THE INFLUENCE OF ONLINE LEARNING INTERACTION ON LEARNING OUTCOMES AND LEARNING CONTINUATION INTENTION OF CHINESE HIGHER INSTITUTIONS STUDENTS

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THE INFLUENCE OF ONLINE LEARNING INTERACTION ON LEARNING OUTCOMES AND LEARNING CONTINUATION INTENTION OF CHINESE HIGHER INSTITUTIONS STUDENTS

by

PAN JUNJIE

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LIST OF ABBREVIATIONS

App	Application
AVE	Average Variance Extracted
CFA	Confirmatory Factor Analysis
CMB	Chemical Mass Balance
CMV	Common Method Variance
CPCA	Consensus PCA
CR	Composite Reliability
EFA	Exploratory Factor Analysis
PLS	Partial Least Squares
SEM	Structural Equation Modeling
PLS-SEM	Partial Least Square-Structural Equation Modeling
SPSS	Statistical Package for the Social Sciences
CSI	Class Separation Indices
CSM	Class Sample Matrix
CSV	Class Sample Vector
PEOU	Perceived Ease of Use
PU	Perceived Usefulness
TAM	Technology Acceptance Model
TPB	Theory of Planned Behavior
TRA	Theory of Reasoned Action
UTAUT	Unified Theory of Acceptance and Use of Technology

LIST OF APPENDICES

PENGARUH INTERAKSI PEMBELAJARAN DALAM TALIAN TERHADAP HASIL PEMBELAJARAN DAN NIAT BERTERUSAN PEMBELAJARAN PELAJAR INSTITUSI TINGGI DI CHINA

ABSTRAK

Pembelajaran dalam talian adalah topik menarik dalam kajian penyelidikan, terutamanya di kalangan pelajar institusi tinggi merupakan kumpulan pengguna terbesar juga memberikan perhatian berterusan dalam penggunaan platform pembelajaran dalam talian. Perkembangan pembelajaran dalam tarian menimbulkan banyak masalah seperti masalah dalam persekitaran pembelajaran dalam talian menyebabkan pelajar menghadapi hasil pembelajaran tidak memuaskan, dengan itu keinginan sambung membelajari juga berkurangan dengan ketara. Walaupun kajian-kajian dahulu telah membuktikan perhubungan antara interaksi pembelajaran dalam talian, hasil pembelajaran dan keinginan sambung membelajari, tetapinya, faktor-faktor seperti pengalaman dan kemudahan penggunaan tidak diketahui dalam penyelidikan kajian terdahulu. Jurang di sastera ini menekan keperluan penyelidikan masa depan sepatutnya meneroka hubungan antara interaksi pembelajaran dalam talian, kegunaan pengalaman dan kemudahan yang dirasakan, dan hasil pembelajaran dan keinginan sambung membelajari. Sehubungan itu, kajian ini menggunakan "Technology Acceptance Model" (TAM) dan teori model interaksi MOORE untuk membina model teori untuk penyelidikan. Selain itu, kajian ini bertujuan untuk menganalisis ciri-ciri pengalaman selepas kegunaan dan kemudahan penggunaan yang dirasakan sebagai pengantara hubungan antara hasil pembelajaran pelajar pengajian tinggi dan keinginan sambung membelajari. Tambahan, kajian ini meninjau 5 universiti di China pada tahun 2023 menggunakan reka bentuk penyelidikan campuran

berurutan penjelasan. Dari segi data analisis, ia akan menjalankan penyelidikan kuantitatif dan memilih responden dan jenis soalan protokol temu bual untuk penyelidikan kualitatif seterusnya mengikut data kuantitatif yang diperolehi. Sejumlah 1494 responden telah dikutip secara melalui kaedah persampelan berstrata dan persampelan kemudahan, dan data telah dianalisis oleh PLS-SEM. Hasil penyelidikan menunjukkan bahawa interaksi pembelajaran dalam talian boleh menjejaskan hasil pembelajaran pelajar institusi tinggi, dan juga keinginan sambung membelajari sebab kemudahan penggunaan yang dirasakan. Keputusan menunjukkan bahawa kemudahan penggunaan yang dirasakan menjadi pengantara hubungan antara interaksi pembelajaran dalam talian dan hasil pembelajaran dan keinginan sambung membelajari. Selain itu, keputusan juga mendapati bahawa walaupun interaksi pembelajaran dalam talian mempunyai kesan yang ketara terhadap kegunaan yang dirasakan dan kemudahan penggunaan yang dirasakan, kegunaan yang dirasakan tidak memberi kesan yang signifikan terhadap hasil pembelajaran dan keinginan sambung belajar. Sebaliknyn, penyelidikan kualitatif berdasarkan hasil data kuantitatif, sebanyak 5 responden ditemubual secara kaedah persampelan yang bertujuan, dan menganalisis data kuantitatif melalui analisis tematik. Keputusan kualitatif menunjuk penggunaan dirasakan tidak mempunyai kesan yang signifikan terhadap hasil pembelajaran pelajar institusi tinggi dan keinginan sambung membelajari. Penemuan kajian ini menunjukkan responden lebih mementingkan kemudahan penggunaan yang dirasakan daripada pengalaman kegunaan. Secara khusus, mereka memberi lebih perhatian kepada fungsi platform, kelancaran antara muka, keserasian perisian, dan pemahaman isi kandungan.

