INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN PROGRESSIVE EDUCATION & DEVELOPMENT

OPEN ACCESS JOURNAL

Vol 12, Issue 2, (2023) E-ISSN: 2226-6348

On the Factors Affecting the Integration of TPACK in ELT Classes

Jiandong Hu[1] & Hongyuan Wang[2]

[1]Postgraduate in Sichuan University of Science and Engineering, Zigong, China, [2]Master Supervisor in Sichuan University of Science and Engineering, Zigong, China

To Link this Article: http://dx.doi.org/10.6007/IJARPED/v12-i2/17663 DOI:10.6007/IJARPED/v12-i2/17663

Published Online: 19 June 2023

Abstract

In recent years, due to the epidemic situation in the world, online teaching has gradually entered the stage. Even though the epidemic has come to an end, online teaching is still employed as a complement, which has higher requirements for teachers' technical knowledge. And teachers' TPACK (Technological Pedagogical Content Knowledge), closely related to teachers' technical knowledge, is a new concept emerging in the process of teachers' professional development and a new requirement for teachers' knowledge put forward by modern education. Starting from the relationship between TPACK and English language teaching in China, this paper first analyzes the connotation of TPACK and expounds the factors that affect the integration of TPACK in ELT classroom in China, and then puts forward the ways to promote the integration of TPACK in ELT classroom.

Keywords: TPACK, ELT Classes, Teachers' Professional Development

Introduction

In today's society, teachers have the responsibility to insist lifelong learning and accept the new knowledge and technology of the new society. Building a high-quality teaching team is crucial for the development of society in the new era. In the current field of education, the ways in which knowledge is acquired and imparted, as well as the relationship between teaching and education, have undergone revolutionary changes in learning. This places higher demands on teachers. Therefore, as an important component of teacher quality, teacher knowledge is undoubtedly a part that needs to be strengthened and improved, and information technology needs to be integrated.

In order to integrate technology into the English classroom environment, scholars have proposed many theories and models, among which TPACK is one of the outstanding representatives. Before TPACK was proposed, the main concern in China was the research on English teachers' knowledge. The research on teachers' knowledge rose in the 1980s with the development of teachers' professional movement and cognitive psychology. And It was mainly based on behaviorism psychology before the 1980s.

However, this kind of research only focuses on the teacher's behavior that can cause changes in students' performance, and lacks the investigation of the teacher's knowledge that supports the behavior. Since the 1980s, the rise of cognitive psychology has shifted teachers' research from focusing on teachers' external behavior to focusing on teachers' knowledge.

During this period, scholars put forward a kind of special knowledge reflecting teachers' professionalism-pedagogical content knowledge. With the influence of information technology on English teaching, people find that technical knowledge is gradually becoming an increasingly important component of English teachers' knowledge system. When discussing the knowledge framework of teachers, people begun to take technical knowledge as an important element of the teache's knowledge system. Among them, Koehler and Mishra (2006) first brought technical knowledge into the teacher's knowledge structure in 2005, and proposed TPACK.

Since the proposal of TPACK, it has attracted widespread attention from scholars both domestically and internationally. TPACK provides a more comprehensive and flexible framework for evaluating teachers' technical integration capabilities. At present, the connotation of TPACK has been deeply studied at home and abroad. However, the current TPACK status of teachers is not ideal. one the on hand, teachers are still unfamiliar with TPACK and their performance is uneven. The structure of the TPACK framework and the integration level of TPACK among teachers is still at a relatively low level. This has led to teachers not being able to fully utilize their strengths in the classroom. On the other hand, the uneven distribution of TPACK is worth noting. The distribution of novice teachers is significantly different from that of experienced teachers. This means that TPACK is demanded for different teachers. What is more, fewer researches have been done on the factors affecting the integration of TPACK in ELT classes.

So this paper will analyze the relationship between TPACK and ELT and the factors influencing ELT classes. And on this basis, this paper will propose some effective ways for English teachers to develop their TPACK ability.

