Key Drivers of College Students' Satisfaction and Continuance Intention to Use E-Learning in Sichuan, China

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Abstract

Purpose: This article aimed to research the critical factors impacting college students' satisfaction and intention to use e-learning in Sichuan, China. The conceptual framework presented cause-and-effect relationships between Interactivity, Course Content Quality, Perceived Usefulness, Confirmation, Perceived Ease of Use, Satisfaction, and Continuance Intention. **Research design, data, and methodology:** The researcher adopted a quantitative technique (n=500) to administer the questionnaire to Sichuan Vocational and Technical College of Commutations students. Non-probability sampling included judgmental sampling to select the school, quota sampling to define the sample size, and convenience sampling to collect data and distribute the questionnaires online. The researcher used structural equation modeling (SEM) and confirmatory factor analysis (CFA) to conduct the data analysis, including model fit, reliability, and construct validity. **Results:** The results showed that interactivity, course content quality, perceived usefulness, confirmation, and perceived ease of use had a significant effect on students' satisfaction. Their satisfaction was an intermediate variable that influenced their intention to continue. **Conclusions:** The statistics supported the six research hypotheses of this paper, indicating that this study was able to achieve the research objectives. Therefore, we suggested that policymakers and program operators could increase their investment in e-learning to make it more effective.

Keywords: Interactivity, Course Content Quality, Satisfaction, Continuance Intention, E-Learning

JEL Classification Code: E44, F31, F37, G15

1. Introduction

Hiltz (1994) introduced e-learning as a web application, simulating face-to-face (FTF) interactions by placing course materials online to create a shared virtual learning space. In the early 1990s, Smith and Ragan (1999) noted that the rapid development of Internet technology laid the foundation for the rise of online education. Zhang et al. (2020) noted that in higher education, more and more college students are acquiring knowledge and skills through online platforms. In China, the development of online learning has been highly valued by the government and educational institutions. Focusing on Sichuan Province, educational statistics show that the province has 147 higher education institutions with a total of 2.89 million students in 2023. Therefore, analyzing the factors influencing the satisfaction and Continuance Intention of online learning in Sichuan Province has practical significance for improving online classroom learning methods and optimizing online classroom learning models.

Lee (2010) stated that the success of e-learning relies not only on the stability and functionality of the technical platform but also on students' satisfaction and continuance behavior. Sun et al. (2008) showed that factors influencing students' satisfaction with e-learning include the quality of course content, the teaching level of instructors, the effectiveness of technical support, and opportunities for peer interaction. Smith and Wang (2014) add that emotional and social recognition are also important factors affecting students' learning experience. Anderson (2003) notes that research indicates students change their learning behavior

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and attitudes through perceptions of the interactivity of the e-learning platform, the quality of course content, perceived usefulness, confirmation, and perceived ease of use. Interactivity is considered a key factor in enhancing student engagement and learning outcomes. Kember et al. (2010) emphasize that high-quality course content can significantly improve students' learning experience and satisfaction. Davis (1989) mentions that perceived usefulness and ease of use are core variables in the Technology Acceptance Model (TAM), significantly influencing students' usage intentions and satisfaction. Roca et al. (2006) found that students' satisfaction affects their continuance intention and influences their overall evaluation and recommendation intention of the system. Bhattacherjee (2001) indicates that confirmation is crucial to users' continuance intention.

Davis (1989) and Venkatesh et al. (2003) point out that existing studies have shown that learning motivation, technology acceptance, and user experience are key factors affecting students' continuance of e-learning platforms. Davis (1989) proposed the TAM model, which suggests that perceived usefulness and ease of use influence users' usage intentions and behaviors. This model has been widely applied and validated in many studies, especially online learning (Venkatesh et al., 2003). Expectation Confirmation Theory (ECT) explains user satisfaction and Continuance Intention. Oliver (1980) proposed that user satisfaction comes from the degree of confirmation between expectations and experience. Bhattacherjee (2001) applied this theory to the field of information systems, proposing the Information Systems Continuance Model. These theoretical models provide a solid foundation for understanding and analyzing students' online learning behavior.