THE INFLUENCE OF ONLINE LEARNING INTERACTION ON LEARNING OUTCOMES AND LEARNING CONTINUATION INTENTION OF CHINESE HIGHER INSTITUTIONS STUDENTS

ABSTRACT

Online learning is a hot topic in the education circle, and higher institutions students, as the largest user group of online learning, have also received continuous attention from the education circle on their use of online learning platforms. Now, due to many problems exposed in the online learning environment, more and more higher institutions students' learning outcomes and learning continuation intention have significantly decreased. Although previous studies have established the link between online learning interaction, learning outcomes and learning continuation intention, little is known about the research on how online learning interaction affects higher institutions students' learning outcomes and learning continuation intention through perceived usefulness and perceived ease of use. To fill this gap, this study explores the relationships among online learning interaction, perceived usefulness, perceived ease of use, learning outcomes, and learning continuation intention. This research adopts the technology acceptance model (TAM) and Moore's model of interaction to construct the theoretical model. This study aims to analyze characteristics of perceived usefulness and perceived ease of use as a mediator of the relationship between higher education students' learning outcomes and learning continuation intention. This study surveyed 5 universities in China in 2023 using an explanatory sequential mixed research design. This research first conducts quantitative research and selects the respondents and interview protocol question types for subsequent qualitative research according to the obtained quantitative data. In the quantitative research stage, 1494

respondents were recruited in this study using stratified sampling and convenience sampling methods, and the data were analysed by PLS-SEM. The research results show that online learning interaction can affect higher institutions students' learning outcomes and learning continuation intention through perceived ease of use. The results showed that perceived ease of use mediated the relationship between online learning interaction and learning outcomes and learning continuation intention. The study also found that although online learning interaction has a significant impact on perceived usefulness and perceived ease of use, perceived usefulness has no significant impact on higher institutions students' learning outcomes and learning continuation intention. In the qualitative research stage, based on the quantitative data results, this study recruited 5 respondents using the purposeful sampling method, and analysed the quantitative data through thematic analysis. The reasons why perceived usefulness has no significant effect on higher institutions students' learning outcomes and learning continuation intention are explored. The findings indicated that respondents cared more about perceived ease of use than perceived usefulness. Specifically, they pay more attention to platform functionality, interface fluency, software compatibility and content legibility.

CHAPTER 1

INTRODUCTION

1.1 Introduction

The outbreak of the epidemic has seriously affected all aspects of society, especially the field of education. Therefore, educational institutions around the world have turned traditional teaching to online teaching (Ali, 2020). The "Education Informatization 2.0 Action Plan" formulated by the Ministry of Education of the People's Republic of China proposes to build an integrated "Internet + Education" platform, which promotes the development of online learning (Ministry of Education of the People's Republic of China, 2018).

Interaction is one of the most important factors in online learning. In the online learning environment, how to design and support real participation and stimulate learning interaction is still a major challenge for contemporary distance education (Katsarou & Chatzipanagiotou, 2021). This is despite the growing potential and importance of online learning in higher education, this has also brought great challenges to the vast number of teachers and students in China (Mourdi et al., 2019). In the process of online learning, offline communication is replaced by online interaction. The epidemic forced the temporary interruption of traditional education and led to a significant increase in e-learning for more than 1.2 billion children and adolescents in 186 countries around the world (Adnan & Anwar, 2020; Dhawan, 2020).

Learning outcomes refers to the achievement satisfaction and benefits obtained by learners through their behavior and internal changes after learning, including the acquisition of knowledge and skills, the effective use of life, the improvement of spirit, and the sense of accomplishment (Xu, 2019). Learners are prone to feelings of

helplessness, loss, loneliness and learning weariness(Chen et al., 2022), learning outcomes stay on the surface (Rzepka et al., 2022), and the self-perceived learning experience level is relatively low. Adnan and Anwar (2020) investigated the attitudes of higher education students in Pakistan towards online learning in a COVID-19 environment. The results show that online learning does not have the desired learning outcomes in developing countries such as Pakistan. Arbaugh (2004) analyzed and discussed the future development direction of online learning by comparing the differences between online learning and offline learning. This difference is an answer to the question of whether online learning has outcomes, which leads to people's concern about learning outcomes (Arbaugh, 2018).

