A STUDY ON THE FACTORS INFLUENCING TPACK USING BEHAVIOR OF UNIVERSITY ENGLISH INSTRUCTORS IN WESTERN CHINA: BASED ON THE MODEL OF TAM-TPB

BY

HONGYUN

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Abstract

This research investigated the factors contributing to the Technological Pedagogical Content Knowledge (TPACK) of English instructors at universities in western China, as evidenced by their instructional behaviors. This study adopted a mixed-methods approach combining the Technology Acceptance Model (TAM) and Theory of Planned Behavior (TPB) to investigate the factors influencing the TPACK of English instructors in western China. A quantitative survey of 422 instructors from 30 universities in 12 provinces was conducted followed by qualitative interviews with 10 instructors to gain deeper insights. Quantitative data were analyzed using structural equation modeling while qualitative data were subjected to thematic analysis.

The primary findings indicated that: 1) English instructors in western China exhibited moderate levels of TPACK abilities. Older and more experienced instructors demonstrated higher TECH-K (Technological Knowledge). 2) Perceived usefulness and subjective norms influenced instructors' intentions to utilize TPACK while perceived ease of use did not have a direct effect. 3) Behavioral intention mediated the relationship between perceived usefulness, subjective norms, and actual TPACK usage. 4) Qualitative data analysis highlighted the importance of institutional support, peers' attitudes, and instructors' self-efficacy as crucial factors in promoting TPACK adoption.

The research findings emphasize the need for systematic training programs, supportive policies, and infrastructure optimization to enhance instructors' TPACK. Future studies should consider expanding the sample size, refining the questionnaire design, and investigating instructors' professional development trajectories. This research contributes to a deeper understanding of TPACK development in the Chinese context. The findings inform strategies for promoting effective technology integration in English language teaching.

(Total 167 pages)

Keywords: TPACK Using Behavior, University English Instructors, Western China, TAM-TPB Model

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CHAPTER 1

INTRODUCTION

1.1 Background and Significance of theStudy

At university level, instructors are not only the implementers of educational activities, but also the leaders and promoters of educational reform (Datnow, 2020). With the continuous application of information technology in higher education activities, traditional educational and teaching methods are undergoing revolutionary changes (Cabaleiro-Cerviño, 2020). For two decades, how to integrate information technology into course teaching to improve educational and teaching effectiveness has become the focus of many educational researchers (Abdullah, 2016). Particularly, in 2005, Koehler and Mishra created a new theoretical structure, TPACK framework which based on Shulman's Pedagogical Content Knowledge (PCK) which refers to the specialization and in-depth content knowledge of a certain type of curriculum or subject with a disciplinary teaching methodology knowledge and integrated information technology knowledge (TK), subject content knowledge (CK), and pedagogical knowledge (PK) into the framework that can be used to promote the process of a dynamic integration process of appropriate choices and adjustments based on different contextual factors while teaching (Mehrak, 2019). Once the concept of TPACK was proposed, its concepts and mechanism has provided a reasonable solution for the integration and application of information technology in educational contexts (Teo,2009), and points out the direction for the development and improvement of instructors' technological and professional literacy (Baracaldo, 2019). Research has shown that curriculum design based on TPACK can effectively improve students' classroom participation and achieve good teaching outcomes (Chaaban & aSawalhi 2023; Rahimi & Pourshahbaz,2018).

While the essence of TPACK is a knowledge of using information technology in teaching the course content (Scherer, 2019), it contains seven components of knowledge which are: 1) Technological Knowledge (TK) -- The general knowledge of digital and emerging technologies, such as using interactive mobile tools.; 2) Pedagogical Knowledge (PK) -- The general knowledge of how to teach; it includes principles of instruction, the psychology of students, classroom management and teaching strategies; 3) Content Knowledge (CK) -- the knowledge of the subject content is the focus; 4) Pedagogical Content Knowledge (PCK) -- The knowledge of adopting pedagogical strategies to foster students' understanding of the content of subject; 5) Technological Content Knowledge (TCK) -- The knowledge to represent the science content subject with digital technologies; 6) Technological Pedagogical Knowledge (TPK) -- The knowledge of the presence, components, and capabilities of various digital technologies which are used for teaching; and 7) Technological Pedagogical Content Knowledge (TPACK) -- The knowledge of using technologies to teach and represent the content subject (Cox & Graham, 2009; Graham et al., 2009; Koehler & Mishra, 2009; Liang et al., 2013). In 2008, Mishra introduced context element into TPACK. As a knowledge framework aimed at improving instructors' professional development, TPACK plays an important role in the comprehensive integration of network information technology and English curriculum in the information-based teaching environment for English instructors' professional development (Fan & Zhang,2016).

High level of TPACK is believed to also bring high-quality of information technology capabilities into teaching in different dimensions (Sefika, 2021). Those dimensions involve: 1) the information technology literacy; 2) the ability applying information technology resources; 3) the dependence on traditional teaching models, and 4) the mastery of new teaching models (Akram, 2022). Putting together, it is salient to investigate the level of the TPACK of the instructors as to understand how well they can do in teaching with technology (Akun & Mohamad, 2023; Kurt, 2018).

At the level of the university, since 2014 worldwide, innovative integration of new technologies in teaching is used to promote curriculum and teaching reform (Costley, 2014; Messina &Tabone, 2014). Through research findings, it is argued that the levels and abilities of integrating technology into instruction (Thohir, Jumadi, &Warsono, 2020) with a TPACK Development Course (TPACK-DC), a training course, preparing lesson plans using micro-teaching or school application (Aktaş &Özmen,2020) such as in a specific branch of science -- chemistry, physics, and biology turned out to be popular (Paristiowati, Nurhadi, & Imansari, 2020;Tondeur, Scherer,&Siddiq, & Baran,2020).

In 2022, the Higher Education Department of the Ministry of Education of China clearly stated in the issued annual work points that it is necessary to comprehensively promote the digitization of higher education teaching, and use digitization to help improve the talent cultivation capability of colleges and universities. Therefore, improving the information technology teaching ability of college and university instructors is of a requirement and inevitable choice of the times (Wang, Y., Wang, J., &Yu, 2022). To respond to this policy, this study will put forwards with the English language instructors. Since it is all of their salience and priority to focus on improving their information technology teaching abilities and behaviors. This is because all of the English instructors must be effective in using technology in teaching "College English Course" that has been listed as compulsory for all students in every major in order to develop, cultivate, and enhance their cultural literacy and being able to beemployed.

As can be seen in the research that has been performed at the national level using a survey with 2,058 English instructors from 76 universities in seven major regions of China to evaluate how importance of information technology in English teaching and at what level of abilities with frequency of use information technology in their daily teaching activities (Rahman, 2022; Wang, Y., Wang, J., Han, & Li, 2023). Moreover, it is revealed that TPACK of English Instructors has been closely connected to the levels of ability and behaviors in web-conferencing teaching, pedagogical content knowledge (Hsu et al., 2021; Lai, Lew, & Ooi, 2022; Prasojo et al.,2020).

Accordingly, there is a need for university English instructors to adapt to the trend of educational technology development, learn more about, and know how to integrate information technology into their teaching as to generate their abilities for effective teaching (Milutinović, 2022; Wanget al., 2022).

In order to systematically explore TPACK, this study will apply the Technology Acceptance Model (TAM) and Theory of Planned Behavior (TPB) as the foundation to gain a deeper understanding of the factors influencing the TPACK behaviors of university English instructors in Western China. By using the results of empirical analysis of the previous research, this study aims to find effective model to promote the application of information technology in the teaching of university English instructors, thereby providing assistance for better teaching English with technology in the universities in Western China.

Technology Acceptance Model (TAM), was developed by Davis (1989) to explain users' acceptance of computers and technologies that come along. The model includes four core variables: 1) perceived usefulness -- the degree to which a person believes that using a particular system would enhance his or her job performance;
2) perceived ease of use -- the degree to which a person believes that using a particular system would be free of effort." This follows from the definition of "ease": "freedom from difficulty or great effort; 3) behavioral intention -- the individual's motivation or inclination to engage in a specific behavior. It is considered as the immediate precursor to actual behavior; and 4) actual behavior -- the end- point where people use thetechnology.

Hence, the main viewpoint of the theory is that of the degree to which the usefulness and difficulty an individual perceives for a product jointly affect the acceptance attitude towards the product or technology and later indirectly affect the behavior. Thus, the information-based teaching ability of university English instructors is essentially an internalization of the integration of the use of information technology equipment and teaching knowledge (Guo, 2018). According to the TAM theory,instructors'perceptionoftheusefulnessandeaseofuseofinformation

technology will affect their views and attitudes towards information technology, thereby affecting their usage behavior (Deng &Yuan, 2020; Su & Rai, 2020). Therefore, in this study, the four core of TAM theory are used to hypothesize the factors that affect instructors' information technology TPACK using behaviors from the perspective of informationtechnology.

Next, the Theory of Planned Behavior (TPB) which started as the Theory of Reasoned Action in 1980 to predict an individual's intention to engage in a behavior at a specific time and place in order to explain all behaviors over which people have the ability to exercise their self-control. The TPB is comprised of six constructs: 1) Attitudes-- the degree to which a person has a favorable or unfavorable evaluation of the behaviorof interest. It entails a consideration of the outcomes of performing thebehavior; 2) Behavioral intention -- the motivational factors that influence a given behavior where the stronger the intention to perform the behavior, the more likely the behavior will be performed; 3) Subjective norms -- the belief about whether most people approve or disapprove of the behavior. It relates to a person's beliefs about whether peers and people of importance to the person think he or she should engage in the behavior; 4) Social norms -- the customary codes of behavior in a group or people or larger cultural context. Social norms are considered normative, or standard, in a group of people; 5) Perceived power -- the perceived presence of factors that may facilitate or impede performance of a behavior. Perceived power contributes to a person's perceived behavioral control over each of those factors; 6) Perceived behavioral control -- A person's perception of the ease or difficulty of performing the behavior of interest. Perceived behavioral control varies across situations and actions, which results in a person having varying perceptions of behavioral control depending on thesituation.

Based on this theory, individuals' abilities and behaviors to integrate information technology with teaching will be jointly influenced by individual subjective cognition and external environmental pressure. However, depending on the research findings, therefore, in this study the TPB theory is to explore the factors that affect university English instructors information-based teaching abilities from their individual perspectives (Dunn & Bowles, 2018; Wu, Zhou, Li, & Chen, 2020, 2022) according to

the significance found in previous research in that there were a positive relationship between attitudes, subjective norms, and perceived behavioral control with intentions, respectively (Duangsanjun & Suangpho, 2022). Thus, the findings can be used to hypothesize the relationships of the factors that affects the College English instructors' TPACK using behaviors from the perspective of individuals' perspectives and intentions in using information technology in teaching.

This study, thus, by putting together the theories of TAM and TPB with findings from the previous research, it appears that perceived ease of use and perceived usefulness from TAM and behavioral attitude, subjective norms, perceived behavioral control, and behavioral intention from TPB will be retained. As such, perceived ease of use, perceived usefulness, behavioral attitude, subjective norms, and perceived behavioral control will be used as the independent variables, behavioral intention as an intermediary variable, and the TPACK behaviors of teaching English will used as the dependentvariable.

Accordingly, the present study examined the relationship between various factors on TPACK using behaviors of teaching with the hypotheses derived from a comprehensive theoretical framework through empirical analysis which will be crucial to enhance the applicability in a wider range of scenarios in English teaching in the universities in Western China.However, in orderto assurethe feasibility of the contribution of the model, the interviews with the 10 informants outside the sampling will be performed to confirm its validity and reliability in the reign of TPACK using behaviors oftheinstructorsinteachingCollegeEnglishCourseintheuniversitiesinWesternChina.

1.2 ResearchObjectives

1.2.1 To explore the factor components that influence the TPACK using behaviors of university English instructors in the universities in WesternChina;

1.2.2 To determine the causal relationship of factors that influence the TPACK using behaviors of university English instructors in the universities in Western China;

1.2.3 To obtain the confirmation of the model of the relationships of factors that influence the TPACK using behaviors of university English instructors in the universities in WesternChina?

1.3 ResearchQuestions

1.3.1 What are the factors components influencing the TPACK using behaviors of university English instructors in WesternChina?

1.3.2 What is the causal relationship of factors influencing the TPACK using behaviors of university English instructors in Western China?and

1.3.3 What is the confirmation of the model of the relationships of factors that influence the TPACK using behaviors of university English instructors in Western China?

1.4 ConceptualFramework

On the basis of understanding the TPACK using behaviors of university English instructors in Western China, this study will explore the explanatory factors that affect the information technology use behavior of university English instructors in Western China from the perspectives of Technology Acceptance Theory (TAM) and Theory of Planned Behavior (TPB). As shown in Figure 1.1

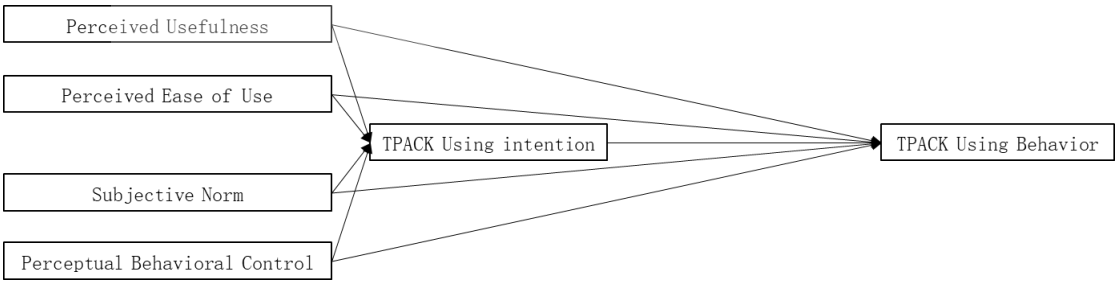

Figure 1.1 Conceptual Framework TAM and TPB on TPACK

Latent Variables:

Perceived ease of use, perceived usefulness, subjective norms, and perceived behavioral control will be used as the independent variables, behavioral intention as a mediator variable, and the TPACK Using Behaviors will used as the dependent variable.

Independent Variables:

Perceived ease of use, perceived usefulness, subjective norms, and perceived behavioral control.

Mediator Variables:

TPACK Using Intention

Dependent Variable:

TPACK Using Behaviors

1.5 ResearchHypotheses

H1: Perceived usefulness has a positive impact on instructors' TPACK using intention.

H2: Perceived ease of use has a positive impact on instructors' TPACK using intention.

H3: Subjective norms have a positive impact on instructors' intention to use TPACK.

H4: Perceived behavioral control has a positive impact on instructors' TPACK usingintention.

H5: Instructors' TPACK usage intention has a mediating effect between perceived usefulness and TPACK using behavior.

H6: Instructors' TPACK usage intention has a mediating effect between perceived ease of use and TPACK using behavior.

H7: Instructors' TPACK usage intention has a mediating effect between subjective norms and TPACK using behavior.

H8: Instructors' TPACK using intention has mediating effect between perceived behavior control and TPACK using behavior.

1.6 ResearchScope

1.6.1 QuantitativePhrase

The Explanatory Sequential Design (Cresswell, 2014) will be used in this study. First the quantitative and then the qualitative.

1.6.1.1 Population

The study included around 40,000 English instructors from 302 undergraduate colleges and universities in 12 provinces and regions of Western China, including such as Sichuan Province, Shaanxi Province, Yunnan Province, and Chongqing, as the overall study population.

1.6.1.2 Sampling

According to Calculator.net (2024) suggestion, the confidence level was calculated to be 95%, with an error range of ± 0.05. In the case of a sampling population of 40,000, the necessary sample size will be 380 subjects. To ensure good representativeness of the sample, the study first selected 30 universities based on the proportion of the number of universities in 12 regions as the sample sampling box, andfinallyconductedproportionalsamplingaccordingtotheproportionofEnglish

instructors in the sampled universities, in order to ultimately obtain the necessary sample size for this study.

1.6.1.3 Measures

To address research issues and achieve research objectives, this study uses three questionnaires to obtain the data required for empirical analysis. Among them, the TPACK ability (and behavior of using) assessment scale developed by Schmidt (2009) was used to measure the TPACK ability level of the test samples. The scale includes seven dimensions: technology knowledge (TK), subject content knowledge (CK), pedagogical knowledge (PK), pedagogical content knowledge (PCK), technological pedagogical knowledge (TPK), technological subject content knowledge (TCK), and technological pedagogical and content knowledge (TPACK).To explore the willingness and influencing factors of the subjects' using behaviors with ability to integrate information technology and teaching, the study uses the TAM scale developed by Davis (1989) and the TPB scale developed by Ajzen (1985). Here the TAM scale includes three dimensions: perceived usefulness, perceived ease of use, and attitude, while the TPB scale includes four dimensions: subjective norms, perceived behavioral control, behavioral intention, and usage behavior. All scales are measured by the Likert five-point scale, ranging from "1-5" indicating "strongly disagree" to "stronglyagree".

1.6.1.4 DataAnalysis

In statistical analysis of data, the study will use descriptive analysis to analyze the demographic variable characteristics of the test samples reliability and validity analysis to test the reliability and consistency of the data measured by the scales in the questionnaires, descriptive analysis (mean ± standard deviation) to measure the TPACK proficiency level of the test samples, and the same method to test the behavioral intention of English instructors in Western China towards integrating information technology and teaching. Finally, guided by the TAM-TPB integrationtheory,thestudywilluseStructuralEquationModeling(SEM)toexplore

the factor components that influence the TPACK using behaviors of English instructors, and based on this, confirm the model as to enhance the TPACK ability of University English instructors in Western China.

1.6.2 QualitativePhrase

The results from the questionnaire will be drawn to write questions for the interview. There will be 10 administrators from 10 English Departments of 10 different colleges and universities in Western China. The information background of the administrators who participated in interview will be strictly protected for their identities.

1.6.2.1 FocusGroup

Focus group with a semi-structured interviews will be used to confirm the relationship of factors influencing TPACK using behaviors as to enhance the ability of teaching of the university English instructors in the universities in Western China. The interview will be crafted to align with the research objectives and questions, offering a flexible yet structured framework for gathering in-depth insights from participants.

1.6.2.2 ContentAnalysis

In the qualitative portion of the study, the content analysis with a thematic analysis (Peel, 2020) will be employed to confirm, complement and elucidate the findings of the quantitative phase. The structured coding techniques of thematic analysis will be used to see the consistent patterns of the themes. The study will utilize the Nvivo12 program to conduct a detailed thematic analysis of data from semi-structured interviews to form a holistic picture about TPACK of teaching English for university instructors in Western China which rigorously corroborated, aligned seamlessly with and validated the quantitative findings. This alignment will demonstrate the capacity of the analysis to offer cohesive and comprehensiveinsights,

ensuring that the qualitative exploration effectively confirmed supported and clarified the initial quantitative results (Creswell et al., 2015).

To prevent social bias and maintain the integrity of the study, it was crucial not to directly solicit stakeholders' opinions during interviews, as it could potentially lead to biased responses. Instead, the research strategy focused on implementing informed consent procedures outlined in the interview protocol, being attentive to participants' needs, and ensuring data collection in a confidential manner. These measures were employed to mitigate response bias and unintended influence on research findings (Robinson & Leonard, 2019).

1.7 Definition of Terms

TPACK: The theoretical framework with seven components of knowledge of using information technology in teaching the course content: 1) Technological Knowledge (TK) -- The general knowledge of digital and emerging technologies,such as using interactive mobile tools.; 2) Pedagogical Knowledge (PK) -- The general knowledge of how to teach; it includes principles of instruction, the psychology of students, classroom management and teaching strategies; 3) Content Knowledge(CK) - the knowledge of the subject content is the focus; 4) Pedagogical Content Knowledge

(PCK) -- The knowledge of adopting pedagogical strategies to foster students' understanding of the content of subject; 5) Technological Content Knowledge (TCK) - The knowledge to represent the science content subject with digital technologies; 6) Technological Pedagogical Knowledge (TPK) -- The knowledge of the presence, components, and capabilities of various digital technologies which are used for teaching; and 7) Technological Pedagogical Content Knowledge (TPACK) -- The knowledge of using technologies to teach and represent the contentsubject.

Technology Acceptance Model (TAM): To explain users' acceptance of computers and technologies that come along. The model includes four core variables:

1) perceived usefulness -- the degree to which a person believes that using a particular system would enhance his or her job performance; 2) perceived ease of use -- the degree to which a person believes that using a particular system would be free of effort or freedom from difficulty or great effort; 3) behavioral intention -- the individual's motivation or inclination to engage in a specific behavior. It is considered as the immediate precursor to actual behavior; and 4) actual behavior -- the end-point where people use thetechnology

Theory of Planned Behavior (TPB): To explain the person's planned behaviors in using technology: 1) Attitudes -- the degree to which a person has a favorable or unfavorable evaluation of the behaviorof interest; 2) Behavioral intention-- the motivational factors that influence a given behavior where the stronger the intention to perform the behavior, the more likely the behavior will be performed; 3) Subjective norms -- the belief about whether most people approve or disapprove of the behavior that relates to a person's beliefs about whether peers and people of importance to the person think he or she should engage in the behavior; and 4) Perceived behavioral control -- A person's perception of the ease or difficulty of performing the behavior of interest depending on thesituations.

TAM-TPB Integration Theory: This theory integrates the TAM theory with the TPB theory, two variables of TAM are retained: Perceived ease of use and Perceived usefulness; and the four variables from TPB are included: Attitude, Subjective norms, Perceived behavioral control, and Behavioral intention.

Instructor: A person who teach at college or university levels

English Instructor: A person who teach Course of English at college or university levels

Universities in Western China: A total of 30 colleges and universities as sampling based on the proportion of universities in 12 regions in Western China.

CHAPTER 2

LITERATURE REVIEW

2.1 TPACKTheory

2.1.1 The connotation ofTPACK

With the deep integration of science and technology in the field of education, the teaching methods of instructors and the learning methods of students are also undergoing profound changes (Amorim, 2018). In modern classrooms, whether it is pre-teaching preparation, classroom application, or after-school learning guidance, there is the presence of information technology. The application of information technology in teaching not only improves instructors' teaching efficiency, but also promotes learners' learning success. Therefore, information technology has become an important component of instructor professional development (Ghavifekr &Rosdy,2015). To achieve the deep integration of information technology and educational activities, it is necessary to construct a knowledge framework that can guide instructors in the deep integration of information technology and curriculum, in order to guide instructors to effectively and reasonably use information technology in teaching activities, thereby improving teaching effectiveness and promoting learners' learning (Falloon, 2020).

In 2005, American scholars Koehler and Mishra found in a study on instructor professional development training programs that although most instructors know how to use technical equipment related to teaching during the teaching process, yet they do not have a deep understanding of the interaction among subject knowledge, technological knowledge, and teaching methods, resulting in instructors' application of information technology staying at a shallow and mechanical level of technical operation. So, they

designed a "design-based learning" method to help instructors learn technological knowledge and apply it reasonably to daily teaching activities (Koehler &Mishra, 2005). In the same year, two scholars first proposed technology-integrated pedagogical content knowledge (TPCK)based on their research results, and elaborated on the seven components of TPCK: subject content knowledge (CK), technological knowledge (TK),pedagogical knowledge (PK), pedagogical content knowledge (PCK), technological pedagogical knowledge (TPK), technological content knowledge (TCK), and technological pedagogical and content knowledge (TPCK). In 2007, Mishra, after extensively soliciting opinions from experts and magazine editors in the teaching sector at the 9th National Technology Leadership Summit, believed that the abbreviation "TPCK" was difficult to pronounce due to its complete composition of consonants. She added the letter "A" to the abbreviation "TPCK"and officially changedthe abbreviation for technological pedagogical and content knowledge to "TPACK"(Wang, 2022).

With the in-depth research of scholars on TPACK, people have realized that TPACK is a new knowledge that involves multiple conditions, factors, and interactions, and instructors learn this knowledge. Mastering and applying are often influenced by a combination of social, cultural, and psychological factors. Therefore, in 2008, Mishra incorporated Context as an element of technological pedagogical and content knowledge into the original TPACK framework (Stoilescu & McDougall, 2010), forming a core element consisting of three core elements: technological knowledge (TK), subject content knowledge (CK), and pedagogical knowledge (PK), as well as pedagogical content knowledge (PCK) and technological subject content knowledge (TCK). A complete and systematic framework of technological pedagogical content knowledge is composed of four composite elements, namely PCK and TPCK, combined with external factors such as Context (Herring, Koehler, & Mishra, 2016). As shown in Figure 2.1.

Subject content knowledge mainly includes the basic theories, concepts, and methods that instructors need to teach specific subjects (Jeschke, 2021). For example, the subject content knowledge of university English instructors involved in this study is English subject content knowledge. Subject content knowledge (CK) can be

understood from two aspects. Firstly, it is the specific teaching content of a subject in instructor teaching, which includes conceptual, theoretical, and procedural knowledge of the specific subject, explanatory framework knowledge for organizing and connecting viewpoints, and can also be summarized as the content that students can learn in the teaching classroom (Koh, Chai, & Lee, 2015).