Literature review

Previous studies on TPACK framework abroad

The professional development of teachers has increasingly become a hot topic of concern in the field of education research worldwide. However, the professional development of teachers is closely related to their knowledge development, and teacher knowledge is the prerequisite and foundation for teachers to carry out effective teaching activities and their professional development. And TPACK is one of the hot topics of teachers' professional knowledge.

TPACK was based on the PCK (Pedagogical Content Knowledge) by Shulman (1986). He proposed a combination of teaching and content to improve teaching effectiveness. This suggestion has had a significant impact on people's perception of teacher knowledge. And Shulman intended to solve problems related to teaching and learning. PCK provides teachers with a new perspective to help learners understand more effectively and plays an important role in their professional development. And PCK is widely used in theoretical research fields such as explaining teaching processes and teaching methods. But it does not provide a clear explanation of the relationship between technology and content, pedagogy and learners.

The concept of TPCK (Technical Teaching Content Knowledge) emerged in the early 21st century (Pierson, 2001). Valanides (2005) believed that TPACK can better understand the abilities that teachers need to cultivate in order to fully utilize information and communication technology for teaching. They believed that TPACK was not a synthesis of several elements, but rather a unique knowledge system. Niess (2005) explored how technology was integrated into classroom teaching practices and how this integration affected the use of technology by teachers and students. He defined TPCK as the combination

of the development of subject knowledge with the development of technical and teaching knowledge.

The TPACK framework has played a significant role in the field of education in recent years. It is the abbreviation of Technical Pedagogical Content Knowledge. American scholars Koehler and Mishra first proposed this framework in 2005. Graham (2012) explored how teachers can use information technology in practical teaching from the perspective of TPACK. He emphasized the relationship between TPACK and PCK. PCK also has technology, but many technologies have not yet been popularized. Olofson (2016) redefined TPACK as TPACKing from the perspective of radical constructivism. This doctrine expects to acquire TPACK knowledge rather than static knowledge. The proposal of TPACK can deepen educators' understanding of the role of technology in education. Once emerging technologies are popularized in the field of education, technology will become a part of subject teaching knowledge, and TPACK will become PCK.

Previous studies on TPACK framework at home

In China, Zhan and Ren (2010) conducted an in-depth and comprehensive study on the concept of the TPACK framework. Xu (2013) proposed the future development direction and trends of TPACK and provided targeted suggestions. In terms of EFL classrooms, Ruan and Yang (2014) provided suggestions for Technical Strategy and Content Knowledge (TSACK) based on an EFL teaching project and referred to TPACK. Zhu (2017) suggested constructing an EFL-TPACK secondary school evaluation index system to ensure the development of teacher TPACK. In addition, Zhao and Lan (2017) elaborated on the relationship between self-efficacy of rural teachers and TPACK, hoping to improve the information technology skills of rural teachers in China. Zhang and Tang (2021) pointed out that research on teacher TPACK in China can be divided into four main themes: 1) Introduction to foreign research on teacher TPACK; 2) TPACK level and development path of pre-service teachers; 3) The development path of TPACK for in-service teachers; 4) TPACK learning for teacher specific subjects.

In conclusion, domestic and foreign scholars are trying to enrich and deepen the TPACK framework to deepen understanding of this framework. But most of them only briefly introduced the TPACK framework and did not conduct systematic and in-depth research. Therefore, the author believes that researches should not only focus on the TAPCK framework, but also explore the influencing factors of TPACK integration and how it can be applied in teaching practice.

The theoretical basis of TPACK

TPACK framework contains three core elements, namely, content knowledge(CK), pedagogical knowledge (PK) and technical knowledge (TK). And It has Four composite elements, namely pedagogical content knowledge (PCK), technical content knowledge (TCK), technical pedagogical knowledge (TPK), Technical Pedagogical Content Knowledge (TPACK).

