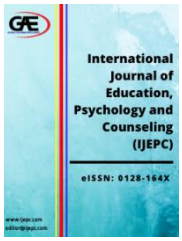
International Journal of Education, Psychology and Counseling
IJEPC
EISSN : 0128-164X
Volume 10 Issue 57 (March 2025) PP. 592-603
DOI 10.35631/IJEPC.1057038



INTERNATIONAL JOURNAL OF EDUCATION, PSYCHOLOGY AND COUNSELLING (IJEPC)
www.ijepc.com

DESIGN AND DEVELOPMENT OF TPACK TRAINING MODULES FOR CHINESE UNIVERSITY TEACHERS UNDER THE WAVE OF EDUCATIONAL INFORMATIZATION

He Sun[1], Noraini Said[2*], Nur suhaidah Sukor[3], Xianjun Dai[4]

[1] Faculty of Education and Sports Studies, Universiti Malaysia Sabah, Malaysia, Email: 785401145@qq.com
[2] Faculty of Education and Sports Studies, Universiti Malaysia Sabah, Malaysia, Email: noraini.said@ums.edu.my
[3] Faculty of Education and Sports Studies, Universiti Malaysia Sabah, Malaysia, Email: nursuhaidahsukor@ums.edu.my
[4] Faculty of Education and Sports Studies, Universiti Malaysia Sabah, Malaysia, Email: daphnedxj@163.com
[*] Corresponding Author

Article Info:

Article history:
Received date: 30.01.2025
Revised date: 19.02.2025
Accepted date: 04.03.2025
Published date: 17.03.2025

To cite this document:

He, S., Said, N., Sukor, N. S., & Xianjun, D. (2025). Design And Development Of Tpack Training Modules For Chinese University Teachers Under The Wave Of Educational Informatization. *International Journal of Education, Psychology and Counseling, 10* (57), 592-603.

DOI: 10.35631/IJEPC.1057038

Abstract:

This research focuses on the design and development of TPACK training module for Chinese college teachers under the background of education informatization. Based on the ADDIE system teaching design model, this paper designs and develops the teaching objectives, teaching contents, teaching modes, teaching resources and teaching implementation plans of TPACK training module courses. This study not only enriched the TPACK training resources for Chinese college teachers, but also provided sufficient support for the subsequent empirical research on TPACK training for college teachers.

Keywords:

TPACK Training Modules, University Teachers, Blended Learning, Educational Information.

International Journal of Education, Psychology and Counseling
IJEPC
EISSN : 0128-164X
Volume 10 Issue 57 (March 2025) PP. 592-603
DOI 10.35631/IJEPC.1057038

Introduction

With the rapid development of information technology, emerging technologies have been widely applied in the field of education. China actively promotes the construction of educational informatization, and the implementation of the "Educational Informatization 2.0 Action Plan" aims to achieve educational modernization (Ministry of Education, 2018). In this process, teachers, as the key executors of educational teaching, directly affect the effectiveness of educational informatization with their level of information-based teaching ability (Xiu & Chen, 2021).

TPACK (Technological Pedagogical Content Knowledge) serves as the core framework for teachers' information-based teaching ability, emphasizing the need for teachers to organically integrate technological knowledge, pedagogical knowledge, and content knowledge to achieve effective teaching (Zhang & Zhou, 2023). However, there is a certain degree of deficiency in TPACK among Chinese university teachers at present. On one hand, some teachers lag in understanding and mastering emerging technologies, making it difficult to apply them flexibly in teaching practice (Oliveira et al., 2021); on the other hand, there is a lack of depth in the integration of teaching methods with technology and subject content, leading to a phenomenon where technology and teaching are disjointed in the classroom (Verawati & Nisrina, 2025). Therefore, it is urgent to carry out TPACK training for university teachers, which is of great significance for enhancing teachers' information-based teaching ability and promoting the in-depth development of educational informatization.

