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EXPLORING ENGLISH TEACHERS' TPACK TRANSFORMATION THROUGH AI-SUPPORTED ARGUMENTATIVE WRITING INSTRUCTION

Roni Sita Widyastuti[1], Dwita Laksmita Rachmawati[2*], Slamet Asari[3]
[1,2,3] *Master's Program of English Education, Universitas Muhammadiyah Gresik, East Java, Indonesia*

Corresponding author's email: dwitalaksmita@umg.ac.id

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Abstract: The integration of Artificial Intelligence (AI) has transformed English language teaching by reshaping teachers' Technological Pedagogical Content Knowledge (TPACK), particularly in argumentative writing instruction. However, limited research has explored how teachers with different levels of English proficiency experience this transformation. This study aimed to investigate the AI-based TPACK transformation of English as a Foreign Language (EFL) teachers with advanced and below-advanced English proficiency in teaching argumentative writing. Employing a qualitative narrative inquiry design, data were collected through semi-structured interviews with four purposively selected EFL teachers and analysed using thematic analysis. The findings revealed five interconnected themes: transformation of technological knowledge, pedagogical knowledge, content knowledge, challenges and adaptive strategies, and professional identity transformation. Teachers with advanced English proficiency demonstrated greater confidence in utilizing AI for instructional innovation, whereas those with below-advanced proficiency experienced a more gradual transformation through continuous experimentation and reflective practice. Nevertheless, both groups showed progressive AI-supported TPACK development, suggesting that English proficiency influenced the pace and depth of transformation rather than teachers' ability to integrate AI effectively. The study contributes to AI-TPACK theory by providing a narrative account of teachers lived experiences and demonstrating how technological, pedagogical, and content knowledge are dynamically reconstructed through AI-supported instruction. It also highlights the importance of AI literacy, pedagogical innovation, and reflective professional development for sustainable AI integration in EFL writing instruction.
Keywords: *Artificial Intelligence; TPACK; narrative inquiry; argumentative writing; EFL teachers; teacher professional development.*

INTRODUCTION

The transformation of TPACK refers to the process of change within the Technological Pedagogical Content Knowledge framework when new technologies particularly Artificial Intelligence (AI) begin to influence not only pedagogical aspects but also the content being taught (Karataş & Ataç, 2025). In this context, TPACK no longer merely emphasizes teachers' skills in integrating technology with instructional methods but also extends its scope to the recontextualization of content through AI assistance (Rahimi, 2024). This transformation requires teachers to develop more advanced digital competencies, including adaptability, critical evaluation, and innovation in their teaching practices. Furthermore, the integration of AI requires teachers to develop interconnected competencies involving AI literacy, technological pedagogical content knowledge, and the capacity to adapt pedagogical practices to emerging technologies (Kohnke et al., 2025; Tan et al., 2025). Kohnke et al., (2025) demonstrate that AI integration requires progressive development of TPACK and AI-related competencies, while Tan et al. (2025) show that teachers' AI competency is positively associated with TPACK and teaching performance. In EFL contexts, these competencies may also interact with teachers' English proficiency, particularly when teachers

are required to evaluate AI-generated language, refine prompts, assess linguistic accuracy, and make pedagogically appropriate decisions about AI-generated argumentative content. English proficiency is therefore considered in the present study as a potentially differentiating factor that may shape the pace and depth of teachers' AI-supported TPACK transformation, rather than as a determinant of their ability to adopt AI.

The consideration is particularly important in argumentative writing instruction, where teachers must simultaneously address language accuracy, rhetorical organization, evidence evaluation, and critical reasoning. Unlike general technology adoption, AI-supported writing instruction requires teachers to critically evaluate AI-generated linguistic and rhetorical outputs and determine whether they are appropriate for the intended learning objectives. Teachers with stronger English proficiency may therefore have greater linguistic resources for scrutinizing AI-generated responses, refining prompts, identifying inappropriate expressions, and adapting AI outputs to disciplinary and rhetorical contexts. Conversely, teachers with lower proficiency may initially rely more heavily on AI for linguistic support and require greater effort to critically evaluate and pedagogically adapt AI-generated content. Thus, English proficiency may influence not whether teachers adopt AI, but how confidently, critically, and pedagogically they integrate it into writing instruction. This distinction provides a theoretical rationale for examining English proficiency as a differentiating factor in teachers' AI-supported TPACK transformation.

