

# Factors Influencing Undergraduates' Perceived Learning and Continuance Intention Towards Using M-Learning

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## Abstract

**Purpose:** This research examined the factors that influence undergraduates' perceived learning and continuance intention using M-Learning in a private university in Chengdu, China. The conceptual framework incorporated self-efficacy (SE), engagement (EN), perceived ease of use (PEOU), perceived usefulness (PU), satisfaction (SA), perceived learning (PL), and continuance intention (CI). **Research design, data, and methodology:** Quantitative methods were used to distribute questionnaires to 500 target respondents online, and 476 valid questionnaires were finally recovered. Purposive sampling and quota sampling were used in the sampling procedures. Before the data gathering, the content validity and reliability of questionnaire was tested by Item-Objective Congruence and pilot test (n=30). After the data collection, the Confirmatory Factor Analysis (CFA) and Structural Equation Model (SEM) was employed to validate the goodness-of-fit of model and confirm hypotheses. **Results:** The results showed that all variables have significant effects in their pairings, with EN having the greatest impact on PL. Therefore, all hypotheses were supported in this study. **Conclusions:** For M-Learning designer, they should focus on platform optimization to improve students' SA and CI about M-Learning. For academic practitioners, they should focus on creating M-Learning atmosphere, creating high-quality online courses, increasing students' EN and improving students' PL.

**Keywords:** M-Learning, Engagement, Perceived usefulness, Perceived learning, Continuance intention

**JEL Classification Code:** E44, F31, F37, G15

## 1. Introduction

Mobile learning (M-Learning) referred to learning that uses a variety of equipment, for example, smartphones as well as iPad to store messages in various places and times (Oberer & Erkollar, 2013). Of course, there were other M-Learning advocates who define M-Learning as wireless networks and digital devices and technologies that are often produced for the public and used by learners as they participate in higher education. When comparing M-

Learning to the traditional learning, some of researcher rated M-Learning as more effective than traditional learning. However, there were also some people who reject it due to the low social interaction, high investment cost, technical problems with exchanging and calculating technology. M-Learning had the potential to improve student achievement and efficiency, but for it to be used effectively in the art and design profession, it was necessary for both teachers and students to use relevant research to guide the learning of the application of new technologies.

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In this study, M-Learning mainly referred to the studying by iPad. The development of mobile techniques and the need for movement of the educational technology to a new direction had revealed the new concept of M-Learning. Learners were able to inject their studying accumulation into the common cooperative atmosphere of M-Learning. Mobile technology played a crucial role in higher education. Advances in wireless technology and mobile had had an impact on the educational environment. Mobile technology could provide teachers with new opportunities to go beyond the traditional classroom scenario. The most important advantage of M-Learning over traditional learning was that students can obtain the information they need independently of time and space. Today, M-Learning had been an important part of educational techniques in institution of higher learning. The majority of higher education institutions all over the world had carried out M-Learning to provide studying no matter when and where with various approaches.

M-Learning was a natural extension of E-learning. There were many advantages of M-Learning, one of them was the probabilities to enhance students' performance based on enabling knowledge and studying could be approached to no matter when and where. Learners could have freedom to take part in studying activities without the consideration of conventional time and space limits. Mobile technology enabled available and extensively used studying compared to studying employed in present E-learning atmosphere. Khaddage et al. (2011) found that today's students, often referred to as millennials, Generation Y, or G2, consider mobile devices to be an integral part of improving their access to learning materials, and further pointed out that M-Learning is operational, engaging, and efficient for students both on and off campus. M-Learning's ability to easily access information can immediately impact students' academic performance and boost their education. M-Learning improved bidirectional exchange, which supported straight exchange of both students as well as teachers, which encourages students who are bashful or irresolute in class to exchange more easily with teachers, and allowed teachers to give all students special guidance in a direct and interactive way. In addition, M-Learning could also help students who face economic, family or health problems migrate to college. Finally, M-Learning was a kind of self-motivated and self-disciplined learning method that reduces time waste and can be learned at any time.

COVID-19 outbreaks had also continued around the world since the dangerous virus was first detected in November 2019 in the southern Chinese city of Wuhan. According to Cucinotta and Vanelli (2020), the World Health Organization (WHO) announced the outbreak of COVID-19 a global epidemic on 11 March 2020. In the first two quarters of 2020, on the basis of instruction as well as enhancement of guiding principle "Disrupted Classes,

Undisrupted Learning" promulgated by the Ministry of Education of China, 282 million students nationwide switched from offline courses to online courses. In order to stop the diffusion of COVID-19, people had no choice but stay at home and maintain social separation. Students' education had also been hampered, and higher education institutions had also canceled the conventional classes that students could sit in the classroom. To ensure that the quality of learning was not compromised by online learning, it was essential to explore innovative and effective approaches of teaching and studying in higher education. One of the pioneering technologies that had taken a significant effect during the spread of COVID-19 pandemic is M-Learning. Kukulka-hulme (2007) believed that M-Learning refers to the M-Learning of students, who could use mobile devices to participate in the learning process at any time and any place. When comparing M-Learning to the traditional learning, some of researcher rated M-Learning as more effective than traditional learning. However, there were also some people who reject it due to the low social interaction, high investment cost, technical problems including exchanging as well as calculating technology. "M-Learning has the underlying ability to enhance students' outcome, while to succeed in the digital economy, individuals and institutions of higher education must use academic studies to guide the application of new technologies and how they are used in the learning process." Nafukho said. For higher education in art, this also provided an opportunity for the rapid promotion of M-Learning in art and design major of higher education. M-Learning allowed learners to access learning materials anywhere and anytime, and had the potential to expand learning environments, connect classrooms and communities, and reach dispersed populations, thus offering a solution for university learning in the context of COVID-19.