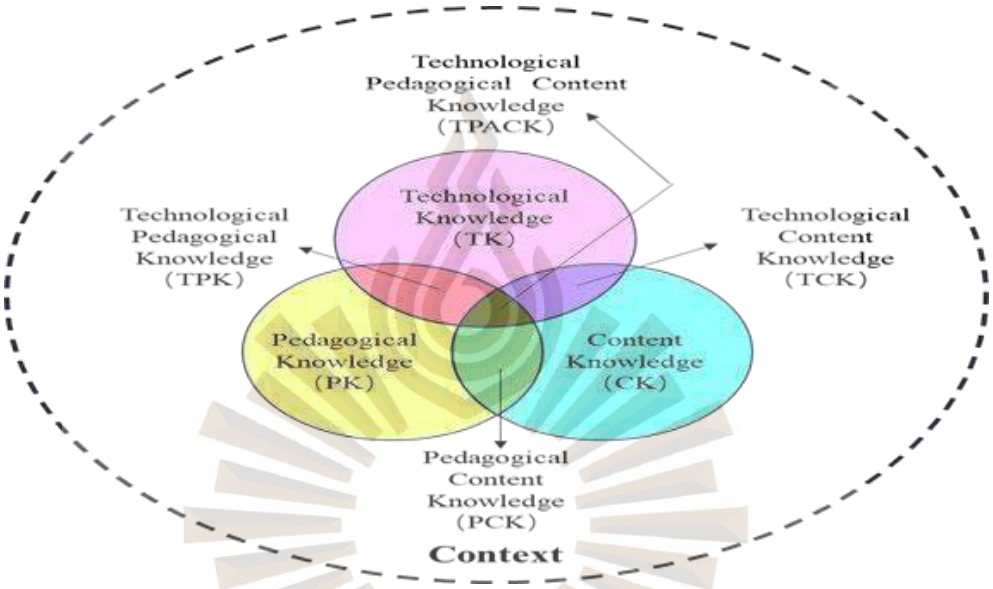

Figure 2.1 TPACK Framework

Source: Koh et al., 2015

Furthermore, the subject content knowledge of instructors refers to their personal understanding and interpretation of subject knowledge, and the essential differences in teaching content between the subject taught by the instructor and other subjects. In short, the necessary subject content knowledge for a instructor should not only include the basic concepts, theories, and methods contained in the subject itself, but also include a deeper understanding of the subject itself and the connections to other related subjects (Martínez-Torregrosa, 2018). Only by mastering this knowledge can instructors have a deeper understanding of the subject they are teaching, and effectively integrate the already mastered subject content knowledge with pedagogical knowledge and technological knowledge in the teaching process, effectively transmitting knowledge to students, and truly achieving the goal of "teaching to catch fish" (Setiawan, 2018).

2.1.2 Pedagogical Knowledge(PK)

Pedagogical Knowledge refers to the knowledge of strategies and methods, evaluation methods, management methods, and other aspects used by instructors in the education and teaching process (Guerriero, 2014). This requires instructors to have a clear understanding of relevant educational theories such as constructivist learning theory, cognitive learning theory, scaffolding teaching, and be able to apply them in educational classrooms (Epp, 2021). Pedagogical Knowledge is also the teaching and learning methods designed by instructors in the process of education and learning, the organization and management of teaching classrooms, or the instructors' own in-depth understanding and interpretation of educational and teaching work. In summary, pedagogical knowledge (PK) mainly includes the organization and management of teaching classrooms, educational strategies, construction of teaching objectives, teaching design, and evaluation of teaching effectiveness (Siyam,2019).

2.1.3 Technological Knowledge(TK)

Technological knowledge is the most dynamic and uncertain factor in the disciplinary teaching knowledge framework that integrates technology (Koehler & Mishra, 2014). Different scholars have different understandings of technological knowledge, mainly manifested in differences in understanding the breadth and depth of technological knowledge. In terms of understanding the breadth of technological knowledge, some scholars believe that the technology in technological knowledge should include all technologies, including traditional technologies such as blackboards, calculators, and projections, as well as new technologies such as computer technology, web 2.0 technology, and semantic web technology (Nicolaou, 2019). However, some scholars believe that the technology in technological knowledge should refer to emerging information technologies rather than traditional technologies (Lewis,2003).

In terms of understanding the depth of technological knowledge, some scholars believe that technological knowledge is knowledge about the specific usage and functional applicability of a certain technology, while others further extend the

depth of technological knowledge and position it as a "constant response to changes" thinking mode, which will be applicable to any technology (Zhan & Ren, 2010). Obviously, the latter's understanding of technological knowledge (TK) belongs to a higher level of understanding, and it is also more in line with the construction of this element by the creators of technological pedagogical and content knowledge (TPACK. Therefore, technological knowledge (TK) refers to the knowledge that instructors possess in terms of ways of thinking and using technology (Herringet al., 2016).

2.1.4 Pedagogical Content Knowledge(PCK)

Pedagogical Content Knowledge (PCK) mainly refers to the application of pedagogical knowledge on specific subject knowledge, which emphasizes the combination of instructors' own subject knowledge and pedagogical knowledge to better impart to students. In other words, this knowledge element is generated by the integration of pedagogical knowledge (PK) elements and subject content knowledge (CK) elements in the TPACK knowledge structure (Mishra & Koehler, 2006). It refers to that instructors teach their already understood subject content knowledge (CK) in the teaching classroom through the rational use of pedagogical knowledge (PK), while are able to design subject teaching and organize and manage the teaching classroom. Pedagogical Content Knowledge (PCK) emphasizes more on teaching methods' ability to transform subject content knowledge into forms that are easy for students to accept, the ability to solve students' learning difficulties, and the ability to form new teaching strategy knowledge through the above process (Park & Oliver,2008).

2.1.5 Technological Pedagogical Knowledge(TPK)

The integration of Technological Pedagogical Knowledge mainly relies on the use of teaching technology to support corresponding educational strategies or methods, and the knowledge of how the two should interact and constrain each other (Harris &Hofer, 2011). It is a certain teaching technology applied by instructors in the teaching process, which has an impact on teaching effectiveness and students' learningafterdesigningteachingmethodsusingteachingtechnology(Ghavifekr&

Rosdy, 2015). In other words, Technological Pedagogical Knowledge refers to the process in which instructors clearly grasp the use of certain teaching techniques to try to better carry out education and teaching. This process mainly includes instructors selecting appropriate educational and teaching technology tools based on teaching objectives, and being able to proficiently use such teaching technology tools, such as using discussion whiteboards and chat rooms to ensure student attendance and record classroom content (Alqurashi, 2019).

2.1.6 Technological Content Knowledge(TCK)

The Technological Content Knowledge mainly refers to the knowledge that the content knowledge of a certain discipline and teaching technology interact, integrate, and constrain each other. That is, instructors use teaching technology to assist in the teachingof a certain subject content, or apply teaching technology to make certain reforms for adapting to the unique knowledge of specific subject content. (Koehler &Mishra, 2009). It is also an understanding of the mutual integration, influence, and interaction between teaching technology and different subject content knowledge. The technological content knowledge (TCK) first involves selecting appropriate teaching techniques based on the subject's teaching content, with the aim of utilizing the application of teaching techniques to make the teaching content easier for students to understand. In summary, instructors not only need to master the knowledge of the subject content they are teaching, but also need to possess and master certain teaching techniques to better impart the subject content knowledge, and improve the quality of education and teaching during the teaching process (Guerriero,2014).

2.1.7 Context

With the continuous deepening of research on TPACK, researchers have added "context" factor within this framework. "Environment" not only includes macro factors such as national and regional policies, but also micro factors such as school teaching philosophy, instructor beliefs, and teaching environment; At the same time, context factors include subjective factors such as the instructor's personality and self-

efficacy, student motivation and achievement, as well as material factors such as classroom environment, software and hardware equipment (Yan, 2021). Therefore, teaching under the TPACK framework places higher demands on the flexibility of instructors, requiring them to clarify the relationships between various elements in complex contexts and flexibly and appropriately handle and adjust various relationships based on the context.

Context is a relatively flexible and loose factor in the TPACK framework, and different people have different understanding from different perspectives (Koehler & Mishra, 2009). Contextual factors are the most difficult to concretize in the framework of technological pedagogical and content knowledge, especially the synergistic effect between certain factors in contextual factors, which are often the most dynamic and difficult to concretize. The interaction between contextual factors and other elements of technological pedagogical and content knowledge technological pedagogical and content knowledge can promote or hinder instructors' teaching and learners' learning (Koh, 2014). It is difficult for instructors to achieve the same level of mastery of such knowledge as other elements, and more importantly, it is a response to specific contextual factors, enabling them to interact positively with other elements, promoting teaching andlearning.

2.1.8 Technological Pedagogical and Content Knowledge(TPACK)

Within the framework of instructor professional knowledge, subject content knowledge, pedagogical knowledge, and technological knowledge are independent, interactive, and integrated to form Technological Pedagogical and ContentKnowledge (TPACK).

Mastering this knowledge is the foundation for effective teaching and a prerequisite for instructors to become expert instructors (Kurt, 2018). Subject content knowledge, pedagogical knowledge, and technological knowledge are interrelated and independent, and loosely coupled to form technological pedagogical and content knowledge. The entire knowledge structure is in a dynamic balance state, and a

change in one element will inevitably cause changes in other elements to maintain balance (Wang, 2016).

The traditional view holds that subject content knowledge determines pedagogical knowledge and technological knowledge (Lu, 2018). However, in the framework of technological pedagogical and content knowledge, the change of technology may also lead to the reconstruction of subject content knowledge and pedagogical knowledge. Therefore, subject content knowledge, pedagogical knowledge, and technological knowledge are a two- way interactive relationship within the framework (Celik, 2023). In addition, instructors from different disciplines, backgrounds, and situations have varying understandings and mastery of subject teaching knowledge related to integrated technology. When faced with each specific teaching problem, instructors need to reorganize and design subject content knowledge, pedagogical knowledge, and technological knowledge (Schmidt, 2009).

Therefore, there is no universal combination that can adapt to every subject knowledge or classroom. Expert instructors who truly possess a high level of integrated technology in subject teaching knowledge are often not the instructors who have the best mastery of subject content knowledge, pedagogical knowledge, or technological knowledge. However, they are the instructors who are most able to effectively integrate their three types of knowledge and maintain a dynamic balance (Abubakir & Alshaboul, 2023).

In summary, TPACK is integrating technology into instructors' professional knowledge framework. It is a requirement of the information technology era for instructors. It constitutes the three core elements of integrated technology in pedagogical content knowledge. Subject content knowledge, pedagogical knowledge, and technological knowledge are not simply superimposed and accumulated, but cross, support each other, integrate with each other, and are in a dynamic balance state.

2.2 The Role ofTPACK

From the analysis of the connotation of the integration of information technology and curriculum, it can be seen that its main role is to reform the existing education model, change the positioning of instructors and students in the education structure, and then promote the development and progress of the education sector (Ghavifekr, 2014). But this is only its ultimate goal, and the specific role of information technology and curriculum integration is still worth in-depth research. The role, purpose, and significance of the integration are also the focus of scholars' research. Scholar Jadhav (2022) analyzed the goal of integrating information technology with curriculum. He believes that improving learning, creating a good learning environment, transforming existing learning methods, achieving teaching objectives to promote student development, and building learning content that meets needs are all functions of the integrationprocess.

It is necessary to comprehensively and systematically integrate information technology with curriculum, choosing the application of information technology based on course objectives and learning objectives. Scholars such as Ghavifekr (2014) proposed that the task and goals of integrating information technology with curriculum include three aspects: building a network learning environment for information technology teaching and learning, building a network learning method for information technology teaching and learning, and building an awareness of information technology, networking, and digitallearning.

Fromthe perspective of teachingpractice,analyzingthe integration of information technology and curriculum can stimulate students' interest in learning and play a dominant role in the learning process. Students no longer only follow the instructor's teaching arrangements, but can actively participate in the teaching process, which helps students memorize and consolidate teaching content knowledge (Ghavifekr &Rosdy, 2015). Applying information technology to the teaching process facilitates students' acquisition of knowledge. It is conducive to the effective organization and integrationofteachingcontent,andtheuseofinformationtechnologyinorganizational

integration can effectively integrate teaching content, teaching objectives, etc. into a whole, contributing to the collaborative implementation of teaching strategies in the teaching process. From these aspects, the integration of information technology and curriculum can integrate various elements in the education system, fully leverage the role of students in the teaching process, and create a good information education environment for cultivating students' innovative and practical abilities (De Vita &Tan,2021).

Analyzing the role played by the most direct participants in the integration process of information technology and curriculum – instructors and students - can summarize more practical patterns. In terms of the specific role of teaching for instructors, firstly, it is beneficial for instructors to break through teaching difficulties and key points. Information technology can improve the abstract teaching knowledge content in traditional teaching models, making it more vivid and specific, especially for students to understand important knowledge points in teaching. Secondly, the integration of information technology and curriculum can enrich instructors' teaching materials. In traditional teaching processes, instructors' teaching resources are relatively limited, and their teaching content is greatly limited, directly affecting the quality of classroom teaching.

Integrating information technology can achieve the sharing of teaching resources, and instructors can timely obtain rich educational and teaching resources according to teaching needs. Finally, it can effectively improve instructors' teaching skills and promote their own development. The integration of information technology and curriculum can transmit the latest educational concepts and methods to instructors, encourage them to continuously learn and improve themselves, and thus achieve professional development.

The integration of information technology and curriculum has a greater impact on students' learning than on instructors' teaching, as students are the most direct participants and ultimate beneficiaries of education. The specific role of learning for students mainly includes the following aspects: firstly, it is conducive to cultivatingstudents'autonomouslearningability.Theintegrationofinformation

technology and curriculum can change the passive learning situation of students in the past, and students' learning is more proactive. The cultivation of learning ability is very important for future learning, work, and life. Furthermore, it is conducive to cultivating students' innovative ability, which is an important ability and quality that talents in today's society must possess. In the context of information-based teaching, it can provide extremely rich teaching and information resources. At the same time, students' identity as educational subjects can greatly stimulate their innovative thinking and ability, promoting the cultivation of students' innovative spirit. Finally, it is beneficial to improve students' practical abilities. Traditional education models often focus more on the teaching of theoretical knowledge and pay little attention to practical education. Through the integration of information technology and curriculum, not only can theoretical knowledge teaching be provided, but also theoretical knowledge can be combined with practice, effectively cultivating students' practical abilities.

In summary, whether analyzed from the perspective of its connotation, objectives, or practical applications, the integration of information technology and curriculum plays a very important role. Analyzing its role from the perspective of the most direct participants in the integration process, it can be summarized in detail that its main functions include: helping instructors break through teaching difficulties and key points; enriching instructors' teaching materials; and effectively improving instructors' teaching skills (Ertmer, 2012).

It is conducive to cultivating students' autonomous learning ability, beneficial for cultivating students' innovative ability, and beneficial for improving students' practical abilities. In summary, the integration of information technology and curriculum plays a very important role in cultivating students' various abilities, improving the teaching environment, integrating subject courses, carrying out instructor teaching activities, and transforming the identity of instructors in traditional education models.

2.3 Characteristics of TPACKStructure

Scholars Yan and Xu (2013) believe that the TPACK structure of instructors from the perspective of integration mainly has two characteristics: situational and silent. They point out that the formation of the TPACK structure originates from specific teaching environments, and only in specific teaching environments can TPACK be effectively applied. Silence refers to the difficulty in explaining TPACK in clear and specific language, but it can play its role in specific teaching environments. Scholar Hu (2009) believes that the main characteristics of the TPACK structure of instructors from an integrated perspective include subjectivity, strong professionalism, individual differences, practicality, and situational teaching (Hu, 2009).

Scholars such as Lachner (2019) and Xu (2014) believe that instructor TPACK from an integrated perspective is a complex knowledge structure, in which the three core elements TK, CK, and PK are all related and independent. The TPACK structure is not simply a combination of these three core elements, but a complex and comprehensive knowledge system that integrates these three elements. The proponents of the instructor TPACK structure from the perspective of integration, American scholars Mishira and Koehler, also believe that the technological pedagogical and content knowledge is a complex knowledge structure system. TPACK involves repeated fusion and cross combination of the three core factors, resulting in four composite factors, forming a new content knowledge system. Therefore, TPACK has certaincomplexity.

In summary, the main characteristics of TPACK structure mainly include the following three aspects:

First, complexity. Through the above research, there are three core elements in the TPACK structure framework for instructors from an integrated perspective. These three core elements influence and interact with each other to generate four new composite elements. At the same time, the three core elements are both independent and interrelated in practical applications. In the process of instructor's practical

teaching, due to the interaction of the three core elements in the TPACK structure, teaching practical activities become relatively complex. Instructors need to design suitable teaching methods based on different teaching methods adopted by different subjects. In summary, the TPACK structure of instructors from the perspective of integration is somewhat complex due to the fact that knowledge elements are generated through actions and influences.

Second, balance. Balance is also one of the main characteristics of instructor's TPACK structure from the perspective of integration, which is also determined by the constituent elements of the TPACK structure (Deng, 2023). The TPACK structure of instructors in a balanced state is composed of three core elements and four composite elements formed through the action of core elements. This equilibrium state will change with the change of one of the seven elements, and once the balance is lost, it needs to be recombined to maintain balance. If the knowledge integration does not reach a balanced state, it is necessary to redesign and integrate to ensure the balance of the TPACK structure and fully utilize its role in education and teaching.

Third, interactivity. The core elements of the instructor's TPACK structural framework have a certain degree of correlation with each other. If one element changes, through the interaction between elements, another element will also be affected, and the affected element will also affect other elements (Zeng, 2022). In other words, in the teaching process, instructors cannot only apply elements from one TPACK structural framework while ignoring other elements for teaching, which will result in the inability to achieve the teaching objectives of the subject. It can be seen that interactivity is one of the main characteristics of the TPACK knowledge structure framework, and cannot be applied as a single element. When using the TPACK structure framework for teaching practice, it is necessary to fully utilize its interactive characteristics to achieve educational and teachingobjectives.

2.4 TPACK MeasurementMethod

From the current research results of scholars, regardless of the perspective, the research on instructor's technological pedagogical and content knowledge (TPACK) needs to verify the effectiveness and accuracy of research conclusions through empirical measurement. Scholars have conducted systematic research on the measurement methods of instructors' TPACK structure in different teaching contexts while studying the TPACK structure.

Mishra and Koehler proposed three TPACK structure measurement methods: self-reported measurement method, performance evaluation method, and interview observation method after summarizing and generalizing empirical research on instructors' TPACK structure.

2.4.1 Self Reporting MeasurementMethod

The self-reported measurement method is the most widely used measurement method among the TPACK structural measurement methods. It is simply a way for instructors or research subjects to truthfully answer questions related to the TPACK structural measurement based on their own situation (Koehler &Mishra, 2005). The specific measurement process is first to incorporate the knowledge from the TPACK structure intothe measurement questions, then to distribute the questions to the measurement subjects, and finally the measurement subjects provide truthful answers to the questions. At present, various self-reported measurement scales have been developedabroad, most of which are designed based on the TPACK structure framework. The measurement dimensions of the self-reported measurement table are basically consistent with the seven components of the TPACK knowledge structure. The advantage of this measurement method is that the measurement process is simple and can directly obtainthe TPACK structure of the instructor. The disadvantage is that selfreported measurement has certain limitations. Due to the existence of subjective factors in self-reportedmeasurement and the susceptibility of the measurement object to interference from otherfactors during the measurement process, the measurement report may not truly reflectthe

knowledge reserves of the TPACK structure of the measurement object in various dimensions. When using the self-reported measurement method to measure the TPACK structure of instructors, other measurement methods are often combined, to ensure the authenticity and validity of measurement results.

2.4.2 Performance EvaluationMethod

The performance evaluation method is also a commonly used TPACK structure measurement method, which mainly measures the TPACK structure knowledge level of the measurement object based on their completion of expected goals (Liu, 2015). Koehler and Mishra have studied and designed an encoding protocol that encodes instructors' activity record files, and further measures instructors' TPACK structure knowledge level through encoding. The specific measurement process of performance evaluation method mainly includes three steps. Firstly, select and analyze the activity records or established goals of the measurement object, and then decompose the records or goals based on the TPACK structural framework. Finally, analyze and judge the completion of the target variables by the research object, in order to evaluate the TPACK structural knowledge level of the measurement object. In the first step, the target sample is mainly composed of basic data and auxiliary data. In the second step, the TPACK structural framework is encoded systematically according to the seven dimensions of the TPACK framework. This method is mostly used in conjunction with other measurement methods, and its application alone can easily affect the authenticity of measurementresults.

2.4.3 InterviewMethod

Interview observation method refers to the process in which researchers obtain data information through interviews with research subjects, classroom observations, or watching teaching process videos, and then determine the TPACK structure knowledge level of the research subjects through research analysis. The famous application of this method to obtain data for TPACK structure knowledge leveljudgmentisProfessorNiessfromOregonStateUniversityintheUnitedStates.

She conducted research and analysis on the development of TPACK among some pre-service instructors using interview observation and electronic spreadsheets. She and her research team did not fully adopt the TPACK theoretical framework defined by Mishra and Koehler in measuring the TPACK structure knowledge level of pre- service instructors. Instead, they divided the TPACK structure into four components: leadership concept, student understanding, curriculum, and teaching strategies. In the specific measurement process, the TPACK structure was further divided into five levels to measure the TPACK structure knowledge level of pre-service instructors (Xu, 2014). Compared to the first two methods, the interview observation method is more complex in application and has higher uncertainty in its effectiveness. Therefore, in general, the interview observation method alone will not be used to measure the TPACK structure knowledge level ofinstructors.

In summary, among the three methods for measuring instructors' TPACK structural knowledge level mentioned above, the self-report measurement method and performance evaluation method are quantitative research methods in principle, while the interview observation method is qualitative research method. Generally, when studyinginstructors' TPACK structural knowledge level, not only one of these methods is used. Researchers often combine quantitative and qualitative research methods in the empirical research process (Yeh, 2021). The purpose of this study is to understand the existing knowledge level of the TPACK structure among University English instructors in Western China. Based on this, this study uses the TPACK ability assessment scale developed by Schmidt (2009) to measure the TPACK ability level of the test samples.

2.5 TAM ModelTheory

2.5.1 TAMConcept

Davis (1989) established the Technology Acceptance Model (TAM) to investigate the influencing factors of individual computer use, as shown in Figure 2.2.

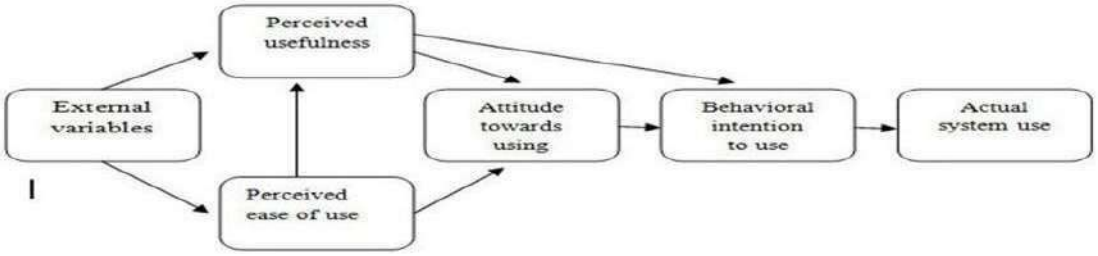

Figure 2.2 Technology Acceptance Model

Source: Davis, 1989

This model defines the factors that affect individuals' use of technology, while also systematically establishes the relationship between external variables and individuals' cognitive beliefs, attitudes, and behavioral intentions (Scherer, 2019). The TAM model focuses on two elements: perceived usefulness and perceived ease of use. The former is an individual's level of recognition that using technology can improve performance, while the latter is an individual's perceived ease of using a certain technology (Marangunić & Granić, 2015). The TAM model believes that individuals' acceptance, intention to use, and even behavior towards a certain technology are deeply influenced by perceived usefulness and perceived ease of use. Specifically, the system design feature variables are used as external variables (technical characteristics, task characteristics, individual traits, situational factors, training, etc.) as the initial influencing variables. External variables and perceived usefulness will directly affect the individual's perceived ease of use, while perceived usefulness is also influenced by external variables. The individual's attitude towards a certain technology is also influenced by both perceived usefulness and perceived ease of use, individual attitudes and perceived usefulness directly determine individual behavioral intentions, ultimately determining the use of actualsystems.

2.5.2 Application ofTAM

With the continuous advancement of research, in recent years, TAM models have been combined with other models and applied in different fields, such as the internet (Chen &Tan, 2004), education (Motaghian, 2013), consumer goods (Vahdat et

al., 2021), and electronic banking (Usman et al., 2022). A new survey has found that the informationization teaching ability of university instructors shows a development process from awareness to literacy, to ability, and then to research. With the continuous development of information technology, most university instructors have already acquired basic information technology knowledge, but their ability to design information technology still needs to be improved. Xie Bin and Deng Yingfeng found through their research on the informationization teaching ability of university instructors that informationization teaching awareness significantly affects the informationization teaching literacy of university instructors, and informationization awareness and attitude are endogenous variables in the development path of teaching ability (Xie & Deng, 2020). Therefore, individual perception guides individual behavioral outcomes. When perceptual technology is easy to use, the frequency of individual use of technology increases. When perceptual technology is useful, the level of individual acceptance of technology increases (Li,2017).

2.6 TPB ModelTheory

2.6.1 TPBConcept

Ajzen (1985) first proposed the Theory of Planned Behavior (TPB). As shown in Figure 2.3, subsequently, TPB theory was widely applied in the field of psychology by academia to predict and explain the mechanisms underlying individual behavior patterns. The core idea is that an individual's behavioral tendencies are mainly influenced by their own subjective cognition and external environmental pressure, which act on their behavior as a result. This theory constructs a TPB model using subjective norms, perceived behavioral control as independent variables, behavioral attitude, and behavioral intention as mediating variables, and actual behavior as dependent variables.

