1986). Before the outbreak of COVID-19, although many scholars paid attention to online learning, online learning was not popularized. On the one hand, it was limited by technology and on the other hand, it was due to the characteristics of education. Since the COVID-19 epidemic, all parts of the world have been trying to promote online learning. For art course systems that require action operations in many parts, online learning has to be carried out on a large scale. Online learning requires high autonomy. If students cannot achieve flow experience in the learning process, the effect of online learning will be greatly weakened. Contrary, when students can achieve flow experience, during online learning, college students can freely learn professional knowledge through teachers' teaching videos and course digital resources, and interact with teachers and other students through online comments and reviews. The pleasant and selfless experience they can get in this process is an important driving force to promote college students to continue to use online courses.

Flow experience plays a partial mediating role in the influence of online course information characteristics on learning intention. This result is consistent with the research of Hussain and Zhou (2018) (Chang, 2013; Hussain & Zhou, 2018). As we all know, many games can make players immerse themselves. At the same time, many people can easily immerse themselves when using the Internet, such as online shopping. For many people, learning is not a happy thing, especially online learning, which cannot communicate with teachers and classmates face to face. Therefore, it is crucial to let learners immerse themselves in online learning to a greater extent. When developing online courses, we need to focus on the

\begin{table}[h]
\centering
\caption{Mediator Effect Test.}
\begin{tabular}{lcccccccc}
\hline
Variables & M1 & M2 & M3 & M4 & M5 & M6 & M7 & M8 & M9 \\
\hline
Control variables & & & & & & & & & \\
Gender & .021 & .081 & .013 & .062 & .015 & .027 & .018 & .064 & .037 \\
Educational background & .025 & .014 & .021 & .017 & .012 & .035 & .042 & .016 & .026 \\
Major & .024 & .002 & .006 & .003 & .023 & .012 & .011 & .014 & .007 \\
Independent variable & & & & & & & & & \\
Professionalism & .325*** & & & & & & & & \\
Interactivity & & .407*** & & & & & & & \\
Entertainment & & & .163*** & & & & & & \\
Usability & & & & .472*** & & & & & \\
Mediator variable & & & & & & & & & \\
Flow experience & & .243*** & & .261*** & & .237*** & & .259*** & \\
R & .014 & .126 & .243 & .118 & .347 & .142 & .253 & .164 & .248 \\
$\Delta R$ & .014 & .112 & .117 & .125 & .229 & .205 & .111 & .089 & .084 \\
F & 2.3 & 21.7 & 53.6 & 12.8 & 50.7 & 17.4 & 55.2 & 16.8 & 23.5 \\
VIF$_{max}$ & 1.02 & 10.4 & 1.01 & 1.30 & 1.02 & 1.40 & 1.03 & 1.01 & 1.40 \\
\hline
\end{tabular}
\end{table}
characteristics of the course, such as professionalism, interactivity, entertainment, and usability, so as to better enable learners to enter the flow experience. However, compared with online course information characteristic that directly affect college students’ online learning intention, after adding the intermediate variable immersion experience, the influence of online course information traits on College Students’ online learning intention is reduced.

