

First-Year Myanmar Students' Perceptions of English Teachers' TPACK Competence at A University in Ayutthaya

Mi Phoo Pwint Soe^{a*}
Marilyn Fernandez Deocampo^b

^{a*}Graduate School of Human Sciences Assumption University of Thailand,

^{*}E-mail: miphupwintsoe@gmail.com,

^b Graduate School of Human Sciences Assumption University of Thailand,

E-mail: mai_67cheng@yahoo.com.sg

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Abstract

This study examined first-year Myanmar students' perceptions of English teachers' Technological Pedagogical and Content Knowledge (TPACK) competence at A university in Ayutthaya, Thailand. Grounded in Mishra and Koehler's (2006) TPACK framework, with its extension to include Contextual Knowledge (XK), the study employed a quantitative survey design. A total of 120 undergraduates completed a 33-item Likert scale questionnaire covering eight TPACK domains (CK, PK, TK, PCK, TCK, TPK, TPACK, and XK). Results indicated high ratings for content knowledge, pedagogical knowledge, and pedagogical content knowledge, but moderate perceptions of technological knowledge, technological content knowledge, and overall TPACK competence. Contextual knowledge was also rated moderate, reflecting challenges such as limited infrastructure and cultural adjustment. The findings highlight the need for targeted professional development, curriculum alignment, and institutional support to enhance technology integration.

Keywords: Myanmar Students' Perception, English Teachers' TPACK Competence

Introduction

Technology integration has become essential to modern education, shaping how teachers deliver instruction, and students engage with learning materials. In the 21st century, rapid information and communication technology (ICT) advancements have significantly transformed education, promoting interactive and student-centred learning environments (Hayati & Zaim, 2024; Scherer et al., 2021). Digital tools such as computers, mobile devices, and online platforms make it easier for teachers to facilitate personalised instruction while also providing students a chance to access to various resources and collaboration beyond traditional classroom settings (Hamilton et al., 2016; Mirzajani et al., 2016; Nguyen & Nguyen, 2023). Therefore, educational institutions or universities across the globe are integrating technology into their educational program to enhance pedagogical effectiveness and improve students' learning outcomes (Chai, Koh, & Teo, 2013).

With the development and advancement of technology in Education, the teaching and learning process has shifted from the 19th century to the 21st century. As a result, technology-enhanced pedagogy has become an important part of modern education, and teachers or educators need to integrate technology tools effectively into their teaching strategies to improve instructional quality (Gherhes et al., 2021). The introduction of pedagogical content knowledge (PCK) highlighted the importance of combining subject knowledge with

effective teaching strategies (Angeli & Valanides, 2013; Mishra & Koehler, 2006). More recently, the Technological Pedagogical and Content Knowledge (TPACK) framework has expanded this by stressing the integration of technology alongside pedagogy and content knowledge for successful teaching (Mishra & Koehler, 2006; Hughes, 2005; Chai, Koh, & Tsai, 2013). Considering the role of external factors, the framework now includes contextual knowledge such as institutional resources and cultural backgrounds to better address real-world teaching challenges (Mishra, 2019; Rosenberg & Koehler, 2015; Mishra et al., 2022).

Literature Review

The TPACK Framework and Its Evolution

The increasing role of digital technology in education has reshaped both teaching strategies and student learning experiences, requiring teachers to develop competencies that extend beyond subject knowledge alone. The Technological Pedagogical and Content Knowledge (TPACK) framework, initially proposed by Mishra and Koehler (2006), provides a conceptual lens for understanding how technology can be integrated meaningfully into pedagogy and content delivery. The framework builds on Shulman's (1986) notion of Pedagogical Content Knowledge (PCK), which emphasized the blending of subject expertise with pedagogical strategies. TPACK expands this model by introducing technological knowledge (TK) as a third pillar, stressing the need for educators to combine CK, PK, and TK to create effective, technology-enhanced instruction.