Pedagogical knowledge refers to general teaching method knowledge. In English teaching practice, teachers' knowledge of teaching methods includes mastery of teaching objectives, application of teaching strategies, and skills in classroom management.

Content knowledge refers to the mastery of subject content by English teachers. This includes two levels, one is to master specific subject knowledge, which is the basic part of content knowledge. The second is to have a state of cultural integration.

And the last is technical knowledge, which refers to the fact that teachers should master information technology related to teaching, especially the mastery of new technologies.

Technical content knowledge (TCK) refers to the ability to understand the bidirectional influence between technology and English subject knowledge. For example, Electronic dictionary is the embodiment of the influence of technology on English subject content. Technical pedagogical knowledge (TPK) refers to information technology changing teaching methods. The change in teaching methods caused by information technology is enormous, such as multimedia teaching. Pedagogical content knowledge (PCK) refers to the knowledge that teachers must master to arrange appropriate teaching methods according to the teaching content. Especially under the influence of technology, the selection of English teaching content will inevitably change, and English teachers must possess this ability to adapt to the changes brought about by information technology.

Compared with content knowledge, pedagogical knowledge and technical knowledge, Technical Pedagogical Content Knowledge is characterized by comprehensiveness, situational, practicality, silence and changeability (Yan & Xu, 2013). TPACK provides a theoretical basis for the construction of dynamic knowledge frameworks in their career development (Wang, 2014). As a result, it is necessary to learn the concept of TPACK and how to promote TPACK integration for English teachers so that they can teach English in a better way.

In recent years, TPACK has become an important factor in English teachers' professional development and an important standard for evaluating English teachers' teaching level. In view of the importance of information technology application in English teaching, it is urgent to improve English teachers' TPACK level. TPACK provides a new perspective for foreign language teachers to integrate technology and teaching, and provides a theoretical basis for the construction of a dynamic knowledge framework in their career development (Fan & Zhang, 2016). An Excellent English teachers can maintain a dynamic balance between content knowledge, pedagogical knowledge and technical knowledge. In the English classes, teachers often use multimedia teaching such as PPT. This actually requires English teachers' technical knowledge.

As a knowledge framework aimed at improving teachers' professional development, TPACK plays an important role in English teachers' professional development, especially in the information teaching environment where Internet information technology and English courses are fully integrated (Koehler & Mishra, 2009).

Factors influencing TPACK integration in EFL Classes

Teacher's beliefs

First of all, English teachers' beliefs are important internal factors to promote the development of TPACK. Teachers' beliefs affect teachers' teaching behavior. For example, beliefs about the use of technology in teaching will affect their TPACK level (Wang & Xiong, 2018). English teachers generally lack strong beliefs to improve their TPACK because they think their current level is enough. Once teachers have firm beliefs, they have strong internal driving force to improve their TPACK level. Therefore, the first step is to inspire teachers' belief in improving TPACK ability. They should integrate the three abilities and apply them to teaching practice.

Teacher's learning and communication

Secondly, teachers' learning and communication is a dynamic factor to promote the development of TPACK (Guzey & Roehrig, 2009). It includes communication between teachers and students, communication between teachers and teachers, learning and competitions,

etc. In order to mobilize students' enthusiasm for learning, teachers will constantly supplement their knowledge and actively explore appropriate teaching methods to better meet the needs of students. Interaction among teachers also facilitates the development of TPACK for teachers. For example, English teachers collaborate with each other to complete micro-lessons. In the process of collaboration between other teachers, they improve their TPACK level so that they can achieve their goals. What is more, the competitions also have huge impact on teacher's TPACK. They improve their TPACK level in the process of competitions.