Therefore, the research aimed to assess the factors that affect students' PL and CI in M-Learning, and the research data were helpful for teachers to better understand students' using of M-Learning. It was conducive to teaching reform and improving the teaching quality of teachers and students' achievement. Secondly, the research data could help educational institutions to improve M-Learning hardware facilities, curriculum design and teacher training, and improve M-Learning services. Thirdly, this study would provide reference for art colleges and universities that want to introduce M-Learning into teaching.

## 2. Literature Review

### 2.1 Self-efficacy (SE)

Self-efficacy (SE) referred to the specific range of abilities to evaluate an individual's ability to achieve the desired goal in a specific field (Bandura, 1986). In the research of Pintrich (1999), SE referred to a student's assurance in his or her capacity successfully implement a particular behavior to produce results or effectively perform a particular learning task. Similarly, Zolait (2014) also expressed that SE was interpreted as students' comprehensive confidence in their ability to perform tasks. Moreover, Cobb (2003) defined SE as the core mechanism that determines students' degree of belief in achieving learning goals, as well as individual behavior and behavioral intention.

According to Igarria and Iivari (1995), SE first influences a person's system anxiety, and then influences a person's PEOU as well as PU to the system. Similarly, in the study of Hasan (2007), SE was included in TAM as an external variable. Thus, the direct effect of SE on PU and PEOU was also evaluated. Preacher and Hayes (2008) also proved that a higher sense of SE enhances the PU of an individual to a specific technical system. Azila-Gbettor et al. (2020) confirmed that students' SE enhances their engagement in learning. Therefore, the hypotheses were put forward as follow:

**H1:** Self-efficacy exerted crucial effect on students' engagement towards using M-Learning.

**H2:** Self-efficacy exerted crucial effect on students' perceived usefulness towards employing M-Learning.

**H3:** Self-efficacy exerted crucial effect on students' perceived ease of use towards using M-Learning.

### 2.2 Perceived Ease of Use (PEOU)

According to Davis et al. (1989), Perceived ease of use (PEOU) was defined as the extent to which people believe that employing a special system is effortless. Ozturk (2016) described the PEOU as the degree to which students insist that M-Learning will not confuse students more, that they were easy to understand and easy to adopt.

The connection of PEOU and Perceived usefulness (PU) had been researched by many academic studies. In the TAM model, a strong direct correlation was existed between PEOU and PU. Assuming that, all other things being equal, if students think a technology is easier to use, they will naturally think it is more useful. PEOU may influence the CI of e-learning systems directly or indirectly through PU (Li et al., 2012; Roca & Gagne, 2008).

**H4:** Perceived ease of use exerted crucial effect on students' perceived usefulness towards using M-Learning.

### 2.3 Perceived Usefulness (PU)

The definition of perceived usefulness (PU) was the degree to which students believe that their performance can be improved through the employment of the technique (Davis et al., 1989). Zhang et al. (2008) believed that in the TAM, whether the technique can assist them to accomplish what they want at work, it can improve their CI. Similarly, Davis (1989) pointed out in TAM theory that people will only accept and continue to employ a technique at the time think it is helpful.

Islam et al. (2018) studied the effects that affect students' SA with employing wireless networks for studying aims in higher institutions. The outcome of the research showed the students' SA was affected by the PU of wireless internet in a straight way. Cheng (2020) studied the elements that affect the CI of healthcare professionals to go on with a cloud-based e-learning system. The outcome shown that PU exerts a crucial influence on SA as well as CI. Based on previous studies, this study proposes:

**H5:** Perceived usefulness exerted crucial effect on students' satisfaction towards using M-Learning.

**H6:** Perceived usefulness exerted crucial effect on students' continuance intention towards using M-Learning.

### 2.4 Satisfaction (SA)

Rust and Oliver (1994) interpreted satisfaction ( SA ) as the extent to which an individual holds that positive feelings can be gained from using a service. In the view of Kunanusorn and Puttawong (2015), SA can also be defined as a feeling about the difference between what a person wants and what he really gets. SA was defined as students' individual assessment of the outcome and experiences they have obtained in the learning process, and it was also about the degree to which students' expectations and requirements are met.

The connection among SA and CI had been investigated by many academics. In the M-Learning environment, SA was the prerequisite for CI, it was able to be predicted that when students feel content with M-Learning, they are more likely to keep on employing M-Learning in years to come (Tan & Kim, 2015; Xu et al., 2017). If students were not satisfied with M-Learning, they will decisively refuse to use it. Previous research had shown that SA exerts an active influence on the students' CI towards M-Learning. The following hypothesis was proposed:

**H7:** Satisfaction exerted crucial effect on continuance intention to using M-Learning.

## 2.5 Engagement (EN)

A definition of engagement (EN) stated that it is a meta-structure containing behavioral, affective, and cognitive EN (Fredricks & McColskey, 2012). EN was referred to the time and energy that students spend on learning and activities related to educational significance (Krause & Coates, 2008). In many school-based literature, student EN meant that students are excited and invested in an aspect or issue that interests them (Cheminais, 2013).