Over the years, TPACK has been widely adopted in teacher education and instructional design (Chai, Koh, & Tsai, 2013; Willermark, 2018; Wang et al., 2018). However, scholars continue to debate its conceptual clarity and practical implementation (Brantley-Dias & Ertmer, 2013; Kimmons, 2015; Zinger, Tate, & Warschauer, 2017). One key criticism concerns its limited attention to external and contextual factors that shape teachers' technology use. Responding to this gap, Mishra (2019) extended the model to include Contextual Knowledge (XK), acknowledging that classroom realities such as institutional policies, cultural norms, student demographics, and infrastructure play a vital role in determining how technology is adopted. Rosenberg and Koehler (2015) further argue that without considering context, the application of TPACK risks remaining theoretical rather than practical. This expanded view (TPACK + XK) is especially relevant for cross-cultural contexts, such as Myanmar students navigating technology-supported education in Thailand.

Empirical Studies on Students' Perceptions of TPACK

While much TPACK research has focused on teachers' self-assessment, an emerging body of work has explored students' perspectives. These studies provide valuable insights into how learners experience technology-mediated instruction and evaluate teacher competence. Hayati and Zaim (2024) found that Indonesian students appreciated technology-enhanced English instruction, associating it with higher engagement and learning efficiency. However, Ilmi, Drajiati, and Putra (2023) reported that students in online EFL classrooms expressed concerns about inconsistent technology use, noting the need for better-structured content and interactive methods. Similarly, Setyowati and Rachmajanti (2023) emphasized students' expectations for improved integration of learning management systems and digital platforms during the pandemic.

Other studies underscore that teachers' TPACK directly shapes the learning environment. For instance, Nurina et al. (2019) observed that students respond positively when teachers blend effective pedagogy with technology, fostering dynamic classrooms. Conversely, when teachers lack technological confidence or training, students report reduced

motivation and engagement. These findings suggest that students' perceptions are a critical lens through which the effectiveness of TPACK can be evaluated.

Relevance to the Present Study

The reviewed literature establishes several key points that inform the present study. First, while the TPACK framework is widely recognized, its practical application requires attention to contextual knowledge, especially in multicultural settings. Second, in ELT, technology integration can significantly enhance learning outcomes, but barriers such as inadequate training, limited resources, and cultural challenges persist. Third, students' perceptions provide essential feedback on teachers' competence, yet little research has examined the experiences of Myanmar students in Thai higher education.

This study addresses these gaps by investigating first-year Myanmar students' perceptions of English teachers' TPACK competence at A University in Ayutthaya. By focusing on this under-researched population, the study extends TPACK scholarship into a cross-cultural context where infrastructure, cultural adjustment, and institutional factors interact with teachers' technological, pedagogical, and content knowledge. In doing so, it not only contributes to the empirical literature on students' perspectives but also reinforces the theoretical importance of incorporating contextual knowledge into the TPACK framework.

This study has answered this research question: How do first-year Myanmar students perceive their English language teachers' TPACK competence at A University in Ayutthaya?

Research Design

This study employed a quantitative survey research design to systematically investigate first-year Myanmar students' perceptions of their English teachers' Technological Pedagogical and Content Knowledge (TPACK) competence. The quantitative approach was appropriate as it allowed the collection of standardized responses from a relatively large sample, enabling statistical analysis of trends and patterns in students' evaluations across different TPACK domains.

Participants

The study involved 120 first-year Myanmar undergraduate students enrolled at A University in Ayutthaya, Thailand. Participants were drawn from three faculties: The Faculty of Education, the Faculty of Buddhism, and the Faculty of Humanities. Students represented diverse regions and states of Myanmar, ensuring a wide range of perspectives on their learning experiences.

All participants were native Burmese speakers who primarily used Burmese in daily communication. Both male and female students were included, with ages ranging from 16 to over 24 years. This variation in age reflects different academic pathways: some students entered university immediately after high school, while others delayed their studies or shifted programs. These demographic variations were expected to shape students' prior exposure to technology and their perceptions of their teachers' TPACK competence.

