



# Research on the Development Status of Chinese University English Teachers for Professional Purposes Based on the TPACK Framework in the Context of Education Informatization Era

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**Abstract.** The advent of education informatization not only provides technical support for the development of higher education in China but also offers new opportunities for the reform of foreign language teaching and the advancement of professional development for foreign language teachers. As an important component of foreign language teaching in Chinese higher education, English education for special purpose (ESP) plays an important role in the high-quality development of higher education. Research on the development of ESP teaching staff has made progress in recent years. However, the era of educational informatization poses new challenges to the knowledge structure and abilities of ESP teaching staff, and also presents more complex and contemporary requirements for the development of ESP teaching staff. In order to address these challenges and propose an ESP teaching staff training path that is more in line with the characteristics of educational informatization, in-depth research through surveys and semi-structured interviews was conducted under the guidance of TPACK framework. By analyzing the data, a clearer understanding of the following aspects has been obtained: the current level of TPACK among ESP teachers in Chinese universities, the impact of demographic variables on ESP teachers' TPACK and the challenges currently faced by ESP teachers.

**Keywords:** Education informatization, Tpack framework, Teachers' development

## 1 Introduction

With the development of information technology, foreign language education is no longer limited to physical spaces such as schools, classrooms, and libraries. Versatile and disruptive technological innovations, such as smart devices, the Internet of Things (IoT), artificial intelligence (AI), augmented reality (AR) and virtual reality (VR), and software applications have opened up new opportunities for advancing teaching and learning [1]. Hence, in recent years, education systems worldwide have

prioritized their educational agendas to adapt strategies or policies around information and communication technology integration [2]. In 2022, the Ministry of Education of China launched the National Education Digitalization Strategy Action, comprehensively promoting the digital transformation of education in China with unprecedented efforts. These issues were exacerbated during the COVID-19 pandemic, which forced teaching across education levels to move online [3]. Education informatization not only provides technical support for the development of educational reforms but also offers new opportunities for the reform of foreign language teaching and the advancement of professional development for foreign language teachers. As an important component of foreign language teaching in Chinese higher education, English education for special purpose (ESP) plays an important role in the high-quality development of higher education. Therefore, understanding the comprehensive teaching ability of university ESP teachers including their information technology proficiency, and promoting the digitalization of the teaching workforce will become a key task in the current education field. This situation also poses various challenges for ESP educators. In this context, conducting research on the development of ESP teachers will contribute to the rational construction of ESP teaching teams in the new era, improve teaching quality, and cultivate more high-quality, internationally-oriented professionals who can meet the demands of the new era.

### **1.1 Current Status and Challenges of ESP Related Research**

One of the core aspects of talent cultivation in the new era is internationalization ability, and foreign language proficiency, especially English proficiency, serves as the foundation for this series of internationalization abilities. Scholars have pointed out that a globalized world requires global citizens to address the international challenges we face[4]. In this context, foreign language teaching is crucial for higher education.

The system of foreign languages in universities can be divided into English for general purpose (EGP) and English for special purpose (ESP). ESP and EGP have different focuses in talent development. EGP can broaden international perspectives, general knowledge, enhance cross-cultural communication abilities and comprehensive literacy. While ESP can enhance professional knowledge, the ability to communicate in English in professional settings, and academic literacy. Many universities in China have reduced the number of EGP courses and introduced specialized English courses. ESP teaching is becoming increasingly prominent in higher education.

In recent years, ESP has played an increasingly important role in English teaching in universities, and many universities have introduced distinctive ESP courses such as engineering English, nursing English, and tourism English. Research on ESP has also deepened. Most ESP-related publications concern the linguistic descriptions (e.g., lexical usage, formulaic language, rhetorical moves, and discipline-specific discourse), while a few prior studies have covered the ESP teacher[5].

