
DEVELOPING AND VALIDATING A TECHNOLOGY PEDAGOGICAL AND CONTENT KNOWLEDGE (TPACK) FRAMEWORK FOR BUSINESS ENGLISH TEACHERS

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ABSTRACT: *The wide employment of technology in language learning enables business English (BE) teachers to cultivate talents with enhanced professional knowledge as well as strong professional English communication competence through improving their teaching quality. Hence, business English teachers need to integrate technological knowledge, pedagogical knowledge, English communication skills and content knowledge of FAME subjects (finance, accountancy, management, economy) into their teaching. In order to accomplish the integration, this paper aims to develop and validate technological pedagogical and content knowledge (TPACK) framework for business English teachers in Chinese higher education with a mixed method. Qualitative methods are used to collect data, including literature review and semi-structured interviews. On the other hand, a quantitative method, named confirmative factor analysis (CFA), is used to analyze the data. The result of the survey indicates that business English teachers consider TPACK is important in general, while they also attach great importance towards two items, PK and PCK.*

KEY WORDS: TPACK, knowledge of FAME subjects, business English teachers

INTRODUCTION

The guidelines on college English teaching (2020) in China claims that the college English curriculum should include General English (GE), English for Specific Purpose (ESP) and cross-cultural communication (Steering Committee for College Foreign Language Teaching of The Ministry of Education, 2020), which indicates that ESP courses should be included in the curriculum system of college English. Meanwhile, the most essential differences between ESP and GE lie in the learners' purposes for learning English (Belcher, 2009). In General English (GE) teaching, all the four language skills-listening, reading, speaking, and writing are equally stressed (Momtazur, 2015), so the learners' purpose is to improve overall English competence. English for

specific purposes (ESP) refers to the teaching and learning of English in a particular domain context (Rahman, 2015) where the goal of the learners is to use English in these domains (Paltridge & Starfield, 2012), such as ELP, English for legal purposes, and EMP, English for medical purposes (Belcher, 2009). In addition, business English is also a subdiscipline of English for specific purposes (ESP) (Dudley-Evans & St John, 1998; Hutchinson & Waters, 1987; St John, 1996). Hence, the aim of business English is to develop learners' communicative competence (Canale & Swain, 1980; Canale, 1983) for business settings (Boyd, 1991) and to use knowledge in different situation of business communication (Olga & Kira, 2018).

Business English is developing fast in China these years. For instance, universities offer a series of business English courses, such as English for Exhibition, English for Tourism Management, English for International Trade, English for E-commerce, Marketing English (Xie, 2019), etc. Besides, researchers show their interests in business English research areas, like business English teaching strategies and teaching methods (Nelson, 2000), business terminologies and business English teaching materials, needs analysis and participants' attitudes toward business English, business English teachers' perceptions of their professional roles, etc. (Wiley & Sons, 2013). Although there are an increasing number of studies in many fields of business English, the research on business English teachers' knowledge is rare. However, teachers should be equipped with various knowledge and skills for effective teaching (Kilic, 2015). Some researchers hold that business English teachers need good English language proficiency, skills in language teaching (Frendo, 2005) and business professional knowledge, an awareness of the business world (Eszter, 2017; Wang & Jin, 2019). Some also believe that business English teachers are dual-qualified teachers who need to develop the type of "language + business multi-skilled" teachers to teach business English courses (Zhu & Deng, 2015). However, in researchers' mind technological knowledge is often seen as an independent item (Rienties & Townsend, 2012).

Through the increasing applications in Information and Communication Technology (ICT) instruments, it is important to know how teachers can effectively integrate ICT with the content of subject-specific knowledge and the pedagogy used (Rienties, & Townsend, 2012). An important theoretical framework of technology, pedagogy, and content knowledge (TPACK) comes out to guide the research in teachers' integration of technological knowledge, pedagogical knowledge and content knowledge (Koehler & Mishra, 2008) including English communication skill and knowledge of FAME subjects. It should be noted that the research on business English teachers' knowledge based on (TPACK) is not sufficient, while most business English teachers lack a relatively complete knowledge framework, which requires exploration and discussion. Hence, an integrated technology, pedagogy, and content knowledge framework for

business English teachers is of essential significance for business English teachers' development. Three questions are specifically discussed in this research:

1. How can a business English teacher's TPACK be constructed?
2. The current situation of business English teachers' knowledge?
3. How is the content and structural validity of the business English teacher's TPACK framework?

LITERATURE REVIEW

ESP TPACK Framework Research

Knowledge models and knowledge measurements are prevalent in the area of ESP. Jarvis (1983) has concluded 10 general competencies that ESP teachers should possess, such as analyzing ESP and scenarios, evaluating teaching materials and related materials, designing and interpreting programs, and writing teaching materials, which belong to different subjects of TPACK (Jarvis, 1983). Dudley-evens & St. John (1998) have indicated that in the field of ESP teaching, "knowledge" includes the professional knowledge of English education, the subject knowledge taught by ESP teachers, and eight aspects of information collected after the "needs analysis" of target learners (Dudley-evens & St. John, 1998). Górska-Poręcka (2013) has conducted a preliminary study on the cognitive structure of ESP teachers and concluded that the PCK of ESP teachers consists of three knowledge bases: language knowledge base, subject content knowledge base and pedagogical knowledge base (Górska-Poręcka, 2013). In addition, a knowledge framework for ESP teacher has been presented by Xu Xiaoshu and Cai Jigang, which includes Technology Knowledge (TK), Content Knowledge (CK), Pedagogical Knowledge (PK), Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical knowledge (TPK) and Technological Pedagogical and Content Knowledge (TPACK) as shown in Figure 1 (Xu & Cai, 2019), providing a close clue to the research of the TPACK framework for business English teachers.