Literature Review

TPACK Framework and Its Development

The TPACK (Technological Pedagogical Content Knowledge) framework originated in the United States as a result of extensive research into the structure of teacher knowledge, driven by the increasing emphasis on educational informatization. In 2005, scholars Koehler and Mishra introduced technological knowledge into the existing PCK (Pedagogical Content Knowledge) framework, originally proposed by Shulman, to create the TPACK model. The framework, initially termed TPCK, was officially renamed TPACK in 2007 to avoid confusion about the order of its components and to highlight the uniqueness of the concept as a whole.

The TPACK framework consists of three core components: Technological Knowledge (TK), Pedagogical Knowledge (PK), and Content Knowledge (CK), along with four hybrid elements formed by their interactions: Pedagogical Content Knowledge (PCK), Technological Pedagogical Knowledge (TPK), Technological Content Knowledge (TCK), and Technological Pedagogical Content Knowledge (TPACK) (Mohamed, 2023). TK encompasses both traditional technologies. As information technology rapidly evolves, teachers must continually update their technological knowledge (Szymkowiak et al., 2021). PK refers to teachers' deep understanding of teaching strategies, methods, organizational structures, and evaluation techniques. CK represents the subject-specific knowledge that teachers impart.

PCK, the intersection of CK and PK, reflects the teacher's ability to effectively teach subject content using appropriate methods. TPK pertains to how technology influences teaching methods. TCK examines how technology impacts the representation and understanding of

International Journal of Education, Psychology and Counseling
IJEPC
EISSN : 0128-164X
Volume 10 Issue 57 (March 2025) PP. 592-603
DOI 10.35631/IJEPC.1057038

content. Finally, TPACK represents the emergent knowledge that arises from the deep integration of these three domains, where teachers skillfully balance technology, pedagogy, and subject content to create innovative teaching experiences.

The research perspective on TPACK has diversified. While earlier studies focused primarily on the individual knowledge structures of teachers (Dong et al., 2014; Ren & Ren, 2015; Zhang & He, 2015), more recent research has broadened its scope to examine the influence of external factors, such as school organizational culture and educational policies, on the development of teachers' TPACK (Xu et al., 2015; Lin & Jiang, 2018; Wang et al., 2022). Additionally, studies have explored the relationship between TPACK and student learning outcomes, as well as the role of TPACK in driving educational innovation (Almaiah et al., 2022; Teknowijoyo, 2024; Li & Li, 2024). These developments provide valuable insights and support for the broader implementation of TPACK in educational practice.

The Current Status And Effectiveness Of TPACK Training In China And Other Countries

Internationally, TPACK research and training practices have a long history, resulting in the development of diverse and distinctive training models. In the United States, numerous universities and professional education institutions collaborate to offer TPACK training programs, with project-driven training being particularly prominent (Saad et al., 2021). For instance, Stanford University's TPACK program involves teachers working in teams to engage in a one-semester digital curriculum design project (Ginting et al., 2022). Additionally, according to Voithofer & Nelson (2021) some state education departments in the United States have developed comprehensive TPACK training standards and certification systems, which motivate teachers to actively engage in training and improve their TPACK competencies, ensuring the quality and recognition of the training.

In Europe, TPACK training is characterized by a focus on the creation of teacher learning communities across schools and regions (Thyssen et al., 2023). For example, according to Wasson et al. (2021) in Finland, several universities have established a teacher TPACK development alliance that organizes regular workshops and academic seminars. Through collaborative discussions, teachers inspire one another and broaden their TPACK perspectives (Yeh et al., 2021).

In contrast, TPACK training in China is still in its developmental stage (Luo et al., 2023). While some progress has been made, challenges persist. Currently, most universities focus on centralized lectures and specialized seminars, with a significant emphasis on theoretical instruction (Mei & Symaco, 2022; Gao et al., 2022). However, the practical application of this knowledge is often lacking, and teachers have limited opportunities to translate theory into practice immediately (Sato & Loewen, 2022).