Despite the extensive research on factors influencing students' satisfaction and continuance intention with e-learning, most studies have focused on technologically advanced regions or general educational contexts. However, cultural and educational background differences can significantly impact the effectiveness of e-learning. Liu et al. (2010) found that cultural background significantly affects participation and learning strategies in e-learning. Zhao et al. (2002) emphasized that local educational policies and cultural differences may affect students' learning outcomes and satisfaction. Therefore, this study aims to explore the key factors influencing college students' satisfaction and continuance intention with e-learning in Sichuan Province, a region with educational backgrounds. To this end, the study proposes the following hypotheses regarding the relationships among interactivity (IN), course content quality (CCQ), perceived usefulness (PU), confirmation (CO), perceived ease of use (PEOU), satisfaction (SA), and continuance intention (CI).

This study adopts a quantitative research approach, collecting data through a questionnaire. The research subjects are students from Sichuan Vocational and Technical College of Communications, who are representative of the college student population in Sichuan Province, as these students come from various administrative regions within the province and have experience using e-learning platforms. The study tests the seven hypotheses within the research framework through data analysis, revealing the variables' relationships. By measuring and analyzing these variables, the study aims to identify the key factors influencing the satisfaction and continuance intention of e-learning among college students in Sichuan Province, thereby contributing to the theoretical development of e-learning. The study's findings will provide valuable insights for educational policymakers and e-learning platform developers, helping to optimize platform design and teaching strategies and enhance students' learning experiences and outcomes, particularly within the specific educational context of Sichuan Province.

2. Literature Review

2.1 Interactivity

Hrastinski (2009) found that courses integrating both asynchronous and synchronous interactivity elements are associated with higher levels of student satisfaction, highlighting the importance of balancing different forms of interactivity to enhance overall satisfaction. Richardson and Swan (2003) showed that students actively engaged in high-level interactive activities are more satisfied with their learning experiences, emphasizing the importance of combining various interactive elements to cater to different learning styles. Arbaugh et al. (2008) emphasized the critical role of user-friendly and highly interactive learning management systems (LMS) in enhancing online learning experiences, closely related to student satisfaction.

H1: Interactivity has a significant impact on satisfaction.

2.2 Course Content Quality

Almaiah et al. (2019) emphasized that the quality of course content significantly affects student satisfaction with e-learning systems, particularly when closely related to course design factors. Nikou and Economides (2017) explored the impact of course content quality on student satisfaction in mobile learning environments, emphasizing the importance of improving the quality of mobile learning resources. Wu et al. (2010) studied the impact of course content quality on student satisfaction in hybrid e-learning environments, finding that high-quality course content positively influences student satisfaction.

H2: Course content quality has a significant impact on satisfaction.

2.3 Perceived Usefulness

Davis (1989) found a positive correlation between users' perceived usefulness of information technology systems and their satisfaction, meaning that when users perceive a system as more useful, their satisfaction levels tend to be higher. Wu and Wang (2006) explored mobile commerce and found a positive relationship between users' perceived usefulness of mobile commerce and their satisfaction. When users perceive mobile commerce as useful, they are more satisfied and willing to use it. Cheng (2020) discovered in the context of cloud-based e-learning systems that the perceived usefulness of courses significantly impacts student satisfaction. Higher perceived usefulness contributes to increased student satisfaction with cloud-based e-learning systems.

H3: Perceived usefulness has a significant impact on satisfaction.

2.4 Confirmation

Oliver (1980) cognitive model revealed the key role of confirmation in forming satisfaction, highlighting its positive influence on satisfaction. Spreng et al. (1996) defined confirmation as the process by which an individual's expectations or beliefs are reinforced through experience, further supporting its importance in consumer satisfaction. Their research emphasized that confirmation is a crucial factor in determining satisfaction levels. Sun et al. (2008) found that confirmation positively influences satisfaction, emphasizing the importance of meeting learners' expectations for successful learning outcomes.

H4: Confirmation has a significant impact on satisfaction.

2.5 Perceived Ease of Use

Davis (1989) proposed that perceived ease of use and perceived usefulness affect users' acceptance of information technology, providing a theoretical basis for later studies explaining user satisfaction with online learning systems. Liaw (2008) directly investigated students' perceived satisfaction while using the Blackboard learning management system, explicitly identifying perceived ease of use as a key factor influencing satisfaction. Similarly, Park (2009) used the TAM to analyze college students' behavioral intentions toward e-learning, finding that perceived ease of use positively influences attitudes and satisfaction.

H5: Perceived ease of use has a significant impact on satisfaction.