On the other hand, with the advent of the era of educational informatization, domestic and foreign universities have accelerated the construction of digital

campuses, encouraging teaching staff to make use of online teaching platforms and resources, creating an innovative learning environment, and promoting quality education[6]. The era of educational informatization poses new challenges to the knowledge structure and abilities of ESP teaching staff, and also presents more complex and contemporary requirements for the development of ESP teaching staff.

To address these challenges and propose an ESP teaching staff training path that is more in line with the characteristics of this era, we need to explore new and suitable model frameworks for comprehensive research.

## 1.2 TPACK Framework and its Application in ESP Related Research

In addressing the issue of how to cultivate a high-quality ESP teaching workforce, scholars both domestically and internationally have conducted extensive research since the 1980s, resulting in various models of teacher knowledge structures. The most representative model is the Pedagogical Content Knowledge (PCK) proposed by L.S. Shulman, which integrates subject content knowledge with pedagogical knowledge. However, with the rapid development of information technology, contemporary information technology has had a profound impact on the overall knowledge structure of the teaching workforce. In 2005, scholars Koehler and Mishra first incorporated technological knowledge into the teacher knowledge structure and proposed the Technological Pedagogical and Content Knowledge (TPACK) framework[7].

The TPACK framework consists of three core elements: Content Knowledge (CK), Pedagogical Knowledge (PK), and Technological Knowledge (TK). It also includes four composite elements: Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and Technological Pedagogical Content Knowledge (TPACK)[8].

It is clear that with the advent of the educational informatization era, the role of TPACK is particularly prominent. The TPACK framework for teacher knowledge is a complex and dynamically changing theoretical framework. It is impractical to use a unified theoretical framework to encompass the teacher knowledge systems of various disciplines in higher education. Therefore, it is urgent to define the TPACK framework for various disciplines, which is the disciplinary research of TPACK theory[9]. In recent years, this research has become a focus in TPACK-related research, with studies on TPACK frameworks for specific disciplines such as foreign languages, mathematics, and pre-service teachers. However, the organization, refinement, and application of the TPACK theoretical framework in the construction and development of the ESP teaching workforce still need to be addressed.

In summary, there is a lack of empirical research on teachers' TPACK in the field of ESP education, and the current status and development plan of ESP teacher TPACK are not yet clear. To fill the gap, this study investigates the current level of TPACK among ESP teachers in Chinese universities and analyzes the impact of demographic variables on ESP teachers' TPACK so as to plan a more appropriate path for the development of ESP teachers in this educational informatization era.

## 2 Research Design

### 2.1 Research Questions

In response to the shortcomings of existing research, the following research questions have been identified: (1) What is the current level of TPACK (Technological Pedagogical Content Knowledge) among ESP teachers in Chinese universities? (2) What is the impact of demographic variables on ESP teachers' TPACK? (3) What are the challenges currently faced by ESP teachers? (4) In the context of educational informatization, how should the development of ESP teachers be planned to meet the demands of the era?

### 2.2 Research Methods

The questionnaire used in this study was adapted from the TPACK questionnaire designed by Schmidt for pre-service teachers, as well as the questionnaire designed by Archambault & Crippen for online teachers, with modifications based on interviews with ESP teachers in universities[10]. The adaptations mainly involved adding and deleting some items based on the characteristics of ESP teaching.

The questionnaire consists of two parts: the first part is the teacher background information, including gender, age, teaching experience, professional title, and educational background; the second part is the ESP teacher TPACK level scale, based on the TPACK framework. The questionnaire includes seven dimensions: content knowledge (CK), pedagogical knowledge (PK), technological knowledge (TK), pedagogical content knowledge (PCK), technological content knowledge (TCK), technological pedagogical knowledge (TPK), and technological pedagogical content knowledge (TPACK). (The scale uses a Likert five-point scale format, ranging from 1 = strongly disagree to 5 = strongly agree). The scale was tested for reliability using Cronbach's  $\alpha$ , with  $\alpha$  values of 0.823 for TK, 0.749 for PK, 0.854 for CK, 0.848 for TPK, 0.726 for TCK, 0.894 for PCK, and 0.851 for TPACK. The overall  $\alpha$  value for the scale was 0.931, indicating good internal consistency. The KMO and Bartlett tests were conducted on the scale, and the results showed a KMO statistic value of 0.871, indicating good structural validity, and a significant level of 0.000 for the chi-square statistic, which is less than 0.01, indicating high correlation between the indicators and suitability for factor analysis. The data obtained from the questionnaire will be quantitatively analyzed to determine the development of ESP teachers' TPACK.