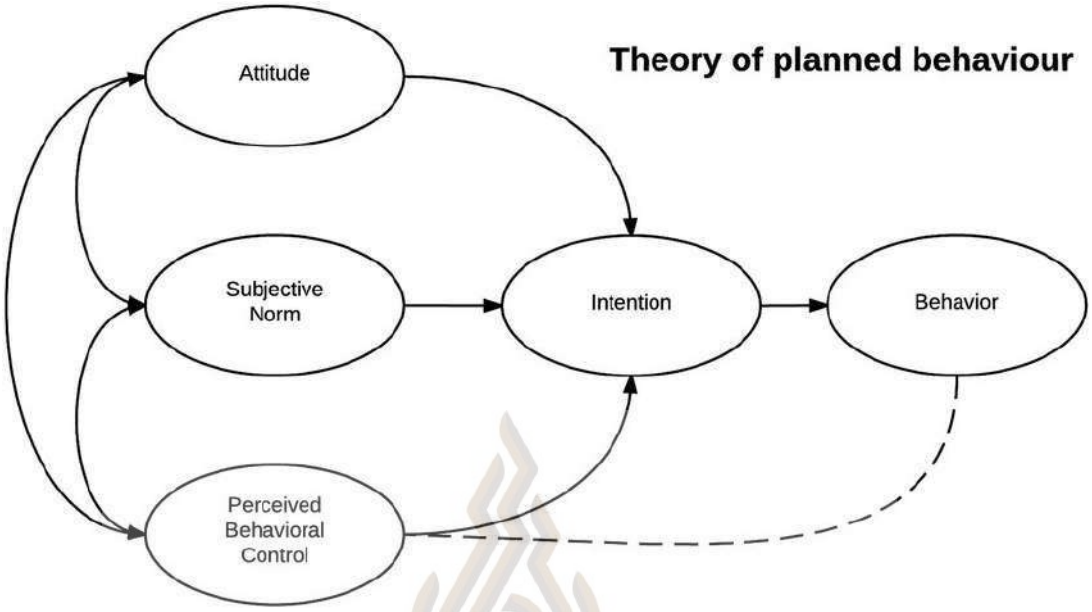

Figure 2.3 Theory of Planned Behavior

Source: Ajzen, 1985

2.6.2 Application ofTPB

In recent years, the TPB model has been widely used by researchers in different research fields, such as online education behavior (Han & Sa, 2022), transportation and travel behavior (Xue et al., 2021), and so on. Some researchers have combined the TPB theoretical framework to deeply explore the impact of informatization on individual behavior. Mouloudj, K. analyzed the intention of online teaching behavior among university instructors from the perspective of planned behavior theory. This study shows that the attitude of university instructors towards online teaching affects their intention to teach online, but the impact of subjective norms on behavioral attitudes is very weak, and perceived behavioral control has no direct impact on behavioral attitudes (Mouloudj,2021).

2.7 TAM-TPB IntegrationModel

The main theoretical basis of this study is the technology acceptance model and the planned behavior theory. These two theoretical models are highly homologous and

originate from the theory of rational behavior. They have important research value in predicting individual behavioral intentions, especially technological behavioral intentions. The willingness to participate in TPACK, as a behavioral willingness that relies on the use of technology, is highly consistent with the behavioral willingness theory model.

Research has shown that the explanatory power of the model obtained by integrating TAM and TPB can reach around 70%, which can improve the model's prediction of individual behavioral intentions to some extent. After the continuous efforts and attempts of predecessors, scholars have gradually begun to recognize the scientific rationality of the TAM-TPB model. Since 2005, domestic and foreign scholars have conducted a certain amount of research using this integrated model, and there is a trend of increasing research quantity and popularity. From the perspective of research methods, over 90% of relevant studies in recent years have been empirical. Scholars have constructed models and designed scales based on theory and previous research, and thencollected and analyzed data through survey research methods - the most commonly usedbeing questionnaire survey methods - to draw research conclusions (Dillman, 2012). This typeof research often explores the correlation between various influencingfactors throughmodelconstruction, in orderto providetheoretical supportfor practical applications. Unlike empirical research methods, research at the theoretical level can be roughly divided into two types. The first type can be understood as the theoretical part before empirical research. Some scholars have constructed influencing variables ormodels based on previous practical research results and disciplinary theories. For example, Dwivedi (2019) and social capital theory to construct five influencing variables when studying the social impact mechanism of libraries. Wu, Kang, Xie, Jia, and Sun (2023) has constructed a research model based on theory, attempting to explain the behavioral willingness of vocational college students to learn online. This has laid a theoretical foundation for subsequent empirical research. The second type of theoretical research focuses on early years, and scholars have summarized and compared various behavioral intention explanation models at the theoretical level. Wu et al. (2023), Taylor and Todd (1995) summarized and compared previous studies and results using integrated models, sorted out the relationship between the explanatory power of integrated models and latent variables, and proposed the TRA-TAM-TPB integrated model. From the perspectiveof

research fields and objects, the application scope of the TAM-TPB integrated model is gradually expanding. The early research objects of this integrated model mostly focusedon various consumer groups in various fields, exploring the driving factors behind consumer willingness and consumption behavior. The research scope includes willingness to use e- government services (mainly online taxation), willingness to use online banking, and willingness to shop online. In the discussion of tax behavior, Chao used Taiwan's personal income tax declaration as an example, combined with TAM and TPB theories,and based on empirical data collected from large-scale surveys across the province, explored the factors that affect taxpayers' willingness to use specific tax declaration methods (manual, QR code, or internet). At the same time, he discussed the demographic characteristics and perspectives of taxpayers to determine their potential determining factors. Delafrooz, Paim, and Khatibi (2011) conducted a study on consumers' attitudes and willingness to shop online, using students from a public university in Malaysia as the research subjects. The application of the TAM-TPB integrated model in the field of education and teaching can be traced back to 2010, while research on this type in China can be traced backto 2014,but the overallnumber of studies is relatively limited (Granić &Marangunić, 2019).

From this, it can be seen that the TAM-TPB model still has significant researchspace in the field of education, whether from the perspective of research topic and research object, or from the perspective of research volume. Previous research has confirmed that it is suitable for explaining learners' learning behavior, especially online learning behavior, and the explanatory power is higher than using other behavioral intention models alone (Imtiaz &Maarop, 2014). However, due to the limited number of existing studies, the degree of interpretation of this model and whether it has good explanatory power for all research subjects and themes remains to be explored (Collins &Stockton, 2018). Therefore, this article attempts to use the TAM-TPB integration model to predictthe willingness of university Englishinstructors to use TPACK, testthe explanatory power and impact of the integration model in English teaching contexts, thereby improving the efficiency and effectiveness of college English instructor education, maximizing the value of TPACK, and achieving instructor professionaldevelopment.

2.8 RelatedResearch

2.8.1 TPACK

In the era of information technology, researchers need to reconstruct the framework of instructor's professional knowledge precisely because technology, as a very important element, is increasingly involved in instructors' daily teaching. Technological knowledgehas becomea necessaryknowledge for instructors. Therefore, the interpretation of technological knowledge will directly affect the understanding and understanding of the subject teaching knowledge of integrated technology, and will also indirectly affect the teaching practice of instructor education (Boonmoh, 2022). This study suggests that the definition of technological knowledge can be divided into two levels: primary and advanced. However, both primary and advanced technological knowledge are based on a broad range of technologies including traditional and digitaltechnologies. Elementary technological knowledge is knowledge about the specific usage and functional applicability of technology, while advanced technological knowledge is knowledge about the ways of thinking and using technology, more specifically referring to a concept (Haleem, 2022). The mastery of technological knowledge is not static, but a dynamic process of development, based on changes in teaching objectives, teaching objects, and teaching environment, and at the appropriate time, choosing an appropriate waytointegratetechnologyintoteachingisawayofthinking(Darling-Hammond,2020).

At the beginning of its establishment, the TPACK did not include the contextual factors. However, with the gradual deepening of research, researchers have increasingly realizedthatthe technological pedagogical and contentknowledgeis a "poorly structured"new knowledge that involves multiple conditions, factors, and interactions (Baytelman &Constantinou, 2020).Instructors' masteryand application of such knowledge often require synergy with many peripheral factors such as society, culture, and psychology. Therefore, contextual factors are essential for integrating the disciplinary teaching knowledge framework with technology. Without consideration of contextual factors, technological pedagogical and content knowledge will become a "castle in the air"andcannotbeappliedtospecificteachingpractices,whichmeansithasnopractical

guiding significance for specific teaching practices. The application of any type of knowledge in the technological pedagogical and content knowledge in specific teaching activities, without considering peripheral factors such as the physical characteristics of the classroom, the demographic and psychological characteristics of learners, will become of no practical value (Kokhan, 2021).

2.8.2 TAM andTPB

With the continuous development of research, researchers have combined TAM and TPB theories toexplore thewillingness ofinstructorsto transfertheir informationbasedteachingabilitiesby usingbehavioralattitudesas independent variables. A study found that perceived usefulness and self-efficacy can significantly promote instructors' willingness to participate in training (Li, Wang, & Guo, 2020). However, some researchers have proposed different perspectives. Zaremohzzabieh (2022) analyzed the adoptionbehaviorofMOOCusersusingmeta-analysismethods.Thestudyfoundthatthe attitude of MOOC users determines their adoption behavior towardsMOOC, andperceived usefulness affects users' motivation to use MOOC. However, the impact of perceivedeaseofuseonadoptionbehaviorisnotsignificant.Therefore,theacceptanceof information technology teaching by university instructorsis mainly determinedby individual perceptions and attitudes (She,2022).

With the continuous development of research, researchers have combined TAM and TPB theories to explore the willingness of instructors to transfer their information-based teaching abilities by using behavioral attitudes as independent variables. A study found that perceived usefulness and self-efficacy can significantly promote instructors' willingness to participate in training (Li et al., 2020). However, some researchers have proposed different perspectives. Zaremohzzabieh (2022) analyzed the adoption behavior of MOOC users using meta-analysis methods. The study found that the attitude of MOOC users determines their adoption behavior towards MOOC, and perceivedusefulness affects users' motivation to use MOOC. However, the impact of perceived ease ofuseonadoptionbehaviorisnotsignificant.Therefore,theacceptanceofinformation

technology teaching by university instructors is mainly determined by individual perceptions and attitudes (She, 2022).

Wei and Fan (2021) conducted an empirical analysis on the influencing factors of instructors' willingness to participate in school governance under the TPB framework. The study showed that subjective norms can significantly affect instructors' willingness to participate in school governance behavior, and behavioral attitudes and awareness are key influencing factors of perceived control behavior (Wei &Fan, 2021). Zheng et al.studied 13,997 university instructors and found that traditional teaching inertia hinders instructors from implementing online teaching. External environmental factors promote the acceptance of online education in universities, with over three-quarters of university instructors willing to adopt an "online+offline"blended teaching approach (Zheng, 2020).Therefore, this study suggests that instructors' subjective judgment of informatization and their perception of the strength of organizational implementation directly affect their behavioralwillingness.

Wang et al. (2023) integrated TAM, TPB, and mobile banking acceptance models to explore consumers' intention to use mobile device based online services. Many studies still use the TAM-TPB model to study consumer behavior, such as Tan Zheng's construction of a behavioral willingness model for consumers to purchase internet insurance, which has been empirically tested. In addition to the main application fieldsmentioned above, in recent years, the influence of the TAM-TPB model has also beenincreasingly seen in the field of education, with high explanatory power. According, the integrated model of TAM and TPB is recently mainly used in the research to predict the teaching and learning behavior of instructors and students, such as predicting learners' willingness to accept blended learning, learners' willingness to accept mobile learning, learners' learningbehaviorin MOOCpractical courses, learners' MOOClearning performance, instructors' information-based teaching behavior, etc. (Xie, 2021).

CHAPTER 3

RESEARCH METHODOLOGY

3.1 ResearchPlan

This study used Explanatory Sequential Design (Cresswell, 2015). First quantitative and then followed by qualitative methods.

Through literature review, a systematic review is conducted on the connotation, function, structural characteristics, and measurement methods of TPACK. Through the research summary of TAM theory and TPB theory, the reason for this dissertation to study the factors affecting the TPACK using behaviors of the university English instructors in Western China based on the TAM-TPB integrated model. In order to gain a deeper understanding of the TPACK using behaviors of university English instructors in Western China and confirm the relationship model of factors influencing the using behaviors as to enhance their TPACK abilities in teaching English, especially, College English Course.

Firstly, based on the research, this study The TAM questionnaire will be used to measure the ease of TPACK teaching of the test samples, the usefulness of assisting in improving teaching effectiveness, and the positive or negative attitude towards conducting TPACK teaching. The TPB questionnaire mainly measures the pressure felt by participants from the outside world to conduct TPACK teaching, the difficulty level of conducting TPACK teaching based on their own experience, the tendency to prepare for TPACK teaching, and the behavior of conducting TPACK teaching in actualwork.

Secondly, the preliminary draft of the questionnaire will be sent to 5 of the IOC experts to test the content validity of the questionnaire The sampling from colleges and universities in Western China will be randomly selected as the survey subjects. Project analysis and exploratory factor analysis will be conducted on the obtained measurement data to eliminate questions with poor discrimination and substandard validity classification, thus forming the questionnaire with good reliability and validity.

Thirdly, the formal questionnaire is distributed to the sample population, and research data will be collected according to the necessary sample size. For the collected sample data, and pretest with 30 subjects out of the sampling group will be performed with Cronbach Alpha Coefficient reliability analysis and confirmatory factor analysis to test the reliability and validity of thequestionnaires.

Fourthly, in the analysis section of the questionnaire data, descriptive analysis with frequency, percentages, mean and standard deviation will be used to analyze the demographic variable characteristics of the test samples, to analyze the TPACK proficiency level of university English instructors in Western China and independent sample T-testand one-way ANOVA to analyze whether there are differences in TPACK abilities among instructors in the Western region based on different demographic characteristics (Jang &Tsai, 2012). Finally, a structural equation model is used to analyze the factors that affect the TPACK ability of university English instructors in WesternChina.

At last, based on the results of qualitative data analysis, the model developed in this study will be confirmed to enhance the TPACK ability of university English instructors in Western China from the perspective of TAM-TPB theory. The overall research plan is shown in Figure 3.1.

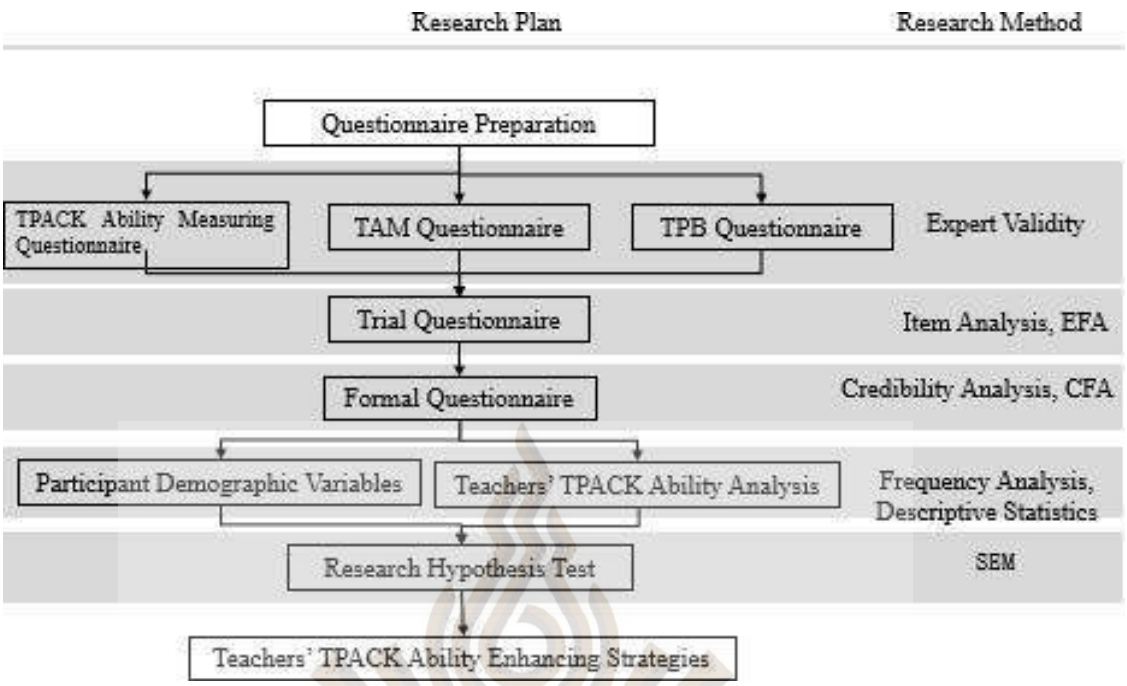

Figure 3.1 The Research Plan

Source: Jang & Tsai, 2012

3.2 ConceptualFramework

This study utilizes the TAM-TPB integrated model to explore the factors affecting the TPACK use behavior of university English instructors in Western China. The research model is shown in Figure3.2.

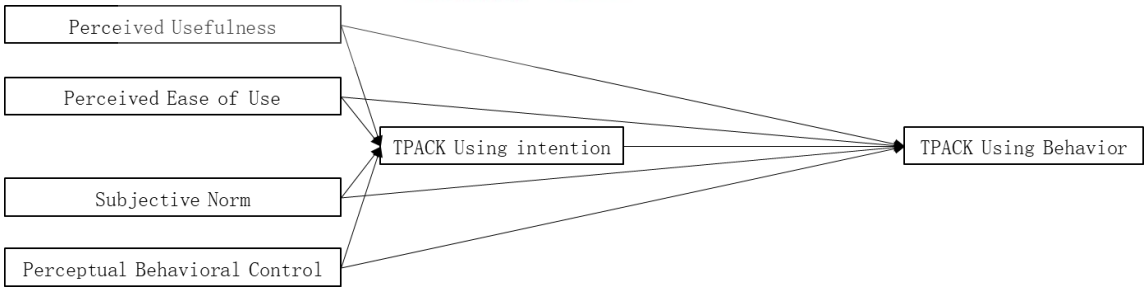

Figure 3.2 The Research Model

3.2.1 Perceived Usefulness, Perceived Ease of Use and Instructors' Intention to UseTPACK

Perceived usefulness refers to the degree to which instructors feel that IT teaching can improve their teaching level. Perceived ease of use refers to how easy it is for instructors to use information technology to teach daily courses. TPACK usage intention refers to the measurable degree of instructors' willingness to use information technology for daily curriculum teaching. The research shows that instructors' perceived usefulness of information technology in improving their teaching level can not only affect instructors' initial adoption of information technology, but also affect their satisfaction and intention to continue using it. In addition, in today's world of user experience, if instructors feel that a certain information technology is easy to use, then their willingness to continue to use is likely to increase. At the same time, empirical research shows that instructors' perceived ease of use and perceived usefulness have a positive impact on their IT usage intention in the context of network and mobile learning.

Based on this, the study puts forward the following hypothesis:

H1: Perceived usefulness has a positive impact on instructors' TPACK using intention.

H2: Perceived ease of use has a positive impact on instructors' TPACK using intention.

3.2.2 Subjective Norms, Perceived Behavioral Control and Instructors' TPACK UsingIntention

Subjective norms refer to the extent to which the words or actions of others influence instructors' use of information technology to teach. Orapin (2009) found that subjective norms can affect individuals' purchase intention for a certain product and thus affect their use behavior. In daily teaching activities, the stronger the degree of subjective norms of instructors, the more easily their behavior in teaching activities is affected by the surrounding environment, so as to produce behavioral intention

consistent with the expectations of others. Shen (2019) pointed out that different from subjective norms, under certain conditions, perceptual behavioral control can directly affect the factors influencing instructors' TPACK ability under the TAM-TPB integrated model in FIG. 5. Ajzen believes that perceptual behavioral control affects people's production of certain behavioral intentions, and Stancu et al. (2016) and Liao et al. (2020) have also confirmed this view in their studies. In this study, perceived behavioral control refers to instructors' judgment on a series of promoting or hindering factors such as their ability and condition to use information technology during teaching. When instructors have enough ability and resources and can better control their own behavior, their enthusiasm to use information technology in daily teaching will be greatly improved. Based on this, the following hypothesis is proposed:

H3: Subjective norms have a positive impact on instructors' intention to use TPACK.

H4: Perceived behavioral control has a positive impact on instructors' TPACK using intention.

323 The Mediating Effect of TPACK UsageIntention

In the current academic research, the test of the mediating effect of a variable has aroused extensive attention of scholars. The so-called intermediary effect is the actual path to study the mutual influence of different variables, which helps to strengthen people's understanding of the actual influence mechanism of something and enhance the credibility of research conclusions. Lu et al. (2021) confirmed in their study that product usage intention plays a positive mediating role in the influence of other variables on usage behavior. Information technology teaching is a conscious and planned behavior. The more active its perceptual behavior control and subjective norms are in the process of information technology teaching, the stronger its perception of usefulness, sensuality and ease of use is, the stronger its subjective intentiontouseinformationtechnologyteachingis,theeasieritistostimulateitsuse

behavior. Based on this, this paper proposes the following hypotheses: The influence of instructors' TPACK usage intention on their usagebehavior;

H5: Instructors' TPACK using intention has a mediating effect between perceived usefulness and TPACK using behavior.

H6: Instructors' TPACK using intention has a mediating effect between perceived ease of use and TPACK using behavior.

H7: Instructors' TPACK using intention has a mediating effect between subjective norms and TPACK using behavior.

H8: Instructors' TPACK using intention has mediating effect between perceived behavior control and TPACK using behavior

3.3 QuantitativePhrase

Prior to distributing questionnaires to samples at the target universities, five experts will be invited to assess the index of Item-Objective Congruence (IOC) to ensure the questionnaire's validity. The scales for verifying questionnaire items are as follows: Scoring +1 = Certain that the test is congruent with the objectives or content. Scoring 0 = Uncertain that the test is congruent with the objectives or content. Scoring -1 = Certain that the test is NOT congruent with the objectives or content.

3.3.1 Population

There are around 40,000 English instructors from a total of 302 colleges and universities and in 12 regions of Western China.

3.3.2 SampleSize

To accurately understand the current situation of TPACK abilities of university English instructors in Western China, the study first selects a total of 30 colleges and universities as sampling based on the proportion of universities in 12 regions. The specific sampled universities are shown in Table 1. Finally, a proportional sampling is conducted based on the proportion of English instructors from the sampled universities, in order to obtain the necessary sample size for thisstudy.

By applying this combined stratified and systematic sampling method, the research achieved a representative and well-distributed sample at each targeted University. The combination of stratified and systematic sampling techniques enhances the reliability and generalizability of the research findings, guaranteeing that each subgroup of the population is adequately represented (Mweshi et al. 2020). As shown in Table 3.1.

Table 3.1 Sampling Universities

Regions	TOT of Universities	Sample of Universities	Sampled Universities
Shanxi	55	5	Xi'an Jiao Tong University, Chang'an University, Xi'an University of Technology, Shaanxi University of Science and Technology, Northwest University
Sichuan	53	5	University of Electronic Science and Technology, Southwest Jiaotong University, Sichuan Agricultural University, Chengdu University of Technology, Southwest Petroleum University

Table 3.1 Sampling Universities (Cont.)

Regions	TOT of Universities	Sample of Universities	Sampled Universities
Guangxi	38	3	Nanning Normal University, Guilin University of Technology, Yulin Normal College
Yunnan	32	3	Yunnan Normal University, Southwest Forestry University, Yunnan Minzu University
Guizhou	29	3	Tongren University, Guizhou Minzu University, Guizhou Institute of Technology
Chongqing	26	2	Chongqing University, Chongqing University of Technology
Gansu	22	2	Lanzhou University, Lanzhou Jiao Tong University
Xinjiang	19	2	Kashgar University, Xinjiang University
Inner Mongolia	17	2	Inner Mongolia University of Finance and Economics, Inner Mongolia Minzu University
Ningxia	9	1	Ningxia Normal University
Qinghai	1	1	Qinghai University
Xizang	1	1	Xizang University
Total	302	30	-

According to the suggestion of Calulator.net (2024), the study adopts a nonrepeated sampling method, and the formula for calculating the sample size is as follows:

$$n = \frac{Nt^2p(1-p)}{N\Delta_p^2 + t^2p(1-p)} \quad (3\text{-}1)$$

Among them, N represents the total sample size, and in this study, N=40,000; T is the t-value corresponding to the probability of sampling error. This study is with a probability of 95%, so here t=1.96 in this study; Δp is the sampling limit error, in this study, Δp taken as 0.05; P is the sampling percentage. In order to increase the sample size a bit and ensure that the error does not exceed the predetermined range, p is taken as 0.5 in this study.

By substituting the above values into the formula, the necessary sample size for this study is 380 subjects.

$$\frac{40000 * 1.96^2 * 0.5(1-0.5)}{40000 * 0.05^2 + 1.96^2 * 0.5(1-.05)} \approx 380 \quad (3\text{-}2)$$

Table 3.2 Sampling Instructors

Number	SampledUniversities	Number of English Instructors	Sample Size
1	Xi'an JiaotongUniversity	141	22
2	Chang'anUniversity	147	23
3	Xi'an University ofTechnology	82	13
4	Shaanxi University of Science andTechnology	93	14
5	NorthwestUniversity	70	11
6	University of Electronic Science andTechnology	112	17
7	Southwest JiaotongUniversity	129	20

Table 3.2 Sampling Instructors (Cont.)

Number	SampledUniversities	Number of English Instructors	Sample Size
8	Sichuan Agricultural University	91	14
9	Chengdu University of Technology	83	13
10	Southwest Petroleum University	115	18
11	Nanning Normal University	71	11
12	Guilin University of Technology	97	15
13	Yulin Normal University	94	15
14	Yunnan Normal University	41	6
15	Southwest Forestry University	51	8
16	Yunnan Minzu University	70	11
17	Tongren College	40	6
18	Guizhou Minzu University	79	12
19	Guizhou Institute of Technology	39	6
20	Chongqing University	163	25
21	Chongqing University of Technology	80	12
22	Lanzhou University	64	10
23	Lanzhou Jiaotong University	80	12
24	Kashgar University	23	4
25	Xinjiang University	85	13
26	Inner Mongolia University of Finance and Economics	78	12
27	Inner Mongolia Minzu University	56	9
28	Ningxia Normal University	73	11
29	Qinghai University	42	7
30	Tibet University	58	10
TOTAL		2447	380

333 QuantitativeResearch

3.3.3.1 Quantitative QuestionnaireDesign

According to research needs, the questionnaire is divided into four parts. Among them, the first part is the basic information of the samples, the second part is the instructors' TPACK ability level measurement questionnaire, the third part is the TAM questionnaire, and the fourth part is the TPBquestionnaire.

The first part mainly includes basic information about samples such as gender, age, educational background, professional title, and working years.