The research area concerning the implementation of AI in teaching English argumentative writing encompasses an exploration of how AI-based tools can support students in developing critical thinking skills, argument structure, and linguistic accuracy (Aldemir et al., 2025; An et al., 2026; Qiu et al., 2024). This study also highlights how teachers utilize AI to provide automated feedback, personalize learning experiences, and enhance students' digital literacy skills. Research in this field contributes to the theory of CALL (Computer-Assisted Language Learning) teacher education by expanding the understanding of intelligent technology integration, not merely as a supportive tool but as a collaborative partner in knowledge construction (Li, 2018). Moreover, its theoretical contribution lies in the refinement of the TPACK framework by incorporating AI as a transformational dimension within teaching practice (Rahimi and Sevilla-Pavón, 2025). Consequently, this study provides a new foundation for teacher professional development while enriching the CALL literature with an innovative AI-based perspective.

Previous studies on TPACK in the context of teaching argumentative writing reveal several limitations that call for further investigation to develop an updated framework related to teachers' digital competence (Li et al., 2025). First, most studies remain limited to the integration of conventional technologies without incorporating the dimension of Artificial Intelligence (AI), which now plays a significant role in the writing instruction process. Second, the traditional TPACK framework tends to emphasize the relationship between technological knowledge and pedagogical knowledge, whereas AI also has a substantial impact on content knowledge particularly in teaching argumentative writing. Third, previous research rarely explores how AI can transform teachers' approaches to delivering rhetorical and argumentative strategies in English. Fourth, many studies only examine technology as an instructional aid, without directly linking it to students' transformation in producing argumentative texts. Fifth, a number of studies adopt a generic approach, failing to capture the unique pedagogical challenges that arise when teaching argumentative writing with AI support. Sixth, although recent studies have increasingly conceptualized AI-TPACK, limited research has examined how AI integration reshapes the interconnected TPACK dimensions specifically in argumentative writing instruction. Seventh, previous studies have not sufficiently explored teachers' digital competence in selecting, adapting, and evaluating AI tools for writing instruction. Eighth, many earlier works overlook the heightened need for digital literacy among teachers to meet the demands of AI-based writing instruction. Ninth, most existing research remains descriptive and does not offer a practical model for teacher professional development. Tenth, these gaps highlight the urgency for new research that positions AI as a transformational factor within the TPACK framework for teaching argumentative writing, thereby fostering a more comprehensive enhancement of teachers' digital competence.

Recent research has begun to address the use of generative AI in argumentative writing from a TPACK perspective. Guo et al. (2025), for example, examined EFL teachers' lesson planning

for chatbot-assisted argumentative writing and demonstrated the relevance of TPACK in understanding teachers' pedagogical use of chatbots. Nevertheless, the existing literature remains limited in explaining how teachers themselves experience and interpret changes in their technological, pedagogical, and content knowledge when integrating AI into argumentative writing instruction. In addition, insufficient attention has been given to how such transformation may differ according to teachers' English proficiency. The present study therefore extends existing research by employing narrative inquiry to explore teachers' lived experiences of AI-supported TPACK transformation across different levels of English proficiency.

The purpose of this study is to explore the transformation of TPACK among English teachers with advanced proficiency in integrating AI into argumentative writing instruction, focusing on how they interpret, adapt, and construct new digital and pedagogical competencies through their personal narratives. In addition, this study seeks to uncover the stories and reflections of teachers with below-advanced English proficiency regarding the challenges, adaptive strategies, and professional identity shifts they experience while utilizing an AI-based TPACK framework to teach argumentative writing.

The Technological Pedagogical Content Knowledge (TPACK) framework is a key model for understanding teachers' competencies in integrating technology, pedagogy, and content knowledge in a coherent manner within the teaching process (Aldemir et al., 2025). In the context of English language teaching, TPACK assists teachers in selecting and integrating appropriate technologies aligned with instructional goals, whether for reading, writing, listening, or speaking skills (Abubakir & Alshaboul, 2023). Digital technologies such as Learning Management Systems (LMS), online collaboration tools, and language software enable teachers to create more interactive and student-centred learning experiences.

Teachers with a strong command of TPACK are not only proficient in using technology but also capable of aligning pedagogical strategies with the linguistic content being taught (Cheng et al., 2025). Through such integration, technology can strengthen students' understanding of language structures, grammar, and complex communication skills (Alharbi, 2020). Previous research has shown that technology integration based on the TPACK framework enhances students' motivation, participation, and learning outcomes in English language classrooms (Li et al., 2025). However, challenges remain in ensuring that teachers possess adequate digital competence so that technology integration serves as an essential learning component rather than a mere addition (Alqurashi et al., 2017; Yang, 2025). Furthermore, the rapid pace of technological advancement requires teachers to continuously update their TPACK knowledge (Bostancıoğlu & Handley, 2018). Thus, TPACK provides a relevant theoretical foundation for exploring how technology can be effectively employed in language teaching and offers a comprehensive perspective for the professional development of English teachers in the digital era.