2.6 Satisfaction

Bhattacherjee (2001) proposed the Expectation-Confirmation Model (ECM), revealing that higher user satisfaction with information systems increases continuance intention, laying the foundation for subsequent research. Thong and Xu (2012) further confirmed in their "Unified Theory of Acceptance and Use of Technology" that satisfaction is a positive driver of continuance intention. Kim (2010) combined the Theory of Planned Behavior with the Expectation-Confirmation Model, validating the positive impact of satisfaction on continuance intention in the context of mobile data services. Alraimi et al. (2015) found that satisfaction is a key factor in promoting continuance intention in their study of Massive Open Online Courses (MOOCs).

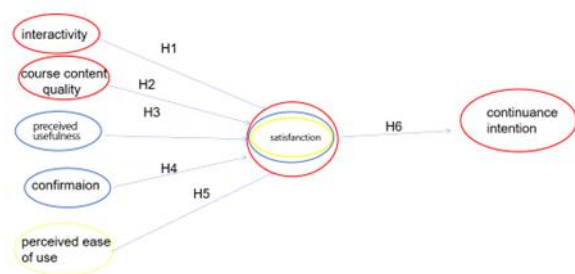**H6:** Satisfaction has a significant impact on continuance intention.

2.7 Continuance intention

Bhattacherjee (2001) defined continuance intention as a forward-looking expectation of system use, rooted in satisfaction derived from meeting or exceeding initial expectations. Bhattacherjee (2001) found that user satisfaction significantly impacts continuance intention in information system use, emphasizing that meeting or exceeding initial expectations leads to a higher likelihood of continuance. Hsu and Lin (2008) studied continuance intention in the context of online learning, finding that learner satisfaction, perceived ease of use, and perceived usefulness are important predictors of learners' intention to continue using online learning platforms.

3. Research Methods and Materials

3.1 Research Framework

This study references several foundational theories, including Anderson's (2003) Interactivity Theory, Kember et al. (2010) theory on the influence of high-quality course content on learning experiences, Davis (1989) Technology Acceptance Model (TAM), Bhattacherjee (2001) Expectation Confirmation Theory (ECT), and DeLone and McLean (2003) Information Systems Success Model. These theories underpin the conceptual framework that was developed by the researchers for this study, as illustrated in Figure 1.

Figure 1: Research Conceptual Framework

H1: Interactivity has a significant impact on satisfaction.
H2: Course content quality has a significant impact on satisfaction.
H3: Perceived usefulness has a significant impact on satisfaction.
H4: Confirmation has a significant impact on satisfaction.
H5: Perceived ease of use has a significant impact on satisfaction.
H6: Satisfaction has a significant impact on continuance intention.

3.2 Research Methodology

The researchers utilized a quantitative approach, employing non-probability sampling by disseminating questionnaires to the target population through an online survey platform (Steffens et al., 2014). The study was conducted with students from Sichuan Vocational and Technical College of Communications, aiming to identify factors that influence student satisfaction and their intention to continue with online learning in Sichuan Province.

The questionnaire comprised three sections. The first contained screening questions, while the second used a 5-point Likert scale to measure variables related to the seven hypotheses. Responses ranged from "strongly disagree" (1) to "strongly agree" (5). The final section gathered demographic information such as gender, age, and academic level.

3.3 Population and Sample Size

Prior to the full survey, a pilot test with 50 participants was conducted. The questionnaire demonstrated acceptable reliability, with an expert item-objective congruence (IOC) score and further validated by Cronbach's Alpha (Hartog & Verburg, 2004). Afterward, the final questionnaire was distributed, yielding 500 valid responses.

For data analysis, SPSS AMOS was employed, including confirmatory factor analysis (CFA) to evaluate the validity and convergence accuracy of the model. Following this, structural equation modeling (SEM) was used to investigate the causal relationships among the study variables. These

steps confirmed the robustness of the study's conceptual framework.

3.4 Sampling Technique

The researchers adopted non-probability, judgment, and quota sampling methods to select the Sichuan Vocational and Technical College of Communications and distributed the questionnaires using an online survey platform. Table 1 shows this study's specific sampling situation.