Research Instrument

A structured questionnaire was used as the primary research instrument to measure students' perceptions of their English teachers' TPACK competence. The instrument was adapted from Liu (2025), which was initially developed for teacher self-assessment. Modifications were made to shift the perspective from teacher self-evaluation to student assessment of their teachers.

Data Collection

Data were collected in June 2025 using paper-based questionnaires administered in classroom settings. Students were provided with sufficient time to complete the questionnaire and were encouraged to ask clarifying questions if needed. The researcher explained the

purpose of the study, assured participants of confidentiality, and obtained informed consent prior to participation.

The questionnaire had two sections:

1. **Section 1** – Demographic information (age, gender, faculty, background).

2. **Section 2** – Items assessing students' perceptions of teachers' TPACK competence.

All 120 distributed questionnaires were completed and returned, resulting in a 100% response rate.

Data Analysis

The collected data were coded and analyzed using a statistical software. Descriptive statistics were used including mean scores and standard deviations. These were computed for each of the eight TPACK domains and overall scores. The interpretation of mean values followed the scale below:

- 4.50–5.00 = Very High
- 3.50–4.49 = High
- 2.50–3.49 = Moderate
- 1.50–2.49 = Low
- 1.00–1.49 = Very Low

The results were used to identify strengths and weaknesses in teachers' perceived TPACK competence and to highlight contextual challenges affecting technology integration in English language instruction.

Research Results

As mentioned above, the Likert scale was used to examine eight domains of TPACK in this research. The total mean scores are shown in Table 2, and the following sections explain the analysis results for each domain.

Table 1 Overall Perceptions of MCU Students Based on TPACK Eight Domains

Domains	Mean	Interpretation
Technological knowledge (TK)	3.42	Moderate
Pedagogical knowledge (PK)	3.54	High
Content knowledge (CK)	3.69	High
Pedagogical content knowledge (PCK)	3.69	High
Technological content knowledge (TCK)	3.44	Moderate
Technological Pedagogical Knowledge (TPK)	3.55	High
Technological pedagogical and content knowledge (TPACK)	3.40	Moderate
Contextual knowledge (XK)	3.38	Moderate
Total mean score of TPACK	3.51	High

The results of the study provide an insightful overview of how first-year Myanmar students at A university perceive their English teachers' TPACK competence. The overall mean score of 3.51 indicates a high level of perceived competence, suggesting that students generally recognize their teachers as knowledgeable and effective in integrating pedagogy and content with some degree of technology use.

Among the eight domains, Content Knowledge (CK) and Pedagogical Content Knowledge (PCK) both received the highest mean scores of 3.69, interpreted as high. This finding underscores students' confidence in their teachers' mastery of English subject matter and their ability to explain content using effective pedagogical strategies.

It also reflects the traditional strength of teachers in language instruction, where subject knowledge and pedagogy remain central. Similarly, Pedagogical Knowledge (PK) (3.54) and Technological Pedagogical Knowledge (TPK) (3.55) were also rated high, demonstrating that teachers are viewed as competent in lesson planning, classroom management, and adapting teaching strategies when incorporating technology.

In contrast, moderate ratings were found in areas directly related to technology: Technological Knowledge (TK) (3.42), Technological Content Knowledge (TCK) (3.44), Technological Pedagogical and Content Knowledge (TPACK) (3.40), and Contextual Knowledge (XK) (3.38). These results suggest that while teachers are willing to use technology, they may lack more profound expertise in selecting, integrating, and troubleshooting digital tools effectively. Furthermore, contextual barriers such as limited infrastructure, institutional support, or students' diverse cultural backgrounds may constrain technology integration.

The findings highlight a clear divide: teachers are strong in traditional pedagogy and subject knowledge but less confident in applying technology-rich strategies. This indicates the need for targeted professional development that emphasizes technological competence and context-sensitive approaches, ensuring that digital tools are meaningfully embedded into language instruction to enhance student engagement and learning outcomes.