The transformation of TPACK through the incorporation of Artificial Intelligence (AI) in writing instruction necessitates a broader and more comprehensive expansion of its dimensions compared to the traditional framework (Brantley-Dias & Ertmer, 2013; Chaaban & Ellili-Cherif, 2017). Within the Technological Knowledge (TK) dimension, AI introduces intelligent tools such as grammar checkers, plagiarism detectors, essay scoring systems, and generative AI applications that help students generate ideas, refine sentence structures, and construct arguments (Rahimi, 2024). The Pedagogical Knowledge (PK) dimension is also shifting, as teachers are now required to design learning strategies that guide students in using AI critically for example, through scaffolding, reflective discussions, and process-based assessment (Weng & Chiu, 2023). Meanwhile, Content Knowledge (CK) is being redefined because writing competence now extends beyond academic structure mastery to include digital literacy, ethical AI use, and the ability to produce authentic arguments (Liu et al., 2024).

The intersection of TK, PK, and CK results in an emerging category known as AI-TPACK, which emphasizes the balance between intelligent technology use, innovative pedagogical approaches, and mastery of academic writing content (Li et al., 2025). This dimension enables the development of writing instruction that is more adaptive, personalized, and data-informed (Redmond & Lock, 2019; Romanowski et al., 2019). Therefore, the transformation of TPACK through AI not only enhances technical efficiency in writing instruction but also fosters students' critical thinking, creativity, and academic responsibility in the digital age.

Over the past seven years, studies on TPACK in writing instruction have centred on three main issues, they are (1) the use of digital technology in writing without incorporating Artificial Intelligence (AI); (2) the focus on TPACK limited to technological and pedagogical aspects; and (3) the absence of an AI-integrated TPACK foundation.

In teaching argumentative writing, the integration of digital technology has typically involved the use of conventional platforms such as Learning Management Systems, multimedia resources, or word-processing applications to support writing skills (Wang et al., 2024). The study demonstrates that technology can help teachers develop more varied pedagogical approaches for example, online peer feedback, forum-based collaboration, and video integration to strengthen students' understanding of argument structure. However, the study has largely focused on enhancing pedagogical knowledge and technological knowledge, with limited attention to how technology impacts content knowledge related to academic writing mastery. Consequently, the transformation observed in these studies remains partial and does not reflect a comprehensive conceptual shift within the TPACK framework (Sáinz & López-Sáez, 2010).

A major limitation of previous research is the lack of attention to the dynamics of AI-based technologies, which have the potential to reshape how teachers and students produce, analyze, and evaluate argumentative texts (Lin et al., 2022). Most studies also fail to distinguish teachers' English proficiency levels, even though this factor influences how they integrate TPACK in argumentative writing contexts (Azennoud, 2024). Teachers with advanced English proficiency tend to adapt more easily to technological complexity, while those with lower proficiency levels face additional challenges in connecting pedagogy, content, and technology (Schmidt et al., 2009). Furthermore, much of the prior research remains descriptive and does not explore teachers' subjective experiences, which could offer richer insights into how TPACK transformation occurs in authentic teaching practice (Gómez-Trigueros & De Aldecoa, 2021; Tseng et al., 2022). Therefore, further research that incorporates the AI dimension and variations in teachers' English proficiency is essential to develop a more responsive and applicable TPACK framework for argumentative writing instruction.

Earlier studies on TPACK have predominantly emphasized the integration of technological and pedagogical knowledge, such as the use of digital devices to support collaborative learning or the implementation of online media to enhance student engagement (Karataş & Ataç, 2025). These studies highlight that technology can enrich teaching methods and promote more dynamic classroom interaction (Rachmawati et al., 2025; Rachmawati & Purwati, 2021, 2022). However, the strong emphasis on technology and pedagogy has led to an under exploration of content knowledge particularly how TPACK supports the mastery of specific content areas like academic writing.

Another limitation of previous research lies in the conceptual imbalance among the three core TPACK domains (Cheng et al., 2025). By not positioning content knowledge as an integral focus, many studies portray technology integration merely as a pedagogical aid rather than a transformation of content understanding. This creates a gap in comprehending how teachers develop professional competence holistically. Consequently, further research is needed to balance the integration of technology, pedagogy, and content especially in the context of language learning and writing skills.