Type	No.	Evaluation indicator
TK	1	Be able to interactively identify, locate, access, evaluate and organize knowledge and information sources as users of information and media
	2	Be knowledgeable about basic technology, tools and resources
	3	Be able to troubleshoot basic technical problems and learn new skills
CK	4	Be knowledgeable about ESP: understand the origin, definition and development of ESP teaching and learning
	5	Be cognizant of foundational knowledge in the subject-area: basic concepts discipline culture, ideas, beliefs and practices that construct the typical speech acts and genres
	6	Be able to use ESP pedagogical strategies
PK	7	Be able to understand the roles of an ESP teacher and be able to change from an EGP teacher to an ESP teacher
	8	Be clear about the purposes, values and aims of ESP teaching as well as be able to apply new teaching methods, strategies & tools in ESP teaching (content-based instruction, corpus-assisted instruction)
	9	Be adept at classroom management: set expectations for a variety of tasks, create a vibrant class environment and provide appropriate feedback
PCK	10	Be clear about contextual knowledge (learner knowledge gained through Needs Analysis, institutional and disciplinary knowledge, the demands of working fields and social environment)
	11	Be able to assess ESP learning
	12	Be familiar with general language learning approaches and experiences, such as ESP learning experience, target language cultural awareness, linguistic research and language analysis experience
TCK	13	Be able to cooperate with different stakeholders distantly
	14	Be benefit from multimedia to express ideas
	15	Be able to use multimedia to support language learning
TPK	16	Be able to use technology to design ESP learning materials
	17	Be able to use technology to carry out course design and teaching strategies
	18	Be able to use technology to meet ESP learners' individualized needs
TPACK	19	Be able to guide learners for ethical technology usage
	20	Be familiar with and able to manage an ESP project: set and refine goals, manage resources, monitor progress and make adjustments
	21	Be able to understand and carry out ESP genre analysis, discourse analysis, linguistic analysis, and register analysis, using digital concordances and corpora

Figure 1: The TPACK model for ESP teacher.

Business English-Related-TPACK-Research

In 2015, Franziska Bouley has formulated a knowledge model, among which professional knowledge is composed of content knowledge (CK), pedagogical content knowledge (PCK), and pedagogical knowledge (PK) (Franziska, 2015). In 2018, Wu Peng, Yu Shulin and Zhang Limin have examined a conceptual framework of the pedagogical content knowledge (PCK) model for business English teaching, which contains four main components, 1) knowledge of the purposes of business English teaching, (2) knowledge of instructional strategies for business English teaching, (3) knowledge of students' understanding of business English, and (4) knowledge of the business English curriculum, among which the first knowledge is the most important one, because it provides the general pedagogical rationale for the PCK construct, as shown in Figure 2 (Wu, Yu & Zhang, 2018). In 2019, Jiang Xia has explored the elements of pedagogical content knowledge (PCK) of business English teachers in

the universities of China (Jiang, 2019). Most of the previous research mainly focus on pedagogy knowledge and content knowledge or integrated pedagogy and content knowledge.

In 2016, Hu Ling, Liu Yun and Deng Li have explored the relationship between content knowledge (CK), pedagogical knowledge (PK), and technology knowledge (TK) through observations and interviews of a sample of business English teachers (Hu, Liu & Deng, 2016). In 2019, Wu Peng and Zhou Lei have elaborated the core knowledge elements and combined knowledge elements in TPACK framework (Wu & Zhou, 2019), without a validated TPACK framework for business English teachers.

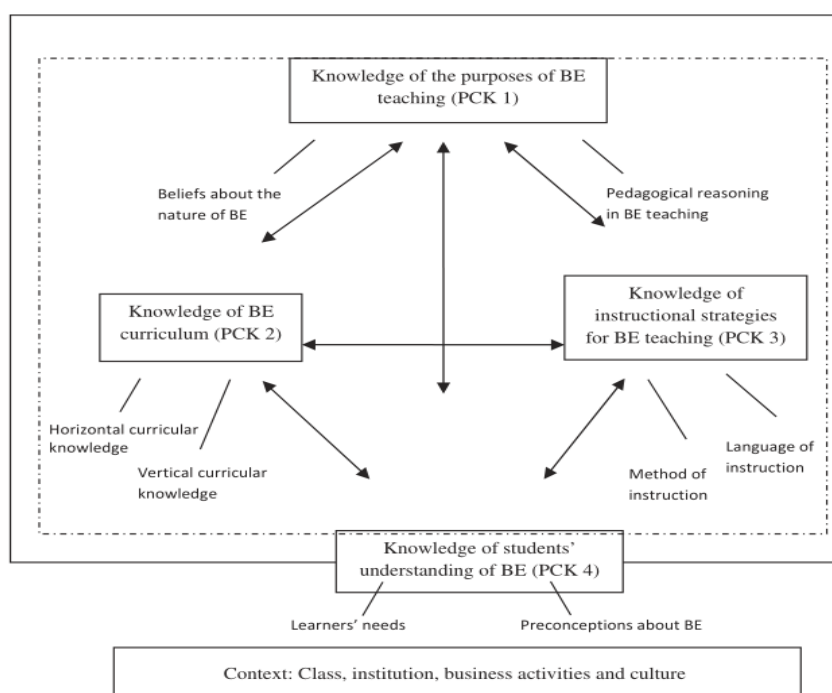


Figure 2: The PCK model for business English teaching.