To ensure that the sample results are more in line with the requirements of the survey, ESP teachers from three universities were randomly selected for the questionnaire survey. To avoid homogeneity, strict control was exercised in the later stage of the questionnaire survey to eliminate invalid questionnaires. A total of 91 teacher questionnaires were collected, with 4 invalid questionnaires. This questionnaire design aims to obtain more objective and practical data.

Based on the quantitative results, 10 teachers will be selected for semi-structured interviews, with each interview ranging from 20 minutes to 60 minutes. After the interviews, the interview content will be analyzed using thematic analysis, which

involves identifying recurring phenomena and important concepts that explain these phenomena, grouping units with similar attributes into categories, and identifying relationships between these concepts to ultimately identify the main challenges.

During the data analysis, the researcher will use SPSS 22.0 to analyze all the data. The overall level of TPACK and the levels of each sub-dimension of the ESP teacher team will be analyzed, as well as the impact of demographic variables on each sub-dimension and the overall TPACK level. The content of the semi-structured interviews will be transcribed and summarized, and a detailed analysis will be conducted on the obstacles in the development of TPACK for ESP teachers, focusing on the aspects of teacher professional competence, adaptation to educational informatization, , and teacher research.

### **3 Research Findings and Analysis**

#### **3.1 Overall Level of ESP Teachers' TPACK Knowledge**

To measure the overall level of ESP teachers' TPACK knowledge, this study conducted a descriptive analysis of the quantitative data. The analysis results showed that the mean values of ESP teachers' TPACK dimensions ranked from high to low as follows: PK > PCK > TCK > CK > TPK > TPACK > TK (Table 1). PK, PCK, and TCK levels were relatively higher, while TK and TPACK levels were lower.

Due to the fact that most of the teachers in this study had long teaching experience, the PK level was generally high. The relatively high PCK level was also related to the teachers' rich teaching experience, which enabled them to teach with appropriate and effective methods. The high TCK level indicated that ESP teachers were able to effectively present the professional knowledge of ESP course with information technology. However, the CK level was at a moderate level compared to PK, mainly because the majority of ESP teachers were originally EGP teachers who had transitioned into ESP teaching. They graduated from English-related majors and received systematic foreign language and linguistic education during their undergraduate or graduate studies, which equipped them with solid language knowledge. They also accumulated rich teaching experience in EGP teaching practice. However, they had limited exposure to subject knowledge unrelated to language learning , resulting in a lack of such subject knowledge. Even though they conducted in-depth research on the teaching materials in ESP teaching, it was difficult for them to integrate textbook knowledge with the cutting-edge trends in the English teaching of the specific fields.

The lower levels of TK and TPACK implied that ESP teachers had weak technological knowledge and lacked the ability to effectively integrate information technology with English teaching. It can be seen that ESP teachers had a relatively shallow understanding of information technology knowledge, only mastering some relatively simple information technology concepts, and they did not fully integrate technological knowledge into their teaching. Therefore, there is a need to strengthen their ability to fully integrate information technology into teaching.