With the emergence of Artificial Intelligence (AI), the application of TPACK in language education has evolved as teachers increasingly integrate AI into technological, pedagogical, and content-related decision-making (Shortt et al., 2023). AI influences not only how teachers select and use technological tools but also how they design instruction, evaluate AI-generated materials, and reconceptualize the content being taught. Consequently, AI-supported teaching requires teachers to develop new forms of technological and pedagogical awareness while critically negotiating the relationship between AI capabilities, instructional goals, and disciplinary content. Recent scholarship on AI-TPACK further highlights the need to understand how teachers' technological, pedagogical, and content knowledge develops in response to AI integration (Ning et al., 2024; Aldemir et al., 2025; Tan et al., 2025; An et al., 2025/2026). In this study, AI-TPACK is therefore used as a theoretical lens for interpreting teachers' experiences of TPACK transformation rather than as a newly proposed framework. Based on the research gap identified above, this study addresses the following research questions: (1) Research Question 1: How do EFL teachers with advanced and below-advanced English proficiency narrate their experiences of TPACK transformation through AI-supported

argumentative writing instruction? (2) Research Question 2: How does English proficiency differentiate teachers' experiences, challenges, and adaptive strategies in transforming TPACK through AI-supported argumentative writing instruction?

METHOD

This study employed a narrative inquiry design because its primary focus lies in exploring English teachers' personal and professional experiences in transforming their Technological Pedagogical Content Knowledge (TPACK) framework through the integration of Artificial Intelligence (AI) in teaching argumentative writing (Cohen et al., 2002). This qualitative approach allows for an in-depth understanding of how teachers with advanced and below-advanced English proficiency interpret pedagogical, technological, and content-related changes in AI-assisted learning contexts. Through narrative accounts, the researcher can capture the teachers' dynamic processes of adaptation, challenges, and reflections that are often inaccessible through quantitative methods. The choice of this design is further justified by the study's aim to develop a deeper understanding of how teachers experience and interpret AI-supported TPACK transformation across different levels of English proficiency. Thus, narrative inquiry not only captures teachers' lived experiences of TPACK transformation but also contributes theoretically to a deeper understanding of how technological, pedagogical, and content knowledge are dynamically reconstructed through AI integration. Viewed through the AI-TPACK perspective, these narratives reveal how teachers negotiate emerging AI capabilities with pedagogical goals, disciplinary content, and their own professional knowledge in CALL contexts. Overall, the methodological design was aligned with the study's research questions, participant grouping, and theoretical orientation, narrative inquiry was employed to explore teachers' lived experiences of TPACK transformation, while differences in English proficiency between advanced and below-advanced teachers were examined through cross-case interpretation using AI-TPACK as a theoretical lens.

This research involved four English teachers from two private schools in East Java, representing different levels of English proficiency, they are two with advanced proficiency and two with below-advanced proficiency. Participants were selected through purposive sampling to ensure a diverse range of narratives regarding AI integration in argumentative writing instruction (Creswell, 2014). Teachers with advanced proficiency were chosen due to their extensive experience in applying digital pedagogical strategies, while those with below-advanced proficiency were selected to explore their challenges and adaptation processes in applying the AI-based TPACK framework.

To establish an objective basis for differentiating participants' English proficiency, the study used their TOEFL ITP Level 1 scores. The classification followed the TOEFL ITP–CEFR mapping provided by Educational Testing Service (ETS), in which a total score of 620 corresponds to CEFR C1, 543 to B2, 433 to B1, and 343 to A2 (ETS, 2026). Accordingly, participants who obtained TOEFL ITP scores of 620–677 were classified as having advanced English proficiency (C1), whereas those scoring below 620 were categorized as below-advanced English proficiency (B2 or lower). This criterion provided an objective and standardized basis for comparing participants' experiences of AI-supported TPACK transformation across proficiency levels.

The following table provides the participants' biographical information, including educational background, teaching experience, English proficiency level, and experiences in using AI tools in English writing instruction.

Table 1. *Participants demographic information*

Participant Code	Gender	Age	Educational Background	Teaching Experience (years)	TOEFL ITP Score	English Proficiency Level	Institutional Context	Experience Using AI in Teaching
P1	Female	46	Master of English Education	20	625	Advanced	Private School A	Uses ChatGPT and Grammarly for guiding students in argumentative writing
P2	Female	40	Bachelor of English	12	620	Advanced	Private School B	Integrates AI feedback tools in students'

			Education					writing assignments
P3	Male	45	Bachelor of English Education	8	556	Below-Advanced	Private School A	Recently started using QuillBot and Google Gemini for text revision
P4	Female	28	Bachelor of English Education	5	543	Below-Advanced	Private School B	Uses AI applications for generating writing ideas but not yet systematically in class