Teacher's self-efficacy

Although English teachers are generally confident in choosing technology for teaching, they are less confident in using technology to effectively integrate teaching and learning, especially in using technology to help students learn in order to improve the quality of teaching and learning (Wang, 2014). That is to say, teachers' self-efficacy is an important factor that affects TPACK integration. Exploring the TPACK Structure and Technology Integration of Foreign Language Teachers. The relationship between self-efficacy and knowledge structure can help reveal the knowledge structure and belief tendencies of foreign language teachers, as well as the existing problems, and provide targeted and constructive suggestions to promote the organic integration of teaching and technology and the sustainable development of foreign language teachers in the information age.

School Facilities

The School facilities are an external contextual factor to ensure teachers' TPACK development. As a matter of fact, multimedia equipment in many schools has not yet been popularized. English teaching facilities include multimedia equipment, voice classroom and other teaching facilities. This considerably affects the integration of TAPCK for English teachers. If schools cannot provide suitable multimedia equipment, teachers will not have the opportunity to develop their technical knowledge. It is important tp improve the level of educational technology and equipment in schools. Good modern teaching equipment is the basis for improving English teachers' TPACK. Schools should increase the investment in modern teaching equipment, such as multimedia classrooms, voice rooms, etc. Schools should also increase training for English teachers to use teaching equipment to help them adapt to modern teaching.

Gender Differences

In addition, the gender differences of English teachers also have a certain impact on TPACK ability. Generally speaking, male teachers have stronger practical ability in computer operation, while female teachers are generally afraid of computer technology, which leads to the difference between men and women teachers in TK. And male students have significantly higher levels of TK and TCK than female students. However, female teachers are generally good at teaching, so their PK is usually higher than that of male teachers. In summary, men and women have their own advantages in various aspects of TPACK.

Teaching Age

The teaching age of English teachers has a significant impact on TPACK integration. As teachers' teaching experience grows, their teaching experience is accumulated. Consequently, their CK and PK levels become higher and higher. This means that the CK and

PK of older teachers are generally higher than those of younger teachers. However, the TK level is relatively higher for novice teachers. This is due to the fact that novice teachers are mostly "post-90s" who have been exposed to computers and the Internet since they were young and have a stronger ability to adapt and accept information technology. For veteran teachers, they should further accept and learn modern information technology while ensuring their own CK and PK, and improve their TK level. For young teachers, they should strengthen their learning of subject knowledge and teaching knowledge while ensuring their TK advantages, and continuously improve their knowledge and teaching level.

Strategies to promote TPACK integration for English teachers

Three basic conditions are required to form EFL-TPACK: proficiency in information technology, proficiency in English content knowledge and pedagogy. The three are cross-coupled when integrated, and together they form the EFL-TPACK knowledge building for English teachers (Zhu, 2017). In order to improve the teacher' TAPCK, the following aspects should be highlighted.

To improve the curriculum system of English teacher education

Modularity is a common choice in the current teacher education curriculum. The structure of the literacy of outstanding teachers in basic education should include six major parts: basic literacy, subject literacy, teaching literacy, management literacy, research literacy, and information literacy. In order to construct EFL-TPACK knowledge building for English teachers, it is urgent to improve English teachers' information literacy(Xu, 2014). Therefore, it is necessary to improve teachers' ability to apply information technology to integrate content and pedagogical knowledge. The school should improve the knowledge and ability module course of using information technology, extend class hours, improve credits, and focus on developing the information teaching concept and information technology practical ability of English major normal students, so as to lay a good foundation for the formation of TPACK in ELT classes.

To construct TPACK evaluation index system for English teachers

It is necessary to integrate the existing TPACK research results with the relevant research results of English teaching knowledge, and build a specific TPACK evaluation index system. In this way, the majority of English teachers can compare the evaluation index system, analyze their own TPACK shortcomings, strengthen their advantages, complement their weaknesses, and constantly improve their own TPACK level (Zhang & Zhang & Wang, 2016). The evaluation index system can also be used by teacher education institutions and education authorities to evaluate the development of TPACK for English teachers.