The learning continuation intention (high dropout rate) has become the most serious problem facing online learning. Studies have shown that although online learning platforms give learners a high degree of autonomy, learners' learning continuation intention is still low. In the context of information systems, Bhattacherjee (2001) defines the willingness to continue to use an information system as the willingness of users to continue to use an information system after using it. Compared with offline learning, the learning continuation intention is indeed manifested in low completion rates, high dropout rates (Rahmani et al., 2024), and lack of management and monitoring by educators (Wang et al., 2019).

These problems caused by the transformation of the interactive mode have a direct impact on the learning outcomes and the learning continuation intention, thus forming an important research field. The research on how online learning interaction affects learning outcomes and learning continuation intention has gradually become a major problem that teachers students and even all walks of life are concerned about and needs to be solved urgently.

Therefore, this study aims to establish an impact model of online learning interaction on learning outcomes and learning continuation intention of Chinese higher institutions students through many theoretical combing. The explanatory sequential mixed methods design will be used to conduct a questionnaire survey on 2200 universities and colleges students from 5 universities and colleges in China and semi-structured in-depth interviews on 5 universities and colleges students. The data will be further analyzed using descriptive, reasoning, and thematic analysis.

The novelty of this study lies in the establishment of an impact model of Chinese higher institutions students' online learning interaction on their learning outcomes and learning continuation intention, and the attempt to solve the problem of Chinese higher institutions students' subjective emotions and learning outcomes, to improve their learning outcomes and their learning continuation intention.

1.2 Research Background

1.2.1 The Explanation of Higher Institutions in China

Higher Institutions in China include universities and colleges, which are mainly divided into ordinary colleges and universities, vocational colleges and universities, and adult colleges and universities (Ministry of Education of the People's Republic of China, 2020a). In terms of academic qualifications and training levels, it includes junior college, undergraduate, master's and doctoral students.

The naming of Chinese higher institutions is based on the Interim Measures for the Naming of Colleges and Universities issued by the General Office (Ministry of Education of the People's Republic of China, 2020). Higher Institutions at the undergraduate level are called "XX University" or "XX College", higher Institutions

at the junior college level are called "XX Vocational and Technical Colleges/Vocational Colleges" or "XX Colleges", and vocational colleges at the undergraduate level are called "XX Vocational and Technical Universities/Vocational Universities". Appropriate qualifiers can be used according to the characteristics of the higher institutions' location, industry, discipline, etc.

The Ministry of Education of China issued a notice on January 29, 2020, instructing higher institutions to utilize online platforms for teaching, promoting the principle of "no stop teaching, no stop learning." The curriculum for online learning in China includes synchronous live broadcasting, asynchronous recording, online flipped classrooms, and online tutoring (Xue et al., 2022). These methods were introduced to adapt to the unprecedented challenges posed by the sudden shift to online education (Ministry of Education of the People's Republic of China, 2020).

Synchronous live broadcasting allows students to participate in classes online at set times, offering a sense of presence and interaction similar to traditional classrooms (Xue & Li, 2020). However, it requires strong internet connections and effective classroom management by teachers. Institutions like Tsinghua University have successfully implemented this method, but challenges such as visual fatigue and technological demands remain (Daguang Wu & Shen, 2020).

Asynchronous recording involves teachers pre-recording lessons, which students can access at their convenience (Daguang Wu & Shen, 2020). This method offers flexibility but makes it difficult for teachers to monitor students' progress in real-time and adjust the teaching content accordingly. Online interactions between teachers and students may also be delayed, affecting the immediacy of feedback (Huang et al., 2020; Jiao et al., 2020).

The online flipped classroom model transforms traditional teaching methods by moving all learning activities online, including pre-class preparation, in-class discussions, and post-class assessments (Xue et al., 2022). While this approach has been explored by institutions like Beihang University, its success largely depends on students' self-discipline and ability to learn independently (Cheng et al., 2020; Yu & Wang, 2020).

Online tutoring provides personalized guidance to students through platforms like Tencent Meeting and DingTalk. This method helps bridge the gap between students and teachers by offering real-time feedback and support. It is particularly beneficial for both advanced students, who can accelerate their learning, and those who need additional help to grasp the material (Cheng et al., 2020; Huang et al., 2020; Jiao et al., 2020; Wu & Shen, 2020; Yu & Wang, 2020).

The integration of digital tools like personal computers, tablets, and mobile phones, along with online platforms such as WeChat, QQ, and Zoom, has become essential for teaching (Yuebo et al., 2022). These technologies have enhanced the learning experience, providing convenience and accessibility to both teachers and students. Despite the challenges, China’s higher education system has made significant strides in adapting to online learning.