From the perspective of training outcomes, many teachers continue to adhere to traditional teaching approaches, using technology primarily as a supplementary tool rather than as an integrated part of their teaching practice (Akram, 2022). As a result, innovation and vitality in classroom teaching are limited, and student engagement and learning outcomes are not significantly improved.

International Journal of Education, Psychology and Counseling
IJEPC
EISSN : 0128-164X
Volume 10 Issue 57 (March 2025) PP. 592-603
DOI 10.35631/IJEPC.1057038

Research Objectives

To design and development TPACK training modules for Chinese University Teachers.

Research Methodology

In this research, the ADDIE instructional design model was deliberately chosen as the fundamental framework for establishing a systematic TPACK training module. Renowned for its well - established theoretical framework and widespread practical utility, the ADDIE model serves as a cornerstone for the development of a scientific, efficient, and all - encompassing training program.

The ADDIE model comprises five core and interrelated stages. In the Analysis stage, the research team deployed a diverse range of research instruments, including questionnaires, interviews, and classroom observations. These methods were employed to gain a profound understanding of the existing knowledge base, skill proficiencies, and the specific requirements of the training participants regarding TPACK - relevant knowledge and skills. By meticulously gathering and rigorously analyzing a substantial volume of data, the research team precisely pinpointed the critical areas of training needs and identified the prevalent issues. This, in turn, laid a solid groundwork for the subsequent stages of the project.

During the Design stage, informed by the outcomes of the needs analysis, the research team took into account multiple factors, such as teaching objectives, instructional content, and the unique learning styles of the trainees. Based on this comprehensive consideration, the team meticulously designed the overall structure of the training curriculum. Decisions were made regarding the course themes, module configurations, instructional sequences, and the selection of appropriate teaching methodologies. These choices were intended to ensure that the training content was systematically organized and precisely tailored to meet the diverse learning needs of the participants.

In the Development stage, in strict accordance with the design plan, the team set about creating various teaching resources essential for the training. This involved drafting detailed teaching syllabi, crafting elaborate teaching courseware, recording high - definition teaching videos, and curating a rich collection of case materials. Concurrently, these teaching resources underwent repeated rounds of testing and refinement to guarantee their quality, relevance, and usability.

In the Implementation stage, the training activities were executed in strict compliance with the pre - established training plan. A blended learning approach, integrating both online and offline teaching methods, was adopted to maximize the benefits of each mode of instruction. Throughout the training process, the learning progress and feedback of the trainees were closely monitored. Any necessary adjustments to the teaching pace and methods were made promptly to ensure the seamless progression of the training.

In the Evaluation stage, a multi - dimensional assessment of the training effectiveness was carried out. The trainees' knowledge acquisition and skill mastery were evaluated through examinations, assignments, and hands - on project experiences. Additionally, feedback from trainee satisfaction surveys was collected to gauge their perceptions of the training content, teaching strategies, and program organization. Simultaneously, the trainees' ability to apply the learned knowledge in real - world teaching scenarios was observed to assess the tangible impact of the training on their teaching practices.

International Journal of Education, Psychology and Counseling
IJEPC
EISSN : 0128-164X
Volume 10 Issue 57 (March 2025) PP. 592-603
DOI 10.35631/IJEPC.1057038

Overall, this study, leveraging the feedback obtained during the needs analysis stage, comprehensively integrated the data from all participants. A detailed and comprehensive training plan was formulated and stringently implemented. This plan covered all crucial aspects, including curriculum development, training implementation, and program evaluation. The ultimate goal was to enhance the training effectiveness substantially through the application of scientific methodologies and meticulous research procedures, thereby providing robust support for elevating the TPACK proficiency of teachers.