Table 2 Technological Knowledge (TK)

Items	Mean	S.D.	Interpretation
My teacher is confident in using technology tools such as computers, tablets, and mobile devices for teaching English.	3.88	0.856	High
My teacher often avoids using technology because it is too complicated.	2.87	0.952	Moderate
My teacher likes using new technology tools for teaching.	3.66	0.855	High
My teacher finds it hard to fix tech issues during class.	3.30	0.820	Moderate
Overall	3.42	0.87	Moderate

Table 2 illustrates that the overall mean score for Technological Knowledge (TK) was 3.42 (SD = 0.87), interpreted as moderate. This indicates that while teachers demonstrate familiarity with basic digital tools, their overall technological competence remains limited. Students rated teachers highly for confidence in using standard devices such as computers, tablets, and mobile phones (M = 3.88) and for their willingness to adopt new technologies in teaching (M = 3.66). These results reflect a positive attitude toward technology integration and openness to innovation.

However, moderate ratings on avoiding technology due to complexity (M = 2.87) and difficulty troubleshooting technical issues during class (M = 3.30) suggest that teachers lack deeper technical proficiency. This limitation may hinder the seamless use of digital resources in instruction. Overall, findings highlight a need for targeted training to strengthen teachers' ability to manage technological challenges and confidently integrate tools in to English language teaching.

Table 3 Pedagogical Knowledge

Items	Mean	S.D.	Interpretation
My teacher designs lesson plans that help us learn English well.	3.80	0.763	High
My teacher often changes teaching methods to fit different learners' needs.	3.43	0.876	Moderate
My teacher is proficient in managing classroom dynamics to enhance student engagement in English learning.	3.36	0.887	Moderate
My teacher often uses students' feedback to improve his/her teaching methods.	3.56	0.858	High
Overall	3.54	0.85	High

The mean score for Pedagogical Knowledge (PK) was 3.54, interpreted as high. This suggests that students view their English teachers as effective in applying appropriate teaching strategies. Teachers were perceived as capable of designing lesson plans, adapting methods to meet diverse learner needs, and incorporating student feedback to improve instruction. These practices created a supportive and engaging classroom environment, fostering student comfort and participation. Overall, the findings highlight teachers' strong pedagogical competence, indicating that they are well-prepared to manage classrooms and implement strategies that enhance English learning outcomes.

Table 4 Content Knowledge

Items	Mean	S.D.	Interpretation
My teacher has a strong understanding of English grammar, vocabulary, and linguistic rules.	3.85	0.795	High
My teacher confidently answered the student's question about English rules.	3.77	0.807	High
My teacher often tries a new teaching method to teach English.	3.58	0.941	High
My teacher often uses new English material to teach English.	3.57	0.837	High
Overall	3.69	0.85	High

The mean score for Content Knowledge (CK) was 3.69, interpreted as high. This indicates that students perceive their English teachers as having a strong command of the subject matter. Teachers were regarded as knowledgeable in grammar and vocabulary, able to answer students' questions with confidence, and willing to introduce new methods and materials to support learning. Such competence reflects their ability to deliver lessons with clarity and relevance. Overall, the findings suggest that students hold a positive perception of their teachers' content knowledge, recognizing it as a key strength in English language instruction.

Table 5 Pedagogical Content Knowledge (Pck)

Items	Mean	S.D.	Interpretation
My teacher knows the best way to teach English different topic.	3.63	0.766	High
My teacher is good at correcting the mistakes students make in English.	3.79	0.809	High
My teacher explains English concepts in a way that is easy to understand.	3.75	0.713	High
My teacher uses different teaching methods to help students understand English.	3.57	0.926	High
Overall	3.69	0.80	High

The mean score for Pedagogical Content Knowledge (PCK) was 3.69, interpreted as high. This suggests that students view their English teachers as effective in combining subject expertise with appropriate teaching strategies to facilitate learning. Teachers were perceived as skilled in selecting effective methods for teaching various English topics, correcting students' mistakes, and explaining concepts in a clear and understandable way. They also demonstrated flexibility in using different instructional approaches to support comprehension. Overall, students held a positive perception of their teachers' PCK, recognizing it as a strength that enhances English language learning.