Research Gap

As can be seen from the above knowledge for business English teachers, the most obvious gap is that only business English teachers have taken part in the survey of the previous research, stakeholders such as FAME subjects' teachers or say, content specialist are not involved (Xu & Sun, 2019; Greene & Jones, 2020). Secondly, technical knowledge is often considered independent of content and pedagogical knowledge, so it is not difficult to see that teachers are challenged to understand the importance of ICT and apply digital methods (Mishra & Koehler, 2006). Moreover, most of the previous studies use empirical studies and qualitative methods to conduct the research, few efforts have been made on the quantitative assessment of business

English teachers' knowledge (Xu & Sun, 2019). Therefore, this paper by means of qualitative analysis and quantitative assessment, aims to explore a business English teachers' TPACK framework in tertiary education under Chinese context.

METHODOLOGY

Research Methods

The process of this business English teachers' TPACK framework study is composed of development stage and validation stage, which adopts a mixed method, covering literature review to establish semi-structure interview guideline, semi-structured interview to get the content validated framework, and questionnaire survey to verify the structure of the framework. In the first stage, the items of initial business English teachers' TPACK framework and a semi-structure interview guideline are generated after a literature review of those relevant researches both in China and abroad. In the validation stage, three business English professors and five teachers who teach FAME subjects are invited to have face-to-face semi-structured interviews to assess content validity of business English teachers' TPACK framework, after which the content validated framework is generated. And 200 questionnaires are then distributed to assess the structural validation of business English teachers' TPACK framework.

Subjects

In the content validation stage of the business English teachers' TPACK framework study, three business English professors with over 10 years of business English teaching experience at Chengdu Institute Sichuan International Studies University (CISISU) in China and five teachers with more than 5 years of teaching experience in the subjects of economics, management, accountancy, and statistics at School of International Business of CISISU are involved to validate the content including modification of the language expression of business English teachers' TPACK framework and supplement of technological knowledge, pedagogical knowledge and content knowledge through face-to-face semi-structured interviews. In the structural validation stage of the study, all the survey respondents from different universities in China are required to have at least one year of business English teaching experience, including teaching the undergraduates majoring in business English or teaching English for Specific Purpose (ESP) in the School of Business and Economics.

Instrument Design

In the preparation stage, qualitative methods are used to collect data. Firstly, the guideline of semi-structured interview of business English teachers' TPACK framework is initially shaped after a literature review of those relevant researches both in China

and abroad. In the validation stage, the content validity of this framework is analyzed (literature review and semi-structured interview) and structural validity is confirmed (survey questionnaire). To validate the content of this framework, and to identify the current knowledge of business English teachers, face-to-face semi-structured interviews are adopted, through which three business English professors and five teachers teaching FAME subjects are invited to discuss the content validity and the language expressions of the TPACK items, to supply and replenish more instruments, technologies and pedagogies for the business English teachers' TPACK Framework. Each interview, lasting about sixty minutes, is recorded and then transcribed for later research. Based on literature review and semi-structured interview, an initial business English teachers' TPACK framework is constructed. To validate the structure of this framework, based on the content validated framework, the questionnaires are generated and then distributed, which compose basic demographic information and the importance of the rating that is assessed on a 5-point Likert scale to evaluate the importance of the items in TPACK framework. After that, a quantitative method named Confirmatory Factor Analysis (CFA) is used to verify the structural validity of the business English teachers' TPACK framework.

Data Analysis

Data collected from business English teachers survey questionnaire of some colleges and universities in China is analyzed in the aspects of Cronbach's alpha, Kaiser–Meyer–Olkin (KMO), the factor loading coefficient, mean scores and standard deviation by means of Statistic Package for Social Science (SPSS), a statistical analysis software.

FINDINGS AND DISCUSSIONS OF THE SEMI-STRUCTURED INTERVIEW

Findings

1. TPACK Content Construction and Validity

Three business English professors and five teachers who teach FAME subjects put forward some suggestions to modify of the framework through face-to-face semi-structured interviews. Some items, over-generalized in meaning, are refined into business English subject in all 21 items. Meanwhile, some items are not complete enough. Thus, some basic knowledge items are added like the eleventh and twelfth, sixteenth and twenty-first items, etc. Lastly, some specific tools, methods or knowledge are added in the framework including 19 items. Thus, a content validated business English teachers' framework is generated as shown in figure 3.