Design and Development of the TPACK Training Modules

Training Goals

The training objectives for TPACK development aim to enhance teachers' knowledge, abilities, and attitudes across key dimensions (Beri & Sharma, 2021). For Technological Knowledge (TK), the goal is to improve teachers' understanding of modern technologies and empower them to integrate these tools effectively into their teaching, fostering a positive attitude toward technology. In Pedagogical Knowledge (PK), the focus is on deepening teachers' understanding of teaching methods and strategies, enabling their application in practice while building confidence in pedagogy. For Technological Pedagogical Knowledge (TPK), the objective is to integrate technology and pedagogy, encouraging teachers to confidently and flexibly apply technology in teaching. In Technological Content Knowledge (TCK), the training aims to help teachers integrate technology with subject content, fostering motivation to adapt to new technologies. In Pedagogical Content Knowledge (PCK), the goal is to improve the integration of teaching methods with subject content, encouraging sensitivity to personalized learning and continual reflection. Finally, the objective for Technological Pedagogical Content Knowledge (TPACK) is to deepen teachers' understanding of the interplay between technology, pedagogy, and content, equipping them to design TPACK-compliant teaching activities and adapt to technological changes, while fostering innovation and a mindset of continuous learning. Overall, the training aims to comprehensively develop teachers' capabilities to integrate technology into their teaching practices effectively.

Training Contents

The training program is structured into three levels—elementary, intermediate, and advanced—each with specific modules and unit topics designed to develop teachers' TPACK competencies. The elementary course focuses on foundational technological and pedagogical knowledge, with modules on digital technology awareness, skills, and application, as well as social responsibility and professional development in technology. Pedagogical knowledge is covered through various teaching methods, including lecture, presentation, discussion, and cooperative learning methods, among others. The intermediate course includes modules on the integration of digital technology with teaching methods (TPK), content teaching (TCK), and the application of teaching methods in content areas (PCK). The advanced course culminates in the integration of subject teaching knowledge with digital technology and pedagogical methods (TPACK), enabling teachers to effectively combine all elements in their instructional practice. This structured approach ensures a comprehensive development of teachers' abilities to integrate technology into teaching at multiple levels of complexity.

International Journal of Education, Psychology and Counseling
IJEPC
EISSN : 0128-164X
Volume 10 Issue 57 (March 2025) PP. 592-603
DOI 10.35631/IJEPC.1057038

Table 1:Training Course Design

Course Level	Course Modules	Unit Topic
Elementary Course (15)	TK	Unit 1 Digital Technology Awareness
		Unit 2 Digital Technology Knowledge and Skills
		Unit 3 Digital Technology Application
		Unit 4 Digital Technology Social Responsibility
		Unit 5 Digital Technology Professional Development
	PK	Unit 6 Lecture Method
		Unit 7 Presentation Method
		Unit 8 Q&A Method
		Unit 9 Discussion Method
		Unit 10 Exercise Method
		Unit 11 Case Teaching Method
		Unit 12 Cooperative Learning Method
		Unit 13 Inquiry Learning Method
		Unit 14 Task-based Teaching Method
		Unit 15 Situational Teaching Method
Intermediate Course (3)	TPK	Unit 16 Digital Technology Application in Teaching Methods
	TCK	Unit 17 Digital Technology Application in Content Teaching
	PCK	Unit 18 Teaching Methods Application in Content
Advanced Course (1)	TPACK	Unit 19 Integration of Subject Teaching Knowledge with DT and Teaching Methods

Training Patterns

Blended learning mode organically integrates the advantages of face-to-face courses and online courses, building a comprehensive and multi-level training system, and opening up new paths for the improvement of teachers' TPACK capabilities. In the early stages of training, teachers use online course platforms to preview relevant theoretical knowledge, watch recorded courses such as "Digital Literacy" and "Frontiers of Educational Technology," understand the knowledge framework and technical points of the training, initially build a knowledge system, and enter the face-to-face session with questions and thoughts. During the face-to-face process, teachers engage in practical operations under the guidance of experts, such as using intelligent teaching software to design interactive classroom teaching activities, using virtual laboratory platforms to carry out subject experiment teaching, etc., putting the theoretical knowledge learned online into practice, and solving practical teaching problems. Group discussions and

International Journal of Education, Psychology and Counseling
IJEPC
EISSN : 0128-164X
Volume 10 Issue 57 (March 2025) PP. 592-603
DOI 10.35631/IJEPC.1057038

experience sharing in the face-to-face classroom further deepen teachers' understanding and application of knowledge.