1.2.2 The Role of Online Learning Interaction in Learning Outcomes

As an important part of online learning, interaction relates to teachers, students, and content, and determines the quality and outcomes of online learning (Bettinger et al., 2016). The impact of interaction on online learning depends not only on the number of interactions, but also on the quality of interactions (Wang et al., 2024). Online learning interaction can effectively shorten the learner’s sense of interaction in the state

of separation of time and space, and effectively promote the occurrence of online learning (Moore, 1989). At the same time, many experts believe that in the process of online learning, the level of online learning interaction achieved by learners through interactive media directly affects the level of knowledge construction of learners, and thus determines online learning outcomes (Archambault et al., 2022).

Online learning interaction is also an important part of online course quality evaluation indicators (Wei & Chou, 2020). The network relationship and social motivation in online learning will indirectly affect the learning outcomes through sharing. Improving the level of online learning interaction can significantly improve online learning outcomes (Tian et al., 2017). Studies have also shown that instructor-student interaction is an important factor affecting learner satisfaction (Lin et al., 2017). As an important part of the learning experience, online learning interaction is an important aspect of portraying learners' online learning process and outcomes (Wei & Chou, 2020).

Moore (2013) focuses on the relationship between online learners' interactive behaviours and learning outcomes. Studies have found that the activity of different online learning interaction in the online learning environment has different outcomes on learners' academic performance; different interaction (Abuhassna et al., 2020). Other studies have pointed out that different online learning environments focus on various interactions, which makes learners have different online learning interactive experiences, which in turn affects learning outcomes (Kaufmann & Vallade, 2022). Online learning interaction is particularly important in an online learning environment.

1.2.3 The Chinese Government and Scholars attach great importance to the Evaluation of Learning Outcomes

In 2014, the Chinese Ministry of Education began to carry out review and evaluation in colleges and universities, which has affected not only Chinese higher institutions, but also various social groups and industries. This work is the centre of the teaching process and evaluates students' learning outcomes. The Ministry of Education for universities in the self-assessment report focuses on the students' learning outcomes.

Hao (2018) pointed out that the scientific construction of the learning outcomes evaluation method can effectively improve the quality of talent cultivation, which is also the main issue that should be paid attention to in the current higher education reform research. Li and Zhu (2019) pointed out that the evaluation of learning outcomes is a very important part of the education evaluation system, and it has realized several changes under the influence of technical factors. The promotion of learning outcomes evaluation is mainly reflected in the following aspects: guiding, feedback, and screening.

It aims at a comprehensive evaluation of students. Zhao (2020) pointed out in his published study on evaluation methods for learning outcomes of secondary vocational students that in the process of economic construction and development in the new era of China, the country is in urgent need of new talents with professional and innovative abilities. Therefore, learning outcomes are the core factor to reflects the success of online education, so it is necessary to study it.

1.2.4 TAM: A Commonly Used Model for Studying Learning Continuation Intention

The technology acceptance model (TAM) was originally proposed to explain the initial acceptance of information systems or information technologies. Then, the structure in TAM is used to explain the continuous intention in the educational context (Liu & Pu, 2020). With the exponential growth of knowledge renewal, continuous learning has become a key factor in people's work and lives. The technology acceptance model (TAM) is derived from the Theory of Reasoned Action (TRA) proposed by Fishbein and Ajzen (1975). TAM is based on TRA, which indicates that the actual behaviour of an individual toward a specific object comes from the behavioural intention (Fishbein & Ajzen, 1977).

TAM is a model used to explain people's behavioural intentions towards technology. According to TAM, the behavioural intention was determined by perceived ease of use (PEOU) and perceived usefulness (PU). In addition, PEOU directly or indirectly influences a person's behaviour intention through Pu (Davis et al., 1989).

In academic circles at home and abroad, the perceived usefulness and perceived ease of use of TAM are widely used as mediating variables to study learning continuation intention. For example, (Mutahar et al., 2018) used the structural equation model (SEM) AMOS to collect 482 bank customers as effective interviewees through questionnaires. The results show that perceived usefulness and perceived ease of use play a mediating role in the model. (Lui et al., 2021) used partial least squares structural equation modelling (PLS-SEM) to investigate 260 respondents and found that perceived ease of use and perceived usefulness played an intermediary role in the model.

Jiang et al. (2020) studied the influencing factors of the continuous use intention of ride-hailing users in the study on the continuous use intention of ride-hailing users, who provided certain references for ride-hailing platforms to formulate corresponding customer management strategies. Zhang et al. (2020) enriched the research in the field of short video in their preliminary study on the influencing factors of the continuous use of short video platforms.

Based on the above, both the Chinese government and the academic community at home and abroad have a strong interest in the development of online learning. Online learning is by no means a "timely work" in the context of the epidemic, but a comprehensive reform of learning methods and a future trend. Although most scholars have reached a consensus on the influence of different interactions of online learning on the learning outcomes of Chinese higher institution students, how will the interaction of online learning affect the learning outcomes and learning continuation intention of Chinese higher institution students? Positive or negative? These questions are still unresolved and need further research and exploration.