The second part of the instructors' TPACK ability level measurement questionnaire makes use of the TPACK ability evaluation scale developed by Schmidt (2009), which includes seven dimensions: technological knowledge (1-7), content knowledge (8-19), pedagogical knowledge (20-26), pedagogical content knowledge (27-30), technological pedagogical knowledge (31-34), technological content knowledge (35-39), and technological pedagogical and content knowledge (40-47).

The TAM model questionnaire in the third part is adapted from the TAM scale questionnaire developed by Davis. The scale includes two dimensions: perceived usefulness (48-50), perceived ease of use (51-53).

The TPB model questionnaire in the fourth part is adapted based on the TPB scale questionnaire developed by Ajzen. The scale consists of four parts: subjective norms (54-57), perceived behavior control (58-61), behavioral intention (62-66), and usage behavior (67-70).

The scale parts (parts 2, 3, and 4) in the above questionnaire are all measured using the Likert five-point scale, with scales ranging from "1-5"

In the data analysis section, the research will use analysis methods such as frequency analysis, descriptive statistics, and structural equation modeling.

Among them, frequency analysis is mainly used to calculate the proportion of demographic variables among subjects.

Descriptive statistics makes use of frequency, percentages, mean, standard deviation, to assist in analyzing the current TPACK ability of university English instructors in Western China. According to Best and Kahn's (2006) research, instructors' self-evaluation on TPACK and its various dimensions made use of the following standards.

The Likert scale is the extremely widely utilized scale in quantitative measurement research (Lodico, 2006; Salkind, 2017). Likert scales were scored by giving a weight to every point along the scale, and the respondent's score was the evenness through all the items. It should be noted that 5 illustrates the strongly agree for the favorable items, and it was contrary for the unfavorable items which 5 represents the strongly disagree (Salkind, 2017).

In this study, each of the participants should score a certain number which demonstrates the explicit attitude.

The degree of agreement is represented as follows:

1 = Strongly disagree

2 = Disagree

3 = Neither agree nor disagree

4 = Agree

5 = Strongly agree

Level of agreement and attitude were analyzed and determined by the study of Taherdoost(2019).

The Level of Attitudes were:

The Mean scores of 4.5-5.00 = Strongly Positive Attitude (SPA)

The Mean scores of 3.50-4.49 = Positive Attitude (PA)

The Mean scores of 2.5-3.49 = Moderately Positive Attitude (MPA)
The Mean scores of 1.50-2.49 = Negative Attitude (NA)
The Mean scores of 1.00-1.49 = Strongly Negative Attitude (SNA)

The Level of Agreement:
The Mean scores of 4.5-5.00 = Strongly Agree
The Mean scores of 3.50-4.49 = Agree
The Mean scores of 2.5-3.49 = Neutrally Agree
The Mean scores of 1.50-2.49 = Disagree
The Mean scores of 1.00-1.49 = Strongly Disagree

Back translation will be done (Son, 2018; Ozolins et al., 2020). First, the English version of the questionnaire will be translated into Chinese and then will be translated back into English in order to check by Professors in English major from the College of Foreign Languages and Cultures of Western University in order to ensure the accuracy of the translation. After careful verification and revision, the translation accuracy of the Chinese version questionnaire in this study has matched the criteria of the backtranslation.

3.3.2.2 Data Analysis

After completing the design of the quantitative questionnaire and successfully collecting the required data, the next crucial stage is data analysis. This stage aims to delve deeper into the information behind the data to validate research hypotheses and reveal the relationships between variables. Specifically, SPSS26 software will be used to perform frequency analysis on demographic variables and other basic information of the sample, in order to depict the basic characteristics of the research subjects. Subsequently, with the powerful functionality of SPSS26, in-depth analysis was conducted on the measurement data of instructors' TPACK ability, calculating descriptive statistics such as mean and standard deviation, in order to comprehensively grasp the current situation and distribution characteristics of instructors' TPACK ability. Finally, in order to test the 8 core hypotheses proposed in

this study, we will switch to using AMOS26 software to construct and validate structural equation models, in order to explore the potential relationships between variables through rigorous statistical analysis and provide strong empirical support for the research results.

In order to comprehensively and deeply analyze the data and uncover the information and patterns contained therein, the following will provide a detailed introduction to some key analysis indicators that will be used in the quantitative analysis section. These indicators not only help us to more accurately describe and explain data characteristics, but also provide a solid foundation for subsequent hypothesis testing, thereby ensuring the scientific and effective nature of the research.

3.3.3 Validity and Reliability of Quantitative Research

Content validity and internal consistency reliability affect the credibility of the research results. The assessment of content validity Indexes of Item-Objective Congruence (IOC) is recommended According to Turner and Carlson (2003), the rating scales consisting of +1, 0, and -1. 0 = lack of certainty about the item's ability to appropriatelyassessitsintendedmeasure,1=thisitemmeasuredtheattribute,and–1 = this item does not measure. In this study, thus, with the five experts in the related fields invited to do the IOC of the items in the instrument and the result of the content validity score gained was 1.

In terms of the reliability, the internal consistency reliability coefficient (Cronbach's α) is used to evaluate the consistency among items in the questionnaire or test. According to DeVellis (1991), a Cronbach's α between 0.65 and 0.7 is the minimum acceptable value, between 0.7 and 0.8 is considered quite good, and between 0.8 and 0.9 is considered very good. The study randomly selected 30 college English instructors from universities in western China to participate in the pretest of the questionnaire used in this study, and used SPSS 26 software to analyze the reliability of the pretest sample data and the Cronbach Alpha Coefficient was9.77.

1) Exploratory Factor Analysis(EFA)

Exploratory factor analysis (EFA) can explore the latent structure from a large number of questionnaire items, verifying whether the questionnaire design aligns with theoretical expectations and ensuring that the questionnaire structure is reasonable and can accurately measure the target concepts. The specific steps of Exploratory Factor Analysis (EFA)include:

First, methods such as the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett's Test of Sphericity are used to test the sample adequacy of the questionnaire, ensuring that the questionnaire data is suitable for factor analysis. Then, factor analysis software is used to process the questionnaire data and estimate the loadings of each item on various factors. Finally, the varimax rotation method is used to rotate the factor matrix to accurately reflect the distribution of items under each factor.

The indicators involved in exploratory factor analysis mainly include KMO value, Bartlett's Test of Sphericity, eigenvalue, variance explanation rate, cumulative variance explanation rate, factors, factor loading coefficients, etc. Among them, the KMO value and Bartlett's Test of Sphericity can be used to judge whether it is suitable to conduct exploratory factor analysis. The KMO value is generally judged by being greater than 0.6 (Kaiser, 1974). If the KMO value is greater than 0.6, it indicates that the corresponding items can be subjected to exploratory factor analysis. The criterion for Bartlett's Test of Sphericity is that the corresponding P-value is less than 0.05. If it is less than 0.05, it indicates that the corresponding items can be subjected to exploratory factor analysis.

2) Confirmatory Factor Analysis(CFA)

Confirmatory Factor Analysis (CFA) is an important application of Structural Equation Modeling (SEM) aimed at evaluating and validating the relationships between latent variables and measurement errors proposed by researchers. Through in-depth analysis of the intrinsic relationship between observed variablesand

latent variables, CFA helps researchers gain a deeper understanding of phenomena, events, concepts, or constructs, and further validate their theoretical hypotheses.

Thus, when doing the CFA, Hair et al. (2010) stated that the acceptable index values for: (1) Chi-square = less than or equal to 3.00; (2) Goodness of Fit Index (GFI) = from 0 to 1.00, with a value of 0.90 or higher considered excellent; (3) Adjusted Goodness of Fit Index (AGFI) = from 0 (indicating a poor fit) to 1 (indicating a perfect fit), with values of 0.90 or higher considered satisfactory; (4) Root Mean Square Error of Approximation (RMSEA) from 0 to 1.00, with lower values indicating better model fit. A threshold of 0.06 or lower suggests an acceptable fitlevel, while an RMSEA value below 0.05 indicates an ideal fit; (5) Incremental Fit Indices (IFIs) = above 0.9, though the index can exceed; (6) Comparative Fit Index (CFI) = ranging from 0 to 1, where higher values indicate a better fit, with a value of 0.90 or abovehasbeenconsideredindicativeofagoodmodelfit;(7)NormedFitIndex(NFI) = the value of 0.95 or higher suggests that the model fits the data well, with acceptable values typically falling between 0 and 1 However, for academic research, ideally, above 0.90.

When conducting CFA analysis, the following steps are usually followed: first, by comparing the fitting degree between observed data and theoretical models, the applicability and effectiveness of the model can be evaluated. In this process, a series of fitting indicators will be used for measurement, including Chi Square, Degrees of Freedom (df), Comparative Fit Index (CFI), Generalized Fit Index (GFI), Adjusted Generalized Fit Index (AGFI), Normalized Fit Index (NFI), Relative Fit Index (TLI), Standardized Root Mean Square Residual (SRMR), and Root Mean Square Error Approximation (RMSEA).

After the model fitting reaches a satisfactory level, a detailed evaluation of convergence validity and discriminant validity is required. Convergence validity emphasizes that measurement items under the same factor should accurately reflect the core characteristics of that factor. To evaluate convergence validity, the average variance extraction (AVE)and combination reliability (CR) are commonly

used as measurement standards. Generally speaking, when the AVE value is greater than 0.5 and the CR value is greater than 0.7, the model can be considered to have good convergencevalidity.

Discriminant validity focuses on whether measurement items under different factors are clearly distinguished. A common method for evaluating discriminant validity is to compare the AVE root value of a factor with its correlation coefficient with other factors. If the AVE root values of all factors are greater than their correlation coefficients with other factors, it indicates that the model has good discriminant validity.

It is particularly emphasized that only when the results of confirmatory factor analysis perform well, can we further advance to the analysis stage of structural equation modeling.

Table 3.3 Model Fit Adaptation Index Reporting Standards

Indicator	Reference Value	Origin
X^2/DF	≤3	Carmines and McIver (1981)
RMSEA	< 0.08	Browne and Cudeck (1993)
SRMR	< 0.08	Hu and Bentler (1999)
GFI	≥0.9	Tanaka and Huba (1985)
AGFI	≥0.9	Byrne (2016)
NFI	≥0.9	Bentler & Bonett (1980)
TLI	≥0.9	Bentler and Bonett (1980)
CFI	≥0.9	McDonald and Marsh (1990)

3) Structural Equation Modeling(SEM)

Structural Equation Modeling (SEM), as an advanced multivariate statistical analysis method, has gradually become an indispensable tool in the field of social science research since its proposal by Joreskog et al. in the 1970s. The core advantage of this model lies in its ability to simultaneously handle and analyze complex relationships between multiple independent and dependent variables,

including direct effects, indirect effects, and common factor effects, providing researchers with a comprehensive and in-depth perspective to explore the interaction mechanisms between variables. Based on these unique advantages, SEM has gradually been widely applied in multiple disciplines such as psychology, sociology, and management, becoming an important means for researchers to verify theoretical hypotheses and reveal complex relationships between variables.

In this study,we carefully designed a structural equation path diagram (Figure 3.2) based on theoretical models, which clearly depicts the expected relationships between variables. To verify whether these relationships are supported in actual data, we used professional statistical software AMOS for model fitting and hypothesis testing.

This rigorous analysis process aims to ensure that our research accurately reveals the intrinsic connections between variables and provides strong empirical support for the effectiveness of theoretical models.

3.4 QualitativePhrase

After completing the exploration of quantitative analysis and testing hypotheses through structural equation modeling. Quantitative analysis provides the objective evidence of the relationships between variables, but to fully understand the complexity of social phenomena or groups, it is necessary to delve into their underlying logic and significance with the qualitative analysis that helps uncover the underlying meanings behind the subjective experiences, emotional responses, and social interactions of our research subjects.

3.4.1 Interview QuestionDesign

The main purpose of this study is to gain a deeper understanding of the currentsituationandchallengesfacedbyEnglishinstructorsinwesternChinese

universities in terms of TPACK ability, and to propose corresponding improvement suggestions.

According to the general structure of the interview questionnaire, this interview questionnaire is carefully designed and includes an introduction, basic information section, and main question section. The introduction briefly explains the background, purpose, and importance of the research, and explicitly promises the anonymity of participants and the principle of data confidentiality to ensure the smooth progress of the research and the authenticity and reliability of the data.

The basic information section focuses on collecting participants' basic information, including gender, age, educational background, work experience, and job level, in order to provide a solid foundation for subsequent data analysis.

For the research purpose, a series of carefully designed questions were included in the main question section of the questionnaire, which comprehensively covers instructors' evaluation of the role of technology in teaching, their perception of the difficulty of learning new technologies, the attitudes of the surrounding population towards their use of technology, factors affecting technology use decisions, self assessment of TPACK ability levels, external factors that restrict the use of technology, motivation to increase willingness to use technology, and factors that promote or hinder the practical application oftechnology.

After the initial draft of the interview questionnaire is completed, it is first submitted to the supervising instructor for internal review to ensure that the logic, clarity, and sensitivity of the questions meet the requirements. Subsequently, we invited some target groups for pre testing, collected their feedback, and made detailed revisions and improvements to the questionnaire based on these feedbacks. In the end, we developed a revised final questionnaire and determined an appropriate distribution method to ensure the smooth progress of the research and extensive datacollection.

3.4.2 TheInterviewees

The interviewees for this interview are 10 carefully selected managers from English departments of 10 universities in western China. These managers are responsible for English teaching and management in their daily work, and have a deep understanding and firsthand experience of the English teaching situation and technology application in their respective universities. As interviewees, they can provide us with valuable first-hand information and insights, which will help us gain a deeper understanding of the current situation, challenges, and improvement suggestions of English instructors in western Chinese universities in terms of TPACK ability. In order to protect the privacy and information security of the interviewees, we will strictly protect the identity of the management personnel who participate in the interviews, ensuring that their personal information is notleaked.

3.4.3 FocusGroup

Focus group with a semi-structured interviews will be used to confirm the relationship of factors influencing university English instructors' TPACK in the universities in Western China which crafted to align with the research objectives and questions for gathering in-depth insights from participants.

3.4.4 ContentAnalysis

In the qualitative portion of the study, the content analysis with a thematic analysis (Peel, 2020) will be employed to confirm, complement and elucidate the findings of the quantitative phase. The structured coding techniques of thematic analysis will be used to see the consistent patterns of the themes. The study will utilize the Nvivo12 program to conduct a detailed thematic analysis of data from semi-structured interviews to form a holistic picture about TPACK of teaching English for university instructors in Western China which rigorously corroborated, aligned seamlessly with and validated the quantitative findings. This alignment will demonstrate the capacity of the analysis to offer cohesive and comprehensive insights,

ensuring that the qualitative exploration effectively confirmed supported and clarified the initial quantitative results (Creswell,2015).

To prevent social bias and maintain the integrity of the study, it will be crucial not to directly solicit stakeholders' opinions during interviews, as it can potentially lead to biased responses. Instead, the research strategy will focus on implementing informed consent procedures outlined in the interview protocol, being attentive to participants' needs, and ensuring data collection in a confidential manner. These measures will be employed to mitigate response bias and unintended influence on research findings (Robinson & Leonard,2019).

CHAPTER 4

DATA ANALYSIS

As a key part, this chapter will systematically present how research data is transformed into meaningful conclusions. First, we will focus on the analysis of the results of the questionnaire pretest. This process not only verifies the rationality and effectiveness of the questionnaire design but also makes necessary adjustments and optimizations to the questionnaire based on the feedback from respondents, ensuring the scientificity and reliability of the subsequent formal survey. Immediately following this, we will shift our attention to the thorough analysis of the data collected after the formal questionnaire is distributed. By employing various statistical methods, we aim to uncover the stories behind the data and reveal the relationships between the research variables, laying a solid foundation for the theoretical contributions and practical implications of this study. Next, we will unfold the analysis of these two aspects one by one, with the expectation of comprehensively and deeply revealing the findings of thisresearch.

4.1 QuestionnairePretest

4.1.1 Reliability Test of the TPACK AbilityScale

The reliability test results of the TPACK ability scale indicate that under the eight dimensions of TECHK, CK, TK, PK, PCK, TCK, TPK, and TPACK, the "Corrected Item-Total Correlation (CITC)" of each item is greater than 0.4, and the "Cronbach's α value after item deletion" is smaller than the overall reliability of that dimension. This meets the inspection criteria proposed by DeVellis (1991). Therefore, the TPACK ability scale demonstrates good reliability in this pretest. As shown in Table 4.1.

Table 4.1 Item-Total Statistics

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
TECHK1	21.43	57.43	0.91	0.97
TECHK2	21.27	56.69	0.91	0.97
TECHK3	21.33	57.40	0.91	0.97
TECHK4	21.43	55.56	0.91	0.97
TECHK5	21.27	58.20	0.89	0.97
TECHK6	21.20	56.86	0.93	0.97
TECHK7	21.27	55.86	0.94	0.97
TECHK			0.98	
CK1	13.07	26.00	0.93	0.96
CK2	12.90	27.27	0.90	0.96
CK3	13.13	25.15	0.93	0.96
CK4	13.00	25.93	0.90	0.96
CK5	12.97	26.45	0.89	0.96
CK			0.97	
TK1	16.07	45.93	0.93	0.97
TK2	16.17	46.28	0.94	0.97
TK3	16.03	45.00	0.93	0.97
TK4	16.10	45.68	0.93	0.97
TK5	16.27	48.75	0.92	0.97
TK6	16.20	47.06	0.90	0.97
TK			0.98	
PK1	19.90	55.61	0.91	0.97
PK2	20.00	56.28	0.88	0.97
PK3	19.90	55.40	0.90	0.97
PK4	20.00	54.62	0.91	0.97
PK5	19.90	54.02	0.92	0.97
PK6	20.10	54.92	0.91	0.97
PK7	20.00	56.34	0.92	0.97
PK			0.98	
PCK1	9.73	16.89	0.92	0.96
PCK2	9.70	14.77	0.93	0.95

Table 4.1 Item-Total Statistics (Cont.)

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
PCK3	9.77	14.94	0.92	0.95
PCK4	9.50	15.29	0.90	0.96
PCK			0.97	
TCK1	10.50	17.29	0.95	0.95
TCK2	10.23	17.50	0.91	0.96
TCK3	10.30	16.56	0.95	0.95
TCK4	10.37	17.34	0.89	0.97
TCK			0.97	
TPK1	16.50	8.67	0.73	0.88
TPK2	16.67	9.68	0.75	0.88
TPK3	16.57	8.74	0.80	0.87
TPK4	16.50	8.33	0.81	0.87
TPK5	16.57	8.94	0.70	0.89
TPK			0.90	
TPACK1	25.90	59.40	0.89	0.97
TPACK2	25.97	58.17	0.90	0.97
TPACK3	26.07	55.58	0.93	0.97
TPACK4	25.93	57.79	0.91	0.97
TPACK5	26.00	61.66	0.87	0.97
TPACK6	25.83	58.97	0.88	0.97
TPACK7	26.10	59.06	0.88	0.97
TPACK8	26.10	57.54	0.90	0.97
TPACK			0.97	

4.1.2 Reliability Test of the TAM Scale

The reliability test results of the TAM scale indicate that under the two dimensions of usefulness and ease of use, the "Corrected Item-Total Correlation (CITC)" of each item is greater than 0.4, and the "Cronbach's α value after item deletion" is smaller than the overall reliability of that dimension. This meets the

inspection criteria proposed by DeVellis (1991). Therefore, the TAM scale demonstrates good reliability in this pretest. As shown in Table 4.2.

Table 4.2 TAM Item-Total Statistics

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
USE1	8.60	20.66	0.93	0.96
USE2	8.53	21.91	0.92	0.96
USE3	8.53	20.33	0.94	0.96
USE4	8.53	21.98	0.91	0.96
USE			0.97	
EOU1	11.83	9.11	0.84	0.91
EOU2	11.77	9.01	0.85	0.91
EOU3	11.80	8.65	0.81	0.92
EOU4	11.60	8.52	0.86	0.90
EOU			0.93	

4.1.3 Reliability Test of the TPBScale

The reliability test results of the TPB scale indicate that under the four dimensions of subjective norms, perceived behavioral control, behavioral intention, and usage behavior, the "Corrected Item-Total Correlation (CITC)" of each item is greater than 0.4, and the "Cronbach's α value after item deletion" is smaller than the overall reliability of that dimension. This meets the inspection criteria proposed by DeVellis (1991). Therefore, the TPB scale demonstrates good reliability in this pretest which signified as followed: SN = 0.91, BC = 0.89, BI = 0.98, and UB =0.97.

Table 4.3 TPB Item-Total Statistics

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
SN1	12.43	7.36	0.77	0.89
SN2	12.47	7.02	0.83	0.87
SN3	12.40	7.49	0.81	0.88

Table 4.3 TPB Item-Total Statistics (Cont.)

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
SN4	12.30	7.67	0.77	0.89
SN			0.91	
BC1	12.07	6.27	0.81	0.84
BC2	12.00	6.21	0.79	0.85
BC3	12.03	7.21	0.72	0.88
BC4	12.00	7.24	0.73	0.87
BC			0.89	
BI1	13.63	37.83	0.93	0.97
BI2	13.30	38.91	0.92	0.98
BI3	13.33	36.64	0.95	0.97
BI4	13.30	35.73	0.94	0.97
BI5	13.37	35.69	0.95	0.97
BI			0.98	
UB1	10.77	28.53	0.91	0.96
UB2	10.90	28.92	0.92	0.96
UB3	10.93	27.58	0.92	0.96
UB4	11.00	27.66	0.91	0.96
UB5	10.93	26.82	0.92	0.96
UB			0.97	

In summary, the questionnaires used in this study have demonstrated good reliability in the pretest, laying a solid foundation for the subsequent data analysis. Next, the researchers will conduct deep analysis based on these reliable data, with the aim of deriving valuable research findings.

4.2 EmpiricalAnalysis

After completing the predictive testing of the questionnaire, the study will elaborate on the process and results of the empirical analysis, aiming to reveal the intrinsic connections and patterns among variables and to validate the research hypotheses proposed in this study.

The prepared questionnaire was distributed online to the selected universities. To avoid situations where the sample size might be insufficient due to factors such as omitted or incorrect responses from some instructors during the questionnaire completion, no limit was set on the number of questionnaires distributed to the selected universities. After excluding samples with excessively short completion times, omitted questions, and consistent responses for all questions, a total of 422 valid questionnaires were collected, exceeding the necessary sample size of 380 required for this study. With the completion of the questionnaire data collection required for this study, we are about to enter the stage of deep data analysis. However, before formally conducting the empirical analysis, it is still crucial to conduct another reliability and validity test on the sample data. Only through rigorous reliability and validity tests can we be confident that the collected data is accurate and reliable, thereby providing strong support for the subsequent empirical analysis. Therefore, we will proceed with a detailed reliability and validity test to ensure the rigor and scientific nature of the study.

4.2.1 Exploratory Factor Analysis(EFA)

4.2.1.1 Exploratory Factor Analysis of the TPACKScale

According to the analysis results, it can be seen that the KMO value of the TPACK scale is 0.854, which is greater than 0.6, and the P-value of the Bartlett's Test of Sphericity is less than 0.001. A total of 8 common factors were extracted using the principal component analysis method, with a cumulative variance explanation rate of 64.64%, indicating that these 8 common factors can extract most of the item information. After rotating the extracted common factors using the varimax method,

the dimension classification of each item aligns with the expected dimension design of the questionnaire, suggesting that the data collected using the TPACK scale in this study has good structural validity. As shown in Table 4.4.

Table 4.4 TPACK of Rotated Component Matrix[a]

Item	Component							
	1	2	3	4	5	6	7	8
TECH-K1			0.739					
TECH-K2			0.778					
TECH-K3			0.794					
TECH-K4			0.783					
TECH-K5			0.796					
TECH-K6			0.741					
TECH-K7			0.751					
CK1						0.790		
CK2						0.719		
CK3						0.772		
CK4						0.739		
CK5						0.686		
TK1	0.796							
TK2	0.812							
TK3	0.818							
TK4	0.822							
TK5	0.843							
TK6	0.791							
PK1				0.686				
PK2				0.697				
PK3				0.783				
PK4				0.785				
PK5				0.780				
PK6				0.782				
PK7				0.756				
PCK1							0.877	
PCK2							0.850	
PCK3							0.861	

Table 4.4 TPACK of Rotated Component Matrixa[a] (Cont.)

Item	Component							
	1	2	3	4	5	6	7	8
PCK4							0.887	
TCK1								0.761
TCK2								0.793
TCK3								0.799
TCK4								0.802
TPK1					0.852			
TPK2					0.833			
TPK3					0.841			
TPK4					0.828			
TPK5					0.848			
TPACK1		0.741						
TPACK2		0.704						
TPACK3		0.721						
TPACK4		0.723						
TPACK5		0.737						
TPACK6		0.742						
TPACK7		0.695						
TPACK8		0.707						
KMO					0.854			
Bartlett's Test of Sphericity Rotation Sums of Squared Loadings Cumulative %	10.58	19.80	28.91	37.66	45.50	52.40	59.11	64.64
Total	6.827	4.969	4.355	3.692	3.242	3.012	2.319	1.320

a. Rotation converged in 5 iterations.

4.2.1.2 Exploratory Factor Analysis of the TAMScale

According to the analysis results, it can be seen that the KMO value of the TAM scale is 0.839, which is greater than 0.6, and the P-value of the Bartlett's

Test of Sphericity is less than 0.001. A total of 2 common factors were extracted using the principal component analysis method, with a cumulative variance explanation rate of 80.79%, indicating that these 2 common factors can extract most of the item information. After rotating the extracted common factors using the varimax method, the dimension classification of each item aligns with the expected dimension design of the questionnaire, suggesting that the data collected using the TAM scale in this study has good structural validity. As shown in Table 4.5.

Table 4.5 TAM of Rotated Component Matrix[a]

Item	Component	
	1	2
USE1	0.913	
USE2	0.900	
USE3	0.894	
USE4	0.903	
EOU1		0.909
EOU2		0.876
EOU3		0.882
EOU4		0.904
KMO	0.839	
Bartlett's Test of Sphericity	< 0.001	
Rotation Sums of Squared Loadings Cumulative %	40.83	80.79
Total	3.487	2.976

a. Rotation converged in 3 iterations.