Table 3: Training Patterns For The Course

Course Level	Course Modules	Main Topic	Units	Training Patterns
Elementary Course(15)	TK	Digital literacy of teachers	Unit1-5	Four hours for online learning Four hours for face-to-face
	PK	Pedagogy-teaching methods	Unit6-15	Ten hours for online learning Ten hours for face-to-face
Intermediate Course(3)	TPK	Digital application in teaching methods	Unit16	Two hours for online learning Two hours for face-to-face
	TCK	Digital application in content teaching	Unit17	
	PCK	Teaching methods application in content teaching	Unit18	Two hours for online learning Two hours for face-to-face
Advanced Course(1)	TPACK	Integration of subject teaching knowledge with information technology and teaching methods	Unit19	
Final test			Two Hours	

Development of TPACK Training Online Platform Resources

The creation of instructional cases is a key aspect of TPACK training resource development, aiming to provide teachers with practical reference examples that help them better understand and apply the TPACK concept in teaching practice (Aldemir Engin, 2023). These cases will focus on the integration of different subjects, technological tools, and teaching methods, fully demonstrating the charm of TPACK in various teaching scenarios.

The creation of practical teaching tools is of significant importance in helping teachers to implement the TPACK concept, effectively enhancing the efficiency and quality of teaching practices (Santos & Castro, 2021). For the production of teaching slides, a series of diverse templates suitable for different subjects have been developed. These templates not only feature clean and aesthetic page designs but also incorporate interactive elements such as knowledge pop-ups, video embedding, and in-class quizzes, making it convenient for teachers to use during the teaching process, thereby enhancing the interactivity and enjoyment of teaching. Taking the science and engineering slide templates as an example, a formula editing quick

International Journal of Education, Psychology and Counseling
IJEPC
EISSN : 0128-164X
Volume 10 Issue 57 (March 2025) PP. 592-603
DOI 10.35631/IJEPC.1057038
toolbar is specially set up, supporting the quick input of complex mathematical formulas and physical symbols, while also reserving areas for inserting experimental demonstration videos, making it easy for teachers to visually present the experimental process and concretize abstract knowledge; the liberal arts slide templates focus on the comfort of text layout, offering a wealth of image and case material links, helping teachers vividly present content in subjects such as literature and history, meeting the needs of teachers for the combination of technology and subject content during the slide production process.

In addition, to assist teachers in overcoming difficulties in technology application, detailed technical operation guidebooks and micro-video tutorials have been produced. The operation guidebook explains the installation, setup, and basic usage of various teaching software and online platforms in a step-by-step manner with illustrations and text, while the micro-video tutorials focus on key and difficult technical operations, such as creating teaching scenarios with virtual reality software and processing learning data with data analysis software, allowing teachers to quickly master the essentials through intuitive demonstrations, reducing technical anxiety, and ensuring that teachers have confidence and the ability to use technological means to optimize teaching in the classroom, promoting the organic integration of various elements of TPACK.

Development of TPACK Training Face-to-face Learning Resources

Building a fully functional and user-friendly teaching platform is an important measure to integrate training resources and enhance the effectiveness of training, providing teachers with a one-stop learning and communication space (Shahade et al., 2023-2024). The platform integrates a wealth of course learning resources, including courses on TPACK theory explanations, subject teaching demonstration classes, and technical hands-on training courses, presented in various forms such as videos, documents, and case studies to meet the diverse learning needs of teachers. Teachers can choose courses to study based on their own knowledge gaps and learning progress, and the platform records learning paths for easy review and reflection by teachers, as well as for training teams to track learning progress. The interactive communication feature is one of the core highlights of the platform. It includes a forum section where teachers can engage in lively discussions on topics such as confusions, experiences, and innovative practices in TPACK practice, promoting knowledge sharing and intellectual exchange; real-time communication features support one-on-one and group instant messaging among teachers, facilitating quick problem-solving and fostering a collaborative learning environment (Malek, 2023).