Table 6 Technological Content Knowledge

Items	Mean	S.D.	Interpretation
My teacher uses technology tools well to teach specific English language topics (e.g., grammar, listening, or writing).	3.62	0.832	High
My teacher finds it difficult to choose the right technological tools to teach English content.	3.28	0.935	Moderate
My teacher uses multimedia resources (videos, apps, games) to reinforce English language content.	3.42	0.833	Moderate
My teacher can easily find and integrate digital resources that fit with the lessons.	3.45	0.798	Moderate
Overall	3.44	0.85	Moderate

The overall mean score for Technological Content Knowledge (TCK) was 3.44 (SD = 0.85), interpreted as moderate. This suggests that while students recognize their teachers' ability to use technology for teaching English content, their competence remains uneven across specific practices. Teachers were rated high for effectively using technology tools to teach skills such as grammar, listening, and writing (M = 3.62). However, students perceived only moderate ability in selecting appropriate tools (M = 3.28), integrating digital resources into lessons (M = 3.45), and using multimedia materials such as videos, apps, and games to reinforce content (M = 3.42).

These findings indicate that teachers demonstrate basic proficiency in applying technology to content instruction but may struggle with aligning digital resources to specific pedagogical goals. Overall, students viewed their teachers' TCK as adequate but in need of improvement, particularly in resource selection and integration.

Table 7 Technological Pedagogical Knowledge

Items	Mean	S.D.	Interpretation
My teacher can adapt his/her teaching methods to technology that improves student learning outcomes.	3.49	0.778	Moderate
My teacher rarely adjusts his/her teaching strategies when incorporating technology into lessons.	3.39	0.792	Moderate
My teacher is skilled at using educational software or apps (e.g., Zoom, Microsoft Team, Google Classroom, Google Meet, Webex Meeting) to facilitate teaching.	3.70	0.763	High
My teacher feels comfortable integrating new technological tools into his/her daily teaching routine.	3.61	0.781	High
Overall	3.55	0.78	High

Table 7 shows that the mean score for Technological Pedagogical Knowledge (TPK) was 3.55 (SD = 0.78), interpreted as high. This suggests that students generally perceive their teachers as confident and competent in integrating technology into pedagogy. Teachers were rated high for their ability to use educational software and applications such as Zoom, Microsoft Teams, Google Classroom, Google Meet, and Webex (M = 3.70), as well as for feeling comfortable incorporating new digital tools into daily teaching routines (M = 3.61).

However, moderate ratings were given to items related to adapting teaching methods (M = 3.49) and adjusting strategies when integrating technology (M = 3.39). These findings suggest that while teachers are skilled in operating digital platforms, they may not fully optimize technology to transform pedagogical approaches or enhance student learning outcomes. Overall, students hold a positive view of teachers' TPK but see room for improvement in adapting strategies to maximize technology's impact.

Table 8 Technological Pedagogical Content Knowledge (Tpack)

Items	Mean	S.D.	Interpretation
My teacher can easily integrate technology, teaching methods, and content knowledge in English teaching.	3.53	0.798	High
My teacher finds it hard to combine technology with teaching methods to teach English effectively	3.23	0.965	Moderate
My teacher often uses online tools or apps to help explain English topics.	3.42	0.885	Moderate
My teacher often changes teaching methods to fit the technology use into lessons.	3.38	0.791	Moderate
My teacher can use the appropriate teaching methods and different technology tools to explain the English lessons	3.46	0.798	Moderate
Overall	3.40	0.85	Moderate