4.2.1.3 Exploratory Factor Analysis of the TPBScale

According to the analysis results, it can be seen that the KMO value of the TPB scale is 0.932, which is greater than 0.6, and the P-value of the Bartlett's Test of Sphericity is less than 0.001. A total of 4 common factors were extracted using the principal component analysis method, with a cumulative variance explanation rate of 71.94%, indicating that these 4 common factors can extract most of the item information. After rotating the extracted common factors using the varimax method,

the dimension classification of each item aligns with the expected dimension design of the questionnaire, suggesting that the data collected using the TPB scale in this study has good structural validity. As shown in Table 4.6.

Table 4.6 Rotated Component Matrix[a]

Item	Component			
	1	2	3	4
SN1			0.812	
SN2			0.793	
SN3			0.798	
SN4			0.797	
BC1				0.809
BC2				0.722
BC3				0.778
BC4				0.733
BI1		0.786		
BI2		0.732		
BI3		0.804		
BI4		0.761		
BI5		0.795		
UB1	0.777			
UB2	0.818			
UB3	0.792			
UB4	0.801			
UB5	0.789			
KMO			0.932	
Bartlett's Test of Sphericity			＜0.001	
Rotation Sums of Squared Loadings Cumulative %	20.18	39.54	56.44	71.94
Total	8.05	1.92	1.58	1.40

4.2.3 Confirmatory Factor Analysis(CFA)

To ensure good convergent validity and discriminant validity among the variables used in this study, confirmatory factor analysis of the core variablesis

required before conducting formal hypothesis testing. Due to the hypothesis model proposed in this study only involving six core variables, namely Perceived easy of use (EOU), Perceived usefulness (USE), Subject norms (SN), Perceived behavioral control (BC), Behavior Intent (BI), and Using Behaviors (UB), only the convergent validity and discriminant validity between these six core variables were tested in confirmatory factor analysis.

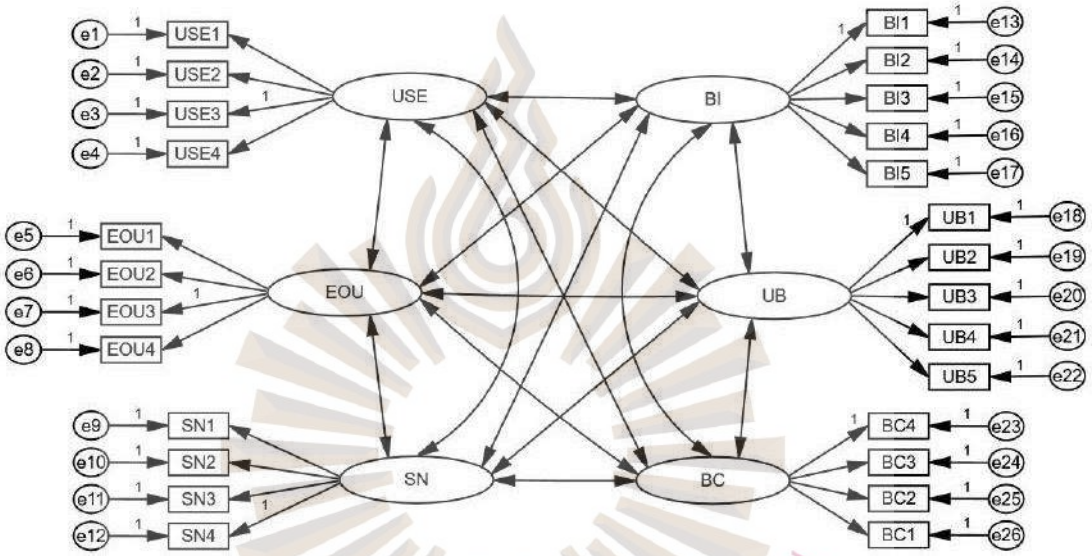

Figure 4.1 Confirmatory Factor Analysis Chart

4.2.3.1 Model FittingDegree

The results of this confirmatory factor analysis show that the fit index of the model performs well. Specifically, the value of X /²DF is 1.517, much lower than the reference value of 3, indicating a high degree of fit between the model and the data, and the model has high explanatory power. The value of RMSEA is 0.035, and the measured value of SRMR is 0.031, both of which are less than the reference value of 0.08, indicating that the model has a small error and a good fitting effect.

In addition, the values of GFI, AGFI, NFI, TLI, and CFI are 0.928, 0.911, 0.944, 0.977, and 0.980, respectively, all of which are greater than or equal to

the reference value of 0.9. This indicates that the model has achieved a high level of fit in all aspects.

In summary, the model fit indicators of this confirmatory factor analysis performed well, indicating a high degree of matching between the model and the data, and the research results have high credibility and explanatory power. This provides a solid foundation for subsequent analysis and discussion.

Table 4.7 Confirmatory Factor Analysis Model Fit

Indicator	X^2/DF	RMSEA	SRMR	GFI	AGFI	NFI	TLI	CFI
Reference value	≤3	< 0.08	< 0.08	≥0.9	≥0.9	≥0.9	≥0.9	≥0.9
Measured value	1.517	0.035	0.031	0.928	0.911	0.944	0.977	0.980

4.2.3.2 Convergence ValidityTest

The convergence validity test results of confirmatory factor analysis show that the standardized path coefficient (Std) of all paths is above 0.7, indicating that each observed variable has strong explanatory power for its corresponding latent variable and good convergence. Secondly, from the perspective of critical ratio (C.R.) and significance level (P), the C R. The values are all greater than 1.96, and the P-values have reached the significance level, indicating that the path coefficients are statistically significant, further supporting the reliability of convergence validity. Again, from the perspective of Average Variance Extracted (AVE), the AVE values of the six latent variables USE, EOU, SN, BC, BI, and UB are all greater than the reference value of 0.5, indicating that these six latent variables have good convergence validity. Finally, from the perspective of combined reliability (C.R.), the combined reliability of the six latent variables is greater than the reference value of 0.7, indicating that the measurement models for these six latent variables have high stability andreliability.

In summary, the convergence validity test results of this confirmatoryfactoranalysisindicatethateachobservedvariablehasastrong

explanatory power for its corresponding latent variable, and the path coefficient is statistically significant. The average variance extraction and combination reliability of the latent variable have reached an acceptable level. Therefore, the study suggests that this confirmatory factor analysis has good convergent validity.

Table 4.8 Convergence Validity Test

Path	Std	S.E.	C.R.	P	AVE	C.R.
USE4-USE	0.872	0.046	23.12	***		
USE3-USE	0.853				0.755	0.925
USE2-USE	0.862	0.045	22.666	***		
USE1-USE	0.889	0.043	23.884	***		
EOU4-EOU	0.881	0.051	22.034	***		
EOU3-EOU	0.829				0.731	0.916
EOU2-EOU	0.820	0.051	19.857	***		
EOU1-EOU	0.888	0.051	22.285	***		
SN4-SN	0.833					
SN3-SN	0.831	0.049	19.893	***	0.684	0.897
SN2-SN	0.835	0.051	20.019	***		
SN1-SN	0.810	0.051	19.17	***		
BC4-BC	0.741					
BC3-BC	0.743	0.073	14.364	***	0.572	0.842
BC2-BC	0.712	0.071	13.773	***		
BC1-BC	0.824	0.071	15.742	***		
BI1-BI	0.775					
BI2-BI	0.769	0.061	16.299	***		
BI3-BI	0.779	0.061	16.542	***	0.617	0.889
BI4-BI	0.815	0.061	17.435	***		
BI5-BI	0.787	0.063	16.762	***		
UB1-UB	0.857					
UB2-UB	0.855	0.044	22.293	***		
UB3-UB	0.838	0.045	21.559	***	0.666	0.908
UB4-UB	0.806	0.045	20.258	***		
UB5-UB	0.715	0.047	16.912	***		

***. Correlation is significant at the 0.001 level (2-tailed).

4.2.3.3 Discriminant ValidityTest

Distinguishing validity is a crucial consideration when validating the effectiveness and reliability of a model. It aims to confirm whether different constructs (or variables) can be clearly distinguished theoretically and empirically to avoid conceptual confusion and statistical overlap. The results of discriminant validity analysis show that there is indeed a certain degree of correlation between the six core variables of USE, EOU, SN, BC, BI, and UB, which is in line with theoretical expectations because in practical situations, these psychological and behavioral factors are often interrelated and influence each other. However, more importantly, the correlation coefficients between these variables did not exceed the square root of their respective Average Variance Extracted (AVE) values. This result not only validates the theoretical validity of the model, but also confirms the statistical independence of the data. Therefore, we can be confident that these variables do not interfere with each other in measurement and independently reflect different aspects of users' acceptance of information systems or technologies, providing a solid and reliable foundation for subsequent analysis and discussion.

Table 4.9 Discriminant Validity Test

Core Variables	USE	EOU	SN	BC	BI	UB
USE	0.869					
EOU	0.078	0.855				
SN	0.392	0.236	0.827			
BC	0.444	0.214	0.500	0.756		
BI	0.444	0.193	0.492	0.505	0.785	
UB	0.417	0.303	0.536	0.464	0.477	0.816

In summary, this confirmatory factor analysis has laid a solid foundation for subsequent data analysis, ensuring the credibility and explanatory power of the study. Based on these reliable results, we will further explore and analyze the relationships and impacts between corevariables.

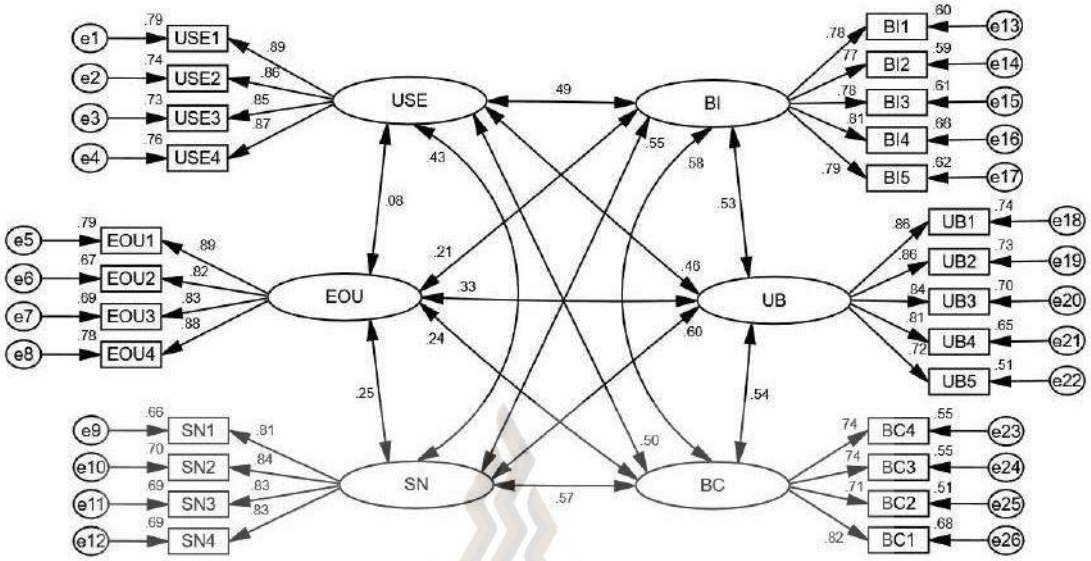

Figure 4.2 Results of confirmatory factor analysis

4.2.4 Descriptive Analysis for the DemographicCharacteristics

Through sorting and analyzing the collected questionnaire data, the study gained a detailed understanding of the distribution of the sample across demographic variables such as gender, age, work experience, educational background, and joblevel.

In the sample group, there is a certain degree of variation in gender distribution. Specifically, there are 148 male participants, accounting for 35.07% of the total sample, while female participants reach 274, accounting for 64.93% of the total sample. In terms of age distribution, the sample covers individuals from different age groups. Specifically, there are 45 participants aged 20-30, accounting for 10.66% of the total sample; the largest number of participants, 161, are in the 31-40 age group, accounting for 38.15% of the total sample; there are 127 participants aged 41-50, accounting for 30.09%; and 89 participants aged 51 and above, accounting for 21.09%. In terms of work experience, there are fewer participants with 1-5 years of work experience, only 70, accounting for 16.59% of the total sample; while there are more participants with 6-10 years of work experience, reaching 169, accounting for 40.05% of the total sample; there are 125 participants with 11-20 years of work experience, accountingfor29.62%;andarelativelysmallernumberofparticipants,58,have21

years or more of work experience, accounting for 13.74%. In terms of educational background, there are 142 participants with a bachelor's degree, accounting for 33.65% of the total sample; while the largest number of participants, 220, hold a master's degree, accounting for 52.13% of the total sample; additionally, there are 60 participants with a doctoral degree, accounting for 14.22%. In terms of job level, the sample covers multiple levels from entry-level to senior management. Specifically, there are 30 assistant-level participants, accounting for 7.11% of the total sample; a larger number of instructor-level participants, reaching 155, accounting for 36.73% of the total sample; the largest number of participants, 184, are at the associate professor level, accounting for 43.60% of the total sample; while there are relatively fewer participants at the professor level, with 53, accounting for 12.56%. As shown in Table 4.10.

Table 4.10 The Demographic Information by Percentage and Frequency

(n=422)

Characteristics	All Respondents			
	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Gender				
Male	148	35.07	35.07	35.07
Female	274	64.93	64.93	100
Age				
20-30 years Old	45	10.66	10.66	10.66
31-40 years Old	161	38.15	38.15	48.81
41-50 years Old	127	30.09	30.09	78.9
51years Old and Above	89	21.09	21.09	100
Working Experience				
1-5 years	70	16.59	16.59	16.59
6-10 years	169	40.05	40.05	56.64
11-20 years	125	29.62	29.62	86.26
21 years or More	58	13.74	13.74	100

Table 4.10 The Demographic Information by Percentage and Frequency (Cont.)

(n=422)

Characteristics	All Respondents			
	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Educational Background				
Bachelor Degree	142	33.65	33.65	33.65
Master Degree	220	52.13	52.13	85.78
Doctorate Degree	60	14.22	14.22	14.22
Positional				
Rank Assistance	30	7.11	7.11	7.11
Instructor	155	36.73	36.73	43.84
Assistance Professor	184	43.60	43.60	87.44
Full Professor	53	12.56	12.56	100
Total	422	100	100	

4.2.5 Descriptive Analysis of TPACKAbilities

Overall, English instructors in private universities in western China exhibit good performance in TPACK abilities and its various secondary dimensions. Their technological knowledge is slightly higher than content knowledge and pedagogical knowledge, but the differences between these dimensions are not significant. Instructors generally demonstrate the ability to integrate technology into teaching and subject matter to some extent, but there is still room for improvement, especially in areas where some instructors' technological knowledge or content knowledge is relatively weak.

Specifically, TECH-K (3.49±0.98) indicates that instructors' technological knowledge is at an upper-middle level, with relatively moderate variation and not very

dispersed. The average level of CK (3.24±1.21) is slightly lower than technological knowledge, with a slightly larger degree of dispersion compared to TECH-K. The level of TK (3.16±1.21) is similar to CK, indicating that instructors' performance in how technology is applied to pedagogy is similar to their content knowledge, with an overall upper-middle level but some variation. The level of PK (3.16±1.04) is slightly lower than technological knowledge and content knowledge, with relatively smaller differences overall. The level and overall variation of PCK (3.24±1.22) are slightly higher than pure pedagogical knowledge. The level of TCK (3.23±1.07) is similar to the previous dimensions, indicating that instructors have a good understanding of how technology supports the teaching of subject matter, and their performance in this dimension is also relatively stable. The level of TPK (3.22±1.20) is slightly lower than TCK. As the core of the overall framework, TPACK has a mean value of 3.19, indicating that instructors' ability to integrate technology, pedagogy, and subjectmatter is generally at an upper-middle level. The standard deviation is 1.03, which is relatively small among these dimensions, indicating that instructors' performance in TPACK abilities is relatively consistent. As shown in Table4.11.

Table 4.11 Descriptive Analysis of Each Construct

Construct	Items	x̄	S.D.	Level
TECHK	TECHK1	3.39 3.46	1.37 1.28	MPA
	TECHK2	3.44	1.27	MPA
	TECHK3	3.44	1.29	MPA
	TECHK4			MPA
	TECHK5	3.54	1.25	PA
	TECHK6	3.60	1.21	PA
	TECHK7	3.55	1.21	PA
CK	CK1	3.15 3.32	1.41 1.38	MPA
	CK2	3.19	1.44	MPA
	CK3			MPA
	CK4	3.25	1.43	MPA
	CK5	3.32	1.46	MPA
TK	TK1	3.15	1.48	MPA
	TK2	3.18	1.44	MPA

Table 4.11 Descriptive Analysis of Each Construct (Cont.)

Construct	Items	x̄	S.D.	Level
	TK3	3.09	1.38	MPA
	TK4	3.18	1.44	MPA
	TK5	3.12	1.41	MPA
	TK6	3.20	1.41	MPA
PK	PK1	3.09 3.22	1.42 1.37	MPA
	PK2	3.04	1.33	MPA
	PK3	3.12	1.37	MPA
	PK4			MPA
	PK5	3.21	1.40	MPA
	PK6	3.24	1.41	MPA
	PK7	3.17	1.37	MPA
PCK	PCK1	3.17 3.26	1.36 1.42	MPA
	PCK2	3.26	1.40	MPA
	PCK3			MPA
	PCK4	3.25	1.41	MPA
TCK	TCK1	3.21 3.27	1.40 1.37	MPA
	TCK2	3.27	1.33	MPA
	TCK3			MPA
	TCK4	3.17	1.31	MPA
TPK	TPK1	3.35 3.20	1.42 1.40	MPA
	TPK2	3.23	1.44	MPA
	TPK3			MPA
	TPK4	3.23	1.43	MPA
	TPK5	3.10	1.41	MPA
TPACK	TPACK1	3.15 3.19	1.39 1.43	MPA
	TPACK2	3.23 3.18	1.44 1.44	MPA
	TPACK3	3.22	1.43	MPA
	TPACK4			MPA
	TPACK5			MPA
	TPACK6	3.12	1.42	MPA
	TPACK7	3.14	1.45	MPA
	TPACK8	3.29	1.36	MPA

4.2.6 Analysis of Differences in TPACKAbilities

4.2.6.1 AnalysisofDifferencesinTPACKAbilitiesAmong Instructors of DifferentGenders

The study used SPSS 26 software to conduct independent sample T-tests on the eight secondary dimensions under the TPACK ability measurement scale for English instructors of different genders in universities in western China. The research results indicate that there are no statistically significant differences in TPACK abilities across genders. This conclusion suggests that among English instructors in universities in western China, both male and female instructors exhibit comparable levels and potential in integrating technology into subject matter teaching knowledge. This may be related to the current educational environment's emphasis on equal development for male and female instructors, as well as the overall improvement in instructors' skill levels in the context of widespread information technology. As shown in Table 4.12.

Table 4.12 Independent Samples Test

	GroupStatistics				T-Test		CI 95%	
Secondary Dimension	Gender	N	M	SD	T	P	Lower	Upper
TECH-K	Male	148	3.38	0.86	-1.834	0.067	-0.359	0.012
	Female	274	3.55	1.03				
CK	Male	148	3.25	1.10	0.106	0.915	-0.220	0.245
	Female	274	3.24	1.27				
TK	Male	148	3.14	1.09	-0.267	0.789	-0.263	0.200
	Female	274	3.17	1.28				
PK	Male	148	3.26	0.94	1.590	0.113	-0.038	0.362
	Female	274	3.10	1.09				
PCK	Male	148	3.30	1.13	0.766	0.444	-0.145	0.329
	Female	274	3.20	1.27				
TCK	Male	148	3.13	0.97	-1.387	0.166	-0.367	0.063
	Female	274	3.28	1.12				

Table 4.12 Independent Samples Test (Cont.)

GroupStatistics					T-Test		CI 95%	
Secondary Dimension	Gender	N	M	SD	T	P	Lower	Upper
TPK	Male	148	3.08	1.19	-1.766	0.078	-0.457	0.024
	Female	274	3.30	1.21				
TPACK	Male	148	3.16	0.90	-0.417	0.677	-0.236	0.154
	Female	274	3.20	1.10				

4.2.6.2 AnalysisofDifferencesinTPACKAbilitiesAmong

Instructors of Different AgeGroups

The study used SPSS 26 software to conduct a one-way ANOVA on the eight secondary dimensions of the TPACK ability measurement scale for English instructors of different age groups in universities in western China. The results showed that there were statistically significant differences only in the TECH-K abilities of English instructors of different age groups. Specifically, English instructors in the 2030 and 31-40 age groups had significantly lower TECH-K abilities compared to English instructors in the 41-50 and over 51 age groups. As shown in Table4.13.

Table 4.13Analysis of Differences in TPACK Abilities Among Instructors of Different Age Groups

Secondary Dimension	AGE	N	M	SD	F	P	MultipleComparisons
TECH-K	20-30years Old	45	3.06	1.06	7.617	0.000	-
	31-40years Old	161	3.34	1.10			
	41-50years Old	127	3.72	0.88			
	51years Old and Above	89	3.64	0.68			
CK	20-30years Old	45	3.04	1.31	0.702	0.551	-
	31-40years Old	161	3.30	1.20			
	41-50years Old	127	3.20	1.24			
	51 years Old and Above	89	3.31	1.13			

Table 4.13Analysis of Differences in TPACK Abilities Among Instructors of Different Age Groups (Cont.)

Secondary Dimension	AGE	N	M	SD	F	P	MultipleComparisons
TK	20-30years Old	45	2.86	1.29	1.292	0.277	-
	31-40years Old	161	3.23	1.24			
	41-50yearsOld	127	3.11	1.21			
	51 years Old and Above	89	3.23	1.12			
PK	20-30years Old	45	3.09	1.18	0.237	0.871	-
	31-40years Old	161	3.13	1.04			
	41-50years Old	127	3.16	1.05			
	51 years Old and Above	89	3.23	0.98			
PCK	20-30years Old	45	3.04	1.38	2.229	0.084	-
	31-40yearsOld	161	3.10	1.21			
	41-50years Old	127	3.32	1.18			
	51 years Old and Above	89	3.46	1.18			
TCK	20-30years Old	45	3.04	1.22	0.529	0.663	-
	31-40years Old	161	3.25	1.06			
	41-50years Old	127	3.26	1.11			
	51years Old and Above	89	3.24	0.98			
TPK	20-30years Old	45	3.22	1.28	1.890	0.131	-
	31-40years Old	161	3.07	1.25			
	41-50years Old	127	3.27	1.19			
	51years Old and Above	89	3.44	1.07			
TPACK	20-30years Old	45	3.09	1.01	0.861	0.461	-
	31-40years Old	161	3.11	1.04			
	41-50years Old	127	3.27	1.10			
	51years Old and Above	89	3.27	0.92			

4.2.6.3 Analysis of Differences in TPACK Abilities Among Instructors with Different Educational Backgrounds

By conducting a one-way ANOVA on the eight secondary dimensions of TPACK abilities among instructors with different educational backgrounds, the results showed that there were statistically significant differences only in three abilities: TECH-K, TK, and TCK, among English instructors with different educational backgrounds. Specifically, in terms of TECH-K ability, instructors with a bachelor's degree had lower TECH-K ability than instructors with a master's degree. In terms of TK ability, instructors with a master's degree had higher TK ability than instructors with a doctoral degree. In terms of TCK ability, instructors with a doctoral degree had higher TCK ability than instructors with a bachelor's degree and a master's degree. As shown in Table 4.14.

Table 4.14 Analysis of Differences in TPACK Abilities Among Instructors with Different Educational Backgrounds

Secondary Dimension	Educational Background	N	M	Sd	F	P	Multiple Comparisons
TECH-K	Bachelor Degree	142	3.26	1.06	6.576	0.002	Bachelor Degree < Master Degree
	Master Degree	220	3.64	0.92			
	Doctorate Degree	60	3.49	0.89			
CK	Bachelor Degree	142	3.18	1.21	0.284	0.753	-
	Master Degree	220	3.27	1.21			
	Doctorate Degree	60	3.29	1.20			
TK	Bachelor Degree	142	3.08	1.14	3.493	0.031	Master Degree > Doctorate Degree
	Master Degree	220	3.29	1.27			

Table 4.14Analysis of Differences in TPACK Abilities Among Instructors with Different Educational Backgrounds (Cont.)

Secondary Dimension	Educational Background	N	M	Sd	F	P	Multiple Comparisons
	Doctorate Degree	60	2.85	1.11			
PK	Bachelor Degree	142	3.08	1.01	1.043	0.353	-
	Master Degree	220	3.23	1.12			
	Doctorate Degree	60	3.07	0.80			
PCK	Bachelor Degree	142	3.34	1.18	1.688	0.186	-
	Master Degree	220	3.24	1.27			
	Doctorate Degree	60	2.99	1.10			
TCK	Bachelor Degree	142	3.10	1.08	5.431	0.005	Bachelor Degree < Doctorate Degree; Master Degree < Doctorate Degree
	Master Degree	220	3.21	1.12			
	Doctorate Degree	60	3.63	0.77			
TPK	Bachelor Degree	142	3.10	1.24	1.701	0.184	-
	Master Degree	220	3.33	1.22			
	Doctorate Degree	60	3.14	1.02			
TPACK	Bachelor Degree	142	3.06	0.96	2.112	0.122	-
	Master Degree	220	3.28	1.13			
	Doctorate Degree	60	3.15	0.76			

4.2.6.4 AnalysisofDifferencesinTPACKAbilitiesAmong

Instructors with Different Years of WorkExperience

By conducting a one-way ANOVA on the eight secondary dimensions of TPACK abilities among instructors with different years of work experience, the results showed that there were statistically significant differences in three abilities: TECH-K, PCK, and TPK, among instructors with different years of work experience. Specifically, in terms of TECH-K ability, the instructor group with 1-5 years of work experience had significantly lower TECH-K ability levels compared to the instructor groups with 6-10 years, 11-20 years, and 21 years or more of work experience. In terms of PCK ability, the instructor groups with 1-5 years and 6-10 years of work experience had significantly lower PCK ability compared to the instructor groups with 11-20 years and 21 years or more of work experience. In terms of TPK ability, the instructor groups with 1-5 years and 6-10 years of work experience had significantly lower TPK ability compared to the instructor group with 21 years or more of work experience. As shown in Table4.16.