**Table 1.** Descriptive Statistics of TPACK Dimensions

Dimension	Sample Size	Maximum Value	Minimum Value	Mean	Standard Deviation
TK	36	5	1	3.34	0.79
CK	36	5	2	3.59	0.64
PK	36	5	3	4.07	0.41
TCK	36	5	2	3.72	0.61
PCK	36	5	2	3.81	0.69
TPK	36	5	2	3.53	0.66
TPACK	36	5	2	3.51	0.58

**3.2 Influence of Demographic Variables on ESP Teachers' TPACK**

According to the basic information provided in the questionnaire, descriptive statistical analysis was conducted on three sets of data related to the gender, teaching experience, and participation in training of the teachers. The differences in TPACK knowledge across these influencing factors were shown in Table 2.

**Table 2.** Mean Statistics of TPACK Elements across Demographic Variables

		TK	CK	PK	TCK	PCK	TPK	TPACK
Gender	Male	4.01	3.92	4.19	3.81	3.93	3.74	3.67
	Female	3.27	3.45	4.02	3.61	3.64	3.41	3.4
Teaching Experience	Less than 3 Years	3.89	3.31	3.69	3.27	3.31	3.43	3.49
	4-15Years	3.48	3.62	4.13	3.81	3.88	3.56	3.52
	15 Years and Over	2.91	3.69	4.11	3.76	3.85	3.62	3.50
Related Training Experience	Participated	3.61	3.55	3.97	3.84	3.65	3.61	3.58
	Have not Participated	3.07	3.62	4.13	3.65	3.84	3.49	3.49

The average values of TPACK dimensions for male teachers were higher than those for female teachers. Except for a small difference in PK level, male teachers had a clear advantage in TK, CK, TPACK, and other composite dimensions. This can be attributed to the fact that male teachers have stronger practical skills in information technology operations, while female teachers generally have a fear of information technology, resulting in differences in TK. In addition, male teachers have a more positive attitude and broader interest in acquiring subject knowledge unrelated to language learning compared to female teachers. Interviews revealed that male teachers enjoy learning about new information technology related to teaching and attending academic presentations. Female teachers, on the other hand, mostly expressed a lack of time or interest in researching new information technology or reading related articles. This may be related to the greater responsibility of female teachers in taking care of their families, resulting in less time and energy devoted to acquiring new knowledge. The integration and transformation of TK, PK, and CK

contribute to TPACK knowledge, and the superiority of male teachers in TK, CK, and PK levels leads to higher TPACK levels compared to female teachers.

As teaching experience increases, CK and PK levels also increase. This indicates that the longer they teach, the more subject knowledge and teaching experience are accumulated, which follows a certain objective pattern. Composite knowledge such as PCK, TCK, and TPK also improve with increasing teaching experience, indicating that the integration and transformation of teachers' knowledge also depend on the passage of time and accumulation of experience. However, TK levels are highest among novice teachers and relatively lower among experienced teachers. This is because novice teachers, mostly born in the 1990s, have been exposed to computers and the internet since childhood, making them more adaptable and receptive to information technology. The lower TK levels among experienced teachers reflect their failure to update their knowledge of information technology in a timely manner and apply the latest information technology to their teaching. However, TPACK levels are lowest among novice teachers, as they have less teaching experience and limited accumulation of subject knowledge. These results also reflect the organic integration of technological knowledge, subject knowledge, and pedagogical knowledge in TPACK.

Teachers who have participated in related training have slightly higher levels of technological knowledge in TK, TCK, TPK, and TPACK compared to those who don't have such experience. This indicates that training is an effective way to improve teachers' information technology knowledge and plays an important role in the development of teachers' digital teaching capabilities. It is also an important means and method to cultivate TPACK knowledge. In the era of the internet and big data, the rapid development of information technology and the emergence of micro-courses, MOOCs, and flipped classrooms are changing the traditional paradigm of foreign language (English) teaching. ESP teachers must regularly receive training in educational technology knowledge in order to keep up with the development and changes of the times and meet the requirements of the information age for ESP teaching.

### 3.3 Challenges Faced by ESP Teachers

According to semi-structured interviews with ten teachers, a deeper understanding of the challenges faced by ESP teachers has been obtained.