The relation of both EN together with PL had been researched by several experts.

Experience Sampling Method was used in Shernoff et al. (2017) to measure student EN and PL in undergraduate financial accounting courses. The study confirmed that the higher the average student EN, the higher the average PL.

**H8:** Engagement exerted crucial effect on students' perceived learning towards using M-Learning.

## 2.6 Perceived Learning (PL)

Rovai (2002) defined perceived learning (PL) as a sense of building knowledge and understanding. In the study of Alavi et al. (2002), PL was defined as "the change in learners' perception of skills and knowledge level before and after learning". Furthermore, Caspi and Blau (2008) interpreted PL as a set of students' feelings or faith about the learning that has taken place, and believed that PL refers to the reviewed assessment of studying accumulations.

## 2.7 Continuance Intention (CI)

Nabavi et al. (2016) defined continuance intention (CI) as a student's decision to continue using the M-Learning that he or she was already using. Similarly, Chang (2013) pointed out that CI indicates the degree to which students would like to use M-Learning and recommend it to others in the future. Bhattacharjee (2001) defined the behavior of students who continue to use M-Learning after receiving it as CI.

## 3. Research Methods and Materials

### 3.1 Research Framework

The conceptual framework in Figure 1 was supported and studied by two main theories (TAM and ECM) and previous academic research frameworks.

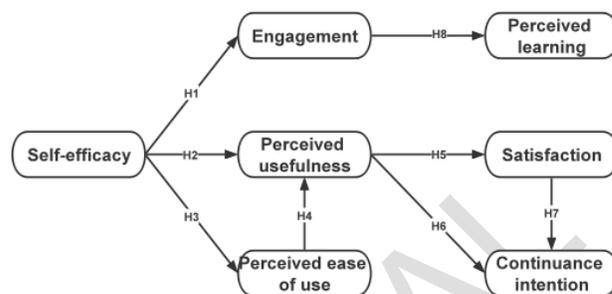


Figure 1: The Conceptual Framework

### 3.2 Methodology

This study conducted a quantitative investigation on 500 art and design undergraduates with M-Learning experience in a private university through online questionnaires. The structure of questionnaire had been divided into three sections: screening questions, demographics information and measuring variables. To make the survey content more vivid for participants, the questionnaire was interpreted in Chinese by a native Chinese speaker who knew about the research project. Before data gathering, 3 experts were invited to verify the content validity of the questionnaire using Item Objective Congruence (IOC). The reliability of the questionnaire was verified by pilot test of Cronbach's Alpha with 30 participants and all items were reserved at a score at least 0.6 or greater (Nunnally & Bernstein, 1994), resulting all items reserved. To save the cost of data collection, the work was completed online, and the questionnaire distribution and collection were carried out using the Questionnaire Star platform and WeChat software, and AMOS 23.0 and SPSS 24.0 were employed to analyze the data. Purposive sampling and quota sampling were used as sampling techniques in this study. The Confirmatory Factor Analysis (CFA) as well as Structural Equation Model (SEM) was employed to validate the goodness-of-fit of model and confirm hypotheses.

### 3.3 Population and Sample Size

In this study, art and design undergraduates (1st, 2nd, 3rd, and 4th years) with experience in M-Learning at a private university (SUMC), a private university in Chengdu, China, were selected as the target population. In addition, the A-Priori sample size calculator of Soper's (2019) Structural Equation Model (SEM) was also used in this study for calculation, and the minimum sample size was suggested to be 425. Kenny and McCoach (2003) claimed that, based on examinations of published SEM papers, many SEM literatures employed a sample size of 250-500. Researcher sent out 500 questionnaires online, and 476 of them were valid after data screening.

### 3.4 Sampling Technique

The researcher conducted the purposive and quota sampling technique. The researcher first selected 2,710 art and design major undergraduates with M-Learning experience from a private university in Chengdu, using purposive sampling. According to Campbell et al. (2020), the advantage of adopting targeted sampling was that the samples can better match the research objectives, which was conducive to improving the credibility and tightness of the research results. The second method of non-probability sampling used by the researcher is quota sampling method to select 500 samples for data collection. According to Zikmund (2003), quota sampling was a non-probability sampling strategy that ensures that specified traits of a population sample are exhibited to the amount proportional that the researcher intends. Due to the impact of COVID-19, researcher used electronic questionnaires for data collection, which could be filled out and submitted by all participants via mobile phones or iPads. All participants had to fill out a questionnaire on their own. This questionnaire was edited and generated electronically through Questionnaire Star (www.wjx.cn), and sent to the target population through WeChat group of students, to collect data conveniently and efficiently (see Table 1).