Implications of the Research

For the online course platform, we should strengthen the platform construction, improve the information quality, system quality, and service quality of online courses, and then improve the user experience, which is an important way to improve the sustainable use intention of college students. Specifically, online courses can start with the following measures to enhance college students’ online learning intention. Firstly, improving the professionalism of online course content. Philipesen et al. (2019) believed that teachers’ professional development strategies need to be formulated, so that teachers can master how to teach in online or mixed learning environments, and ensure the professionalism of curriculum resources, so as to give full play to the potential of online and mixed learning. In the process of online course construction, we should enrich the course content and emphasize the course form, so as to help college students easily understand the course content and solve the difficulties encountered in online learning. Secondly, strengthening the interaction of online courses. For example, improve social interaction functions (such as comments, forwarding, and sharing), enhance the social contacts and social attributes of platform users, and then improve the user stickiness of college students. Warshawski (2022) studied the online learning of nurse courses after the outbreak of the COVID-19 epidemic, and the research results confirmed the importance of interaction in the online learning of nurse courses. There are many practice links in both nurse courses and art design courses. It is difficult to achieve the expected learning effect if you simply rely on online learning of theoretical knowledge. When students are learning online, problems in their practical operations need to be solved in a timely manner. When they are in offline classes, they can always ask teachers for guidance or classmates for help. This interaction also needs to be improved when they are learning online courses. Thirdly, enhancing the entertainment of online courses. During course construction, should fully consider how to make students not only learn professional knowledge, but also feel entertainment value in the process of online learning. Nair (2022) proved the effectiveness of entertainment teaching methods in online teaching of tourism vocational education after the outbreak of COVID-19 epidemic. The entertainment of online courses can significantly enhance students’ participation, increase learning experience, and make the course content more diversified and inclusive. Fourthly, increasing the ease of use of online courses, improving the timeliness of response, and creating a comfortable and pleasant virtual learning environment. Tao et al. (2022) confirmed the important role of ease of use in MOOC, and usability and perceived quality have a strong indirect impact on behavioral intention and perceived effective use through the intermediary of perceived ease of use, perceived usefulness, and perceived enjoyment. This poses a double challenge to the development of online course platform and the preparation of online course content. For online course platform, the development of more convenient and applicable terminals, as well as the humanization of terminal visual interface, etc. How to make the structure of online course content more reasonable, and how to more easily meet the needs of learners for reading, downloading, interaction, etc. These are not only the requirements of online courses of art and design, but also the development direction of other online courses.

Conclusions and Limitations

This study constructs a set of research conceptual model affecting college students’ online learning intention, collects data, and uses structural equation analysis and hierarchical regression analysis to test the main effect and intermediary effect between variables, which has certain theoretical and practical value. Firstly, in terms of theoretical value, different from the existing studies focusing on the impact of user satisfaction and user expectation on online learning, this study focuses on how user immersion experience affects online learning intention, so as to provide reference for the follow-up research on online learning intention; At the same time, different from the existing studies that focus on the integration of multi-dimensional variables from subject, object and environment, this study focuses on the important impact of online course information characteristics on College Students’ user experience, psychology and behavior intention in the emerging technology environment. Then, in terms of practical value, this study puts forward some enlightenment and suggestions from the perspective of online curriculum construction, which provides some inspiration for relevant management practice activities.

This study also has some limitations. For example, only four variables of professionalism, interactivity, entertainment, and usability are used as independent variables, and the determination of variables needs to be more comprehensive and in-depth. The survey objects
only select college students who have received online learning, and there is a lack of survey on people without online learning experience. Future related research can further explore the impact of users’ negative emotions such as anxiety, chagrin, and self blame after immersion experience on users’ unsustainable use behavior and intermittent dropout behavior of online learning. In addition, relevant research can focus on the impact of user subject characteristics on users’ online learning intention from the perspective of user subject.

Acknowledgments

We want to thank the reviewers and editors who persevered through revisions of this paper, and helped nurture it to completion. Any remaining errors are fully our own responsibility. IRB permission number is not applicable.

Author Contributions

HW completed the collection of some data, drafted, and revised the manuscript. YS compiled a questionnaire, completed some data collection, and participated in data analysis and discussion.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

ORCID iD

Tian Hewei https://orcid.org/0000-0002-4418-9410

Availability of Data and Materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

References

Abu Bakar, N. F., Yusof, A. F., Iahad, A. N., & Ahmad, N. W. (2018). The implementation of gamification in massive open online courses (MOOC) platform. In N. N. Abdullah, W. Wan Adnan, & M. Foth (Eds.). User Science and Engineering. i-USEr 2018. Communications in Computer and Information Science (Vol. 886). Springer.

Aisha, A. D. (2019). The effects of perceived usefulness, confirmation and satisfaction on continuance intention in using massive open online course (MOOC). Knowledge Management & E-Learning: An International Journal, 11(2), 201–214. https://doi.org/10.34105/j.kmel.2019.11.010

Al-Hunaiyyan, A., Alhajri, R., Al-Sharhan, S., & AlGhannam, B. A. (2021). Factors influencing the acceptance and adoption of online learning in response to the covid-19 pandemic. International Journal of Web-Based Learning and Teaching Technologies, 16(6), 1–16. https://doi.org/10.4018/IJWLTT.20211101.oa5

Alraimi, K. M., Zo, H., & Ciganek, A. P. (2015). Understanding the MOOCs continuance: The role of openness and reputation. Computers & Education, 80, 28–38. https://doi.org/10.1016/j.compedu.2014.08.006