Table 4.15 Analysis of Differences in TPACK Abilities Among Instructors with Different Years of Work Experience

Secondary Dimension	Educational Background	N	M	Sd	F	P	Multiple Comparisons
TECH-K	1-5years	70	3.03	0.92	8.902	0.000	1-5years < 6-10years < 21years above; 1-5years < 11-20years
	6-10years	169	3.44	1.08			
	11-20years	125	3.67	0.91			
	21years Above	58	3.79	0.61			
CK	1-5years	70	3.12	1.17	1.176	0.318	-
	6-10years	169	3.38	1.19			
	11-20years	125	3.16	1.25			
	21years Above	58	3.21	1.21			

Table 4.15 Analysis of Differences in TPACK Abilities Among Instructors with Different Years of Work Experience (Cont.)

Secondary Dimension	Educational Background	N	M	Sd	F	P	MultipleComparisons
TK	1-5years	70	3.02	1.14	0.807	0.491	-
	6-10years	169	3.26	1.22			
	11-20years	125	3.13	1.26			
	21years Above	58	3.08	1.16			
PK	1-5years	70	3.00	1.00	1.118	0.342	-
	6-10years	169	3.18	1.03			
	11-20years	125	3.13	1.07			
	21years Above	58	3.33	1.07			
PCK	1-5years	70	3.03	1.24	3.062	0.028	1-5years < 11-20years; 1-5years < 21years above; 6-10years < 11-20years; 6-10years < 21years above
	6-10years	169	3.11	1.19			
	11-20years	125	3.40	1.25			
	21years Above	58	3.51	1.15			
TCK	1-5years	70	3.06	1.01	1.095	0.351	-
	6-10years	169	3.22	1.12			
	11-20years	125	3.26	1.07			
	21years Above	58	3.39	1.02			
TPK	1-5years	70	2.99	1.22	4.576	0.004	1-5years < 21years above 6-10years < 21years above
	6-10years	169	3.08	1.24			
	11-20years	125	3.37	1.19			
	21years Above	58	3.62	0.98			
TPACK	1-5years	70	3.05	0.85	1.753	0.156	-
	6-10years	169	3.11	1.03			
	11-20years	125	3.30	1.09			
	21years Above	58	3.36	1.09			

4.2.6.5 AnalysisofDifferencesinTPACKAbilitiesAmong

Instructors with Different ProfessionalTitles

By conducting a one-way ANOVA on the eight secondary dimensions of TPACK abilities among instructors with different professional titles, the results showed that there were significant differences in the ability levels of instructors with different professional titles in three secondary dimensions: TECH-K, TK, and PCK. Specifically, in terms of TECH-K ability, assistant professors and associate professors had significantly lower TECH-K ability compared to full professors. In terms of TK ability level, assistant professors had significantly lower ability compared to full professors. In terms of PCK ability level, assistant professors, associate professors, and associate professors had significantly lower PCK ability compared to full professors. As shown in Table4.16.

Table 4.16 Analysis of Differences in TPACK Abilities Among Instructors with Different ProfessionalTitles

Secondary Dimension	Educational Background	N	M	Sd	F	P	Multiple Comparisons
TECH-K	Assistance Instructor	30	3.11	0.97	5.878	0.001	Assistance < Full Professor; Instructor < Full Professor
		155	3.32	1.11			
	Assistance Professor	184	3.61	0.89			
	FullProfessor	53	3.80	0.68			
CK	Assistance Instructor	30	3.07	1.25	1.364	0.253	-
		155	3.19	1.21			
	Assistance Professor	184	3.23	1.23			
	FullProfessor	53	3.54	1.08			
TK	Assistance Instructor	30	2.72	1.18	2.647	0.049	Assistance < Full Professor;
		155	3.10	1.22			
	Assistance Professor	184	3.18	1.25			
	FullProfessor	53	3.47	0.97			
PK	Assistance Instructor	30	2.81	1.02	1.437	0.231	-
		155	3.16	1.07			
	Assistance Professor	184	3.17	1.03			
	FullProfessor	53	3.30	1.02			

Table 4.16 Analysis of Differences in TPACK Abilities Among Instructors with Different Professional Titles (Cont.)

Secondary Dimension	Educational Background	N	M	Sd	F	P	Multiple Comparisons
PCK	Assistance Instructor	30 155	2.64 3.17	1.27 1.19	6.361	< 0.001	Assistance < Full Professor; Instructor < Full Professor; Assistance Professor < Full Professor
	Assistance Professor	184	3.23	1.24			
	Full Professor	53	3.79	1.03			
TCK	Assistance	30	3.04	1.05	0.936	0.423	-
	Instructor	155	3.20	1.12			
	Assistance Professor	184	3.23	1.06			
	FullProfessor	53	3.42	0.98			
TPK	Assistance	30	3.07	1.20	2.484	0.060	-
	Instructor	155	3.13	1.22			
	Assistance Professor	184	3.21	1.23			
	FullProfessor	53	3.63	1.02			
TPACK	Assistance	30	3.08	0.89	1.425	0.235	-
	Instructor	155	3.13	1.06			
	Assistance Professor	184	3.18	1.04			
	FullProfessor	53	3.45	0.97			

In summary, although gender did not show significant differences in various dimensions of TPACK, age, educational background, years of work experience, and professional titles had significant impacts on instructors' abilities. Specifically, younger instructors had relatively lower TECH-K abilities, while older instructors performed better. In terms of educational background, instructors with a master's degree excelled in multiple abilities compared to instructors with a bachelor's or doctoral degree, but instructors with a doctoral degree performed exceptionally well in TCKability.Instructorswithshorteryearsofworkexperiencesignificantlylagged

behind experienced instructors in TECH-K, PCK, and TPK abilities. Furthermore, assistant professors and associate professors had significantly lower abilities in TECH-K, TK, and PCK compared to full professors. These differences reflect the impact of different personal characteristics on instructors' TPACK abilities and provide a basis for formulating targeted instructor training and developmentstrategies.

4.2.7 Correlation Analysis of CoreVariables

The study conducted a detailed examination of the correlations between the core variables, and the results revealed significant correlations among them. Specifically:

USE (Expected Usefulness) had a significant positive correlation with EOU (Expected Ease of Use), SN (Subjective Norm), BC (Behavioral Control), BI (Behavioral Intention), and UB (Usage Behavior). This indicates that when the expected usefulness increases, these variables also tend to increase.

EOU (Expected Ease of Use) had a significant positive correlation with SN (Subjective Norm) and BC (Behavioral Control). This implies that when an individual perceives something to be easy to use, social influence and behavioral control factors also tend to enhance.

SN (Subjective Norm) had a high positive correlation with BC (Behavioral Control), BI (Behavioral Intention), and UB (Usage Behavior). This indicates that social influence has a significant promoting effect on behavioral control, behavioral intention, and usage behavior.

BC (Behavioral Control) had a significant positive correlation with BI (Behavioral Intention) and UB (Usage Behavior). This suggests that when individuals have a stronger perception of behavioral control, their likelihood of engaging in specific behaviors (intention and behavior) is also higher.

BI (Behavioral Intention) had a high positive correlation with UB (Usage Behavior). This indicates that individuals' behavioral intentions directly predict their actual usage behavior, i.e., stronger behavioral intentions lead to more actual usage behavior.

In summary, the core variables form a tightly connected network. The increase in usage behavior is positively influenced by multiple factors such as expected usefulness, subjective norm, and behavioral control, which further promote individuals' behavioral intentions and actual usage behavior. As shown in Table4.17.

Table 4.17 Correlation Analysis of Core Variables

Core Variables	USE	EOU	SN	BC	BI	UB
USE	1					
EOU	0.078	1				
SN	0.392**	0.236**	1			
BC	0.444**	0.214**	0.500**	1		
BI	0.444**	0.193**	0.492**	0.505**	1	
UB	0.417**	0.303**	0.536**	0.464**	0.477**	1

**. Correlation is significant at the 0.01 level (2-tailed).

4.2.8 HypothesisTesting

To visuallydemonstrate the logicalrelationships betweenthe proposed hypotheses and the expected mechanism of action, the study used structural equation modeling analysis software AMOS 26 to draw a model diagram. As shown in Figure 4.3.

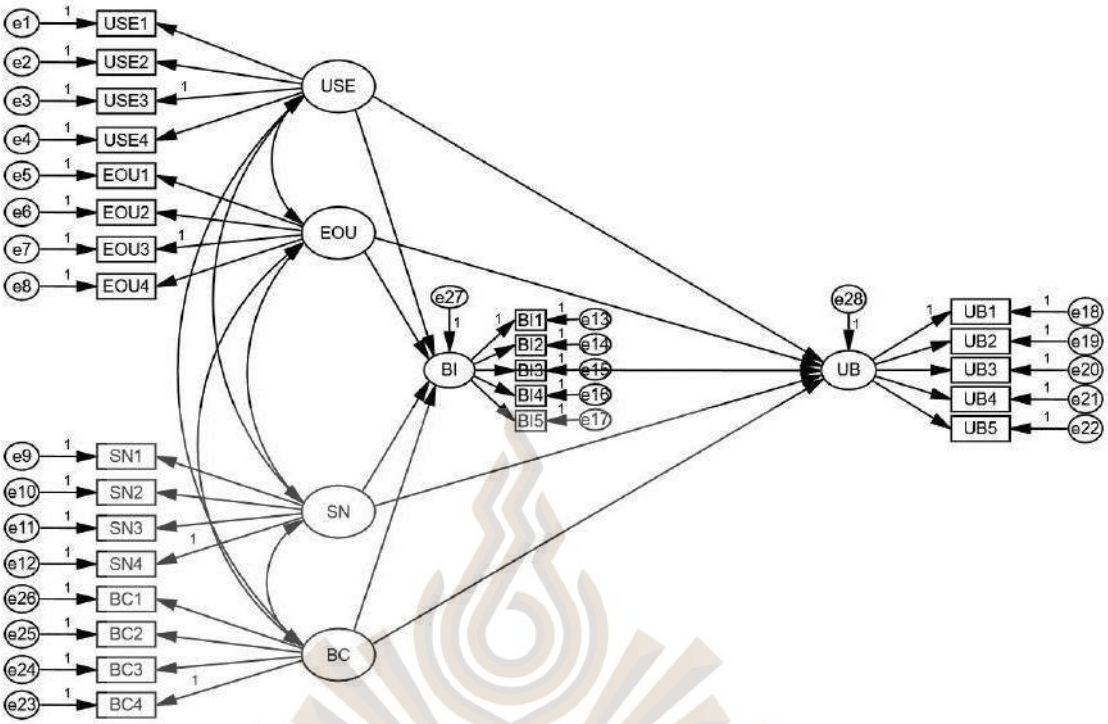

Figure 4.3 Assumed Model Diagram

4.2.8.1 Model FitTest

After using AMOS26 software to perform data analysis on the structural equation model constructed in the research, the results showed that all key fit indices met the established criteria. This indicates that the model constructed in this research has a good fit relationship with the data, and the model can effectively explain and represent the structural relationships in the actual data. Therefore, the structural equation model constructed in this research is a reasonable and effective data analysis tool, providing a reliable foundation for subsequent research and practical applications. As shown in Table4.18.

Table 4.18 Model Fit

Indicator	X^2/DF	RMSEA	SRMR	GFI	AGFI	NFI	TLI	CFI
Reference value	≤3	< 0.08	< 0.08	≥0.9	≥0.9	≥0.9	≥0.9	≥0.9
Measured value	1.517	0.035	0.031	0.928	0.911	0.944	0.977	0.980

4.2.8.2 Hypothesis TestingResults

(1) Hypothesis Testing Results forH1-H4

After testing the hypothesized paths in the structural equation model using AMOS software, the hypothesis verification results are as follows.

H1: Perceived usefulness has a positive impact on instructors' TPACK usage intention.

The standardized coefficient (Std) for this path is 0.22, and the statistical significance level (P) is less than 0.001, indicating that the path is highly significant statistically. The confidence interval (Lower to Upper) excludes 0, further confirming this. Therefore, we can accept the original hypothesis that perceived usefulness has a positive impact on instructors' TPACK usage intention.

H2: Perceived ease of use has a positive impact on instructors' TPACK usageintention.

The standardized coefficient for this path is 0.052, with a P-value of 0.238, which is greater than the significance level of 0.05, indicating that this path is not statistically significant. Since the confidence interval includes 0, the original hypothesis is notsupported.

H3: Subjective norms have a positive impact on instructors' intention to use TPACK.

This path shows strong statistical significance, with a standardized coefficient of 0.276 and a P-value less than 0.001. The confidence interval also excludes 0, confirming that SN has a positive and significant impact on BI, and the original hypothesis issupported.

H4: Perceived behavioral control has a positive impact on instructors' TPACK usage intention.

Similar to the BI←SN path, the BI←BC path also exhibits high statistical significance, with a standardized coefficient of 0.296 and a P-value less than 0.001. The confidence interval excludes 0, indicating that BC has a positive and significant impact on BI, and the original hypothesis is similarly supported.

In summary, by analyzing the hypothesis testing results output from AMOS software, we have confirmed that USE, SN, and BC all have significant positive impacts on BI, while the impact of EOU on BI is not significant. As shown in Table4.19.

Table 4.19 H1-H4 Hypothesis Testing Results

Hypothesis	Std	S.E.	C.R.	P	Lower	Upper	Results
H1:BI←USE	0.22	0.063	3.492	0.001	0.096	0.339	Accepted
H2:BI←EOU	0.052	0.045	1.156	0.238	-0.036	0.145	Rejected
H3:BI←SN	0.276	0.066	4.182	0.001	0.151	0.404	Accepted
H4:BI←BC	0.296	0.073	4.055	0.001	0.153	0.447	Accepted

(2) Hypothesis Testing Results forH5-H8

After testing the hypothesized paths (H5-H8) in the structural equation model using AMOS software, the hypothesis verification results are asfollows.

H5: Instructors' TPACK usage intention has a mediating effect between perceived usefulness and TPACK usage behavior.

Total effects: The total effect of USE on UB is significant (Estimate = 0.189, S.E. = 0.062, C.R. = 3.048, P = 0.001), indicating that BI plays a significant mediating role between USE and UB.

Direct effects: The direct effect of USE on UB is significant (Estimate = 0.153, S.E. = 0.066, C.R. = 2.318, P = 0.013), indicating that USE has a direct positive impact on UB.

Indirect effects: The indirect effect of BI between USE and UB is significant (Estimate = 0.035, S.E. = 0.019, C.R. = 1.842, P = 0.009), suggesting that BI plays a significant mediating role in the process of USE influencing UB, and its indirect effect accounts for 18.52% of the totaleffect.

H6: Instructors' TPACK usage intention has a mediating effect between perceived ease of use and TPACK usage behavior.

Total effects: The total effect of EOU on UB is significant (Estimate = 0.181, S.E. = 0.044, C.R. = 4.114, P = 0.001), indicating that BI plays a significant mediating role between EOU and UB.

Direct effects: The direct effect of EOU on UB is significant (Estimate = 0.173, S.E. = 0.043, C.R. = 4.023, P = 0.001), indicating that EOU has a direct positive impact onUB.

Indirect effects: The indirect effect of BI between EOU and UB is not significant (Estimate = 0.008, S.E. = 0.009, C.R. = 0.889, P = 0.152). Although there is an indirect effect, its statistical significance is low, accounting for only 4.42% of the totaleffect.

H7: Instructors' TPACK usage intention has a mediating effect between subjective norms and TPACK usage behavior.

Total effects: The total effect of SN on UB is significant (Estimate = 0.367, S.E. = 0.058, C.R. = 6.328, P = 0.001), indicating that BI plays a significant mediating role between SN and UB.

Direct effects: The direct effect of SN on UB is significant (Estimate = 0.322, S.E. = 0.059, C.R. = 5.458, P = 0.001), indicating that SN has a direct positive impact on UB.

Indirect effects: The indirect effect of BI between SN and UB is significant (Estimate = 0.044, S.E. = 0.022, C.R. = 2.000, P = 0.01), suggesting that BI plays a significant mediating role in the process of SN influencing UB, and its indirect effect accounts for 11.99% of the total effect.

H8: Instructors' TPACK use intention has a mediating effect between perceived behavior control and TPACK use behavior.

Total effects: The total effect of BC on UB is significant (Estimate = 0.189, S.E. = 0.066, C.R. = 2.864, P = 0.005), indicating that BI plays a significant mediating role between BC and UB.

Direct effects: The direct effect of BC on UB is significant (Estimate = 0.141, S.E. = 0.065, C.R. = 2.169, P = 0.029), indicating that BC has a direct positive impact on UB, but the significance is relatively low.

Indirect effects: The indirect effect of BI between BC and UB is significant (Estimate = 0.048, S.E. = 0.022, C.R. = 2.182, P = 0.01), suggesting that BI plays a significant mediating role in the process of BC influencing UB, and its indirect effect accounts for 25.40% of the total effect.

Further analysis revealed that instructors' usage intention played a significant mediating role between multiple independent variables and Usage Behavior (UB). Specifically, the mediating effect of usage intention between USE and

UB accounted for 18.52% of the total effect, between SN and UB accounted for 11.99%, and between BC and UB accounted for a substantial 25.40%. These findings not only confirm the central role of usage intention in facilitating the process of technology acceptance but also uncover the complex pathways through which different factors influence behavior via intention. As shown in Figure4.2.

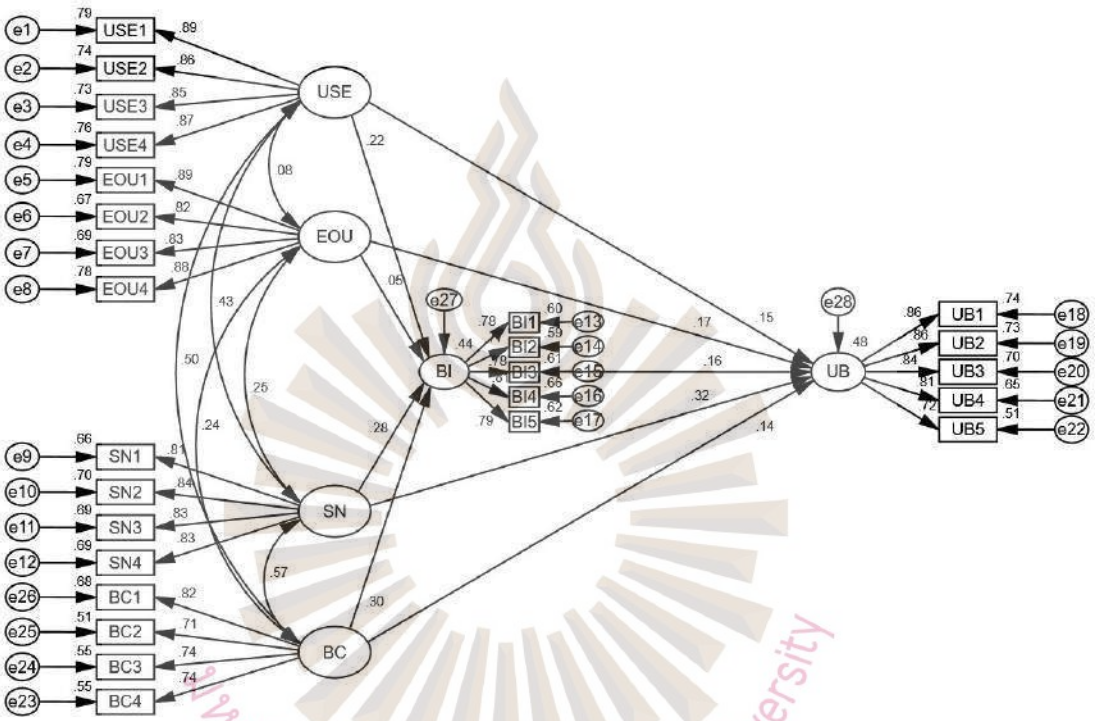

Figure 4.4 Hypothesis of structural model verification result diagram

In summary, the study conducted a thorough data analysis ofthe constructed structural equation model using AMOS 26 software, verifying multiple key hypotheses. Specifically, Perceived Usefulness (USE), Subjective Norms (SN), and Perceived Behavioral Control (BC) all had significant positive effects on the Usage Intention (BI) of the Technological, Pedagogical, and Content Knowledge (TPACK) model among instructors, with standardized coefficients of 0.22, 0.276, and 0.296, respectively, and statistical significance levels below 0.001. This result indicates that these factors play crucial roles in stimulating instructors' willingness to adopt new technologies. However, the impact of Perceived Ease of Use (EOU) on usageintentionwasnotsignificant,withastandardizedcoefficientof0.052andaP-

value of 0.238, suggesting that ease of use is not a decisive factor influencing instructors' adoption of TPACK in the context of this study. As shown in Table 4.21.

Table 4.20 Direct, Indirect, and Total Effects of the Relationship among Variables of H5-H8 Hypothesis Testing Results

Hypothesis			Std	S.E.	C.R.	Low er	Upp erP		Proportion of indirect effect	results
H5	UB←BI← USE	Total effects	0.189	0.062	3.048	0.077	0.320	0.001	18.52%	Accepted
		direct effects	0.153	0.066	2.318	0.033	0.289	0.013		
		Indirect effects	0.035	0.019	1.842	0.008	0.085	0.009		
H6	UB←BI←E OU	Total effects	0.181	0.044	4.114	0.096	0.267	0.001	4.42%	Accepted
		direct effects	0.173	0.043	4.023	0.085	0.259	0.001		
		Indirect effects	0.008	0.009	0.889	0.003	0.031	0.152		
H7	UB←BI←S N	Total effects	0.367	0.058	6.328	0.251	0.481	0.001	11.99%	Accepted
		direct effects	0.322	0.059	5.458	0.204	0.436	0.001		
		Indirect effects	0.044	0.022	2.000	0.01	0.09 6	0.01		
H8	UB←BI← BC	Total effects	0.189	0.066	2.864	0.059	0.313	0.005	25.40%	Accepted
		direct effects	0.141	0.065	2.169	0.016	0.272	0.029		
		Indirect effects	0.048	0.022	2.182	0.011	0.099	0.01		

4.3 Analysis of InterviewResults

In order to explore the current situation and improvement strategies of TPACKability among English instructors in universities in western China, ten English instructors from universities in western China were selected as interviewees. The aim is to reveal the actual situation of TPACK ability among English instructors in the region through their perspectives and experiences, including their practices, challenges, and needs in technology integration, teaching method innovation, and content knowledge deepening. Through in-depth interviews with these ten instructors, we can not only outline the overall TPACK ability of English instructors in western universities,butalsofurtherexplorethekeyfactorsthataffecttheirTPACKability

development, providing strong empirical support for proposing targeted improvement strategies in the future.

4.3.1 Characteristics of Demographic Variables ofInterviewees

The demographic variables of the 10 English instructors from universities in western China interviewed in this study showed gender balance, reasonable age structure, high educational background, rich work experience, and diverse professional titles. These characteristics provide a rich sample basis for in-depth research on the current status and improvement strategies of TPACK abilities of English instructors in universities in the region. As shown in Table 4.21.

Table 4.21 Characteristics of demographic variables of interviewees

No	Gender	Age	Educational Background	Working Experience	Position Rank
1	Male	41-50 years old	Master Degree	21 years or more	Associate Professor
2	Female	50 years old and over	Master Degree	21 years or more	Full Professor
3	Female	50 years old and over	Master Degree	21 years or more	Associate Professor
4	Male	41-50 years old	Master Degree	11-20 years	Associate Professor
5	Male	31-40 years old	Doctorate Degree	11-20 years	Assistant Professor
6	Male	50 years old and over	Bachelor Degree	21 years or more	Assistance
7	Female	31-40 years old	Master Degree	6-10 years	Assistance
8	Female	41-50 years old	Master Degree	11-20 years	Assistant Professor
9	Male	31-40 years old	Doctorate Degree	11-20 years	Lecturer
10	Female	31-40 years old	Master Degree	6-10 years	Lecturer

4.3.2 Role Evaluation of Technology in AchievingTeaching Objectives (Q6)

The interview results show that most instructors highly evaluate the role of technology in achieving teaching objectives. They generally believe that technology is not only a teaching aid, but also a key factor in promoting innovative teaching methods and improving teaching effectiveness. Through multimedia teaching and online interaction, technology can stimulate students' interest in learning, improve teaching efficiency, and promote the sharing of educational resources. This positive evaluation reflects the recognition and expectation of instructors for the integration of technology in teaching, and also indicates the important significance of technology in enhancing the TPACK ability of English instructors in universities. The following are responses from someinterviewees:

> "In my opinion, technology is not only a teaching aid, but also a key factor in promoting innovative teaching methods and adapting to the needs of the times. By utilizing modern technology, instructors can enrich their teaching methods, such as using multimedia teaching, online interaction, etc., to stimulate students' interest in learning and improve teaching effectiveness. At the same time, technology also promotes the sharing of educational resources, enabling high-quality teaching content to transcend geographical limitations and benefit more students. Therefore, I believe that technology has significant value in enhancing the teaching ability of English instructors in universities and achieving teaching goals." (Y. Chen, personal communication, July 30, 2024).

> "I believe that technology plays a significant role in achieving teaching objectives. By using modern teaching technology, teaching content can be presented more intuitively, which helps students understand and master knowledge points more clearly. At the same time, technology can alsoprovide standardized language demonstrations to help students correct pronunciation and improve oral proficiency. Most importantly, the application oftechnology

can effectively shorten the time required to achieve teaching objectives and improve teaching efficiency. Overall, technology provides strong support for English teaching, making the teaching process more efficient and vivid." (Y. Peng, personal communication, July 29, 2024).