**Table 1:** Sample Units and Sample Size

Target Private University	Sampling Units	Population Size Number of students	Proportional Sample Size
a private university	Freshman	579	107(579*500/2710)
	Sophomore	731	135(731*500/2710)
	Junior	670	124(670*500/2710)
	Senior	730	134(730*500/2710)
	<b>Total</b>	<b>2710</b>	<b>500</b>

## 4. Results and Discussion

### 4.1 Demographic Information

500 questionnaires were distributed across the four grades and 488 were collected, 476 of which were valid as presented in Table 2. Among the 476 participants, there was 50.8% male and 49.2% female participants in this survey. In terms of academic year organization, freshmen account for 21.4%, sophomores account for 27.3%, juniors account for 24.4%, and seniors account for 26.9% (see Table 2).

**Table 2:** Demographic Information

Demographic / General Data (N=476)		Rate	Percentage
Gender	Man	242	50.8%
	Woman	234	49.2%
Grade	Freshman	102	21.4%
	Sophomore	130	27.3%
	Junior	116	24.4%
	Senior	128	26.9%
Total		476	100%

### 4.2 Confirmatory Factor Analysis (CFA)

Confirmatory factor analysis (CFA) was applied to structural equation modeling (SEM) in this study. It focuses on the interrelation between unobserved and observed variables that validate that questions set of all constructs which can test the hypotheses (Arbuckle, 2008). Furthermore, the importance of the factor loading of every observed variable and allowable value indicated the good of fits degree of the research matrix (Hair et al., 2006).

According to Table 3, when Cronbach’s Alpha (CA) worth surpassed 0.7 (Nunnally, 1978), factor loading was higher than 0.50 (Tavakol & Dennick, 2011), Composite Reliability (CR) exceeded 0.6 (Hair et al., 2017). In addition, according to Fornell and Larcker (1981), average variance extraction (AVE) was greater than 0.50, indicating that all evaluations were significant (see Table 3).

**Table 3:** Results of CFA, CR, and AVE

Latent Variables	Source of Items	No. Of Items	CA	Factors Loading	CR	AVE
SE	Ozturk (2016)	6	.890	.654- .782	.886	.566
EN	Diemer et al. (2012)	4	.844	.693- .789	.845	.577
PU	Leon (2018)	5	.846	.702- .739	.846	.524
PEOU	Kulviwat et al. (2014)	5	.869	.738- .787	.869	.570
SA	Cheng (2014)	4	.845	.741- .772	.839	.566

Latent Variables	Source of Items	No. Of Items	CA	Factors Loading	CR	AVE
CI	Mouakket and Bettayeb (2015)	4	.825	.719- .768	.845	.578
PL	Barzilai and Blau (2014)	4	.838	.740- .761	.825	.541

Note: CA= Composite reliability, CR = Composite reliability, AVE = Average variance extracted

It was proposed to measure the discriminant validity by calculating the square resource of AVE, and the overall correlation was proved to be better than the corresponding correlation value (Fornell & Larcker, 1981). Results were presented in Table 4; it presented the square root of AVEs. All the discriminant validity worth was better than the correlation, so the discriminant validity was confirmed (see Table 4).

**Table 4:** Discriminant Validity

	SE	E	PU	PEOU	SA	CI	PL
SE	.759						
EN	.590	.760					
PU	.626	.536	.724				
PEOU	.609	.585	.562	.755			
SA	.535	.499	.497	.564	.760		
CI	.647	.621	.627	.593	.567	.735	
PL	.543	.548	.521	.566	.530	.639	.752

After the model modification to ensure that CFA analysis had met the acceptable threshold levels. The results were adjusted by SPSS AMOS version 23 shown that Chi-Square = 744.199, df = 442, P-value = .000 < .05, and CMIN/DF = 1.684, which meant the outcomes meet acceptable thresholds. The model shown good fit of CFA analysis results after modification including AGFI = .902, GFI = .918, RMSEA = .038, CFI = .963, NFI = .915, and TLI = .959. Hence, Table 5 revealed that the CFA analysis after modification presents overall good fit, and all estimates were acceptable. Hence, the discriminant validity and convergent validity of this research was considered approved (see Table5).

**Table 5:** Goodness of Fit for CFA

Index	Acceptable Values	After Adjustment Values
CMIN/DF	≤ 3 Hair et al. (2010)	744.199/442=1.684
AGFI	≥ .80 Filippini et al. (1998)	.902
GFI	≥ .90 Hair et al. (2006)	.918
RMSEA	< .08 Hu and Bentler (1999)	.038
CFI	≥ .90 Hair et al. (2006)	.963
NFI	≥ .90 Arbuckle (1995)	.915
TLI	≥ .90 Hair et al. (2006)	.959

Note: CMIN/DF=The ratio of the chi-square value to degree of freedom, AGFI= Adjusted goodness-of-fit index, GFI=Goodness-of-fit index, RMSEA= Root-mean-square error of approximation, CFI= Comparative fit index, NFI= Nor-med fit index, TLI=Tucker-lewis index

### 4.3 Structural Equation Model (SEM)

According to Byrne (2010), SEM was defined as a statistical approach to measure the correlation of structural equations. This research employed SEM to verify the relationship between structure and hypothesis (Jöreskog & Sörbom, 1993). Similarly, In the study of Hair et al. (2010), to achieve a better fit, the acceptable way was to draw covariance lines to error terms of the model, and the error should be drawn within the same construct's errors terms as avoiding theoretical concerns and maintain unidirectionality. After the model modification to ensure that SEM analysis has met the acceptable threshold levels. The results were illustrated in Table 4 adjusted by SPSS AMOS version 23. The outcome of fit indicator was provided good fit which are CMIN/DF = 1.697, AGFI = .901, GFI = .916, RMSEA = .038, CFI = .962, NFI = .913, and TLI = .958. Table 4 revealed that the SEM analysis after modification presents overall good fit. Consequently, each indicator of the goodness of fits in SEM verification for this research was acceptable (see Table 6).