The overall mean score for Technological Pedagogical Content Knowledge (TPACK) was 3.40 (SD = 0.85), interpreted as moderate. This indicates that while students acknowledge their teachers' ability to integrate technology, pedagogy, and English content, the practice is not yet fully effective. Teachers were rated high for their ability to integrate these three domains in lessons (M = 3.53). However, moderate ratings were given for key aspects such as using online tools to explain English topics (M = 3.42), adapting teaching methods to fit technology use (M = 3.38), and applying diverse methods with appropriate digital tools (M = 3.46). These findings suggest that teachers can combine content, pedagogy, and technology but often do so at a basic rather than transformative level. Students perceive that greater effort is needed in adjusting strategies and employing digital tools more effectively to enhance English learning outcomes. Overall, teachers' TPACK competence is seen as moderate, highlighting room for improvement in seamlessly blending all three domains.

Table 9 Knowledge (XK)

Items	Mean	S.D.	Interpretation
My teacher adapts his/her teaching methods based on the specific needs and backgrounds of his/her students.	3.47	0.849	Moderate
My teacher finds it challenging to use technology effectively because of limitations in the classroom environment (e.g., lack of resources or support).	3.28	0.954	Moderate
My teacher modifies the use of technology to fit with the cultural and contextual factors of his/her students.	3.48	0.767	Moderate
My teacher feels that external factors, such as institutional policies or school resources, limit how he/she integrate technology into their teaching.	3.31	0.838	Moderate
Overall	3.38	0.85	Moderate

The overall mean score for Contextual Knowledge (XK) was 3.38 (SD = 0.85), interpreted as moderate. This indicates that students perceive their teachers as making some effort to adapt teaching methods and technology use to students' diverse needs and cultural contexts, but with noticeable limitations. Teachers were rated moderately for adapting instruction to students' backgrounds (M = 3.47) and modifying technology use to fit cultural and contextual factors (M = 3.48).

However, challenges emerged in areas influenced by external conditions. Teachers were perceived as constrained by classroom limitations, such as inadequate resources or technical support (M = 3.28), as well as institutional factors like policies or lack of infrastructure (M = 3.31). These constraints appear to reduce teachers' ability to integrate technology in ways that are contextually responsive effectively.

Discussion of the Research Findings

The results of this study reveal that students generally perceive their English teachers' TPACK competence positively, with an overall mean score of 3.51 (High). This suggests that teachers demonstrate solid subject-matter expertise and pedagogical skills, though their ability to integrate technology into instruction fully requires further development. These findings align with the premise of the TPACK framework (Mishra & Koehler, 2006), which highlights the importance of balancing content, pedagogy, and technology in effective teaching.

Among the eight domains, Content Knowledge (CK) and Pedagogical Content Knowledge (PCK) achieved the highest ratings ($M = 3.69$, High). Students recognized their teachers' strong grasp of English subject matter and their ability to apply instructional strategies that promote comprehension. This resonates with the findings of Suyamto et al. (2020) and Gamayao and Binas (2021), who emphasized that teachers with strong content expertise can more effectively select and adapt teaching strategies that enhance student learning. In English language teaching, PCK is particularly vital as it enables teachers to bridge complex linguistic concepts with practical pedagogy, ensuring that students not only understand language but also apply it meaningfully.

Pedagogical Knowledge (PK) ($M = 3.54$, High) and Technological Pedagogical Knowledge (TPK) ($M = 3.55$, High) were also rated positively. Students valued teachers' lesson preparation, classroom management, and the use of digital tools to support pedagogy. The relatively high TPK score indicates teachers' confidence in using platforms such as Zoom, Microsoft Teams, and Google Classroom, reflecting Chai et al.'s (2013) argument that effective TPK enhances student engagement by embedding technology into instructional methods. Nevertheless, challenges remain in fully exploiting digital tools for pedagogical adaptation, echoing Alotumi (2020) and Ilmi et al. (2023), who reported that many teachers are hesitant to transform teaching strategies to maximize technological potential.