Type	No.	Items
TK	1	Be able to interactively identify, locate, access, evaluate and organize knowledge and information sources as users of information and media (web crawlers, Python software, Excel and SPSS)
	2	Be knowledgeable about basic technology, tools and resource (multimedia teaching technology, online teaching platforms, data visualization tools, business simulation software and mind mapping software and cloud computing, big data, platform operation and AI technology)
	3	Be able to troubleshoot basic technical problems and learn new skills
CK	4	Be knowledgeable about BE: understand the origin, definition and development of BE teaching and learning
	5	Be cognizant of foundational knowledge in the BE-area: basic business concepts, business terminologies, business abbreviations, classical cases, business thinking, business etiquette, business culture, ideas, beliefs and practices that construct the typical speech, acts and genres (the knowledge of economics and management, the basic knowledge of accounting and statistics, the basic professional knowledge of each major)
PK	6	Be able to use BE pedagogical strategies (traditional language classroom organization methods, scenario simulation teaching, case analysis teaching)
	7	Be able to understand the roles of an BE teacher and be able to change from an GE teacher to an BE teacher
	8	Be clear about the purposes, values and aims of BE teaching as well as be able to apply new teaching methods, strategies & tools in BE teaching (content-based instruction, business terminology corpus-assisted instruction, teaching methods based on business cases, mind mapping knowledge arrangement, academic papers learning, classroom simulation practice, business practice learning)
PCK	9	Be familiar with general language learning theories and approaches, English cultural awareness, cross-cultural knowledge, linguistic research and English analysis experience, BE learning experience, BE teaching objectives, key and difficult points and the error-prone points in BE teaching
	10	Be adept at classroom management: set expectations for a variety of tasks, create a vibrant class environment and provide appropriate feedback (the instrumentations of achieving business goals and the effectiveness of communication)
	11	Be clear about contextual knowledge (disciplinary knowledge, curricular knowledge, business discourse knowledge, the demands of working fields, social environment knowledge, learner knowledge gained through Needs Analysis including students' preconceptions of BE and their needs for learning BE)
	12	Be able to set goals of BE teaching, to assess and choose instructional strategies applicable to BE teaching (learners' stronger sense of having benefitted and having learned useful knowledge, learners' economic thinking ability cultivation)
TCK	13	Be able to cooperate with different stakeholders distantly (through communicational tools)
	14	Be benefit from multimedia to express ideas (dynamic data, data visualization)
	15	Be able to use multimedia to support BE learning (AI technical feedback, business simulation software, personal learning platform)
TPK	16	Be able to use technology to update and design BE learning materials (editing case video)
	17	Be able to use technology to carry out course design and teaching strategies (crawlers and Python software, data visualized PPT and case videos, simulating software)
	18	Be able to use technology to meet BE learners' individualized needs (cloud computing, big data, AI technology)
TPACK	19	Be able to guide learners for ethical technology usage
	20	Be familiar with and able to manage an BE project: set and refine goals, manage resources, monitor progress, provide feedback and analysis, make adjustments
	21	Be able to understand, establish and carry out BE genre analysis, discourse analysis, linguistic analysis, and register analysis, using digital concordances and corpora

Figure 3: Content validated business English teachers' TPACK framework.

Meanwhile, three business English professors and five teachers who teach FAME subjects also supply and replenish some more instruments, technologies and pedagogies for the business English teachers' TPACK Framework.

(1) Technical Knowledge

The three business English teachers mainly talk about their technical knowledge of language teaching, such as the basic multimedia teaching technology or online teaching platforms like MOSOTEACH, MOOCs.

However, the five teachers teaching FAME subjects put forward more technical knowledge related to FAME subjects, especially accounting and statistics courses, such as the use of web crawlers, like Python software to collect information and to form data reporting, the use of Excel and SPSS to reduce the interference in the process of information transmission, and the use of data visualization software to display the dense data with diagrams, the utilization of websites like ebay, Amazon and applets like Wechat, Weibo and Douyin, Xiaohongshu, two popular short video applets used on the telephone in China, as cases study tools, the adoption of business simulation software and mind mapping software, as well as cloud computing, big data, platform operation and AI technology to assist teaching.

(2) Content Knowledge

The three business English teachers try to explain the hidden business logic in the text and analyze business events with business knowledge. They also analyze the economic value of language translation in movie industry from the perspective of economics.

In the mind of the five teachers teaching FAME subjects, the qualified business English teachers should have basic knowledge of business, such as some basic concepts of business, the process of trade, existing enterprise frameworks and their different functions, business terminologies, classic business cases, business thinking as well as the basic professional knowledge of each major. For example, if the text is about a company's annual report, business English teachers should at least understand the logical relationship of accounting statements. the five teachers teaching FAME subjects also propose that the basic knowledge of FAME subjects that business English teacher are required to acquire include (1) the basic knowledge of economics and management that forms business thinking, (2) the basic knowledge of accounting and statistics, which is conducive to improving the ability to analyze and interpret business cases and information data as well as forming digital thinking mode and logical thinking.

(3) Pedagogy Knowledge

Pedagogy knowledge refers to the knowledge about the process and implementation of teaching and learning, including teaching purposes, teaching objectives, teaching values and teaching methods, etc. The three business English teachers mention that experienced business English teachers have upgraded their teaching methods. In addition to the traditional language classroom organization methods, like the reading of texts, the analysis and translation of vocabulary and sentences, and the class discussion, they activate the business atmosphere in class by adopting business scenario simulation apart from the traditional way of role play that is frequently used in language learning. This simulation teaching method requires business English teachers to pay attention not only to business terms, business etiquette, and body language, but also to the overall orderly conduct of business activities, which is also a great challenge to teachers' strong management ability of classroom teaching. For example, simulating an international business reception aims to improve students' observation and analysis ability in business activities, and new knowledge acquiring ability, not only the accuracy of language. In addition, business English teachers also try to adopt business case analysis teaching method, which is the traditional and classical teaching method of business.