**Table 6:** Goodness of Fit for SEM

Index	Acceptable Values	Value
CMIN/DF	≤ 3 Hair et al. (2010)	763.837/450=1.697
AGFI	≥ .80 Filippini et al. (1998)	.901
GFI	≥ .90 Hair et al. (2006)	.916
RMSEA	< .08 Hu and Bentler (1999)	.038
CFI	≥ .90 Hair et al. (2006)	.962
NFI	≥ .90 Arbuckle (1995)	.913
TLI	≥ .90 Hair et al. (2006)	.958

### 4.4 Research Hypothesis Testing Result

The importance of each variable was studied in terms of standardized path coefficient ( $\beta$ ) and t-value. According to Figure 2, the outcomes showed that each hypothesis was backed. The results based on Table 5 showed that each hypothesis was significantly supported when  $p < .5$ . In addition, Table 5 explained the Standardized Path Coefficients and t-values. Therefore, the details of the

research hypothesis test were as follows: H1 had shown significant impact of SE on EN, this structural pathway results in the standard coefficient value of .666, and the t-value at 12.273\*\*\*. H2 had presented significant impact of SE on PU with the standard coefficient value of .467, and the t-value at 8.721\*\*\*. H3 had revealed that SE exerts crucial influence on PEOU with value of .709 of standard coefficient, and the t-value at 12.835\*\*\*. H4 had the standard coefficient worth of .320 of which publicized essential influence of PEOU on PU, and the t-value at 6.639\*\*\*. Based on the result of H5, the significant impact between PU and SA had exposed the standard coefficient worth of .947 which confirmed H5, and the t-value at 11.29\*\*\*. H6 had the standard coefficient worth of .676 of which publicized significant influence of PU on CI, and the t-value at 9.338\*\*\*. Per H7, SA on CI presented the worth of .479 on standard coefficient which confirmed the essential influence, and the t-value at 7.138\*\*\*. Finally, H8 hypothesized that EN exerts a crucial influence on PL on the basis of the results of .999, and the t-value at 12.321\*\*\*. In a word, the importance was verified H1, H2, H3, H5, H6, H7 as well as H8 (see Table 7).

**Table 7:** Hypothesis Result of the SEM

Hypotheses	Standardized Path Coefficient ( $\beta$ )	T-value Tests	Results of Testing
H1 SE→EN	.666	12.273***	Supported
H2 SE→PU	.467	8.721***	Supported
H3 SE→PEOU	.709	12.835***	Supported
H4 PEOU→PU	.320	6.639***	Supported
H5 PU→SA	.947	11.29***	Supported
H6 PU→CI	.676	9.338***	Supported
H7 SA→CI	.479	7.138***	Supported
H8 EN→PL	.999	12.321***	Supported

Note: \*\*\*  $p < .001$

## 5. Conclusion and Recommendation

### 5.1 Conclusion

In the research, undergraduates of art and design major in a private university in Chengdu, Sichuan Province, China was selected as the target population of the research. This conceptual framework aimed to explore the effect of SE, EN, PU, PEOU together with SA on PL and CI in M-Learning. In his study, SPSS 24.0 version and AMOS 23.0 version were adopted to analyze the hypotheses in the conceptual framework. Questionnaires were distributed to 500 undergraduates majoring in art and design at a private university in Chengdu, China, who had at least one month

of M-Learning experience. CFA was adopted to guarantee reliability, convergence together discriminant validity. What is more, SEM was employed to examine all hypotheses and verify the main influencing factors of PL and CI.

The results were as follows. Firstly, the outcome presented that EN exerts a straight influence on PL. This highlighted the fact that familiarity or proficiency with mobile technology alone does not guarantee the quality of PL for students. For the sake of ensuring the PL standard of students in M-Learning, it was crucial to improve students' EN in the classroom, because students themselves were responsible for their own learning issues. The lack of physical socialization of online courses removed students from campus and peer learners, making EN an even more important determinant of students' PL. Similarly, there were literature findings that support M-Learning not only improves students' EN and SA, but also reduced the dropout rate of students from online courses. Compared with traditional learning, M-Learning avoided students' shyness and timidity in face-to-face exchange in the classroom. As a mode of E-Learning, M-Learning was no stranger to students. It could be said that they are more familiar with and friendly to the communication environment of m-learning, which helped to enhance their EN and therefore improved their perceived studying level in M-Learning.

Secondly, SE had been proved to exert an indirect influence on PL. In addition, based on SE theory (Bandura, 1997), SE judgment determined how hard people will try on a mission and how long they will persist. People who had an intensive sense of SE would try harder to cope with challenges. Therefore, the higher the SE of students, the more they realized the importance of EN in M-Learning.