To carry out targeted teacher education technology training in combination with the actual needs of English teachers

Most English teachers only receive pre-job training, and few receive post-job training and special education technology training. Moreover, their training content always concentrate on theory and ignore their practical ability in teaching. This leads to the weak technical knowledge in English teachers' TPACK (Dong & Sang & Cai, 2014). Therefore, schools and educational institutions should strengthen teachers' practical training on the premise of ensuring theoretical knowledge learning. It is important to enable teachers to continuously

improve their teaching level through continuous learning and training throughout their entire career.

To provide specific teaching situations

The development of teachers' TPACK ability cannot be separated from the specific and systematic teaching situation. Effective language learning and teaching must also create specific situations, and can not be isolated from specific situations to impart relevant knowledge. English teachers also need to develop the ability to create effective language learning situations for language learners with the help of specific situations. When creating a learning environment, teachers should give full consideration to learners' personality characteristics. The learning environment should be closely related to learners' actual life so that they can use their own conceptual system to explain, absorb, change and use new knowledge. Overall, a specific teaching environment plays a crucial role in the development of teachers' TPACK abilities.

To promote mutual assistance and cooperation among English teachers

There should be cooperation between male and female teachers (Zhang & Liu, 2015). Female teachers can help male teachers improve their teaching level, while male teachers can guide female teachers to use information technology in teaching. Teaching cooperation should also be carried out between novice teachers and experienced teachers. Experienced teachers can impart their own teaching experience, while novice teachers can help them adapt to information teaching. Generally speaking, the overall TPACK level of novice teachers is lower than that of other teachers, especially in the field of education knowledge. Therefore, the TPACK level of novice teachers should be improved in various aspects. Young teachers can participate in some teacher seminars. They can discuss the latest teaching theories and methods with experienced teachers and share their teaching experience there. In this way, they can enhance their knowledge in education. Most novice teachers have just graduated from university. Their existing knowledge mainly comes from the courses they study in university. Therefore, educational institutions and educators should consider integrating different courses and providing more opportunities for students. Only when teachers help and learn from each other can their TPACK abilities be jointly improved.

To hold the concept of lifelong learning

English teachers should hold the concept of lifelong learning and pay attention to the improvement of their basic knowledge. With the rapid change of today's society, English teachers can keep up with the requirements of the development of the times only by holding the concept of lifelong learning and constantly improving their basic knowledge. Teachers' professional development is a lifelong and continuous process (Fan & Yang, 2015). If learning is stopped, the teacher's knowledge of CK, PK, and TK will all stop developing, which is unfavorable for the integration of teacher TPACK.

Whether English teachers can actively accept new technologies is related to their smooth development of TPACK abilities. In other words, to cultivate teachers' TPACK ability is to let them form the concept of active acceptance and Lifelong learning. However, in reality, whether and how teachers use information technology in English teaching is often influenced by individual and external evaluation systems and incentive mechanisms. Therefore, two measures can be taken to transform teacher' learning concepts (Li, 2017). Firstly, schools should attach great importance to the cultivation of English teachers' TPACK ability in the

system, requiring teachers to increase their learning efforts and appropriately combine technical concept evaluation with performance. Secondly, it is necessary to guide English teachers to establish a TPACK ability development community, and invite educational technology teachers, teaching theory experts, and outstanding TPACK teachers to guide and help, forming an active learning and good professional literacy development atmosphere. These two measures can ensure the transformation of English teachers' technical concepts.

To develop the quality of integrating knowledge elements

First of all, English teachers should develop the ability to integrate English CK with PK. Teachers should be able to accurately match the most effective teaching methods suitable for the language knowledge they teach. Secondly, English teachers should develop the knowledge literacy of integrating TK with PK. English teachers should be able to use the best teaching tools and auxiliary means to design teaching and improve teaching strategies. What is more, English teachers should improve their knowledge literacy of integrating TK and CK. Teachers should have the ability to choose the most effective technology that can support language learners to learn certain language knowledge. English teachers should integrate PK, CK and TK to form a high degree of sensitivity and master the dynamic balance between them. And they should maintain this dynamic balance in teaching activities and create new balance to meet the needs of different teaching situations (Archambault & Crippen, 2009).