"I think the role of technology in helping achieve teaching goals is enormous. It can improve teaching efficiency and make the classroom more lively and interesting. The introduction of technology not only allows students to understand knowledge more intuitively, but also enhances instructor-student interaction, thereby helping to better achieve teaching goals." (C. Wu, personal communication, July 26, 2024).

"I believe that technology has played an important role in helping me achieve my teaching goals, making my main teaching work easier. By utilizing multimedia teaching tools and online learning platforms, I can prepare and organize teaching content more efficiently, enrich classroom presentation formats, and stimulate students' learning interests." (Y. Zuo, personal communication, July 31, 2024).

"Technology has indeed played a certain role in helping me achieve my teaching goals, such as making my teaching classroom more vivid and providing a variety of forms to achieve my teaching objectives." (C. Yu, personal communication, July 28, 2024).

4.3.3 Self-Perception of Difficulty in Learning New Technologies(Q7)

There are differences in opinions among the interviewees regarding the difficulty of learning and mastering new teaching technologies. Some instructors believe that learning new technologies is challenging, especially for those who come from nontechnical backgrounds and require additional time and effort. They pointed out that rapid technological updates require instructors to constantly learn to adapt to changes. However, some instructors believe that mastering new technologies is not

difficult through the accumulation of basic knowledge and practical experience. This difference reflects the diversity of instructors' adaptability to new technologies and learning strategies. The following are responses from some interviewees:

> “I think learning and mastering new teaching technologies is somewhat difficult because it involves various technical issues. With the rapid development of technology, new teaching technologies emerge one after another, and each technology has its own unique learning curve. For instructors with non-technical backgrounds, understanding and mastering these technologies requires additional time and effort. In addition, effectively integrating new technologies into teaching practice and achieving a perfect combination of technology and teaching content is also a challenge. Nevertheless, I am still willing to continue learning to adapt to the changes in the field of education.” (X. Zhao, personal communication, July 27, 2024).

> “I think it's quite difficult to learn and master new teaching techniques. Computer technology is advancing rapidly, and new teaching tools and methods are constantly emerging. Whenever I just become familiar with and master a new technology, updated technology has already emerged. Thisrapid technological update requires me to constantly learn in order to keep up with the pace of the times. Therefore, I feel that there is a certain pressure and challenge in learning new teaching techniques.” (L. Cai, personal communication, July 27,2024).

> “I have a certain foundation in mathematics, which makes me more adept at understanding and applying new technologies. Therefore, I believe that learning and mastering new teaching techniques is not difficult.” (J. Lv, personal communication, July 26, 2024).

> “I think there are indeed some difficulties in the early stages of learning new teaching technologies. This is mainly because in the initial stage, instructors needto invest a certain amount of time and energy to deeply study and

understand the application of these technologies. However, once instructors master these technologies proficiently, they will greatly improve teaching efficiency. Therefore, in my opinion, although learning new technologies in the early stage is somewhat difficult, in the long run, it is a very worthwhile investment." (Y. Zuo, personal communication, July 31, 2024).

"Learning and mastering new teaching techniques is quite difficult for me because it requires systematic learning support and practical opportunities, but I lack systematic training and practical guidance." (W. Zhang,personal communication, July 28,2024).

"I think it depends on the complexity of the specific technology and personal foundation. For some intuitive and easy-to-use technologies that integrate well with existing teaching processes, learning and applying them may be relatively easy. However, for those new technologies with complex functions and cumbersome operations, it may require more time and effort to master. Therefore, it cannot be generalized, and specific situations need to be analyzed." (C. Yu, personal communication, July 28,2024).

4.3.4 Attitude Feedback and Its Impact on the Surrounding Environment (Q8&Q9)

In interviews, instructors generally mentioned that the attitudes of people around them (such as colleagues, school leaders, and students) towards technology teaching have a significant impact on their decisions to use technology. A positive attitude of encouragement and support can enhance instructors' confidence and determination to use technology, while a negative or neutral attitude may weaken instructors' motivation. Instructors say that recognition from colleagues, support from school leaders, and positive feedback from students are important driving forces for them to continue exploring and applying new technologies. Therefore, creating an environment that supports technological teaching is crucial for enhancing instructors' TPACK abilities.

The following are responses from some interviewees:

“The people around me have a positive and encouraging attitude towards using technology in teaching. They believe that the application of technology in teaching is very beneficial and necessary, and have given full recognition and support to my technology teaching practice.” (C. Wu, personal communication, July 26, 2024).

“It is widely believed that the integration of technology in teaching is an innovation that has a significant driving effect on improving the quality of education. Therefore, my use of technology in teaching has been widely recognized and supported.” (Y. Chen, personal communication, July 30, 2024).

“Around me, there hasn't been much discussion about using technology for teaching. Perhaps because people are more focused on daily teaching tasks and students' academic performance, there is relatively less exploration of teaching technology.” (X. Zhao, personal communication, July 27, 2024).

“The positive attitude of people around me towards my use of technology in teaching has greatly inspired me to delve deeper into researching and applying advanced technologies in teaching. I feel the support and expectations from colleagues, school leaders, and students, which has become a powerful driving force for me to continuously explore and innovate teaching methods.” (L. Cai, personal communication, July 27,2024).

“The attitudes of those around me have indeed had a certain impact on my decision to use technology in teaching. When colleagues, school leaders, and students all show a positive attitude towards technology teaching, it enhances my confidence and determination to adopt technology assisted teaching.” (Y. Peng, personal communication, July 29, 2024).

"When deciding whether to use technology for teaching, I pay more attention to the teaching value and practicality of the technology itself, rather than just being influenced by others' attitudes. If a technology can effectively improve the quality of teaching, enhance students' interest and ability to learn, I will actively adopt it." (Y. Zuo, personal communication, July 31, 2024).

"When I feel the support and encouragement from colleagues, school leaders, and students, it gives me more confidence and motivation to explore and apply new teaching technologies. This positive feedback not only strengthens my determination to integrate technology into teaching, but also provides me with the motivation to constantly try and improve teaching methods." (W. Zhang, personal communication, July 28,2024).

4.3.5 Assessment of Self Technical Mastery Ability(Q10)

There are differences in instructors' cognitive abilities in assessing their own technical mastery. Some instructors believe that their performance in technology application is average and they find it difficult to face emerging technologies; However, some instructors believe that they have strong abilities in this area and can proficiently master various teaching techniques. This difference may be related to factors such as personal learning background, practical experience, and the speed of technological updates. Overall, instructors generally recognize the potential for improvement in their technical proficiency and express a desire to continuously enhance their technical abilities through learning and practice. The following are responses from some interviewees:

"I think my ability in this area is average. Although I am able to operate some commonly used teaching technology tools, I find it difficult to deal with emerging technologies or more advanced technology applications." (C. Yu, personal communication, July 28, 2024).

"I think I have strong abilities in this area. Through continuous learning and practice, I have become proficient in various teaching techniques and can flexibly apply them to classroom teaching." (Y. Chen,personal communication, July 30, 2024).

"At present, I have relatively few teaching techniques and methods, but I believe that as long as I invest enough time and energy in in-depth learning and practice, I can quickly master the required teaching techniques." (Y. Peng, personal communication, July 29, 2024).

"I think I still lack the ability to master the techniques required for teaching." (L. Cai, personal communication, July 27, 2024).

4.3.6 Identification of external limiting factors (Q11)

The interviewees pointed out that various external factors have limited their ability to use technology in teaching. These factors include the complexity of machinery and equipment, lack of relevant training, tight teaching time, heavy workload, insufficient economic investment, and lack of motivation and support. Especially in resource limited western regions, the cost of hardware and software may become a major burden for instructors to use technology. In addition, the lack of support from leaders and the scarcity of technical resources also limit instructors' ability to effectively use technology in teaching. The following are responses from some interviewees:

"I think the complexity of machine equipment and whether schools organize relevant training are the main external factors that limit my use of technology in teaching. On the one hand, modern teaching technology involves complex operation of machine equipment, which requires certain learning and practice to master proficiently. On the other hand, whether schools regularly organize technical training also directly affects whether I can timely understand and

master these technologies." (L. Zhang, personal communication, July 30, 2024).

"I think it is a challenge to fully prepare and apply technology for teaching within a tight teaching schedule. At the same time, the heavy teaching workload also makes it difficult for me to allocate enough time for in-depth learning and application of new technologies. In addition, the large number of students makes personalized teaching and interaction difficult, which also limits my possibility of using technology for refined teaching." (Y. Peng, personal communication, July 29, 2024).

"The cost of related hardware and software is an important external factor that limits my use of technology in teaching. Due to the continuous updating of teaching technology, instructors need to constantly purchase or upgrade hardware and software to keep up with the times, but these require a certain amount of economic investment. Especially in resource limited western regions, these costs may become a major burden for instructors to use technology in teaching." (Y. Chen, personal communication, July 30, 2024).

"Many factors can affect my ability to use technology in teaching. Among them, the lack of advanced teaching equipment is a major problem, which affects teaching efficiency and effectiveness. In addition, the inability of computers to connect to the internet also limits the access and sharing of teaching resources, resulting in limited teaching content. More importantly, the lack of support from leaders makes it difficult for me to obtain necessary help and resources in teaching." (X. Zhao, personal communication, July 27, 2024).

"The lack of motivation and guidance is the main external factor limiting my use of technology in teaching. Although I understand the importance of technology in teaching, it is difficult for me to sustain my efforts to learn and

apply new technologies due to a lack of sufficient motivation and support. At the same time, there is no professional guidance and training to help me better master teaching techniques." (J. Lv, personal communication, July 26, 2024).

"Faced with a massive amount of learning resources, how to screen and delete the best and most suitable teaching content is an important challenge. With the increasing abundance of online resources, instructors need to spend a lot of time and energy evaluating, selecting, and integrating various teaching resources. This not only requires instructors to have high information literacy, but also requires them to have the ability to judge which resources are more in line with teaching goals and which resources can better stimulate students' interest in learning. This problem limits instructors' ability to effectively use technology in teaching, because they need to first solve the problem of resource screening before further utilizing technology to optimize teaching." (C. Wu, personal communication, July 26, 2024).

4.3.7 Potential Motivation for Increasing Willingness to Use Technology (Q12)

Instructors have proposed various potential motivations for increasing the willingness to use technology in teaching. These motivations include personal preferences for teaching and research, policy and regulatory requirements, school encouragement and support, significant improvement in student performance, easy-to-use learning demonstration resources, and active student cooperation. These factors collectively affect the inner needs and external environment of instructors, inspiring their willingness to increase their use of technology. Especially when students' academic performance significantly improves and schools provide high-quality teaching equipment, instructors' enthusiasm will be greatly enhanced. The following are responses from some interviewees:

“My personal preference for teaching and research is the main factor that drives me to increase my willingness to use technology in teaching. The effective use of technology can enhance teaching effectiveness, make classrooms livelier and more interesting, and also provide more possibilities and convenience for my research work. This personal teaching and research preference drives me to be more willing to try and adopt new technologies to explore more efficient and interesting teaching methods, thereby providing students with a better learning experience.” (Y. Chen, personal communication, July 30, 2024).

“I think the requirements of policies and regulations are an important factor that drives me to increase the use of technology in teaching. When education policies or school regulations require the use of technology in teaching, I tend to integrate technology into the classroom. In addition, participating in competitions is also a motivation for me to use technology, as it can encourage me to explore and try more innovative teaching methods to improve teaching effectiveness.” (C. Yu, personal communication, July 28, 2024).

“The universities' encouragement, possession of high-quality teaching equipment, and significant improvement in student performance are key factors that have prompted me to increase my willingness to use technology in teaching. The school's encouragement provides motivation and support for instructors to try new technologies in teaching, while advanced teaching equipment provides the necessary hardware foundation for practical teaching. Most importantly, when the use of technology can significantly improve students' grades, it not only verifies the effectiveness of teaching methods, but also greatly stimulates instructors' enthusiasm to continue exploring and applying technology. Therefore, these factors work together to make instructors more willing to use technological means in teaching.” (Y. Zuo, personal communication, July 31,2024).

“If there were easy to understand and user-friendly learning demonstration resources, I would be more willing to increase the use of technology in teaching. Such resources can lower the threshold for technology application, help instructors master new technologies faster, and better integrate them into classroom teaching. The ease of use and practicality of learning demonstration resources are crucial for enhancing instructors' enthusiasm for using technology in teaching, as they can provide intuitive guidance, enabling instructors to quickly understand and apply new technologies, thereby improving teaching effectiveness.” (L. Cai, personal communication, July 27,2024).

“The degree of cooperation from students and the support from school policies are key factors that encourage me to increase my willingness to use technology in teaching. Students' active participation and cooperation can give instructors more confidence and motivation to explore and apply new teaching technologies, thereby improving teaching effectiveness. At the same time, if schools can provide more policy support and resource investment, such as technical training, equipment updates, etc., then instructors will have more confidence and conditions to apply technology, further innovate teaching methods, and improve teaching quality.” (W. Zhang, personal communication, July 28,2024).

“The demand of students for courses and the overall development of the school are important factors that have prompted me to increase my willingness to use technology in teaching. With the progress of the times, students' demands for course content and teaching methods are becoming increasingly diverse, which requires instructors to constantly update teaching methods to meet students' expectations. At the same time, as the overall development level of the school improves, there will be more resources and platforms available for instructors to utilize, which also provides more opportunities for instructors to integrate technology into teaching.” (C. Wu, personal communication, July 26,2024).

4.3.8 Factors That Promote and Hinder the Use of Technology in Actual Teaching (Q13)

In practical teaching, the use of technology is promoted or hindered by various factors. Promoting factors include the availability of new technology training, ease of use of teaching equipment, students' acceptance of new technologies, and support from school policies. These factors provide favorable conditions for instructors to use technology in teaching. However, obstacles cannot be ignored, such as lack of technical proficiency, poor equipment performance, unstable networks, and low integration of teaching content and technology. These factors limit the effective application of technology in teaching and require the attention and resolution of education departments and schools. The following are responses from some interviewees:

> "The availability of new technology training and the ease of use of teaching equipment are important factors that affect my use of technology in actual teaching. If there is regular new technology training, I will be able to master and apply new technologies more proficiently, thereby improving teaching effectiveness. On the contrary, if there is a lack of such training, I may feel insecure when using new technologies. Similarly, if teaching equipment is user-friendly and easy to use, I will be more willing to use technology in teaching; conversely, equipment issues may become obstacles to using technology." (L. Cai, personal communication, July 27, 2024).

> "In actual teaching, I have found that some learning content actually does not require too much technical assistance. This may be because some traditional teaching methods are more intuitive and effective for specific content, or technology is not the best way to present these contents. Therefore, in these cases, the use of technology may be hindered to a certain extent." (Y. Peng, personal communication, July 29, 2024).

“I believe that my lack of proficiency in technology is a key factor hindering my ability to use it in practical teaching. Without sufficient technical proficiency, I may encounter operational difficulties when using new technologies.” (C. Yu, personal communication, July 28, 2024).

“I think the use of technology in actual teaching is influenced by various factors, including the device itself, network speed, and content. The quality and ease of use of the device directly affect the teaching experience of instructors. If the device performance is poor or the operation is complex, it will reduce the enthusiasm of instructors to use technology. At the same time, a stable network environment is also a key factor to ensure smooth teaching. Slow or unstable network speed can seriously affect the effectiveness of online teaching. In addition, the degree of integration between teaching content and technology can also affect the use of technology. If the content and technology can be closely integrated, it can better play the role of technology in assisting teaching.” (Y. Chen, personal communication, July 30,2024).

“I believe that students' attitudes are important factors in promoting their use of technology in practical teaching. Students' positive attitudes and acceptance of new technologies can encourage instructors to apply teaching technologies more widely, thereby enhancing classroom interaction and teaching effectiveness. On the contrary, if students hold negative or resistant attitudes towards new technologies, it may make instructors hesitant about introducing technology in teaching, thereby limiting the use of technology.” (C. Wu, personal communication, July 26, 2024).

In summary, through qualitative analysis of the interviewees, we have gained a deeper understanding of the current situation and challenges of technology integrated teaching among English instructors in universities in western China. To enhance the TPACK ability of instructors, it is necessary to comprehensively consider multiple factors, including strengthening instructor training, optimizing teachingequipment,

improving policy support, and creating a favorable technical teaching environment. These measures will provide stronger support and guarantee for instructors, promoting the widespread application and deep integration of technology in teaching.

CHAPTER 5

DISCUSSIONS AND CONCLUSION

In this chapter, this paper discusses the findings of the study, and gives some suggestions.

Summary of the findings:

Perceived usefulness (USE): Assuming H1 is validated, that is, perceived usefulness has a significant positive impact on instructors' intention to use TPACK (Std=0.22, P<0.001). This suggests that when instructors believe that using TPACK can bring significant teaching improvements, they are more likely to have the intention to useTPACK.

Subjective Norms (SN): Assuming H3 is validated, subjective norms have a significant positive impact on instructors' intention to use TPACK (Std=0.276, P<0.001). This reflects the enhancing effect of positive attitudes and support from colleagues, school leaders, and students on instructors' intention to use TPACK.

Perceived Behavioral Control (BC): Assuming H4 is validated, perceived behavioral control also has a significant positive impact on TPACK usage intention (Std=0.296, P<0.001). This suggests that when instructors believe they have the ability to overcome obstacles in using TPACK, they are more likely to generate usage intention.

Perceived ease of use (EOU): Assuming H2 is not supported, the impact of perceived ease of use on TPACK usage intention is not significant (Std=0.052, P=0.238). This result suggests that although ease of use is an important factor, it may

not be the determining factor in whether instructors are willing to use TPACK, especially when the instructor population generally has a certain level of technical foundation.

Mediating effect: In hypotheses H5 to H8, we further validated the mediating effect of TPACK usage intention between multiple independent variables (USE, EOU, SN, BC) and usage behavior (UB). The results indicate that usage intention plays a significant mediating role in most cases, especially in the influence of perceived usefulness (USE) and subjective norm (SN) on usage behavior, with mediating effects reaching 18.52% and 11.99%, respectively. This emphasizes the crucial role of using intention in promoting behavioral change.

5.1 Discussion

This study conducted a comprehensive and in-depth exploration of the TPACK (Technological Pedagogical Content Knowledge) ability of English instructors in universities in western China through a combination of quantitative analysis and qualitative interviews. Ultimately, out of eight hypotheses, seven were confirmed, only the second hypothesis wasnot.

H1: Perceived usefulness has a positive impact on instructors' TPACK using intention, was confirmed.

H2: Perceived Ease of Use has positive impact on instructors' TPACK using intention, was not confirmed.

H3: Subjective norms have a positive impact on instructors' intention to use TPACK, wasconfirmed.

H4: Perceived behavioral control has a positive impact on instructors' TPACK using intention, was confirmed.

H5: Instructors' TPACK usage intention has a mediating effect between perceived usefulness and TPACK using behavior, was confirmed.

H6: Instructors' TPACK usage intention has a mediating effect between perceived ease of use and TPACK using behavior, was confirmed.

H7: Instructors' TPACK usage intention has a mediating effect between subjective norms and TPACK using behavior, was confirmed.

H8: Instructors' TPACK using intention has mediating effect between perceived behavior control and TPACK using behavior, wasconfirmed.

This finding aligns with the research outcomes of multiple scholars, further substantiating the significance of perceived usefulness in technology acceptance and application. Mishra and Koehler (2006) pointed out in their study that the TPACK (Technological Pedagogical Content Knowledge) framework aims to identify and describe the types of knowledge teachers need when integrating technology into teaching. They argued that when teachers recognize the potential of technology integration to enhance teaching effectiveness, they are more motivated to grasp and apply TPACK. This viewpoint directly supports the results of the hypothesis testing, namely, that perceived usefulness is a crucial driver for teachers' use of TPACK. Scherer et al. (2019), through a meta-analysis of the TPACK acceptance model, found that perceived usefulness is an important predictor of teachers' adoption of digital technologies in teaching. Their research indicates that when teachers believe a certain technology is useful for improving teaching quality, they are more inclined to use it in the classroom. This finding is highly consistent with the hypothesis testing results of this paper, further reinforcing the positive impact of perceived usefulness on TPACK usage intention. Ertmer et al. (2012) noted in their study that teachers' perceived usefulness of technology integration significantly influences their practice of technology integration. They believed that when teachers see technology integration as a solution to teaching problems or an improvement in teaching practice, they are more likely to actively adopt these technologies. This aligns with the positive impact of perceived usefulness on TPACK usage intention observed in the hypothesis testing, emphasizing the central role of teachers' perceived usefulness of technology in their technology acceptance process. Although the study by Teo et al. (2019) directly focused on the acceptance of Web 2.0 technologies, their conclusions are also applicable to the TPACK framework. They found that perceived usefulness is one of the main factors determining teachers' acceptance and use of new technologies, which echoesthehypothesistestingresultsofthispaperandonceagainunderscoresthe

crucial role of perceived usefulness in driving teachers to adopt new technologies, including TPACK. In summary, perceived usefulness has a significant positive impact on teachers' intention to use TPACK, and this conclusion is supported by multiple scholars. From Mishra and Koehler's (2006) description of the TPACK framework to Scherer, Siddiq, and Tondeur (2019) meta-analysis results, and further to the specific empirical studies by Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, E., and Sendurur, P. (2012) and Teo, Sang, Mei, and Hoi (2019), all indicate that perceived usefulness is an integral part of the technology acceptance model, playing a vital role in promoting teachers' adoption and application of newtechnologies.

Ajzen (1991) explicitly pointed out the significant influence of Subjective Norms (SN) on behavioral intention in his Theory of Planned Behavior (TPB). Subjective Norms refer to an individual's perception of the expectations of others or groups that have influence over their behavioral decisions. This normative pressure is also applicable in the adoption and use of educational technology. When teachers feel positive support and expectations from colleagues, school leaders, and students, they are more likely to adopt new technologies, such as the teaching practices advocated by the TPACK framework. Furthermore, multiple scholars have emphasized the importance of a supportive culture for technology adoption. For instance, Teo et al. (2019) found in their study that support from organizations or communities has a significant impact on teachers' willingness to use technology. This support is not only reflected in the provision of resources but also includes emotional encouragement and positive evaluations of new technologies.

Therefore, when teachers feel supported by school leaders and colleagues in practicing TPACK, their willingness to use it significantly increases (Teo et al., 2019). Venkatesh, Morris, Davis, G., and Davis, F. (2003) also mentioned the importance of social influence (i.e., Subjective Norms) on technology acceptance in theirUnifiedTheoryofAcceptanceandUseofTechnology (UTAUT).Theypointedout that individuals are often influenced by the expectations and behavioral patterns of those around them (such as colleagues and students) when using new technologies. In the field of education, this influence is particularly significant because teachers, as knowledge transmitters, have a profound impact on students' behaviorsand attitudes.

Therefore, when teachers perceive that their colleagues and students expect them to adopt new technologies, they are more motivated to learn and implement the TPACK framework (Venkatesh et al., 2003). Multiple empirical studies also support the influence of Subjective Norms on teachers' use of TPACK. For example, Hatlevik, Throndsen, Loi, and Gudmundsdottir (2018) found in their study of Icelandic students that teachers' selfefficacy in information technology and their computer and information literacy were influenced by peer and student support, which indirectly enhanced their willingness to adopt new technologies. Similarly, these supportive factors also played a positiveroleintheadoptionprocessofTPACK (Hatleviketal.,2018).

Ajzen's (1991) TPB model provides a theoretical foundation for understanding the intention to use TPACK. TPACK involves the integration of technological, pedagogical, and content knowledge, and its implementation process may be influenced by various internal and external factors. Perceived Behavioral Control (BC), as an individual'sassessmentoftheirabilitytoexecuteTPACK,directlyaffectstheirintention to use it. When teachers believe they have the adequate ability to overcome various obstaclesencounteredintheprocessofintegratingTPACK,theyaremorelikelytoform an intention to use TPACK. Venkatesh et al. (2003) also emphasized the influence of ease of use on behavioral intention in the Unified Theory of Acceptance and Use of Technology (UTAUT), which echoes the concept of BC inTPB.

In the integration process of TPACK, if technological tools are easy to use, teachers are more likely to believe that they can successfully integrate and form an intention to use. Cheng (2019) pointed out in their comparison of TPB and TAM that although both models focus on users' perceptions and behavioral intentions, TPB provides a more in-depth explanation of complex behavioral intentions by introducing the BC construct. In the context of TPACK usage, teachers not only need to perceive the usefulness of TPACK but also believe that they can overcome obstacles related to technology, pedagogy, or content during the implementation process. This belief, known as PBC, significantly influences the intention to use TPACK. Habibi, Razak, Yusop, Mukminin,and Yaqin (2020) found in their study on the integration of ICT by pre-service teachers in teaching practice in Indonesian universities that BC has a significant impact on the

actual use of TPACK. This finding supports the important role of BC in the intention to use TPACK, indicating that when teachers believe they have the ability to successfully integrate TPACK, they are more likely to put it intopractice.

In summary, Perceived Behavioral Control, as a core construct in the Theory of Planned Behavior, has a significant positive impact on the intention to use TPACK. When teachers believe they can overcome various obstacles encountered in the process of integrating TPACK, they are more likely to form an intention to use TPACK. This viewpointhasbeenverifiedandsupportedbytheresearchofmultiplescholars.

Zheng and Li (2020) pointed out in their research that Perceived Usefulness (PU) in the technology acceptance model is one of the important factors for predicting technology acceptance intention. Similarly, Jang, Ko, Shin,andHan (2021) also mentioned in their research on AR and VR technologies that perceived usefulness (referred to as performance expectancy in their study) directly influences usage intention, which further affects actual usage behavior. Subjective Norm (SN), as a social influence factor, indirectly affects usage behavior through usage intention. Venkatesh et al. (2003) explicitly stated in the UTAUT model that Subjective Norm (SN) is one of the important factors influencing behavioral intention. Similarly, in the study by Rahimi and Tafazoli (2022), the significant influence of subjective norm on usage intention, which further affects university teachers' actual usage attitude towards ICT, was alsoverified.