Conclusion

This research aimed to design and develop a TPACK (Technological Pedagogical Content Knowledge) training module tailored for Chinese university teachers, addressing the growing demands of educational informatization. Utilizing the ADDIE instructional design model (Analysis, Design, Development, Implementation, and Evaluation), the study systematically constructed the training module, including its teaching objectives, content, modes, resources, and implementation plans. The module was designed to enhance teachers' ability to integrate technology, pedagogy, and content knowledge effectively in their teaching practices.

International Journal of Education, Psychology and Counseling
IJEPC
EISSN : 0128-164X
Volume 10 Issue 57 (March 2025) PP. 592-603
DOI 10.35631/IJEPC.1057038

The study contributes to the field by enriching TPACK training resources specifically for Chinese university teachers, addressing a critical gap in the context of rapid educational informatization. Furthermore, the developed module provides a solid foundation for future empirical research on TPACK training, offering a structured framework that can be adapted and expanded upon. By aligning with the needs of modern educational environments, this research supports the professional development of university teachers and promotes the effective use of technology in higher education.

In conclusion, this study not only advances the theoretical understanding of TPACK in the context of Chinese higher education but also offers practical tools and strategies for implementing TPACK training. The outcomes of this research have the potential to significantly impact teaching quality and innovation in Chinese universities, fostering a more technologically adept and pedagogically skilled teaching workforce.study designed and developed a TPACK training module for Chinese university teachers, through the analysis of specific cases, fully validated its effectiveness and feasibility in enhancing teachers' information technology teaching capabilities.

Acknowledgements

I am deeply indebted to numerous individuals and institutions that have significantly contributed to the successful completion of this research on constructing a systematic TPACK training module based on the ADDIE instructional design model. First and foremost, I would like to express my sincere gratitude to my academic advisors. Their profound insights, meticulous guidance, and unwavering support throughout the research process have been invaluable. Their expertise in educational technology and instructional design has not only provided me with the theoretical foundation but also inspired me to think critically and approach the research from multiple perspectives. I am also extremely thankful to the research team members who worked alongside me. Their hard work, dedication, and collaborative spirit have made the data collection, analysis, and implementation of the training module a smooth - sailing process. Each of them brought unique skills and knowledge to the table, and their contributions have been essential in every stage of the project, from the initial design to the final evaluation. Last but not least, I am deeply grateful to my family and friends. Their continuous encouragement, understanding, and patience during the long hours of research have been my source of strength. In conclusion, this research is the result of collective efforts, and I am truly grateful to everyone who has played a part in it. Their contributions have not only made this study a success but also opened up new possibilities for further research in the field of educational technology and teacher training.

References

Akram, H., Abdelrady, A. H., Al-Adwan, A. S., & Ramzan, M. (2022). Teachers' perceptions of technology integration in teaching-learning practices: A systematic review. *Frontiers in Psychology, 13*, 920317. https://doi.org/10.3389/fpsyg.2022.920317

Akram, H., Yingxiu, Y., Al-Adwan, A. S., & Alkhalifah, A. (2021). Technology integration in higher education during COVID-19: An assessment of online teaching competencies through technological pedagogical content knowledge model. *Frontiers in Psychology, 12*, 736522. https://doi.org/10.3389/fpsyg.2021.736522

Aldemir Engin, R., Karakuş, D., & Niess, M. L. (2023). TPACK development model for pre-service mathematics teachers. *Education and Information Technologies, 28*(4), 4769-4794. https://doi.org/10.1007/s10639-023-11250-0

International Journal of Education, Psychology and Counseling
IJEPC
EISSN : 0128-164X
Volume 10 Issue 57 (March 2025) PP. 592-603
DOI 10.35631/IJEPC.1057038

Almaiah, M. A., Alfaisal, R., Salloum, S. A., Al-Otaibi, S., Shishakly, R., Lutfi, A., ... & Al-Maroof, R. S. (2022). Integrating teachers' TPACK levels and students' learning motivation, technology innovativeness, and optimism in an IoT acceptance model. *Electronics*, *11*(19), 3197. https://doi.org/10.3390/electronics11193197

Beri, N., & Sharma, L. (2021). Development of TPACK for teacher-educators: A technological pedagogical content knowledge scale. *Linguistics and Culture Review*, *5*(S1), 1397-1418.