1.3 Problem Statement

The rapid shift to online learning during the COVID-19 pandemic exposed significant challenges in the education sector, particularly in higher institutions in China. While the pandemic necessitated the widespread adoption of online learning platforms, it became evident that such platforms were not without their limitations (Agormedah et al., 2020). Issues such as reduced engagement, insufficient interaction, and unclear learning outcomes emerged as critical areas of concern (Lin & Wang, 2024).Despite the gradual return to normalcy, these challenges have not dissipated. The post-pandemic landscape continues to face difficulties in sustaining effective

online learning experiences, indicating a pressing need for ongoing research into these problems.

In the post-COVID-19 era, the relevance of online learning outcomes and continuation intention remains significant as educational institutions grapple with long-term changes in pedagogical approaches (Marandu et al., 2023, Ntim et al., 2021). Zhang (2022) emphasizes that although online learning has become an integral part of education, its efficacy remains questionable. Learning outcomes, especially in environments that rely on asynchronous interactions and lack face-to-face engagement, often remain superficial (Mehall, 2020). Moreover, the absence of effective strategies for promoting interaction continues to hinder both student satisfaction and academic achievement.

The post-pandemic context has further exacerbated the issue of learning continuation intention, as students face fatigue and disengagement with online platforms. Prior studies, such as those by Yu et al. (2020), have demonstrated that online learning environments suffer from low levels of student engagement and high dropout rates. This trend persists even beyond the pandemic, raising concerns about the sustainability of online learning as a viable educational model. Recent data from Chinese higher institutions show that dropout rates in online learning continue to surpass those in traditional classroom settings, with over 90% of students expressing frustration with the limited interaction and support (Shelton et al., 2017; Zhang & Chai, 2017).

Despite the rapid growth of online learning in China, significant challenges persist that hinder its effectiveness, particularly in relation to student engagement and learning outcomes (Lin & Wang, 2024).

Zhang (2022) mentioned that at present, students' learning outcomes are unclear, and their openness and flexibility characteristics are greatly reduced. This may be due to the lack of effective face-to-face interaction between teachers and students, because distance education focuses more on the transfer of knowledge and does not achieve in-depth exploration of the course teaching system, knowledge system and internal logic. Mehall (2020) mentioned that although teachers are constantly asked to enrich students' learning outcomes, there is a lack of strategies to encourage student interaction. This may be because teachers have been teaching in a face-to-face environment for many years and were asked to switch to an online format without teaching and technical support in a short period of time.

Based on the well-established fact that the level of learning continuation intention is low (Yu et al., 2020), keeping learners engaged is challenging because the lecturer's style is missing or limited (Panigrahi et al., 2018). A recurring problem in 65% of higher education institutions is that despite the continued growth in online learning enrollments, the dropout rate of online learning is still higher than in traditional face-to-face courses (Shelton et al., 2017). The high dropout rate of online learning students has been one of the most serious problems with web-based online learning. Zhang and Chai (2017) pointed out through a survey that the dropout rate of online learning in China has reached over 90%. Unlike traditional classroom education, online learning requires students to be more self-disciplined.

In addition, while online learning has been widely adopted for its accessibility and cost-effectiveness (Panigrahi et al., 2018), the relationship between online learning interaction and perceived usefulness and perceived ease of use remains underexplored, particularly in the context of higher education. Existing studies have largely examined the individual impacts of online learning interaction or perceived ease of use and

perceived usefulness on learning outcomes and learning continuation intention (Jung & Lee, 2018; Martin & Rimm-Kaufman, 2015). However, the mediating roles of these constructs in online learning environments have not been sufficiently investigated, particularly in the context of Chinese higher education.

For instance, while learner-learner interaction, learner-content interaction, learner-instructor and learner-interface interaction have been shown to contribute to online learning (Lin & Wang, 2024), there is still a gap in understanding how these forms of interaction affect perceived usefulness and perceived ease of use, and how these mediators, in turn, influence learning outcomes and continuation intention. Previous research, such as that by Adnan and Anwar (2020), has underscored the importance of these interactions in online learning environments, yet the mechanisms through which these interactions affect learner perceptions remain unclear.

Moreover, perceived usefulness and perceived ease of use, as posited by the Technology Acceptance Model (TAM), play a crucial role in determining the success of online learning platforms (Davis, 1989). Although TAM has been extensively applied to investigate the acceptance of educational technologies, few studies have systematically analyzed how online learning interaction influences these mediators and, subsequently, learning outcomes and continuation intention. This unverified relationship necessitates further empirical research to fill the existing gaps and extend our understanding of how interactions within online learning environments drive these critical mediators.

Thus, while online learning platforms have evolved to include interactive features designed to enhance engagement and learning experiences, the relationship between the types of online learning interaction and mediators such as perceived

usefulness and perceived ease of use has not been thoroughly validated in the current literature. Addressing this gap is crucial for improving the design of online learning platforms and for ensuring that the interactions facilitated by these platforms effectively contribute to both perceived ease of use and perceived usefulness, ultimately enhancing learning outcomes and the intention to continue learning.