Amir, L. R., Tanti, I., Maharani, D. A., Wimardhani, Y. S., Julia, V., Sulijaya, B., & Puspitawati, R. (2020). Student perspective of classroom and distance learning during COVID-19 pandemic in the undergraduate dental study program Universitas Indonesia. BMC Medical Education, 20(1), 392. https://doi.org/10.1186/s12909-020-02312-0

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. Journal of Personality and Social Psychology, 51(6), 1173–1182. https://doi.org/10.1037/0022-3514.51.6.1173

Bhattacherjee, A. (2001). Understanding information systems continuance: An expectation-confirmation model. MIS Quarterly, 25(3), 351–370. https://doi.org/10.2307/3250921

Binali, T., Tsai, C. C., & Chang, H. Y. (2021). University students’ profiles of online learning and their relation to online metacognitive regulation and internet-specific epistemic justification. Computers & Education, 175, 104315. https://doi.org/10.1016/j.compedu.2021.104315

Chang, C. C. (2013). Examining users’ intention to continue using social network games: A flow experience perspective. Telematics and Informatics, 30(4), 311–321. https://doi.org/10.1016/j.tele.2012.10.006

Chang, S. C., & Tung, F. C. (2007). An empirical investigation of students’ behavioural intentions to use the online learning course websites. British Journal of Educational Technology. Advance online publication. https://doi.org/10.1111/j.1467-8553.2007.00742.x

Chang, T. Y., Hsu, M. L., Kwon, J. S., Kusdhany, M. L. S., & Hong, G. (2021). Effect of online learning for dental education in Asia during the pandemic of COVID-19. Journal of Dental Sciences, 16(4), 1095–1101. https://doi.org/10.1016/j.jds.2021.06.006

Commission of the European Communities. (2001). The E-Learning Action Plan: Designing Tomorrow’s Education. Commission of the European Communities. http://hdl.handle.net/10707/58356

Croxton, R. A. (2014). The role of interactivity in student satisfaction and persistence in online learning. Journal of Online Learning and Teaching, 10(2), 314. https://jolt.merlot.org/vol10no2/croxton_0614.pdf

Csikszentmihalyi, M., & MacAloon, D. (1975). Beyond boredom and anxiety. In M. Csikszentmihalyi (Ed.). Jossey-Bass Publishers.
Dai, H. M., Teo, T., Rappa, N. A., & Huang, F. (2020). Explaining Chinese university students’ continuance learning intention in the MOOC setting: A modified expectation confirmation model perspective. *Computers & Education, 150*, 103850. https://doi.org/10.1016/j.compedu.2020.103850

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319–340. https://doi.org/10.2307/249008

Desmond, K. (2002). *The Future of Learning: From eLearning to mLearning*. https://eric.ed.gov/?id=ED472435

Dzakiria, H., & Idrus, R. M. (2003). Teacher-learner interactions in distance education: A case of two Malaysian universities. *Turkish Online Journal of Distance Education, 4*(3). https://dergipark.org.tr/en/pub/tojde/article/16937/176820

Elshami, W., Taha, M. H., Abuzaid, M., Saravanan, C., Al Dzakiria, H., & Idrus, R. M. (2003). Teacher-learner interactions in distance education: A case of two Malaysian universities. *Turkish Online Journal of Distance Education, 4*(3). https://dergipark.org.tr/en/pub/tojde/article/16937/176820

Elshami, W., Taha, M. H., Abuzaied, M., Saravanan, C., Al Kawas, S., & Abdalla, M. E. (2021). Satisfaction with online learning in the new normal: Perspective of students and faculty at medical and health sciences colleges. *Medical Education Online, 26*(1), 1920090. https://doi.org/10.1080/10872981.2021.1920090

Elshami, W., Taha, M. H., Abuzaied, M., Saravanan, C., Al Kawas, S., & Abdalla, M. E. (2021). Satisfaction with online learning in the new normal: Perspective of students and faculty at medical and health sciences colleges. *Medical Education Online, 26*(1), 1920090. https://doi.org/10.1080/10872981.2021.1920090