Chuang, S. (2021). The applications of constructivist learning theory and social learning theory on adult continuous development. *Performance Improvement, 60*(3), 6-14. https://doi.org/10.1002/pfi.21933

Dong, Y., Sang, G. Y., & Cai, J. X. (2014). Empirical research on pre-service teachers' TPACK knowledge. *Journal of Teacher Education Research, 26*(3), 36-43.

Gao, Y., Zeng, G., Wang, Y., Khan, A. A., & Wang, X. (2022). Exploring educational planning, teacher beliefs, and teacher practices during the pandemic: A study of science and technology-based universities in China. *Frontiers in Psychology, 13*, 903244. https://doi.org/10.3389/fpsyg.2022.903244

Ginting, D., Fahmi, F., Barella, Y., Hasbi, M., Kadnawi, K., Rojabi, A. R., & Zumrudiana, A. (2022). Students' perception on TPACK practices on online language classes in the midst of pandemic. *International Journal of Evaluation and Research in Education (IJERE)*, *11*(4), 1995-2009. https://doi.org/10.11591/ijere.v11i4.22192

Koehler, M. J., & Mishra, P. (2005). Teachers learning technology by design. *Journal of Computing in Teacher Education*, *21*(3), 94-102.

Li, M., & Li, B. (2024). Unravelling the dynamics of technology integration in mathematics education: A structural equation modelling analysis of TPACK components. *Education and Information Technologies*, 1-29. https://doi.org/10.1007/s10639-024-11416-9

Lin, Y. M., & Jiang, M. L. (2018). Investigation and countermeasure analysis of TPACK among rural primary school teachers in northern Guangdong. *Basic Education Research*, *23*, 21-25.

Luo, W., Berson, I. R., Berson, M. J., & Park, S. (2023). An exploration of early childhood teachers' Technology, Pedagogy, and Content Knowledge (TPACK) in Mainland China. *Early Education and Development, 34*(4), 963-978. https://doi.org/10.1080/10409289.2023.2165542

Malek, M. A. (2023). Role of the current E-learning platforms in urban primary teachers' professional development: Opportunities and challenges (Doctoral dissertation, Brac University).

Mei, W., & Symaco, L. (2022). University-wide entrepreneurship education in China's higher education institutions: Issues and challenges. *Studies in Higher Education, 47*(1), 177-193. https://doi.org/10.1080/03075079.2020.1839515

Mishra, P., & Koehler, M. J. (2006). Technological Pedagogical Content Knowledge: A framework for teacher knowledge. *Teachers College Record, 108*(6), 1017-1054.

Mohamed, A. (2023). Teachers' use of mobile learning tools aligned with technological pedagogical and content knowledge (TPACK): A quantitative study (Doctoral dissertation, American College of Education).

Oliveira, G., Grenha Teixeira, J., Torres, A., & Morais, C. (2021). An exploratory study on the emergency remote education experience of higher education students and teachers during the COVID-19 pandemic. *British Journal of Educational Technology*, *52*(4), 1357-1376. https://doi.org/10.1111/bjet.13175

International Journal of Education, Psychology and Counseling
IJEPC
EISSN : 0128-164X
Volume 10 Issue 57 (March 2025) PP. 592-603
DOI 10.35631/IJEPC.1057038

Ren, X. H., & Ren, F. (2015). Survey on the current situation of TPACK among university teachers and problem analysis. *Modern Educational Technology, 25*(4), 38-44.

Saad, A. F. (2021). An exploratory study regarding the use of blogs in a project management approach in teaching and learning for the case of "students at risk." *Online Submission*.