To establish a resource guarantee mechanism to promote the development of English teachers' professional literacy

The resources here can be divided into two aspects (Zhang, 2015). The first is to increase investment in information technology equipment. This includes increasing the popularization of multimedia equipment, establishing an English teaching technology center, and a future English teacher space station. The second is to increase investment in technology. This includes strengthening cooperation between English teachers and educational technology departments, organizing educational technology exchanges and learning activities, etc.

Conclusion

The proposal of TPACK framework provides a new perspective for the professional development of English teachers. It plays an important role in enriching teachers' knowledge, enabling them to master modern educational technology and educational concepts. It also facilitates to train compound foreign language talents to meet the requirements of the information age. In a word, the development of English teachers' TPACK plays a crucial role in utilizing technology to effectively carry out teaching activities and promote professional development.

The major findings of this paper include the following points. Firstly, in terms of the connotation of TPACK, it refers to the integration of subject teaching knowledge of technology. It includes three core elements, namely CK, PK, TK, and four composite elements, namely PCK, TCK, TPK, and TPACK. Secondly, this paper investigates the factors influencing TPACK integration in EFL Classes. The influencing factors are very extensive, including various aspects such as teachers' own beliefs, learning and communication, self-efficacy, school equipment and facilities, gender differences, and their teaching age. Finally, the author proposes some strategies based on these influencing factors to promote TPACK integration for English teachers, including improving the curriculum system of English teacher education, constructing TPACK evaluation index system, carrying out teacher education technology

training, providing specific teaching situations, promoting cooperation, holding the concept of lifelong learning, developing the quality of integrating knowledge elements and establishing a resource guarantee mechanism.

Through the analysis of this study, in order to better promote the TPACK integration of English teachers, the following suggestions are proposed for teaching. First of all, However, the integration of English teachers' TPACK cannot be achieved at once. It requires the joint efforts of teachers and scholars. The development of English teachers' TPACK requires them to constantly improve their knowledge structure and improve the integration level of technology. They need to constantly reflect on the development process and development strategies of TPACK ability so as to realize the sustainable development of English teachers' profession. Secondly, the role of TPACK in teacher professional development largely depends on the teacher's own TPACK awareness and whether they can scientifically and reasonably practice the process of teacher TPACK ability development. The rapid development of English teachers' TPACK ability requires them to constantly improve their knowledge structure, improve the integration level of technology and teaching process, constantly reflect on the development process of TPACK ability and its development strategies, so as to achieve the sustainable development of English teachers' own specialty.

At present, there are relatively fewer researches on the influencing factors and cultivation strategies of TAPCK integration. Based on previous research, this study investigated the TPACK of English teachers, its influencing factors, and training strategies have important theoretical and practical significance for the study of TPACK. However, limitations still exist due to the author's research ability, time, and energy. Therefore, the teachers still need to improve their knowledge structure, promote the integration of teacher technology as well as teaching knowledge and achieve sustainable development of the teaching profession.

References

Angeli, C. N. (2005). Valanides. Pre-service elementary teachers as information and communication technology designers: An instructional systems design model based on an expanded view of pedagogical content knowledge. *Journal of Computer Assisted Learning*, (4), 292-302.

Archambault, L., & Crippen, K. (2009). Examining TPACK among K-12 online distance educators in the United States. *Contemporary Issues in Technology and Teacher Education*, (1), 71-88.

Dong, Y., & Sang, G. Y., & Cai, J. X. (2014). An Empirical Study on TPACK Knowledge among Normal University Students. *Teacher Education Research*, (3), 36-43.

Fan, L., & Yang, J. Y. (2015). Exploration of Career Burnout and Corresponding Strategies for College English Teachers. F*oreign language education,* (3), 44-49.