Current online learning platforms have been criticized for generally low perceived usefulness and perceived ease of use among learners, as these platforms lack flexible e-learning environments and convenient navigation (Baki et al., 2018). Research suggests that how learners' perceived usefulness and perceived ease of use change when using online learning platforms remains a prominent question for researchers and educators. Although a large number of studies have analyzed the perceived usefulness and perceived ease of use of users of different platforms (Maziriri et al., 2020; Tahar et al., 2020; Ventre & Kolbe, 2020), it must be noted that there is still a lack of empirical evidence on the relationship between learners' perceived usefulness and perceived ease of use of online learning platforms. Therefore, further academic reflection is considered necessary.

Based on the above statement, at present, the academic community has not reached a consensus on the theoretical models of the weakening of learning outcomes (Zhang, 2022) and the low learning continuation intention (Yu et al., 2020), that is, how perceived usefulness and perceived ease of use mediate online learning interaction and the relationship between learning outcomes and learning continuation intention remains to be modeled and observed. Secondly, as far as research design is concerned, there are abundant quantitative empirical studies in the literature at present, and there is a lack of qualitative and mixed research designs. Therefore, this study will adopt mixed research design, establish research model, collect quantitative and

qualitative data, and finally verify the research hypothesis and theoretical model. Thirdly, the previous research mainly focused on the user's use of a specific platform (Jiang et al. 2020), but lacked the research on online learning platform and its application in the field of higher education.

1.4 Research Objective

Based on the problem statement, 12 objectives were developed to guide this study:

1.4.1 To examine the significant influence of online learning interaction on perceived usefulness of higher institutions students using e-learning platform.

1.4.2 To examine the significant influence of online learning interaction on perceived ease of use of higher institutions students using e-learning platform.

1.4.3 To examine the significant influence of perceived ease of use on perceived usefulness when higher institutions students using e-learning platform.

1.4.4 To examine the significant influence of perceived usefulness on learning outcomes of higher institutions students using e-learning platform.

1.4.5 To examine the significant influence of perceived usefulness on the learning continuation intention of higher institutions students.

1.4.6 To examine the significant influence of perceived ease of use on the learning outcomes of higher institutions students using e-learning platform.

1.4.7 To examine the significant influence of perceived ease of use on the learning continuation intention of higher institutions students using e-learning platform.

1.4.8 To examine the mediating effect of perceived usefulness between online learning interaction and learning outcomes.

1.4.9 To examine the mediating effect of perceived usefulness between online learning interaction and learning continuation intention.

1.4.10 To examine the mediating effect of perceived ease of use between online learning interaction and learning outcomes.

1.4.11 To examine the mediating effect of perceived ease of use between online learning interaction and learning continuation intention.

1.4.12 To investigate higher institutions students' attitudes toward online learning platforms and the impact of these perceptions on their learning outcomes and learning continuation intention.

1.5 Research Question

Based on the research objectives, the research questions are as follows:

1.5.1 Does online learning interaction promote perceived usefulness of higher institutions students using e-learning platform?

1.5.2 Does online learning interaction promote perceived ease of use of higher institutions students using e-learning platform?

1.5.3 Does higher institutions students' perceived ease of use promote their perceived usefulness using e-learning platform?

1.5.4 Does higher institutions students' perceived usefulness promote their learning outcomes using e-learning platform?

1.5.5 Does higher institutions students' perceived usefulness promote their learning continuation intention?

1.5.6 Does higher institutions students' perceived ease of use promote their learning outcomes using e-learning platform?

1.5.7 Does higher institutions students' perceived ease of use promote their learning continuation intention using e-learning platform?

1.5.8 Do Perceived usefulness positively mediate the relationship between online learning interaction and learning outcomes?

1.5.9 Does perceived usefulness positively mediate the relationship between online learning interaction and learning continuation intention?

1.5.10 Do perceived ease of use positively mediate the relationship between online learning interaction and learning outcomes?

1.5.11 Do perceived ease of use positively mediate the relationship between online learning interaction and learning continuation intention?

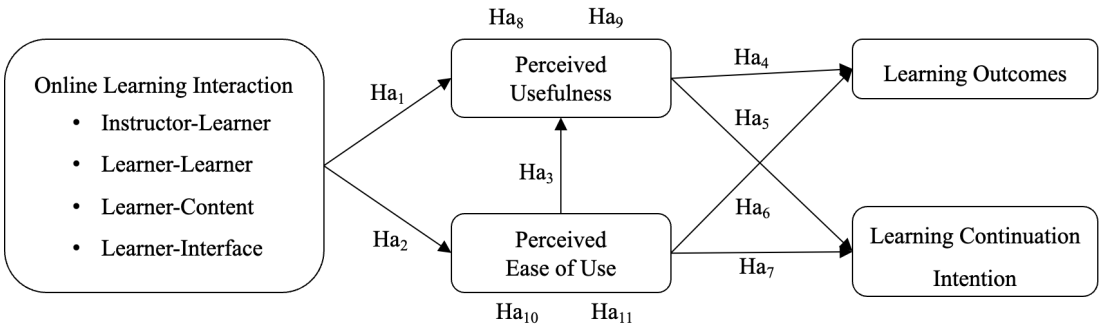
1.5.12 What are the attitudes of higher institutions students towards online learning platform and how do these perceptions affect their learning outcomes and learning continuation intention?