Table 1: Sample Units and Sample Size

Sichuan Vocational and Technical College of Communications	Population Size	Proportional Sample Size
Transportation Operation Management	256	156
Logistics Management	276	168
Tourism Management	287	176
Total	**819**	**500**

Source: Constructed by author

4. Results and Discussion

4.1 Demographic Information

We distributed questionnaires to 500 Sichuan Vocational and Technical College of Communications students. The demographic information collected from participants included the gender of the students, their age, the frequency of using e-learning, and the commonly used e-learning. As shown in Table 2, there were 236 females and 264 males, accounting for 47.2% and 52.8% respectively. The age distribution was 311 (62.2%) students aged 18 to 20, 138 (27.6%) students aged 21 to 22, and 51 (10.2%) students aged 23 to 24. No students were over the age of 24. Regarding the weekly frequency of e-learning usage, the results indicated that 52 students (10.4%) used e-learning 1-2 times per week, while 149 students (29.8%) engaged in e-learning 3-4 times per week. Additionally, 203 students (40.6%) reported using e-learning 5-6 times per week, 72 students (14.4%) used it 7-8 times per week, and 24 students (4.8%) accessed e-learning more than eight times per week. Demographic information for this study is presented in Table 2.

Table 2: Demographic Profile

Demographic and General Data (N=500)		Frequency	Percentage
Gender	Male	236	47.2%
	Female	264	52.8%
Age	18 to 20 years old	311	62.2%
	21 to 22 years old	138	27.6%
	23 to 24 years old	51	10.2%
	over 24 years old	0	0.0%
	1-2 times	52	10.4%

Demographic and General Data (N=500)		Frequency	Percentage
The frequency of using the e-learning	3-4 times	149	29.8%
	5-6 times	203	40.6%
	7-8 times	72	14.4%
	Over 8 times	24	4.8%

4.2 Confirmatory Factor Analysis (CFA)

This study used confirmatory factor analysis (CFA) to measure each variable in the conceptual framework. The measurement results showed that all scale items of each variable were significant. Additionally, the factor loadings of each scale item were acceptable, indicating a good fit of the conceptual framework. All factor loadings in this study were greater than 0.30, all p-values were less than 0.05, all construct reliability was greater than 0.70, and all average variance extracted (AVE) values were greater than 0.50. These estimates are significant. Table 3 presents all these values.

Table 3: Confirmatory Factor Analysis Result, Composite Reliability (CR) and Average Variance Extracted (AVE)

Variables	Source of Questionnaire (Measurement Indicator)	No. of Item	Cronbach's Alpha	Factors Loading	CR	AVE
Interactivity (IN)	Cheng (2020)	3	0.839	0.810-0.821	0.840	0.636
Course Content Quality (CCQ)	Cheng (2020)	3	0.809	0.753-0.798	0.810	0.588
Perceived Usefulness (PU)	Cheng (2012)	4	0.856	0.769-0.795	0.856	0.598
Confirmation (CO)	Alami and El Idrissi (2022)	3	0.825	0.756-0.814	0.826	0.613
Perceived Ease of Use (PEOU)	Cheng (2012)	4	0.856	0.768-0.776	0.856	0.598
Satisfaction (SA)	Alami and El Idrissi (2022)	3	0.816	0.790-0.770	0.817	0.598
Continuance Intention (CI)	Chang (2013)	3	0.810	0.750-0.797	0.811	0.58

Table 4 shows the square root of the AVE values, indicating that the correlations between all variables in this study are appropriate. This study used GFI, AGFI, NFI, CFI, TLI, and RMSEA as model fit indicators in CFA testing.

Table 4: Goodness of Fit for Measurement Model

Fit Index	Acceptable Criteria	Statistical Values
CMIN/DF	< 5.00 (Awang, 2012; Marsh et al., 2004)	266.797/209=1.277
GFI	≥ 0.85 (Sica & Ghisi, 2007)	0.957
AGFI	≥ 0.80 (Sica & Ghisi, 2007)	0.943
NFI	≥ 0.80 (Wu & Wang, 2006)	0.951
CFI	≥ 0.80 (Bentler, 1990)	0.989
TLI	≥ 0.80 (Sharma et al., 2005)	0.987
RMSEA	< 0.08 (Pedroso et al., 2016)	0.024
Model Summary		Acceptable Model Fit

Remark: CMIN/DF = The ratio of the chi-square value to degree of freedom, GFI = goodness-of-fit index, AGFI = adjusted goodness-of-fit index, NFI = normalized fit index, CFI = comparative fit index, TLI = Tucker Lewis index, and RMSEA = root mean square error of approximation

Table 5 presents this study's convergent and discriminant validity. These values are validated and acceptable. All measurement results confirm the validity of this study's estimated structural model.