Santos, J. M., & Castro, R. D. (2021). Technological Pedagogical content knowledge (TPACK) in action: Application of learning in the classroom by pre-service teachers (PST). *Social Sciences & Humanities Open, 3*(1), 100-110. https://doi.org/10.1016/j.ssaho.2021.100110

Sato, M., & Loewen, S. (2022). The research–practice dialogue in second language learning and teaching: Past, present, and future. *The Modern Language Journal, 106*(3), 509-527. https://doi.org/10.1111/modl.12813

Shahade, A. K., Butekar, D., Parne, H., Patond, N., & Peshattiwar, P. (2023-2024). DESIGN AND DEVELOPMENT OF EFFICIENT VIRTUAL EDUCATIONAL SYSTEM.

Szymkowiak, A., Melović, B., Dabić, M., Jeganathan, K., & Kundi, G. S. (2021). Information technology and Gen Z: The role of teachers, the internet, and technology in the education of young people. *Technology in Society, 65*, 101565. https://doi.org/10.1016/j.techsoc.2021.101565

Teknowijoyo, F. (2024). Exploring the role of TPACK in promoting inquiry-based learning in 21. *KnE Social Sciences*, 1088-1100. https://doi.org/10.18502/kss.v8i5.12518

Thyssen, C., Huwer, J., Irion, T., & Schaal, S. (2023). From TPACK to DPACK: The "Digitality-related pedagogical and content knowledge"-model in STEM-education. *Education Sciences, 13*(8), 769. https://doi.org/10.3390/educsci13080769

Verawati, N. N. S. P., & Nisrina, N. (2025). Reimagining physics education: Addressing student engagement, curriculum reform, and technology integration for learning. *International Journal of Ethnoscience and Technology in Education, 2*(1), 158-181.

Voithofer, R., & Nelson, M. J. (2021). Teacher educator technology integration preparation practices around TPACK in the United States. *Journal of Teacher Education, 72*(3), 314-328. https://doi.org/10.3102/0022487120908944

Wang, J. X., Wang, S. Q., & Chen, W. G. (2022). Research on the TPACK-based model of university teachers' competency in blended teaching. *China Distance Education, 8*, 26-34.

Wasson, B., Ness, I., Hansen, C., Lakkala, M., Ilomäki, L., Tammets, K., ... & Dagiene, V. (2021). State of the field review of research on digital innovation. D1. 1. *Accelerating Digital Innovation in Schools through Regional Innovation Hubs and a Whole-School Mentoring Model (iHub4Schools) project*, Horizon 2020, European Union.

Xiu'E, G., & Chen, W. (2021). Discussion on how to improve the teaching efficacy of Chinese university teachers from the perspective of information leadership. *NVEO-Natural Volatiles & Essential Oils Journal, NVEO*, 7798-7803.

Xu, C. H., Fu, G. S., & Hou, X. J. (2018). The TPACK level of university teachers in China and development strategies. *Modern Educational Technology, 1*, 59-65.

Xu, R. C., Dong, Y., & Lu, L. J. (2015). Analysis of the TPACK knowledge structure of novice teachers based on the nine-factor model. *Modern Distance Education Research, 0*(1), 98-105.

Yeh, Y. F., Chan, K. K. H., & Hsu, Y. S. (2021). Toward a framework that connects individual TPACK and collective TPACK: A systematic review of TPACK studies investigating teacher collaborative discourse in the learning by design process. *Computers & Education, 171*, 104238. https://doi.org/10.1016/j.compedu.2021.104238

International Journal of Education, Psychology and Counseling
IJEPC
EISSN : 0128-164X
Volume 10 Issue 57 (March 2025) PP. 592-603
DOI 10.35631/IJEPC.1057038

Zhang, F. J., Lin, J., & He, S. (2015). The characteristics of university English teachers' TPACK and their development. *Chinese Journal of Educational Technology, 0*(5), 124-129.

Zhang, S., & Zhou, A. (2023). The construction and practice of a TPACK development training model for novice university teachers. *Sustainability, 15(15),* 11816. https://doi.org/10.3390/su151511816