1.6 Research Hypothesis

The hypotheses built was for research question 1-11. As shown in Figure 1.1:

Figure 1.1

Hypotheses and models built for this study



Ha_1: Online learning interaction has a positive influence on perceived usefulness of higher institutions students.

Ha_2: Online learning interaction has a positive influence on perceived ease of use of higher institutions students.

Ha_3: Higher institutions Students' perceived ease of use has a positive influence on perceived usefulness.

Ha_4: Perceived usefulness of higher institutions students have a positive influence on their learning outcomes.

Ha_5: Perceived usefulness of higher institutions students have a positive influence on their Learning Continuation Intention.

Ha_6: Perceived ease of use of higher institutions students have a positive influence on their learning outcomes.

Ha_7: Perceived ease of use of higher institutions students have a positive influence on their Learning Continuation Intention.

Ha_8: Perceived usefulness positively mediates the relationship between online learning interaction and learning outcomes.

Ha_9: Perceived usefulness positively mediates the relationship between online learning interaction and learning continuation intention.

Ha_{10}: Perceived ease of use positively mediates the relationship between online learning interaction and learning outcomes.

Ha_{11}: Perceived ease of use positively mediates the relationship between online learning interaction and learning continuation intention.

1.7 Research Significance

1.7.1 Theoretical Significance

From the theoretical level, in this study, multiple theoretical models were integrated to construct a model of the influence of online learning interaction on the learning outcomes and learning continuation intention among Chinese universities and colleges students. Combined with the WenJuanXing network platform, which has certain theory significance to the rich online learning model. It also provides a theoretical reference for subsequent scholar's research.

By adopting the combination of qualitative and quantitative research methods from the WenJuanXing network platform to obtain first-hand information and data, in theory, to explore the factors regarding online learning interaction that may influence the learning outcomes and learning continuation intention among Chinese higher institutions students, which will promote the researchers promoted online learning outcomes, enhance students' learning continuation intention, enrich the existing research results, to some extent, and expect expanded online learning design theory.

1.7.2 Practical Significance

It is helpful to improve the course quality of online education platforms and enhance the learning outcomes of higher institutions students. Online courses should not only maintain their richness and diversity in practical application, but also pay attention to some basic design rules to ensure their teaching quality. The research results can provide the most direct reference basis for teachers to design and produce online video courses, help to improve the learning experience of learners, and have practical reference value for improving the learning outcomes of universities and colleges students.

It is helpful to understand the motivation of students' behaviour and strengthen their learning continuation intention. This study explores the influencing factors of online learning interaction on the learning outcomes and learning continuation intention among Chinese higher institutions students through empirical analysis, to help online course designers and developers better understand students' ideas and expectations for online courses, discover the key factors affecting students' learning behaviour, and then formulate corresponding practical countermeasures, which has important practical reference significance.

1.8 Research Limitation

The short-term limitations of this study are mainly related to the time constraints that affect the depth and breadth of the data collected. First, the study was unable to track longitudinal changes in student responses over a long period of time. Without the ability to conduct multiple follow-up evaluations, we could not determine whether the observed effects were stable, temporary, or varied over time. Second, due to limited time, the study may not have captured all the variables that affect student

achievement. For example, factors such as curriculum changes or external influences on student behavior may go unnoticed during data collection. In addition, the short-term nature of the study limited sample size and diversity, limiting the generalization of the findings to the wider population. Future research would benefit from a longer data collection window to more fully analyze trends and external factors influencing student responses over time.

The data measured in this study are short-term in nature and these measurements only reflect a snapshot of respondents' attitudes towards online learning, which is often a long-term and evolving process. Both the learning outcomes and the learning continuation intention belong to the delayed and summative attitude of higher institutions students. This study is subject to constraints such as time and resource constraints, and short-term surveys limit the ability to capture the full dynamics and processes of changes in respondents' attitudes and behaviors over time. As a result, this study may not fully account for the fluctuations in learning outcomes and learning continuation intentions that may occur over longer periods of time. In addition, the study's single-survey approach limits insights into respondents' changing attitudes because it fails to capture the ongoing interactions and influences that shape students' summative attitudes toward learning. Future research could consider longitudinal studies, which would allow for a more comprehensive and nuanced understanding of these processes.