Thirdly, SE, PEOU, and PU all had different degrees of influence on CI. Among them, PU and SA had been verified to exert crucial direct impact on CI, and the degree of impact of PU is greater than SA. Moreover, the potential variables that indirectly affected CI were SE together with PEOU.

Based on standardized coefficient, the target sample in this paper generally believed that PU in M-Learning is more influential than SA in influencing students' CI. Under the background of the COVID-19 epidemic, M-Learning had broken the restrictions of time and space on professional course learning and ensured the conditions for students to continue learning in various places, which greatly improved the PU of M-Learning for students. Meanwhile, they could complete professional software courses more intuitively through M-Learning. Software courses for art and design major included Adobe Photoshop, Lumion, Adobe Illustrator, ZBrush, KeyShot, Creature Animation, Autodesk Maya, Autodesk 3dsMAX, CINEMA 4D, SketchUp, AutoCAD, CorelDRAW, and other professional graphics software. Traditional classroom teaching mode could not guarantee students to obtain satisfactory professional skills,

while online teaching resources provided by M-Learning platforms can also help students produce ideal learning effects. Therefore, the PU of M-Learning could help students decide what teaching model is best for their learning, thus enhancing the CI of this model.

This result indicated that the target students' SA with M-Learning will also directly affect their CI to M-Learning. Some students believed that their SA with M-Learning directly affects their determination to use M-Learning, and then affects their tendency to use M-Learning psychologically. For those undergraduates majoring in art and design who were content with M-Learning, they could complete their professional curriculum through M-Learning, and the results are good.

## 5.2 Recommendation

According to the outcome of the study on the factors that affect the PL as well as CI of the undergraduates majoring in art and design in a private university in Chengdu, China. Therefore, the following suggestions were specifically proposed by the researcher to improve students' PL and CI in M-Learning.

a private university for M-Learning. This study proved that students are crucial for the triumph of M-Learning. Therefore, it was suggested that teachers formulate teaching requirements according to the characteristics of M-Learning, and students were encouraged to complete the learning requirements independently (SE) and make more efforts (EN) to achieve the learning goals. These factors would directly or indirectly affect PL and ultimately improve students' academic performance. Secondly, teaching units should do an excellent job of training tutors as well as students about the employment of M-Learning skills and provide corresponding technical support to reduce their resistance to adopt M-Learning and improve the use rate of M-Learning. This study identified the basic influencing variables of PL and CI of undergraduates majoring in art and design in Chengdu. The results showed that all the changeable elements in the model play their own parts in students' PL and continuous intention, but some factors should be emphasized by higher education bureaus or other decision makers in promoting students' participation as well as the employment of M-Learning to achieve more effective teaching effects and teaching quality.

Firstly, teachers should encourage students to enhance their SE and EN in M-Learning in order to achieve satisfactory PL. First of all, teachers needed to create a positive learning environment for M-Learning and create a good classroom atmosphere to encourage students to actively participate in M-Learning. Secondly, according to the learning tasks and professional skills requirements of different courses, teachers needed to design effective

learning plans for students of different majors and different academic years. Finally, the teaching requirements were formulated according to the characteristics of M-Learning, and students were encouraged to complete the learning requirements independently (SE) and make more efforts (EN) to achieve the learning goals. These factors would directly or indirectly affect PL and ultimately improve students' academic performance.

Secondly, teachers should seriously consider the effective combination of the professional characteristics of art and design and mobile technology, to produce more effective teaching quality in M-Learning. On the basis of perceived ease, teachers as well as teaching units should do a good job in training students on the employment of M-Learning, to reduce students' unfamiliar with and resistance to M-Learning, and provide corresponding technical support so that students can easily operate relevant operations of M-Learning. The developers of relevant M-Learning platforms should optimize the learning platform according to the characteristics of the courses of each major, fully integrated online resources, and met the teaching needs as far as possible.

In addition, according to the specific characteristics of art and design courses, teachers should effectively integrate the teaching content of traditional classrooms and online learning platforms, take video content as auxiliary teaching, gradually improve the corresponding text, pictures, and teaching content, and build a systematic teaching design. This teaching design can effectively reduce the learning difficulty of professional core courses, promote students' progress, and obtain satisfactory learning results. Therefore, university students' positive psychology of PEOU and PU of M-Learning would improve students' SA with M-Learning, and ultimately generate students' CI towards M-Learning.

## 5.3 Limitation and Further Research

There were still 3 limitations in this study, which can be further expanded in the following studies. At the first time, the results of this research just described the perception on M-Learning toward PL and CI by art and design students at only one private university in Chengdu, China in the background of COVID-19. Therefore, the research results may not apply to private universities in other cities or regions other than Chengdu. The reason was that universities of different regions and categories have different conditions such as capital investment, faculty, and teaching management. Similarly, the research results may not be applicable to students of other majors due to differences in teaching content, curriculum Settings and students' quality. While the outcome of the research could provide references for relevant researches of other majors,

and the results may be slightly different. Secondly, this study did not take into account the influence of factors such as gender and age of the participants on the research results, which may have significant differences. Thirdly, this study only focused on five variables that affect PL and CI in M-Learning: SE, EN, PEOU, PU, and SA. Different variables could also produce different results.