Esteban-Millat, I., Martinez-López, F. J., Huertas-García, R., Meseguer, A., & Rodríguez-Ardura, I. (2014). Modelling students’ flow experiences in an online learning environment. *Computers & Education, 71*, 111–123. https://doi.org/10.1016/j.compedu.2013.09.012

Ferrer, J., Ringer, A., Saville, K., A Parris, M., & Kashi, K. (2022). Students’ motivation and engagement in higher education: The importance of attitude to online learning. *Higher Education, 83*, 317–338. https://doi.org/10.1007/s10734-020-00657-5

Flores, M. A., Barros, A., Simão, A. M. V., Pereira, D., Flores, P., Fernandes, E., Costa, L., & Ferreira, P. C. (2022). Portuguese higher education students’ adaptation to online teaching and learning in times of the COVID-19 pandemic: Personal and contextual factors. *Higher Education, 83*, 1389–1408. https://doi.org/10.1007/s10734-021-00748-x

Fu, S., Gu, H., & Yang, B. (2020). The affordances of AI-enabled automatic scoring applications on learners’ continuous learning intention: An empirical study in China. *British Journal of Educational Technology, 51*(5), 1674–1692. https://doi.org/10.1111/bjet.12995

Ho, L. A., & Kuo, T. H. (2010). How can one amplify the effect of e-learning? An examination of high-tech employees’ computer attitude and flow experience. *Computers in Human Behavior, 26*(1), 23–31. https://doi.org/10.1016/j.chb.2009.07.007

Hong, J. C., Hwang, M. Y., Tai, K. H., & Lin, P. H. (2017). Intrinsic motivation of Chinese learning in predicting online learning self-efficacy and flow experience relevant to students’ learning progress. *Computer Assisted Language Learning, 30*(6), 552–574. https://doi.org/10.1080/09588 221.2017.1329215

Hossain, M. S., & Zhou, X. (2018). Impact of m-payments on purchase intention and customer satisfaction: Perceived flow as mediator. *International Journal of Science and Business, 2*(3), 503–517. https://doi.org/10.5281/zenodo.1408692

Ip, H. H. S., Li, C., Leoni, S., Chen, Y., Ma, K. F., Wong, C. H., & Li, Q. (2019). Design and evaluate immersive learning experience for massive open online courses (MOOCs). *IEEE Transactions on Learning Technologies, 12*(4), 503–515. https://ieeexplore.ieee.org/abstract/document/8515107

Jiang, L., & Wang, X. (2020). Optimization of online teaching quality evaluation model based on hierarchical PSO-BP neural network. *Complexity, 2020*, 1–12. https://doi.org/10.1155/2020/6647683

Khtere, A. R., & Yousef, A. M. F. (2021). The professionalism of online teaching in Arab Universities. *Educational Technology & Society, 24*(3), 1–12. https://www.jstor.org/stable/27032852

Kitsantas, A., & Chow, A. (2007). College students’ perceived threat and preference for seeking help in traditional, distributed, and distance learning environments. *Computers & Education, 48*(3), 383–395. https://doi.org/10.1016/j.compedu.2005.01.008

Lackie, K., Najjar, G., El-Awaisi, A., Frost, J., Green, C., Langlois, S., Lising, D., Pfeifle, A. L., Ward, H., Xyrichis, A., & Khalili, H. (2020). Interprofessional education and collaborative practice research during the COVID-19 pandemic: Considerations to advance the field. *Journal of Interprofessional Care, 34*(5), 583–586. https://doi.org/10.1080/13561568.2020.1807481

Liu, M., & Hu, F. (2021). Masking, breaking and uncovering: Analysis and thinking of online teaching. *modern educational technology, 31*(3), 28–33.

Lu, Y., Zhou, T., & Wang, B. (2009). Exploring Chinese users’ acceptance of instant messaging using the theory of planned behavior, the technology acceptance model, and the flow theory. *Computers in Human Behavior, 25*(1), 29–39. https://doi.org/10.1016/j.chb.2008.06.002

Mahyooob, M. (2021). Online learning effectiveness during COVID-19 pandemic: A case study of Saudi universities. *International Journal of Information and Communication Technology Education, 17*(4), 1–14. https://doi.org/10.4018/ijicte.20211001oa07

McAndrew, P., Farrow, R., & Cooper, M. (2012). Adapting online learning resources for all: Planning for professionalism in accessibility. *Research in Learning Technology, 20*(4), 345–361. https://doi.org/10.3402/rlt.v20i0.18699