#### *Insufficient Professional Competence of ESP Teachers*

As mentioned earlier, the ESP teacher workforce in Chinese universities is mainly composed of two types of teachers, both facing challenges in ESP teaching practice. The advantage of ESP teachers transitioned from EGP teachers lies in their strong language skills and rich language teaching experience. However, due to a lack of subject knowledge unrelated to language learning, their teaching focuses on English language knowledge rather than true ESP teaching. On the other hand, ESP teachers transitioned from specialized courses to ESP teachers have a high level of English

proficiency and specialized knowledge, but they lack systematic language teaching training and language teaching experience, resulting in a focus on explaining professional knowledge in ESP teaching. The majority of ESP teachers face their own challenges.

### ***Insufficient Use of Information Technology by ESP Teachers***

ESP teachers still face deficiencies in the use of information technology in two aspects. Firstly, there is an issue with the integration of technology and teaching. Currently, most ESP teachers in universities consider information technology in teaching as a supplementary means and have not effectively integrated information technology into their teaching practices. In the era of information technology, various teaching methods such as MOOCs and micro-courses are highly regarded. Although many teachers are aware of the trend, their application of technology remains superficial, limited to creating simple PowerPoint presentation slides or downloading videos and materials for students to watch. While it may seem like information technology is being used, there are still some problems, particularly the simple overlay of technology and content.

Furthermore, female teachers with longer teaching experience are still struggling to adapt to the era of educational informatization. According to the results of a questionnaire survey, most of the older female teachers scored relatively low in dimensions related to information technology. Through semi-structured interviews, it was found that these respondents faced three main problems in the process of adapting to educational informatization. Firstly, some teachers are still stuck in the traditional teaching mode and have not fundamentally accepted new technologies and teaching methods. Secondly, for some teachers, they find it difficult to learn various teaching information technology methods and need guidance and assistance from professionals. Thirdly, some female teachers have more commitments in their family lives compared to male teachers, which makes it difficult for them to invest excessive time and energy in learning educational information technology.

### ***Disconnect Between ESP Teachers' Research Direction and Teaching Content***

Usually, the teaching and research directions of university teachers are aligned. The majority of EGP teachers in China have backgrounds in foreign language and literature, with research directions mainly focused on linguistics, English and American literature, and translation. However, their engaging in EGP teaching results in a disconnect between their teaching content and research direction. Even after transitioning to ESP teachers, this situation remains unchanged. This is because foreign language and literature is a first-level discipline, and the publication of papers, project applications, and promotion of professional titles for university foreign language teachers tend to focus on language and literature research achievements. ESP is not an independent discipline but a type of language teaching. ESP lacks disciplinary independence, which affects the promotion of professional titles for ESP teachers. When the promotion path for ESP teachers is limited, they may develop a sense of apathy towards ESP teaching, unwilling to invest more energy and time into



improving the abilities and qualities required for ESP teaching, thereby affecting the development of the ESP teaching workforce.

Hentic target language contexts to simulate real language usage environments.

## 4 Conclusion

This article addresses the shortcomings in ESP teacher development researches and conducts in-depth research through surveys and semi-structured interviews under the guidance of TPACK framework. By analyzing the data obtained from the surveys and interviews, the following conclusions are drawn: Firstly, the average levels of ESP teachers' TPACK dimensions are measured, with high levels in PK, PCK, and TCK, and low levels in TK and TPACK. Secondly, the impact of different demographic variables, like gender, teaching experiences and the participation of information technology related training, on ESP teachers' TPACK is demonstrated. Thirdly, through in-depth analysis of the results of semi-structured interviews, three main problems encountered in the development process of ESP teachers are identified: lack of professional competence, inadequate adaptation to educational informatization, and disconnect between research direction and teaching content. Some insights into the development path of ESP teachers' TPACK can be provided through the research results of this article.

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