Table 5: Discriminant Validity

	IN	CCQ	PU	CO	PEOU	SA	CI
IN	**0.797**						
CCQ	0.308	**0.767**					
PU	0.387	0.447	**0.773**				
CO	0.388	0.342	0.422	**0.783**			
PEOU	0.359	0.323	0.350	0.322	**0.773**		
SA	0.412	0.354	0.415	0.392	0.394	**0.773**	
CI	0.377	0.404	0.396	0.341	0.381	0.424	**0.767**

Note: The diagonally listed value is the AVE square roots of the variables
Source: Created by the author.

4.3 Structural Equation Model (SEM)

Awang (2012) suggested that a chi-square to degrees of freedom ratio (CMIN/DF) of less than 5.00 is an acceptable measure of model fit, a view supported by Marsh et al. (2004). Sica and Ghisi (2007) recommended that both the Goodness of Fit Index (GFI) and the Adjusted Goodness of Fit Index (AGFI) should be greater than 0.80. Wu and Wang (2006) argued that Normed Fit Index (NFI) should be greater than 0.80. Bentler (1990) argued that the Comparative Fit Index (CFI) should exceed 0.80, while Sharma et al. (2005) stated that the Tucker-Lewis Index (TLI) should also be greater than 0.80. Furthermore, Pedroso et al. (2016) suggested that the Root Mean Square Error of Approximation (RMSEA) should be less than 0.08. In this study, researchers utilized SPSS AMOS version 26 to calculate the Structural Equation Modeling (SEM) and refine the model. The fit indices indicate an acceptable fit: CMIN/DF = 3.530, GFI = 0.850, AGFI = 0.815, NFI = 0.856,

CFI = 0.892, TLI = 0.878, and RMSEA = 0.071. These values are presented in Table 6.

Table 6: Goodness of Fit for Structural Model

Fit Index	Acceptable Criteria	Statistical Values
CMIN/ DF	< 5.00 (Awang, 2012; Marsh et al., 2004)	787.146 / 223 or 3.530
GFI	≥ 0.85 (Sica & Ghisi, 2007)	0.850
AGFI	≥ 0.80 (Sica & Ghisi, 2007)	0.815
NFI	≥ 0.80 (Wu & Wang, 2006)	0.856
CFI	≥ 0.80 (Bentler, 1990)	0.892
TLI	≥ 0.80 (Sharma et al., 2005)	0.878
RMSEA	< 0.08 (Pedroso et al., 2016)	0.071
Model Summary		Acceptable Model Fit

Remark: CMIN/DF = The ratio of the chi-square value to degree of freedom, GFI = goodness-of-fit index, AGFI = adjusted goodness-of-fit index, NFI = normalized fit index, CFI = comparative fit index, TLI = Tucker Lewis index, and RMSEA = root mean square error of approximation

4.4 Research Hypothesis Testing Result

The researchers calculated the significance of the study model based on the regression weights and R^2 variances for each variable. Table 7 presents the calculation results. These results support all the hypotheses of this study. Interactivity influenced Satisfaction (β=0.277), Course Content Quality influenced Satisfaction (β=0.185), Perceived Usefulness influenced Satisfaction (β=0.244), Confirmation influenced Satisfaction (β=0.221), Perceived Ease of Use influenced Satisfaction (β=0.272), and Satisfaction influenced Continuance Intention (β=0.526).

Table 7: Hypothesis Results of the Structural Equation Modeling

Hypothesis	(β)	t-value	Result
H1: IN→SA	0.277	5.226*	Supported
H2: CCQ→SA	0.185	3.541*	Supported
H3: PU→SA	0.244	4.724*	Supported
H4: CO→SA	0.221	4.251*	Supported
H5: PEOU→SA	0.272	5.216*	Supported
H6: SA→CI	0.526	8.409*	Supported

Note: * p<0.05
Source: Created by the author

According to the results in Table 7, the researchers concluded that H1 indicates that interactivity (IN) is a key driver of satisfaction (SA), with a standardized path coefficient value of 0.277. H2 indicates that course content quality (CCQ) is a key driver of satisfaction (SA), with a standardized path coefficient of 0.185. H3 indicates that perceived usefulness (PU) is a key driver of satisfaction (SA), with a standardized path coefficient value of 0.244. H4 indicates confirmation (CO) is a key driver of satisfaction (SA), with a standardized path coefficient value of 0.221. H5

indicates that perceived ease of use (PEOU) is a key driver of satisfaction (SA), with a standardized path coefficient value of 0.272. H6 indicates that satisfaction (SA) is a key driver of continuance intention (CI), with a standardized path coefficient of 0.526.