Mejia, C., & Phelan, K. V. (2014). Academic referent group influences on hospitality students’ intentions to enroll in an online course. *Journal of Hospitality & Tourism Education, 26*(2), 65–74. https://doi.org/10.1016/j.jhoteu.2014.090378

Moore, J. L., Dickson-Deane, C., & Galyen, K. (2011). e-learning, online learning, and distance learning environments: Are they the same? *The Internet and Higher Education, 14*(2), 129–135. https://doi.org/10.1016/j.ijhete.2010.10.001

Nair, B. (2022). Endorsing gamification pedagogy as a helpful strategy to offset the COVID-19 induced disruptions in tourism education. *Journal of Hospitality Leisure Sport & Tourism Education, 30*, 100362. https://doi.org/10.1016/j.jhlste.2021.100362

Pelet, J. E., Ettis, S., & Cowart, K. (2017). Optimal experience of flow enhanced by telepresence: Evidence from social media use. *Information Management, 54*(1), 115–128. https://doi.org/10.1016/j.im.2016.05.001

Phillipsen, B., Tondeur, J., Pareja Roblin, N., Vanslambrouck, S., & Zhu, C. (2019). Improving teacher professional development for online and blended learning: A systematic meta-
Rodríguez-Ardura, I., & Meseguer-Artola, A. (2017). Flow in e-learning: What drives it and why it matters. *British Journal of Educational Technology, 48*(4), 899–915. http://hdl.handle.net/10609/5318

Shin, N. (2006). Online learner’s ‘flow’ experience: An empirical study. *British Journal of Educational Technology, 37*(5), 705–720. https://doi.org/10.1111/j.1467-8535.2006.00641.x

Su, Y. S., Chiang, W. L., James Lee, C. T., & Chang, H. C. (2016). The effect of flow experience on player loyalty in mobile game application. *Computers in Human Behavior, 63*, 240–248. https://doi.org/10.1016/j.chb.2016.05.049

Tao, D., Fu, P., Wang, Y., Zhang, T., & Qu, X. (2022). Key characteristics in designing massive open online courses (MOOCs) for user acceptance: An application of the extended technology acceptance model. *Interactive Learning Environments, 30*(5), 882–895. https://doi.org/10.1080/10494820.2019.1695214

Terävä, M., Suoranta, J., Terävä, H., & Curcher, M. (2020). Post-Covid-19 education and education technology ‘solutionism’: A seller’s market. *Postdigital Science and Education, 2*(3), 863–878. https://doi.org/10.1007/s42438-020-00164-x

Ulrich, J., & Karvonen, M. (2011). Faculty instructional attitudes, interest, and intention: Predictors of Web 2.0 use in online courses. *The Internet and Higher Education, 14*(4), 207–216. https://doi.org/10.1016/j.iheduc.2011.07.001

Warshawski, S. (2022). Academic self-efficacy, resilience and social support among first-year Israeli nursing students learning in online environments during COVID-19 pandemic. *Nurse Education Today, 110*, 105267. https://doi.org/10.1016/j.nedt.2022.105267

Wu, B. (2021). Influence of MOOC learners discussion forum social interactions on online reviews of MOOC. *Education and Information Technologies, 26*(3), 3483–3496. https://doi.org/10.1007/s10639-020-10412-z

Yang, H., & Lee, H. (2018). Exploring user acceptance of streaming media devices: An extended perspective of flow theory.” *Information Systems and e-Business Management, 16*(1), 1–27. https://doi.org/10.1007/s10257-017-0339-x

Yousef, A. M. F., Chatti, M. A., Schroeder, U., & Wosnitza, M. (2015). A usability evaluation of a blended MOOC environment: An experimental case study. *The International Review of Research in Open and Distributed Learning, 16*(2). https://doi.org/10.19173/irrodl.v16i2.2032

Yunxian, Z., Jing, H., & Zhenfeng, L. (2021). Research on acceptance intention of SPOC blended teaching under sharing inter-collegiate MOOC [Conference session]. 2021 International Conference on Education, Information Management and Service Science (EIMSS) (pp. 372–376). IEEE. https://doi.org/10.1109/EIMSS53851.2021.00087