Other four teaching methods are also proposed by the five teachers teaching FAME subjects. In addition to case analysis, open discussion of cases and other different teaching methods based on cases are adopted. The second teaching method is mind mapping knowledge arrangement that can help connect the complex and scattered knowledge points through mind mapping, which is conducive to understanding and memorizing. This method is similar to the logical framework of knowledge arrangement. The third one is learning from academic papers, which ensures students understand the forefront of the academic development of the subject. The last teaching method is classroom simulation practice. For example, in international investment class, by paying attention to current affairs and news, students select today's top news, analyze the cause of stock prices to fall or rise, and buy or sell of stocks in stock simulation system, and finally look at the performance of stock gains. Another example is simulation of the establishment of a company from establishment of building a corporate framework by students to indication of the problems of corporate's framework by teacher.

(4) Pedagogy Content Knowledge

The three business English teachers talks in terms of pedagogy content knowledge. Simulation teaching process consists of setting the goals of each task, creating a good classroom environment, and providing appropriate feedback. In order to integrate content and pedagogical knowledge, more attention should be paid to the achievement of business goals and the effectiveness of English communication in the evaluation and

feedback. Moreover, teachers need to know what employers' requirements of students on mastering English, because there are gaps and common points between learners and employers, and teachers should help to fill the gaps.

The five teachers teaching FAME subjects mentioned that practical teaching helps students to use the knowledge through practice. For instance, students plan and implement the project and teachers provide feedbacks, which enables students to have a stronger sense of having benefitted and having learned useful knowledge. Furthermore, some knowledge of economics can explain some phenomenon happened in people's daily life, so students can feel the charm of economics and their economic thinking mode could be gradually cultivated. Moreover, business English teachers require knowledge of the work field and social environment. For example, in Lenovo's corporate training, trainer usually use corporate internal terminologies that are not in textbooks. Finally, teachers need to understand basic abbreviations within the industry (B2C, C2C), industrial knowledge as well as business etiquette. For instance, how to ask a simple question in a formal or polite way and how to ask others to pass a cup, or how to inquire the client's name.

(5) Technology Content Knowledge

In terms of technology content knowledge, both the three business English teachers and the five teachers teaching FAME subjects give the least feedback on all the questions asked in the interview guideline.

Among the five teachers teaching FAME subjects, only two teachers who teach accounting, statistics and investment put forward some technology content knowledge like data visualization techniques to help intuitively display and understand the data. In addition, the two teachers mention that some majors require a good combination of technology and content, such as e-commerce major. In these e-commerce English classes, e-commerce platforms can be adopted to assist teaching of the platform, such as ebay and Amazon, which makes it easier to understand the actual operation while speaking and operating in class. E-commerce simulation platform can also be used, where students can simulate to buy and sell. Except that, in financial sectors, simulation stock software helps students to better use and practice stock knowledge, and in management majors, business simulation software assists students completing the whole project process, from the preliminary research, data analysis, plan proposal and project implementation.

(6) Technology Pedagogy Knowledge

In terms of technology pedagogy knowledge, both the three business English teachers and the five teachers teaching FAME subjects argue that current teaching methods and technology are inextricably linked. Hybrid teaching methods applied by an increasing number of teachers in recent years require the integration of different technologies. For instance, to prepare a lecture before class, teachers often collect information by means of crawlers like Python software, and clarify the idea by using mind maps software. In class, teacher needs to present knowledge points with PPT, share information with case videos, and interact with students through software like punching in software or voting software. At the same time, Enterprise Resource Planning (ERP), a simulating enterprise operation software, and software for simulating stock trading, etc. are used in the class teaching as well. In addition, online courses require the teachers to know how to operate online teaching platforms such as MOSOTEACH and MOOCs. Besides, case study teaching needs websites like Ebay or Amazon, applets such as WeChat, Weibo and Dou Yin, Xiao Hongshu, two popular short video applets used on the telephone in China to assist teaching. Lastly, exercises or tests with varying difficulty could be implemented with the support of cloud computing, big data and AI technology, etc. This integration of technology into teaching methods is a response to the increasing reliance on Big Data analytics in decision-making (M. Muniswamaiah, T. Agerwala, & C. C. Tappert 2020)

(7) Technology Pedagogy and Content Knowledge

As for technology pedagogy and content knowledge, project teaching is the best teaching method that integrates language knowledge and FAME subjects' knowledge, pedagogical knowledge and technology knowledge, such as the project of international guesthouse (business + language). As shown in the following project teaching example, according to the early market survey conducted by students, including the English questionnaire for foreign tourists, the project scheme will be put forward, and then learners will implement the whole project scheme on project simulation platform. Teachers then use this platform's intelligent data analysis system to provide feedback for learners. Based on the experience of this project, teachers could utilize the data analysis supported by the platform as a new business English teaching case in the next project teaching.

2. The Current Situation of business English Teachers' Knowledge

During the interview, the three business English teachers also mentioned the current situation of their business English teaching. Because of the teachers' deficiency of accumulation of content knowledge of basic FAME subjects, students receive incorrect information and form a wrong understanding. For example, some business English teachers cannot distinguish the right from wrong of professional terms, because the translation is correct in terms of grammar. And they can't clearly explain the logic of loss or profit and the logical relationship between the sheet and the conclusion to

students in the text. In addition, they fail to grasp the teaching characteristics, the key and difficult points and the error-prone points of business English teaching, so they prefer to teach English language knowledge like the analysis of long and difficult sentences, as they usually do in general English (GE) class. Therefore, business English teachers hold that it is vital to acquire basic FAME subjects' knowledge and to form business thinking if GE teachers are willing to be business English teachers.