Perceived Ease of Use (EOU) also plays a crucial role in promoting technology acceptance, but its impact on usage behavior is partially mediated through usageintention. Yang, Wang, Q., Wang, J., Huang, and Ma(2021), in their study on K-12 teachers' technology acceptance of e- Schoolbag, found that perceived ease of use not only directly affects perceived usefulness but also indirectly promotes usage behavior by influencing usage intention. Perceived Behavioral Control (BC) is a key variable in the TPB model, representing an individual's perception of the ease or difficulty of performing a certain behavior. According to theresearch by Foulger, Buss, and Su(2021), behavioral control has a significant impact on the actual behavior of integrating technology into teaching by influencing usage intention. This findingechoesthediscoverybyVenkateshetal.(2003)intheUTAUTmodel,where

facilitating conditions, as a similar concept to behavioral control, also showed an indirectinfluence on usage behavior by affecting intention.

In summary, usage intention plays a significant mediating role in the influence of multiple independent variables (such as perceived usefulness, subjective norm, perceived ease of use, and behavioral control) on usage behavior. This finding is not only consistent with classic theories such as TPB and UTAUT but also supported by empirical research conducted by multiple scholars (Li et al., 2016; Jang et al., 2021; Venkatesh et al., 2003; Yang et al., 2019; Foulger et al., 2021). Therefore, when promoting the application of technology in teaching, emphasizingthe enhancement of teachers' or users' usage intention is key to promoting behavioral change and achieving effective technologyintegration.

In this study, Hypothesis H2 was not confirmed.

Herzberg's two factor theory (Herzberg et al., 1959) states that improvements in health factors such as work environment, company policies, supervision and management, interpersonal relationships, wages, and benefits can alleviate employee dissatisfaction, but cannot directly increase employee satisfaction or work enthusiasm. In this study, perceived ease of use (EOU) can be considered as a healthcare factor. It is related to the ease of operation of technical tools or platforms, and is a basic requirement that users feel during the use process. According to the research results, although the direct impact of perceived usability on TPACK usage intention is not significant, it does not mean that usability is not important. On the contrary, usability, as a health factor, has a limited further motivating effect on users after reaching a certain level. For English instructors in universities in western China, they generally have a certain technical foundation, so the ease of use of technical tools may no longer be a key factor in deciding whether to use TPACK. They may be more concerned with deeper issues such as whether technological tools can bring actual improvements in teaching effectiveness and whether they meet teaching needs.

5.2 Limitations

Despite the efforts made in sample selection, data collection, and analysis in this study, there are still some limitations that cannot be ignored, which may affect the comprehensiveness and universality of the research results. To enhance the generalizability of the research, future studies may consider including instructor samples from a wider range of regions to ensure the broad applicability of the results. In addition, some potential interactions and regulatory effects may have been overlooked during the data analysis process, resulting in incomplete research results. To overcome these limitations, future research can adopt more complex and refined data analysis methods, such as multilevel analysis, structural equation modeling, etc., to more comprehensively reveal the relationships and mechanisms between various factors.

5.3 Recommendations

Based on the above research conclusions, this study proposes specific strategic suggestions from multiple aspects such as systematic training, optimization of teaching resources, policy support, communication and cooperation, in order to effectively promote the development of TPACK ability of English instructors in westernChina.

5.3.1 Strengthen Systematic Training and ContinuousSupport

In order to enhance instructors' TPACK abilities, comprehensive and in-depth training courses must be provided. These courses should cover the principles, application methods, and specific teaching cases of new technologies to ensure that instructors can comprehensively understand and proficiently master them. At the same time, establish a dedicated technical support team and online learning community to provide instructors with instant technical support and learning exchange platforms, forming a comprehensive and multi-level instructor development support system.

5.3.2 Optimize Teaching Resources and TechnologicalEnvironment

Increase investment in teaching resources, introduce advanced teaching software and hardware equipment, and provide instructors with a strong material foundation. At the same time, establish a sound technical support system to ensure that instructors can receive timely and professional assistance and guidance when using new technologies. This can not only relieve instructors' worries about technical operations, but also improve their teaching efficiency andeffectiveness.

5.3.3 Implement Policy Incentives andSupport

Develop incentive policies, such as setting up special funds, providing incentives and other economic support measures, to encourage instructors to actively apply new technologies in teaching practice. At the same time, university leaders should clearly express their recognition and support for new technologies, formulate relevant policies, provide necessary resources and financial guarantees, and create a favorable environment for instructors to teach technology.

5.3.4 Promote Communication andCooperation

Organize collective lesson preparation, teaching observation and other activities, and build a platform for instructors to communicate and learn. Through inter school cooperation and communication, advanced teaching concepts and methods are introduced to provide instructors with a broader perspective and diversified learning resources. These exchanges and collaborations not only facilitate mutual learning and progress among instructors, but also stimulate their innovative thinking and practicalabilities.

5.3.5 Inspire Instructors' Intrinsic Motivation andSelf-Efficacy

By setting clear learning goals and reward mechanisms, instructors' interest and motivation in learning can be stimulated. At the same time, helping instructors

develop personalized career development plans to enhance their sense of professional identity and achievement. These measures can significantly enhance instructors' intrinsic motivation and confidence, driving them to continuously improve their TPACK abilities to meet the development needs of educational informatization.

5.3.6 Establish a Scientifically Reasonable EvaluationSystem

Build a diversified evaluation system to comprehensively and objectively evaluate the application effectiveness of instructors in technology teaching. The system should cover multiple dimensions such as the basic abilities of instructors in technology application, teaching innovation, and student participation. Through timely and specific feedback mechanisms, help instructors clarify their strengths and weaknesses in teaching and provide improvement suggestions and resource support. This will help instructors continuously accumulate experience, optimize teaching methods, and enhance their TPACKabilities.

5.4 Future Research andSuggestions

In view of the above limitations, the following are some directions and suggestions that can be considered for futureresearch:

5.4.1 Expand the Scope ofResearch

Future research should aim to expand the sample size to cover English instructors from different regions and types of universities. By collecting sample data nationwide or even globally, it is possible to more comprehensively and objectively reflect the current status and influencing factors of TPACK ability among English instructors in universities. This cross regional and cross type comparative research not only helps to discover differences and similarities between instructors from different regions and types, but also provides strong support for developing more targeted improvement strategies.

5.4.2 Optimize QuestionnaireDesign

In order to reduce subjectivity and bias in questionnaire design, future research can further optimize questionnaire design. Specifically, more objective and quantitative evaluation criteria can be used to measure instructors' TPACK ability; At the same time, strengthen the reliability and validity testing of the questionnaire to ensure that the collected data has high reliability and effectiveness. In addition, it is also possible to consider introducing multiple data sources and evaluation methods (such as observation records, teaching videos, etc.) to form a multi angle and multi-dimensional evaluation system.

5.4.3 Increase the Depth and Breadth of QualitativeInterviews

Qualitative interviews provide an important supplement to understanding instructors' actual experiences and challenges. Future research can increase the sample size of interviews and expand the distribution range of background characteristics of interviewees (such as age, professional title, work experience, etc.), in order to deeply explore the underlying reasons and mechanisms that affect the development of instructors' TPACK abilities. At the same time, strengthen the coding and analysis of interview data (such as using thematic analysis, content analysis, etc.) to extract more detailed and in-depth information points. In addition, it is also possible to consider introducing various qualitative research methods (such as case studies, ethnographic research, etc.) to form a more diverse and three-dimensional research perspective.

5.4.4 Apply Advanced TechnologicalMeans

With the rapid development and widespread application of information technology and AI, future research can consider introducing more advanced technological means to evaluate and enhance instructors' TPACK abilities. For example, big data analysis technology can be used to mine valuable information from massive educational data; Using artificial intelligence technology to simulate and optimize the teaching process; Utilize virtual reality (VR) and augmented reality (AR)

technologies to create more realistic and immersive teaching environments. The application of these technological means not only helps to improve the accuracy and efficiency of evaluation, but also provides instructors with more personalized and precise teaching support and development suggestions.

5.4.5 Pay Attention to Instructors' ProfessionalDevelopment

In addition to focusing on the impact of external factors on instructors' TPACK abilities, future research should also pay more attention to the intrinsic motivation and mechanisms in instructors' personal growth and professional development processes. For example, we can explore how factors such as instructors' self-efficacy, learning motivation, and professional identity affect the development of their TPACK ability; Research on how to stimulate instructors' enthusiasm and creativity by providing personalized career development paths and resource support; Explore how to promote knowledge sharing and experience exchange among instructors by establishing learning communities and collaborative networks. These studies will contribute to a more comprehensive understanding of the developmental patterns of instructors' TPACK abilities and provide scientific basis for developing more effective and sustainable improvementstrategies.

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APPENDICES

APPENDIX A

QUESTIONNAIE

Questionnaire

This questionnaire contains 2 parts:

Part 1: Respondent's demographic information

Part 2: 48 items of "A Study on the Factors Influencing TPACK Using Behavior of University English Instructors in Western China: Based on the Model of TAM-TPB". Your answers are valuable in terms of understanding the overall picture and situations pertaining this topic. Accordingly, the researcher would like to show greatappreciation and gratitude for your valuable time in answering thisquestionnaire.

Part 1: Demographic Information

1. Gender
   - ○ Male
   - ○ Female

2. Age
   - ○ 20-30 yearsold
   - ○ 31-40 yearsold
   - ○ 41-50 yearsold
   - ○ 50 years old andover

3. EducationalBackground
   - ○ BachelorDegree
   - ○ MasterDegree
   - ○ DoctorateDegree

4. WorkingExperience
   - ○ 1-5 years
   - ○ 6-10 years
   - ○ 11-20years
   - ○ 21 years ormore

5. PositionalRank
   - ○ Assistance
   - ○ Lecturer
   - ○ AssistanceProfessor
   - ○ AssociateProfessor
   - ○ Fullprofessor

Part2: A Study on the Factors Influencing TPACK Using Behavior of University English Instructors in Western China: Based on the Model of TAM-TPB

please answer the following question by ticking √ in the blank which are given according to the disagree to which you agree as follows:

1=strongly disagree
2=disagree
3=neither agree or disagree
4=agree
5=strongly agree

Technology Knowledge (TECH-K)	strongly	disagree	neutral	agree	strongly
1. I can learn technology easily.					
2. I have the technical skills I need to use technology.					
3 I have had sufficient opportunities to work with different technologies.					
4. l frequently play around with the technology.					
5.I know about a lot of different technologies.					
6. I keep up with important new technologies.					
7. I know how to solve my own technical problems when using IT.					
Content Knowledge of Teaching English (CK-TE)					
8. I have sufficient knowledge in teaching English to my students.					

Technology Knowledge (TECH-K)	strongly	disagree	neutral	agree	strongly
9. I put theories into practice when I teach my English courses.					
10. I know the basic theories and concepts in teaching English.					
11. I have various ways and strategies in teaching English.					
12. I am familiar with recent research in teaching English					
Teaching Knowledge in Teaching English (TK-TE)					
13. I know how to select effective teaching approaches to guide my students' thinking and learning in my teaching English.					
14. I know how to develop appropriate tasks to promote students complex thinking of my teaching English.					
15. I know how to develop appropriate English lesson tools to promote students complex thinking of my teaching English.					
16. I know how to develop exercises in that students can consolidate their knowledge of my teaching English.					
17. I know how to develop exercises in that students can combine their skills of my teaching English.					
18. I know how to evaluate students' performance in my teaching English.					
Pedagogical Knowledge in Teaching English (PK-TE)					
19. I know how to assess my student performance in my English classes.					
20. I can adapt my styles of teaching English depending on mystudent' current stages of understandings, either on understanding or not understanding.					
21. In my English classes, I can adapt my teaching style to different learners.					
22. In my English classes, I apply multiple ways of assessing students' learning outcomes.					
23.In my English classes, I can use a wide range of teaching approaches to teach my students.					
24. In my English classes, I can tell whether the students really					

Technology Knowledge (TECH-K)	strongly	disagree	neutral	agree	strongly
understand what they learn or not.					
25. I can organize and manage my English classes well.					
Pedagogical Content Knowledge for Teaching English (PCK-TE)					
26. I can choose technologies that help enhance my English teaching.					
27. I can choose the kind of technologies to enhance my students in learning English.					
28. In my English classes, I can adapt the use of the technologies to teach different activities.					
29. I am thinking critically about how to use technology in my English classes					
Technological Content Knowledge (TCK-TE)					
30. I combine technologies with English lessons.					
31. I can choose appropriate technologies to enhance the content of English lesson.					
32. I can choose technologies that will enable to learn English content knowledge more easily.					
33. I can utilize technology at the correct place and inadequate time while teaching English.					
Technological Pedagogical Knowledge (TPK-TE)					
34. I can choose technologies that enhance the English teaching approaches.					
35. I can choose technologies that enhance students' English learning.					
36. Technologies could influence teaching approaches I use in my English classes					
37.I am thinking critically about how to use technology in my English classes.					
38. 1 can adapt the use of technologies to different teaching activities in my English classes.					
Technological Pedagogical Content Knowledge in Teaching					

Technology Knowledge (TECH-K)	strongly	disagree	neutral	agree	strongly
English (TPACK-TE)					
39. I can take into account English contents, learning-teaching strategies and relevant new technologies during lesson planning					
40. I can use technology-assisted evaluation tools while assessing the learning-teaching process					
41. I can make use of technological devices in order to measure students' preliminary knowledge about English courses					
42. I can make use of technological devices in order to identify students' misconceptions about English courses.					
43. I can use technology to reinforce students' skills in understanding and predicting learning English.					
44. I can make use of technologies with high levels of students' satisfaction when teaching English.					
45. I can effectively integrate technology into English classes in order to make them easier and more comprehensible for my students.					
46. At the university level and/or district, I can provide leadership in helping others to coordinate the use of content, technologies, and teaching approaches.					
Perceived Usefulness					
47. I think it necessary to use technology to fulfil my tasks while teaching English.					
48. I perceive that any technological tools or platforms system can help me teaching English more effectively.					
49. The technological tools or platform systems I am using can boost my teaching English productivity.					
50. The technological tools I am using can enable me to achieve my goals while teaching English courses.					
Perceived Ease of Use					
51.It is not a burden for me to study English courses through hybrid teaching and learning.					
52.I think that studying English courses using technology turned out to					

Technology Knowledge (TECH-K)	strongly	disagree	neutral	agree	strongly
be easy, understandable, and effective.					
53. It is efficient for me to teach English by using technology					
54. Overall, I become more skilful in using particular technological tools to fulfil any tasks while teaching English courses					
Subjective Norms					
55. University leaders require all English instructors to use information technology for teaching.					
56. My colleagues often use information technology in their teaching English Courses.					
57. Educational experts always suggest that the instructors must use information technology in teaching English.					
58. All students enjoy information-based English teaching classrooms.					
Perceived Behavior Control					
59. My university provides rich resources and platforms for practicing information technology in teaching.					
60. I have the ability to master the basic theories and methods of information technology to use in teaching English.					
61. My university is equipped with specialized information technology teaching content training and guidance.					
62. In classroom teaching, students acknowledge my use of information technology for teaching English.					
Behavioral Intention					
63. As an English instructor, I really enjoy teaching my Englishcourses by using information technology.					
64. In teaching English, I intend to use any of the information technological tools in order to attract students' attention and enhance their interest to learn.					
65. In teaching English, in order to expand teaching content and improve teaching efficiency, I am willing to use any of the information technology.					

Technology Knowledge (TECH-K)	strongly	disagree	neutral	agree	strongly
66. In teaching English, in order to help highlight the key anddifficult points to understand, I help students by using informationtechnology.					
67. In order to achieve teaching objectives, I am willing to use information technology for teaching					
Using Behaviors					
68. In order to enrich and expand teaching content, I often use information technology to teach English.					
69. I am happy to use information technology to enhance my students' knowledge and skills while teaching English.					
70. As an English instructor undergraduate English I feel rewarded in using information technology to teach English.					
71. As an English instructor I am confident to use information technology to teach English.					
72. As an English Instructor, I will continue to use information technology because if its benefits occurring during my teaching English courses.					

APPENDIX B

INTERVIEW PROTOCOL

This interview aims to delve into the current status and development of TPACK abilities among English instructors in western Chinese universities. We anticipate that through this interview, we can provide valuable references and insights for enhancing the professional qualities and teaching abilities of English instructors in western Chinese universities.

1. Gender
    - ○ Male
    - ○ Female

2. Age
    - ○ 20-30 yearsold
    - ○ 31-40 yearsold
    - ○ 41-50 yearsold
    - ○ 50 years old andover

3. EducationalBackground
    - ○ BachelorDegree
    - ○ MasterDegree
    - ○ DoctorateDegree

4. Working Experience
    - ○ 1-5 years
    - ○ 6-10 years
    - ○ 11-20years
    - ○ 21 years ormore

5. PositionRank
    - ○ Assistance
    - ○ Lecturer
    - ○ AssistantProfessor
    - ○ AssociateProfessor
    - ○ FullProfessor

6. How do you evaluate the role of technology in helping you achieve teachinggoals?

7. Do you find it difficult to learn and master new teaching technologies? Why or whynot?

8. What attitudes do people around you (such as colleagues, school leaders, students) hold towards your use of technology inteaching?

9. How much influence do these attitudes have on your decision to use technology in teaching?

10. How do you evaluate your ability to master the technology needed forteaching?

11. What external factors limit your ability to use technology inteaching?

12. What factors do you think would motivate you to increase your willingness to use technology inteaching?

13. What factors do you think have promoted or hindered your use of technology in actualteaching?

……

APPENDIX C

INDEX OF ITEM OBJECTIVE CONGRUENCE

AN IOC FOR A SURVEYRESEARCH

Topic: A Study on the Factors Influencing TPACK Using Behavior of University English Instructors in Western China: Based on the Model of TAM-TPB

Dear Expert:

This research is to fulfill the dissertation for Doctor of Education Program in Educational Studies, Suryadhep Techers College, Rangsit University. Its topic is "A Study on the Factors Influencing TPACK Using Behavior of University English Instructors in Western China: Based on the Model of TAM-TPB"

The objectives of the study are:

1. To explore the factor components that influence the TPACK using behaviors of university English instructors in the universities in WesternChina;

2. To determine the causal relationship of factors that influence the TPACK using behaviors of university English instructors in the universities in Western China; and

3. To obtain the confirmation of the model of the relationships of factors that influence the TPACK using behaviors of university English instructors in the universities in the universities in WesternChina.

This questionnaire is a part of a quantitative method as to gain a model of the actors that influence the TPACK using behaviors of university English instructors to obtain the confirmation of the model of the relationships of factors that influence the TPACK using behaviors of university English instructors in the universities in the universities in Western China. After that, the data obtained will be used to write up for the interview questions as to gain insights into the factors that influence the TPACK using behaviors of university English instructors in the universities in the universities in Western China

Your answers will be valuable in terms of validating the information containing in this questionnaire which will be beneficial for understanding the overall picture and situations pertaining this topic.

Accordingly, the researcher would like to show great appreciation and gratitude for your valuable time and comments for the validity of this research instrument.

Hong Yun

An IOC for A Survey Research Instructions

Congruent =+1

Questionable = 0 Incongruent = -1

This questionnaire contains 2 parts:

Part 1: Demographic Information.

Part 2: Items of the Factor Components that Influence the TPACK Using Behaviors of University English Instructors in the Universities in Western China

Part 1: Demographic Information

Demographic's Items	-1	0	+1	Suggestions
Gender: ☐ Male ☐ Female				
Age: ☐ 20-30 yearsold ☐ 31-40 yearsold ☐ 41-50 yearsold ☐ 50 years old andover				
EducationalBackground ☐ BachelorDegree ☐ MasterDegree ☐ DoctorateDegree				
Working Experience ☐ 1-5years ☐ 6-10years ☐ 11-20years ☐ 21 years ormore				

Demographic's Items	-1	0	+1	Suggestions
Positional Rank: □ Assistance □ Instructor □ AssistanceProfessor □ AssociateProfessor □ Fullprofessor				

1) TPACK Capability Evaluation Part 2: Items of the factor components that influence the TPACK using behaviors of university English instructors in the universities in Western China;

Technology Knowledge (TECH-K)	-1	0	+1	Suggestions
1. I can learn technology easily.				
2. I have the technical skills I need to use technology.				
3 I have had sufficient opportunities to work with different technologies.				
4. I frequently play around with the technology.				
5.I know about a lot of different technologies.				
6. I keep up with important new technologies.				
7. I know how to solve my own technical problems when using IT.				
8. I have sufficient knowledge in teaching English to my students.				
9. I put theories into practice when I teach my English courses.				
10. I know the basic theories and concepts in teaching English.				
11. I have various ways and strategies in teaching English.				

Technology Knowledge (TECH-K)	-1	0	+1	Suggestions
12. I am familiar with recent research in teaching English.				
Teaching Knowledge in Teaching English (TK-TE)				
13. I know how to select effective teaching approaches to guide my students' thinking and learning in my teaching English.				
14. I know how to develop appropriate tasks to promote students complex thinking of my teaching English.				
15. I know how to develop appropriate English lesson tools to promote students complex thinking of my teaching English.				
16. I know how to develop exercises in that students can consolidate their knowledge of my teaching English.				
17. I know how to develop exercises in that students can combine their skills of my teaching English.				
18. I know how to evaluate students' performance in my teaching English.				
Pedagogical Knowledge in Teaching English (PK-TE)				
19. I know how to assess my student performance in my English classes.				
20. I can adapt my styles of teaching English depending on my student' current stages of understandings, either on understanding or not understanding.				
21. In my English classes, I can adapt my teaching style to different learners.				

Technology Knowledge (TECH-K)	-1	0	+1	Suggestions
22. In my English classes, I apply multiple ways of assessing students' learning outcomes.				
23.In my English classes, I can use a wide range of teaching approaches to teach my students.				
24. In my English classes, I can tell whether the students really understand what they learn or not.				
25. I can organize and manage my English classes well.				
Pedagogical Content Knowledge for Teaching English (PCK-TE)				
26. I can choose technologies that help enhance my English teaching.				
27. I can choose the kind of technologies to enhance my students in learning English.				
28. In my English classes, I can adapt the use of the technologies to teach different activities.				
29. I am thinking critically about how to use technology in my English classes.				
Technological Content Knowledge (TCK-TE)				
30. I combine technologies with English lessons.				
31. I can choose appropriate technologies to enhance the content of English lesson.				
32. I can choose technologies that will enable to learn English content knowledge more easily.				
33. I can utilize technology at the correct place and inadequate time while teaching English.				
Technological Pedagogical Knowledge (TPK-TE)				

Technology Knowledge (TECH-K)	-1	0	+1	Suggestions
34. I can choose technologies that enhance the English teaching approaches.				
35. I can choose technologies that enhance students' English learning.				
36. Technologies could influence teaching approaches I use in my English classes.				
37.I am thinking critically about how to use technology in my English classes.				
38. 1 can adapt the use of technologies to different teaching activities in my English classes.				
Technological Pedagogical Content Knowledge in Teaching English (TPACK-TE)				
39. I can take into account English contents, learning-teaching strategies and relevant new technologies during lesson planning.				
40. I can use technology-assisted evaluation tools while assessing the learning-teaching process.				
41. I can make use of technological devices in order to measure students' preliminary knowledge about English courses.				
42. I can make use of technological devices in order to identify students' misconceptions about English courses.				
43. I can use technology to reinforce students' skills in understanding and predicting learning English.				
44. I can make use of technologies with high levels of students' satisfaction whenteaching English.				

Technology Knowledge (TECH-K)	-1	0	+1	Suggestions
45. I can effectively integrate technology into English classes in order to make them easier and more comprehensible for my students.				
46. At the university level and/or district, I can provide leadership in helping others to coordinate the use of content, technologies, and teaching approaches.				
Perceived Usefulness				
47. I think it necessary to use technology to fulfil my tasks while teaching English.				
48. I perceive that any technological tools or platforms system can help me teaching English more effectively.				
49. The technological tools or platform systems I am using can boost my teaching English productivity.				
50. The technological tools I am using can enable me to achieve my goals while teaching English courses.				
Perceived Ease of Use				
51. It is not a burden for me to study English courses through hybrid teaching and learning.				
52. I think that studying English courses using technology turned out to be easy, understandable, and effective.				
53. It is efficient for me to teach English by using technology.				
54. Overall, I become more skilful in using particular technological tools to fulfil any tasks while teaching English courses.				

Technology Knowledge (TECH-K)	-1	0	+1	Suggestions
Subjective Norms				
55. University leaders require all English instructors to use information technology for teaching.				
56. My colleagues often use information technology in their teaching English Courses.				
57. Educational experts always suggest that the instructors must use information technology in teaching English.				
58. All students enjoy information-based English teaching classrooms.				
Perceived Behavior Control				
59. My university provides rich resources and platforms for practicing information technology in teaching.				
60. I have the ability to master the basic theories and methods of information technology to use in teaching English.				
61. My university is equipped with specialized information technology teaching content training and guidance.				
62. In classroom teaching, students acknowledge my use of information technology for teaching English.				
Behavioral Intention				
63. As an English instructor, I really enjoy teaching my English courses by using information technology.				

Technology Knowledge (TECH-K)	-1	0	+1	Suggestions
64. In teaching English, I intend to use any of the information technological tools in order to attract students' attention and enhance their interest to learn.				
65. In teaching English, in order to expand teaching content and improve teaching efficiency, I am willing to use any of the information technology.				
66. In teaching English, in order to help highlight the key and difficult points to understand, I help students by using information technology.				
67. In order to achieve teaching objectives, I am willing to use information technology for teaching.				
Using Behaviors				
68. In order to enrich and expand teaching content, I often use information technology to teach English.				
69. I am happy to use information technology to enhance my students' knowledge and skills while teaching English.				
70. As an English instructor undergraduate English I feel rewarded in using information technology to teach English.				
71. As an English instructor I am confident to use information technology to teach English.				
72. As an English Instructor, I will continue to use information technology because if its benefits occurring during my teaching English courses.				

BIOGRAPHY

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