By contrast, Technological Knowledge (TK) ($M = 3.42$, Moderate), Technological Content Knowledge (TCK) ($M = 3.44$, Moderate), and Technological Pedagogical Content Knowledge (TPACK) ($M = 3.40$, Moderate) were evaluated at only moderate levels. These findings suggest that teachers can use basic technological tools but encounter difficulties in applying them effectively to teach specific English content or in aligning them with pedagogy. Alotumi (2020) and Ilmi et al. (2023) similarly reported that teachers often lack confidence in selecting appropriate tools for particular instructional goals. Mishra and Koehler (2006) emphasized that genuine TPACK integration requires not just tool use, but thoughtful alignment of technology with both content and pedagogy, a process many teachers still find challenging.

The lowest score was assigned to Contextual Knowledge (XK) ($M = 3.38$, Moderate). While students noted that teachers attempted to adapt to cultural and situational needs, they also observed barriers such as insufficient resources, institutional policies, and infrastructural limitations. This finding affirms Petko, Mishra, and Koehler (2025), who stressed that contextual factors, such as policy environments, available resources, and student diversity, significantly shape the implementation of TPACK. Similarly, Tschonhens et al. (2024), Gozali and Cahyono (2022), and Heath and Moore (2024) argued that effective technology integration requires not only technical skills but also culturally responsive approaches that align instruction with students' socio-cultural realities.

Conclusion

To conclude, this study highlights that students perceive their English teachers' TPACK competence positively, with strengths in content knowledge, pedagogical content knowledge, and pedagogical strategies supported by technology. However, moderate ratings in technological knowledge, technological content knowledge, technological pedagogical content knowledge, and contextual knowledge indicate areas requiring further support. Consistent with prior research, the findings emphasize the importance of professional development, contextual awareness, and institutional support to strengthen technology integration in language classrooms. Ultimately, improving teachers' ability to balance

technology, pedagogy, and content within specific learning contexts will enhance student engagement and foster more effective English language learning experiences.

References

- Angeli, C., & Valanides, N. (2013). Technology mapping: An approach for developing technological pedagogical content knowledge. *Journal of Educational Computing Research*, 48(2), 199-221.
- Boonmoh, A., Jumpakate, T., & Karpklon, S. (2022). A close look at the use of technology by Thai teachers in secondary EFL classrooms. *Computer-Assisted Language Learning Electronic Journal*, 23(1), 78-107.
- Chai, C. S., Koh, J. H. L., & Tsai, C. C. (2013). A review of technological pedagogical content knowledge. *Journal of Educational Technology & Society*, 16(2), 31-51.
- Chaipidech, P., Srisawasdi, N., Kajornmanee, T., & Chaipah, K. (2022). A personalized learning system-supported professional training model for teachers' TPACK development. *Computers and Education: Artificial Intelligence*, 3, 100064.
- Čipková, E., Karolčík, Š., Fuchs, M., & Vaněková, H. (2024). Slovak science teachers' TPACK and their attitudes toward educational technologies. *Journal of Science Teacher Education*, 35(6), 634-660.
- Cox, S., & Graham, C. R. (2009). Diagramming TPACK in practice: Using an elaborated model of the TPACK framework to analyze and depict teacher knowledge. *TechTrends: Linking Research & Practice to Improve Learning*, 53(5).
- Gherheș, V., Stoian, C. E., Fărcașiu, M. A., & Stanici, M. (2021). E-learning vs. face-to-face learning: Analyzing students' preferences and behaviors. *Sustainability*, 13(8), 4381.
- Hafidurrahman, M., & Dwiaryanti, R. (2024). Innovation in English Language Teaching: The Implementation of Digital Technology in the Classroom. *Indo-MathEdu Intellectuals Journal*, 5(6), 7004-7016.
- Hamilton, E. R., Rosenberg, J. M., & Akcaoglu, M. (2016). The substitution augmentation modification redefinition (SAMR) model: A critical review and suggestions for its use. *TechTrends*, 60, 433-441.
- Heath, M. K., & Moore, S. (2024). Locating TPACK XK between theory and practice: Reflective practice, applied ethics, and technoskeptical dispositions. *Computers and Education Open*, 7, 100204.
- Hughes, J. (2005). The role of teacher knowledge and learning experiences in forming technology-integrated pedagogy. *Journal of technology and teacher education*, 13(2), 277-302.
- Ilmi, R. D., Drajiati, N. A., & Putra, R. (2023). Exploring students' perceptions of EFL teachers' TPACK knowledge in online classroom environments. *CALL-EJ*, 24(1), 54-72.
- Li, N., Lau, K. L., Liang, Y., & Chai, C. S. (2024). Pre-service foreign language teachers' TPACK preparation for technology integration: what are the profiles and key drivers? *Asia Pacific Journal of Education*, 1-17.
- Liu, X. (2025). An investigation of English teachers' TPACK competence in a high school, Shandong, China using TPACK model. *Paper presented at the Glovento Conference, Bangkok, Thailand*.
- Mishra, P. (2019). Considering contextual knowledge: The TPACK diagram gets an upgrade. *Journal of Digital Learning in Teacher Education*, 35(2), 76-78.