The three business English teachers also point out that due to the lack of professional knowledge of accounting and law, they could not analyze and explain in depth and thoroughly, or use effective teaching methods when they came across the text of financial tables or intellectual property rights. Hence, business English teachers need to firstly integrate professional English knowledge and basic FAME subjects' knowledge, so as to better combine pedagogy for effective teaching. Thus, by mastering the key and difficult points of FAME subjects' teaching and the error-prone points in business English teaching, business English teachers, based on students' learning cognition and understanding of content knowledge, could combine contents with pedagogy (PCK) well to clarify teaching objectives.

In addition, the three business English teachers who feel it is necessary to update their technical knowledge has adapted to the teaching situation in the era of new media technology, and can consciously apply new educational technology to teaching. For example, the courseware has more business characteristics, such as dynamic data in PPT, which can refer to the new product release conference of Apple or Xiaomi.

Discussion

The semi-structured interviews reveal that business English teachers are relatively familiar with the language teaching technologies, pedagogies and contents, but unacquainted with the technology and content in the FAME subjects' teaching. Therefore, on the whole, business English teachers still lack the integrated knowledge of FAME subjects' and language.

First of all, technological knowledge is insufficient for business English teachers. This is partly due to the impact of rapid development of information technology and artificial intelligence on foreign language education and the insufficient updating of teachers' technical knowledge (Rienties & Townsend, 2012). It is also because the teachers are not familiar with the technological knowledge in FAME subjects' section. Therefore, business English teachers are generally not familiar with items like TK, TCK, TPK, TPACK, all of which are related to technology.

In addition, the obvious lack of content knowledge is due to that this kind of knowledge in the business English context has the characteristics of complex combination, which

needs to have the knowledge of carrying out intercommunication in the context of business, the knowledge of business theory and practice, and the knowledge of the language of business field (Dudley-Evans & St-John, 1998). In addition, the content knowledge of business English is influenced not only by the reform of foreign language teaching and by the theory and practice of modern business in the era of big data, but also by temporal intermodal models, which add to the complexity of content knowledge in business English.

The three business English teachers indicate that business English teachers are relatively familiar with business English pedagogical knowledge, because most of business English teachers master not only language teaching methods but also certain business English teaching methods.

In addition, most of the supplementary of TK and TPK is provided by skill-based courses' teachers who teach FAME subjects, because, the five teachers teaching FAME subjects believe that they are divided into two categories: knowledge-based courses teachers and skill-based courses teachers. Knowledge-based courses teachers refer to teachers teaching management and economics teachers whose teaching don't much rely on technology. However, skill-based courses teachers refer to teachers teaching accounting, statistics, investment whose teaching much depend on the support of technology.

FAME subjects' teachers also provide some valuable insights on the importance of technology, the relationship between FAME subjects and English, business English teachers case knowledge accumulation methods. Firstly, FAME subjects are now relying on technology, especially tools, because users' operations totally depend on back-stage data analysis, which is based on computer technology, software engineering, artificial intelligence and big data, especially some majors like cross-border e-commerce major. Thus, technology is of importance in business English teaching as well. Secondly, English is a tool that can naturally be integrated with other subjects. Thus, business English teachers' initial task is to master professional knowledge of FAME subjects (core logic) to transform themselves from GE teachers to business English teachers. Thirdly, case knowledge should be accumulated by business English teachers themselves. (1) Classic cases like the case of Southwest Airlines, can be easily learned and understood by reading original materials or textbooks, since the business knowledge system comes from foreign countries written in English. (2) Teachers can accumulate cases by auditing experts' lessons, such as the Haidilao case in human resources class. (3) Teachers should pay attention to current affairs and news to capture case information with their own business core logic. (4) Business English teachers should consciously attend business English teacher training, seminars or lectures, which

is full of cases from business English professors.

FINDINGS AND DISCUSSIONS OF THE SURVEYS

Findings

1. Participants

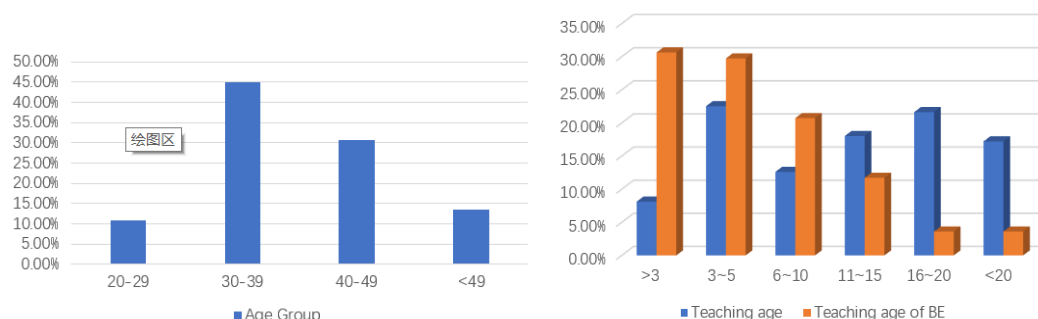
As proposed by Anderson (2010), the appropriate sample size for factor analysis should be 5 times the number of items investigated. Thus, the suitable number of a 21-item survey is 105 participants. Altogether 200 surveys are distributed through Enterprise-WeChat, WeChat, QQ and emails. However, 76 respondents are unwilling to participate in the survey and 15 received responses are unusable because the participants finish the questionnaire within less than 60 seconds. Thus, the effective response number is 109 responses that fit for confirmatory factor analysis (CFA).