Fan, L., & Zhang, X. C. (2016). Research on Professional Development of English Teachers Based on TPACK Perspective. *China university teaching*, (3), 76-79.

Graham, C. R., Borup, J., & Smith, N. B. (2012). Using TPACK as a framework to understand teacher candidates' technology integration decisions. *Journal of Computer Assisted Learning*, (6), 21-23.

Guzey, S. S., & Roehrig, G. H. (2009). Teaching science with technology: Case studies of science teachers. *Contemporary Issues in Technology and Teacher Education*, (1), 25-45.

Li, Y. Y. (2017). The Structure and Development of TPACK Ability for English Teachers. *Journal of Teaching and Management*, (12), 65-67.

Mishra, P., & M. Koehler. (2006). TPACK: A fram work for teacher knowledge. *Teachers College Record*, (6): 31-33.

Koehler, M., & Mishra, P. (2009). What is Technological Pedagogical Content Knowledge(TPACK). *Contemporary Issues in Technology and Teacher Education*, (1), 60-70.

Olofson, M. W., & Swallow, M. J., & Neumann, M. D. (2016). TPACKing: A constructivist framing of TPACK to analyze teachers' construction of knowledge. *Computers & Education*, (5), 188-201.

Pierson, M. E. (2001). Technology integration practice as a function of pedagogical expertise. *Journal of research on computing in education*, (4), 413-430.

Ruan, Q. Y., & Yang, Y. Q. (2014). The development of Technological Pedagogical Content Knowledge:From TPACK, TSACK to TMACK. *Distance Education in China*, (11), 20-26.

Shulman, L. S. (1986). Those who understand: knowledge growth in teaching. *Educational Researcher*, (2), 4-14.

Wang, Q. (2014). A Study on the TPACK Structure and Technical Integration Self efficacy of Foreign Language Teachers. *Technology Enhanced Foreign Languages*, (4), 14-20.

Wang, X. M., & Xiong, Y. (2018). W. A Study on College English Teachers' TPACK Level and Its Influencing Factors in the Context of Internet plus. *Shandong Foreign Language Teaching*, (6), 40-51.

Xu, P. (2013). Current Status and Enlightenment of TPACK Research Abroad. *China Educational Technology*, (9), 112-116.

Xu, Z. T. (2014). Research on the Development Strategy of TPACK Based on Key Features. *Modern Educational Technology*, (9), 58-64.

Yan, Z. P., & Xu, F. Y. (2013). TPACK: The Knowledge Foundation of Teacher Professionalization in the Information Age. *Modern Educational Technology*, (3), 5-9.

Zhang, F. J. (2015). A Study on the Characteristics and Development of TPACK for College English Teachers. *China Educational Technology*, (5), 8-12.

Zhu, H. C. (2017). A Study on EFL-TPACK Literacy of Middle School English Teachers-Analysis of lesson examples based on the 2015 Jiangsu Province Junior High School English Teaching Observation Seminar. *Journal of Schooling Studies*, (3), 78-85.

Zhang, J., & Liu, G. H. (2015). The Development Mechanism and Training Path of Teacher TPACK from a Multidimensional Perspective. *Journal of Distance Education*, (3), 95-102.

Zhao, L. L., & Lan, T. (2017). The relationship between teachers' self-efficacy and TPACK in Underdevelopment and its enlightenment. *Theory and Practice of Education*, (29), 34-37.

Zhang, W., & Tang, J. (2021). Review of Teachers' Technological Pedagogical Content Knowledge (TPACK) in China. *Creative Education*, (7), 1726-1743.

Zhan, Y., & Ren, Y. Q. (2010). A Brief Introduction to the Connotation and Research Status of TPACK. *Journal of Distance Education*, (4), 78-87.

Zhang, Z., & Zhang, H., Wang, Y. N. (2016). A Study on the Factors Influencing the Development of TPACK among Pre service Teachers. *Modern Educational Technology*, (1), 46-52.