- Mishra, P. (2019). Considering contextual knowledge: The TPACK diagram gets an upgrade. *Journal of digital learning in teacher education*, 35(2), 76-78.
- Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers college record*, 108(6), 1017-1054.
- Nehe, B. M. (2021). Students' perception on google meet video conferencing platform during English speaking class in pandemic era. *English Review: Journal of English Education*, 10(1), 93-104.
- Niess, M. L. (2005). Preparing teachers to teach science and mathematics with technology: Developing technology pedagogical content knowledge. *Teaching and teacher education*, 21(5), 509-523.
- Niess, M. L., Ronau, R. N., Shafer, K. G., Driskell, S. O., Harper, S. R., Johnston, C., ... & Kersaint, G. (2009). Mathematics teacher TPACK standards and development model. *Contemporary issues in technology and teacher education*, 9(1), 4-24.
- Petko, D., Mishra, P., & Koehler, M. J. (2025). TPACK in context: An updated model. *Computers and Education Open*, 8, 100244.
- Quyen, P. T. (2022). An investigation into EFL teachers' application of TPACK: Insights within a high school context of a city in Vietnam. *International Journal of Science and Management Studies (IJSMS)*, 5(5), 301-322.
- Rosenberg, J. M., & Koehler, M. J. (2015). Context and technological pedagogical content knowledge (TPACK): A systematic review. *Journal of research on technology in education*, 47(3), 186-210.
- Shulman, L. S. (1986). Those who understand: A conception of teacher knowledge. *American educator*, 10(1).
- Starkey, L. (2020). A review of research exploring teacher preparation for the digital age. *Cambridge Journal of Education*, 50(1), 37-56.
- Tschönhens, F., Backfisch, I., Fütterer, T., & Lachner, A. (2024). TPACK in action: Contextual effects of pre-service and in-service teachers' knowledge structures for technology integration. *Computers and Education Open*, 7, 100219.
- Wang, W., Schmidt-Crawford, D., & Jin, Y. (2018). Preservice teachers' TPACK development: A review of literature. *Journal of digital learning in teacher education*, 34(4), 234-258.
- Willermark, S. (2018). Technological pedagogical and content knowledge: A review of empirical studies published from 2011 to 2016. *Journal of educational computing research*, 56(3), 315-343.
- Wyatt-Smith, C., Lingard, B., & Heck, E. (2021). *Digital disruption in teaching and testing: Assessments, big data, and the transformation of schooling* (p. 248). Taylor & Francis.
- Yu, H. H., & Lwin, K. K. (2023). The relationship between teacher educators' technological knowledge and their self-efficacy in education degree colleges. *Journal of the Myanmar Academy of Arts and Sciences*, 21(6).
- Zinger, D., Tate, T., & Warschauer, M. (2017). Learning and teaching with technology: Technological pedagogy and teacher practice. *The SAGE handbook of research on teacher education*, 1, 577-593.