2. Demographics

All the 109 participants are business English teachers from 18 provinces in China, most of whom teach business English course (52%) as shown in figure 4. Meanwhile, the age of experienced business English teachers are around 30-39 years old and 40-49 years old as shown in figure 5, accounting for 45.05% and 30.63% respectively. The majority of the respondents are lecturers (46.73%) or professors (42.06%). Teaching experience of participants is concentrated in two groups: a group with teaching experience of 3~5 years (22.43%) and the other group with more than 11 years (51.88%), but their teaching experience of business English is gathered around the age group of less than 10 years (80.38%) as shown in figure 6.

Teaching Courses



Figure 4: The percentage of teaching courses.**Figure 5: The percentage of age group.****Figure 6: The percentage of teaching age.**

3. Results

Participants are asked to respond to the 5-Point Scale (5=excellent; 1=very poor) considering the importance of each item of business English teachers' TPACK framework. The degree of internal consistency with initiation 0.975 based on Cronbach's alpha confirm the questionnaire had very high reliability.

Meanwhile, the structural validity of the survey is analyzed based on confirmatory factor analysis (CFA). The KMO of sampling adequacy (0.931) and approximate chi-square value of Bartlett's test of sphericity is large (1572.221) and the significant Bartlett's test of sphericity $p < .001$ (Sig.=0.000) indicated that the items are appropriate for confirmatory factor analysis. After confirmatory factor analysis (CFA), the corresponding relationship between the questions and the study variables is basically consistent with the expectation, and the factor loading coefficient reached the ideal value (>0.4) (see Table A). Hence, the study variables are valid. In addition, table B illustrates the mean scores of the study variables, the mean scores of all variables are higher than 4.0, indicating that all business English teachers generally hold a relatively favorable attitude towards each variable. Meanwhile, the standard deviation is very small, indicating that the data fluctuation degree is very small, which means the framework is stable (see Table B).

	Component				
	1	2	3	4	5
(1)	0.43	0.31	0.67	0.33	0.10
(2)	0.40	0.43	0.69	0.04	0.29
(3)	0.22	0.22	0.47	0.20	0.69
(4)	0.40	0.36	0.27	0.15	0.54
(5)	0.57	0.69	0.12	0.19	0.18
(6)	0.22	0.71	0.53	0.16	0.11
(7)	0.21	0.82	0.24	0.26	0.21
(8)	0.23	0.73	0.28	0.34	0.21
(9)	0.31	0.55	0.19	0.56	0.20
(10)	0.14	0.61	-0.01	0.53	0.42
(11)	0.62	0.56	0.25	0.24	0.18
(12)	0.51	0.47	0.19	0.20	0.50
(13)	0.50	0.41	0.21	0.59	0.10
(14)	0.34	0.19	0.73	0.30	0.33
(15)	0.69	0.47	0.24	0.28	0.01
(16)	0.80	0.21	0.28	0.12	0.27
(17)	0.63	0.10	0.39	0.44	0.21
(18)	0.24	0.34	0.29	0.74	0.15
(19)	0.67	0.40	0.28	0.36	0.19
(20)	0.62	0.22	0.47	0.26	0.38
(21)	0.66	0.15	0.52	0.17	0.31
KMO	0.931				
Bartlett's test of sphericity	1572.221				
df	210.000				
p	-				

Table A: Rotated factor loading matrix (extraction method: principal component).

	N	Minimum	Maximum	MS	SD	
	1	109	1	5	4.25	1.37
	2	109	1	5	4.21	0.83
	3	109	1	5	4.2	1.27
TK subtotal					4.22	1.16
	4	109	1	5	4.08	1.18
	5	109	1	5	4.5	0.68
CK Subtotal					4.29	0.93
	6	109	1	5	4.29	0.76
	7	109	1	5	4.31	0.88
	8	109	1	5	4.5	0.69
PK Subtotal					4.37	0.78
	9	109	1	5	4.4	0.59
	10	109	1	5	4.41	0.8
	11	109	1	5	4.33	0.83
	12	109	1	5	4.25	0.8
PCK Subtotal					4.35	0.76
	13	109	1	5	3.91	1.02
	14	109	1	5	4.06	0.89
	15	109	1	5	3.94	1.04
	16	109	1	5	4.08	0.8
TCK Subtotal					4	0.94
	17	109	1	5	4.13	0.86
	18	109	1	5	4.1	0.75
	19	109	1	5	4.08	0.72
TPK Subtotal					4.1	0.78
	20	109	1	5	4.21	0.9
	21	109	1	5	4.06	0.98
TPACK Subtotal					4.13	0.94

Table B: Descriptive statistics (mean scores and standard deviation) for the importance of the business English teachers' TPACK framework.