In the future research could be carried out from the following aspects. Firstly, this research could be further replicated in public and private universities to obtain a more representative state of M-Learning in higher education institutions in Chengdu, China, to obtain more comprehensive research conclusions. Secondly, student demographic variables should be considered in future studies to compare results. These factors included age, previous online learning experience, traditional versus non-traditional learners, and online learning preferences. Thirdly, other forms of interaction should also be considered, such as learner interaction with technology, as well as learner autonomy, flexibility, and synchronous versus asynchronous forms of learning. Lastly, future investigations should also consider the impact of online learning support, the design of online courses, the knowledge of teachers, and the training of online instruction.

## References

- Alavi, M., Marakas, G. M., & Youngjin, Y. (2002). A Comparative Study of Distributed Learning Environments on Learning Outcomes. *Information Systems Research*, 13(4), 404-415.
- Arbuckle, J. (2008). *Amos 17.0 user's guide*. SPSS Inc.
- Arbuckle, J. J. (1995). *AMOS user's guide*. Small Waters.
- Azila-Gbetor, E. M., Atatsi, E. A., Mensah, C., & Abiemo, M. K. (2020). Self-esteem, organizational citizenship behavior and commitment among university students. *Journal of Applied Research in Higher Education*, 12(5), 975-991. <https://doi.org/10.1108/JARHE-04-2019-0095>
- Bandura, A. (1997). Self-efficacy: toward a unifying theory of behavioral change. *Psychological review*, 84(2), 191.
- Bandura, A. (1986). *Social Foundations of Thought and Action: A Social Cognitive Theory*. Prentice-Hall.
- Barzilai, S., & Blau, I. (2014). Scaffolding game-based learning: Impact on learning achievements, perceived learning, and game experiences. *Computers & Education*, 70, 65-79.
- Bhattacharjee, A. (2001). Understanding information systems continuance: An expectation-confirmation model. *MIS quarterly*, 25(3), 351-37.
- Byrne, B. M. (2010). *Structural equation modeling with AMOS: Basic concepts, applications, and programming* (2nd ed.). Routledge Taylor & Francis Group.
- Campbell, S., Greenwood, M., Prior, S. J., Shearer, T., Walkem, K., Young, S., Bywaters, D., & Walker, K. (2020). Purposive sampling: complex or simple? Research case examples. *Journal of Research in Nursing*, 25, 652-661.
- Caspi, A., & Blau, I. (2008). Social presence in online discussion groups: Testing three conceptions and their relations to perceived learning. *Social Psychology of Education*, 11(3), 323-346.
- Chang, C. C. (2013). Exploring the determinants of e-learning systems continuance intention in academic libraries. *Library Management*, 34(1/2), 40-55.
- Cheminais, R. (2013). *Engaging pupil voice to ensure that every child matter: a practical guide*. David Fulton Publishers.
- Cheng, Y. M. (2020). Investigating medical professionals' continuance intention of the cloud-based e-learning system: an extension of expectation-confirmation model with flow theory. *Journal of Enterprise Information Management*, 34(4), 1169-1202.
- Cheng, Y.-M. (2014). Roles of interactivity and usage experience in e-Learning acceptance: a longitudinal study. *International Journal of Web Information Systems*, 10(1), 2-23.
- Cobb, R. (2003). *The Relationship Between Self-Regulated Learning Behaviors and Academic Performance in Web-Based Courses* [Unpublished Doctoral Dissertation]. Virginia Polytechnic Institute and State University, Blacksburg, USA.
- Cucinotta, D., & Vanelli, M. (2020). WHO declares COVID-19 a pandemic?. *Acta Biomedica*, 91(1), 157-160.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319-339.
- Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management science*, 35(8), 982-1003.
- Diemer, T. T., Fernandez, E., & Streepey, J. W. (2012). Student perceptions of classroom engagement and learning using iPads. *Journal of Teaching and Learning with Technology*, 1(2), 13-25.
- Filippini, R., Forza, C., & Vinelli, A. (1998). Trade-off and Compatibility Between Performance: Definitions and Empirical Evidence. *International Journal of Production Research*, 36(12), 3379-3406.
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research*, 18(1), 39-50.
- Fredricks, J. A., & McColskey, W. (2012). The measurement of student engagement: A comparative analysis of various methods and student self-report instruments. In A. J. & W. McColskey (Eds.), *Fredricks Handbook of research on student engagement* (pp. 763-782). Springer.
- Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (2010). *Multivariate Data Analysis* (6th ed.). Prentice Hall.
- Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2006). *Multivariate Data Analysis*. Pearson International Edition.
- Hair, J., Hollingsworth, C. L., Randolph, A. B., & Chong, A. Y. L. (2017). An updated and expanded assessment of PLS-SEM in information systems research. *Industrial Management & Data Systems*, 117(3), 442-458.
- Hasan, B. (2007). Examining the effects of computer self-efficacy and system complexity on technology acceptance. *Information Resources Management Journal*, 20(3), 76-88.

- Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, 6(1), 1-55.
- Igbaria, M., & Iivari, J. (1995). The effects of self-efficacy on computer usage. *Omega, International Journal of Management Science*, 23(6), 587-605.
- Islam, A. A., Mok, M. M. C., Xiuxiu, Q., & Leng, C. H. (2018). Factors influencing students' satisfaction in using wireless internet in higher education: Cross-validation of TSM. *The Electronic Library*, 36(1), 2-20.
- Jöreskog, K. G., & Sörbom, D. (1993). *LISREL 8: Structural equation modeling with the SIMPLIS command language*. Scientific Software International.
- Kenny, D. A., & McCoach, D. B. (2003). Effect of the number of variables on measures of fit in structural equation modeling. *Structural equation modeling*, 10(3), 333-351.
- Khaddage, F., Lattemann, C., & Bray, E. (2011, March). Mobile apps integration for teaching and learning. (Are Teachers Ready to Re-blend?). In *Society for Information Technology & Teacher Education International Conference*, 2545-2552.
- Krause, K. L., & Coates, H. (2008). Students' engagement in first-year university. *Assessment & Evaluation in Higher Education*, 33(5), 493-505.
- Kukulska-Hulme, A. (2007). Mobile usability and user experience. *Mobile Learning*, 61-72.
- Kulviwat, S., Bruner, G. C., & Neelankavil, J. P. (2014). Self-efficacy as an antecedent of cognition and affect in technology acceptance. *Journal of Consumer Marketing*, 31(3), 190-199.
- Kunanusorn, A., & Puttawong, D. D. (2015). The mediating effect of satisfaction on student loyalty to higher education institution. *European Scientific Journal*, 1, 449-463.
- Leon, S. (2018). Service mobile apps: a millennial generation perspective. *Industrial Management & Data Systems*, 118(9), 1837-1860.
- Li, Y., Duan, Y., Fu, Z., & Alford, P. (2012). An empirical study on behavioural intention to reuse e-learning systems in rural china. *British Journal of Educational Technology*, 43(6), 933-948.
- Mouakket, S., & Bettayeb, A. (2015). Investigating the factors influencing continuance usage intention of Learning management systems by university instructors. *International Journal of Web Information Systems*, 11(4), 491-509.
- Nabavi, A., Taghavi-Fard, M. T., Hanafizadeh, P., & Taghva, M. R. (2016). Information technology continuance intention: A systematic literature review. *International Journal of E-Business Research (IJEER)*, 12(1), 58-95.
- Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). McGraw-Hill.
- Nunnally, J. C. (1978). *Psychometric theory* (2nd ed.). McGraw-Hill.
- Oberer, B., & Erkollar, A. (2013). M-Learning in higher education: a marketing course design project in Austria. *Procedia - Social and Behavioral Sciences*, 93, 2125-2129.
- Ozturk, A. B. (2016). Customer acceptance of cashless payment systems in the hospitality industry. *International Journal of Contemporary Hospitality Management*, 28(4), 801-817.
- Pintrich, R. (1999). The Role of Motivation in Promoting and Sustaining Self-Regulated Learning. *International Journal of Educational Research*, 31(6), 459-470.
- Preacher, K., & Hayes, A. (2008). Asymptotic and Resampling Strategies for Assessing and Comparing Indirect Effects in Multiple Mediator Models. *Behavior Research Methods*, 40(3), 879-891.
- Roca, J. C., & Gagne, M. (2008). Understanding e-learning continuance intention in the workplace: a self-determination theory perspective. *Computers in Human Behavior*, 24(4), 1585-1604.
- Rovai, A. P. (2002). Sense of community, perceived cognitive learning, and persistence in asynchronous learning networks. *The Internet and Higher Education*, 5(4), 319-332.
- Rust, R. T., & Oliver, R. L. (1994). Service quality: insights and managerial implication from the frontier. In Rust, T. R. & Oliver, R. L. (Eds), *Service Quality: New Directions in Theory and Practice* (pp. 1-19). Sage.
- Sherhoff, D. J., Sannella, A. J., Schorr, R. Y., Sanchez-Wall, L., Ruzek, E. A., Sinha, S., & Bressler, D. M. (2017). Separate worlds: The influence of seating location on student engagement, classroom experience, and performance in the large university lecture hall. *Journal of Environmental Psychology*, 49, 55-64.
- Soper, D. S. (2019, August 9). *A-priori Sample Size Calculator for Structural Equation Models [Software]*. <http://www.danielsoper.com/statcalc>
- Tan, X., & Kim, Y. (2015). User acceptance of SaaS-based collaboration tools: a case of Google Docs. *Journal of Enterprise Information Management*, 28(3), 423-442.
- Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's Alpha. *International Journal of Medical Education*, 2, 53-55.
- Xu, F., Tian, M., Xu, G., Ayala, B. R., & Shen, W. (2017). Understanding Chinese users' switching behaviour of cloud storage services. *The Electronic Library*, 35(2), 214-232.
- Zhang, S., Zhao, J., & Tan, W. (2008). Extending TAM for online learning systems: an intrinsic motivation perspective. *Tsinghua Science and Technology*, 13(3), 312-17.
- Zikmund, W. G. (2003). *Business research methods* (7th ed.). Thomas Learning.
- Zolait, A. H. S. (2014). The nature and components of perceived behavioural control as an element of theory of planned behaviour. *Behaviour & Information Technology*, 33(1), 65-85.