Another limitation of this study is that relevant model variables may be omitted. Although the choice of variables aims to capture the most critical factors that affect online learning interaction and its influence on learning outcomes and learning continuation intention, the complexity and variability of these factors in different backgrounds pose a major challenge. Therefore, although this study aims to balance

comprehensiveness and practicality, we admit that some potential influencing factors may not be included, which may limit the overall explanatory power of the model.

Online learning interaction is a new research hot spot, and many problems have not been fully discussed. There is almost no research on students' learning continuation intention. The author can only design a research model for reference by referring to the research results in other contexts, and the improvement and expansion of the theoretical model need further research by subsequent scholars.

SmartPLS 4 was not launched during the implementation of this study. Therefore, SmartPLS 3.3.7 is adopted in this study. SmartPLS 3 has many weaknesses and is no longer recommended for use. This is a limitation of the study. Compared to SmartPLS 3, SmartPLS 4 has the following advantages, first, SmartPLS 4 provides a more modern and intuitive user interface, making it easier to navigate and visualize the model. Second, SmartPLS 4 allows for more complex model structures, enabling researchers to specify and analyze higher-order structures more efficiently. Third, SmartPLS 4 includes enhancements to the estimation algorithm and provides additional capabilities for bootstrap and confidence interval estimation, improving the robustness of the results. Fourth, SmartPLS 4 provides more comprehensive reporting capabilities, including automatic output of results, which helps to clearly present findings. These improvements make SmartPLS 4 a more powerful tool for structural equation modeling and enhance its applicability in various areas of research.

1.9 Conceptualization of the Variables

This section briefly explains the basic terms and concepts used in this study.

1.9.1 Online Learning

Online learning refers to a way of learning in which students and teachers are physically far apart (Patricia Aguilera-Hermida, 2020).Online learning can make the teaching process more student-centered, innovative, and even more flexible (Dhawan, 2020). Online learning is defined as "a learning experience in a synchronous or asynchronous environment using different devices with Internet access (e.g., mobile phones, laptops, etc.)." In these environments, students can learn (independently) anywhere and interact with teachers and other students "(Singh & Thurman, 2019).

1.9.2 Online Learning Interaction

Moore defines online learning interaction as a two-way exchange between the learner and the online learning environment, which is essential to creating a meaningful and engaging educational experience. This is a fundamental concept in distance education, where interaction is seen as key to a meaningful learning experience that promotes active engagement and deeper understanding (Moore, 1989). Online learning interaction refers to a series of dynamic learning behaviors between learners or between learners and instructors through which they adjust their ideas or understandings, including verbal or non-verbal communication (Cai et al., 2023).

Therefore, this study defines online learning interaction as a series of meaningful and dynamic learning behaviors and experiences between learners and online learning environments (including people and objects).

Moore (1989) divides the interaction in online learning into the following three categories: instructor-learner, learner-learner, and learner-content. Hillman et al. (1994a) argue that in the context of online learning, another category of interaction should be considered and analyzed. This fourth category is called learner-interface interaction. This research is based on Moore's (1989) interaction and joins the learner-interface interaction proposed by Hillman et al. (1994), and divides the interaction into learner-content, learner-instructor, learner-learner, and learner-interface.

Therefore, the substructure of the online learning interaction can be defined operationally as follows:

1.9.2(a) Learner-instructor interaction

Learner-instructor interaction is a two-way communication between learners and course instructors (Moore & Kearsley, 1996). Learner-instructor interaction is defined as the communication initiated by students and teachers, which occurs before, during and after teaching(Katsarou & Chatzipanagiotou, 2021).

Therefore, this study defines learner-instructor interaction as two-way communication between learners and lecturers in online learning.

1.9.2(b) Learner-learner interaction

Learner-learner interaction is a two-way communication between learners (Moore & Kearsley, 1996). Learner-learner interaction refers to the interaction between peers or course participants, which allows the investigation of a problem and the development of multiple viewpoints (Nyathi & Sibanda, 2023).

Therefore, this study defines learner-learner interaction as two-way or multidirectional communication between learners in online learning.

1.9.2(c) Learner-content interaction

Ozturk and Kumtepe (2023) further expands the definition of learner-content interaction to include learners' access to and use of content in an online learning environment, as well as the connections between learners and learning resources. Learner-content interaction is the interaction between the student and the subject, which is a highly personalized process, with help from the instructor (Moore & Kearsley, 1996).

Therefore, this study defines learner-content interaction as a highly personalized process in online learning between students and subjects.

1.9.2(d) Learner-interface interaction

Learner-interface interaction refers to the process in which learners operate tools to complete tasks (Hillman et al., 1994). Learner-interface interaction refers to communication between instructional technology and learners (interfaces can be blogs and social media such as Facebook and other applications around learners) (Di Wu et al., 2020).

Therefore, this study defines learner-interface interaction as the process in which learners operate the online learning platform to complete learning tasks.