DISCUSSION

The results of this study reveal that business English teachers consider that business English teachers' TPACK framework is important in general. In spite of that, they pay closest attention to pedagogical knowledge (Mean = 4.37, SD = 0.78) with the greatest perceived strength in business English teaching, followed by content knowledge (Mean = 4.29, SD = 0.93) and technical knowledge (Mean = 4.22, SD = 1.16), indicating that business English teachers value teaching methods the most. Therefore, the proportion

of PCK (Mean = 4.35, SD = 0.76) with “general language learning theories and approaches” slightly above average, is much higher than that of TPK (Mean = 4.10, SD = 0.78) and TCK (Mean = 4.00, SD = 0.94). But relatively speaking, TPK is slightly higher than TCK (as shown in Table B). The significance of PK and PCK could be explained by the research made by Jiang & Chang (2016) and Jang & Tsai (2012) that teachers with more language teaching experience are generally inclined to have more confidence in their knowledge regarding CK, PK, and PCK (Jiang & Chang, 2016; Jang & Tsai, 2012).

However, the combining TK with PK and CK is of relatively low importance compared with other items of TPACK, which could be explained by the Roig-Vila's research that their teaching experience may be negatively linked to their perceived competence of knowledge with regard to TK, TPK, TCK, and TPACK (Roig-Vila, 2015). On the other hand, the requirement of technology in knowledge-based business English class is low, such as economic trade English.

In terms of content knowledge, business English teachers felt some knowledge items are significant, like item “foundational knowledge in the subject- area” while, some items are less important, such as item of “knowledgeable about business English”, because teachers believe that they themselves need to be equipped with “basic business concepts, business terminologies, business abbreviations, classical cases, business thinking, business etiquette, business culture, ideas, beliefs and practices that construct the typical speech, acts and genres”, not with “understand the origin, definition and development of business English teaching and learning”.

The results of this study may suggest that the participants possessed more significance in knowledge regarding TPACK (Mean = 4.13, SD = 0.94), which shows the comprehensive knowledge of business English teachers. That is because TPACK included an understanding of the complexity of relationships between learners, teachers, content, practices and technologies (Archambault & Crippen, 2009).

IMPLICATION

Developing and validating of the business English teachers' knowledge framework based on TPACK could facilitate the business English teachers' development, the improvement of the teaching quality, as well as fill the academic vacancy of business English teacher's knowledge framework under the Information and Communication Technology (ICT) prevailing circumstance in modern society in tertiary education in China. In addition, as is pointed out by Öz (2015), mere TPACK development cannot necessarily guarantee the application of the business English teachers' knowledge in classroom teaching (Öz, 2015).

Future research should explore how to implement the TPACK framework for business English teachers to help higher educational business English teachers to build experiences in effectively integrating technology, content, and pedagogy. Future research can also apply this framework to the specific subjects of business English areas, such as English for exhibition purpose, English for tourism management purpose, English for economic and trade purpose, English for e-commerce purpose, etc., to respond to the current interest in developing content-specific surveys that support the idea that each content area values its own pedagogical and technological practices (Baser & Kopcha & Ozden, 2015).

CONCLUSION

This study develops and validates the knowledge framework of business English teachers from the perspective of business English professors and teachers who teach FAME subjects, based on the TPACK theory. In addition, the current knowledge status of business English teachers is obtained through semi-structure interview. Finally, content and structure of this business English TPACK framework are validated by means of qualitative and the quantitative research. The findings of the survey show that in the development of business English teachers' TPACK framework, more attention should be paid to business English teachers' contextual knowledge of business English teaching, cooperation with different stakeholder distantly, expression of idea and supporting language learning with multimedia, the design business English learning material with technology and the use of digital concordance and corpora.

The finding of this knowledge framework highlights the challenging mission of high-quality business English teachers. This framework could therefore be used in the assessment of the effectiveness of business English teachers' preparation programs in cultivating knowledge depending on universities' requirement. The framework can also be used to provide the administrators or educators with the baseline data of business English teachers to improve business English teaching in their systems, and to provide the basis for the curriculum development and teaching method research of business English teachers.

LIMITATION AND FUTURE RESEARCH

Although the validity of the study has attracted great attention, there are still some limitations. Interviews and surveys of target business English teachers can provide a reliable data and can more accurately measure business English teachers' knowledge framework, so the range of the study is limited by the target population business teachers. Hence, the number of samples of the survey are small in the study. Besides, because of the tight schedule of the whole research and the impact of COVID-19,

questionnaires cannot be distributed in more diversified ways, like samples in live seminar. In addition, other forms of assessing business English teachers' TPACK like classroom observation, empirical studies are not included either, except semi-structure interviews and survey questionnaires. In terms of participants, business English teachers can be classified into various groups in the future study, such as FAME subjects' background teachers, English background teachers, or dual backgrounds. Moreover, since business English learners are not involved in this study, future research can invite learners to verify this framework in the classroom practice in the future. In addition, two suggestions on the future research of teachers in higher education are offered. One suggestion is that business English teachers' leadership development research could be considered to better realize the management of business classroom, because of the requirement of business English teaching, like project teaching. The other suggestion is that the integration of emerging technology like virtual reality could be designed in business English stimulation teaching. Lastly, more quantitative methods, named Analytic Hierarchy Process (AHP) and entropy value method can be used to analyze these data by calculating the weight coefficient.

ACKNOWLEDGEMENTS

Several colleagues are included in the semi-structural interview, especially Cao Zhaohong, Liu Zhiguo, Guo Songtao, Zhao Qian, Wang Lingting, Luo Ting, Liu Ke. And Xu Jiajia helps to analyze data from survey questionnaire. We thank them for their constructive suggestions and insightful feedback.

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