5. Conclusion and Recommendation

5.1 Conclusion

This study aims to comprehensively analyze the factors affecting the satisfaction and Continuance Intention of-learning among college students in Sichuan Province. The study's target population comprises Sichuan Vocational and Technical College of Communications students. The data collected from the 500 questionnaires were analyzed, supporting the conceptual framework of this study. Previous related literature informed this conceptual framework. Based on past relevant studies, we used satisfaction as a mediating factor affecting students' Continuance Intention. The 500 data points collected in this study were analyzed using SPSS and JAMOVI. The conceptual framework was validated using AMOS, supporting the factor structure of this study's items. The confirmatory factor analysis (CFA) verified the factor structure and the applicability of the validation model, with the data fitting reasonably well (West, 2002).

The data collected from the 500 questionnaires passed the CFA measurement. These results indicate that the conceptual model of this study is robust through validity and reliability testing. The results of the convergent validity tests - composite reliability, Cronbach's alpha reliability, factor loadings, average variance extracted analysis, and discriminant validity-confirm the correctness of the study's concepts (Steigenberger, 2015). This study used structural equation modeling (SEM) to analyze the impact of online learning satisfaction and Continuance Intention among college students in Sichuan Province. These results indicate that the research hypotheses proposed in this study are valid. They support all six research hypotheses in this study.

The results indicate that interactivity, course content quality, perceived usefulness, and perceived ease of use directly affect students' satisfaction. Additionally, as a mediating variable, satisfaction significantly influences students' continuance intention (Bhattacherjee, 2001). Furthermore, confirmation is crucial in enhancing students' satisfaction with online learning. By providing timely feedback and support, students are more likely to recognize the effectiveness and value of their online learning experiences.

5.2 Recommendation

Firstly, we suggest developing targeted measures to optimize resource allocation and enhance the interactivity, course content quality, perceived usefulness, and perceived ease of use of e-learning platforms. For example, by increasing the interactive features of e-learning platforms, ensuring the high quality and timely updates of course content, and simplifying the operation processes of e-learning platforms to improve user-friendliness, students can more easily use the platform for learning.

Secondly, we recommend that e-learning platform managers take advantage of student's satisfaction with the platform by investing resources in optimizing platform functionalities and services. Specific measures include introducing more interactive features such as online discussion forums, real-time Q&A sessions, and group projects to increase interaction between students and teachers and ensure timely updates and practicality of course content to meet students' learning needs and provide clear learning paths and goals, demonstrating the practical benefits of e-learning for students' academic and career development and optimizing the platform interface and operational processes to make it more user-friendly, reducing students' difficulties during use.

Finally, an effective feedback mechanism should be established by regularly collecting and analyzing student feedback to optimize various functions and services of the e-learning platform. This helps improve student satisfaction and enhances their willingness to continue using the platform.

5.3 Limitation and Further Study

This study's limitations include focusing on individual-level variables, with data collected from a specific period and only from the Sichuan Vocational and Technical College of Communications. The data were collected within a concentrated timeframe, which may not capture variations over time or across different institutions. Future research should consider including variables similar to those in this study but apply a longitudinal or experimental design to collect data at multiple time points. This approach would allow for a more comprehensive understanding of the dynamics influencing online learning satisfaction and Continuance Intention.

Expanding the sample to include students from different universities and educational backgrounds across Sichuan Province would provide more generalizable results. Examining the cultural and institutional differences that may affect online learning experiences and satisfaction levels would also add valuable insights to the field.

Further research should also investigate other potential mediating or moderating variables that could influence the relationships identified in this study. Variables such as digital literacy, prior experience with online learning, and support from family or peers could be important factors to consider.

In conclusion, while this study provides significant insights into the factors influencing online learning satisfaction and Continuance Intention among college students in Sichuan Province, addressing the limitations and expanding the scope of future research will contribute to a more robust understanding and enhancement of online learning environments.

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