The primary research instrument in this study was a semi-structured interview protocol designed to elicit rich narrative accounts of English teachers' experiences in transforming their Artificial Intelligence (AI)-based Technological Pedagogical Content Knowledge (TPACK) for teaching argumentative writing. The interview protocol was developed based on the three core domains of the TPACK framework, namely Technological Knowledge (TK), Pedagogical Knowledge (PK), and Content Knowledge (CK), which served as the conceptual basis for exploring teachers' AI integration practices, pedagogical adaptation, content knowledge transformation, and professional identity development. The interview questions were adapted from (Li et al., 2025) and modified to suit the context of AI-supported argumentative writing instruction. The decision to focus on TK, PK, and CK was based on the argument that these three domains represent the fundamental knowledge components underlying teachers' TPACK, whereas the integrated domains (TPK, TCK, and PCK) are often difficult to distinguish conceptually during qualitative inquiry (Brantley-Dias & Ertmer, 2013; Koehler et al., 2014).

The interview protocol consisted of four major sections. The first section explored teachers' Technological Knowledge (TK) by examining their experiences in utilizing AI-based applications such as ChatGPT, Grammarly, QuillBot, and Google Gemini to facilitate argumentative writing instruction. The second section investigated Pedagogical Knowledge (PK), focusing on teachers' instructional strategies, scaffolding techniques, classroom management, and assessment practices when integrating AI into the writing process. The third section examined Content Knowledge (CK), particularly teachers' understanding of argumentative writing, rhetorical organization, academic language, and the ways AI influenced the delivery of writing content. The final section encouraged participants to reflect on the challenges, opportunities, and professional identity transformation they experienced while integrating AI into their teaching practices.

To establish content validity, the interview protocol was reviewed by two experts in CALL teacher education and English language educational technology. The experts evaluated the relevance, clarity, representativeness, and comprehensiveness of every interview question with respect to the TK, PK, and CK constructs. Their comments primarily concerned improving the wording of several questions, refining the sequence of interview prompts, and ensuring that each question accurately reflected the intended theoretical construct. Based on these recommendations, several interview questions were revised before the protocol was administered in the pilot study. A pilot study was subsequently conducted involving 20 English teachers who possessed characteristics similar to those of the research participants but were excluded from the final sample. The pilot study aimed to examine the clarity, feasibility, and consistency of the interview protocol. Feedback obtained from the pilot participants indicated that the interview questions were generally understandable and relevant to the research objectives, although several minor revisions were made to improve linguistic clarity and eliminate overlapping interview prompts.

Although the primary data were qualitative, a preliminary pilot study was conducted to examine the internal consistency of the structured interview indicators designed to operationalize the TPACK dimensions of Technological Knowledge (TK), Pedagogical Knowledge (PK), and Content Knowledge (CK). Cronbach's Alpha was used at this pilot stage as an auxiliary instrument-development procedure to assess whether the indicators within each construct demonstrated sufficient internal consistency before the main interviews were conducted. The results showed satisfactory internal consistency across the three constructs, with coefficients exceeding 0.70. These results are reported as pilot-study evidence supporting the coherence of the structured interview indicators rather than as a measure of the reliability of the qualitative narratives themselves. The coefficients are presented in Table 2.

Table 2. *Pilot internal consistency of the structured interview indicators*

Construct	Number of Indicators	Cronbach's Alpha	Interpretation
Technological Knowledge (TK)	8	0.89	Excellent
Pedagogical Knowledge (PK)	7	0.86	Good
Content Knowledge (CK)	6	0.84	Good
Overall Instrument	21	0.88	Good

Note: Cronbach's Alpha was calculated during the pilot study to examine the internal consistency of the structured interview indicators and was not used to establish the reliability of the qualitative narratives

To ensure the reliability of qualitative data analysis, inter-coder reliability was also established. Two independent researchers with expertise in qualitative research and CALL teacher education independently coded approximately 25% of the interview transcripts using the coding framework developed from the TPACK dimensions and the emerging themes. The level of agreement between the coders was calculated using Cohen's Kappa coefficient, while disagreements were resolved through discussion until consensus was achieved. The obtained Kappa coefficients indicated substantial to almost perfect agreement (McHugh, 2012), demonstrating that the coding procedure was reliable and consistently applied across the data. The inter-coder reliability results are presented in Table 3.

Table 3. *Inter-coder reliability*

Coding Category	Cohen's Kappa	Interpretation
Technological Knowledge (TK)	0.88	Almost Perfect
Pedagogical Knowledge (PK)	0.85	Almost Perfect
Content Knowledge (CK)	0.86	Almost Perfect
AI Integration Practices	0.91	Almost Perfect
Professional Identity Transformation	0.87	Almost Perfect
Overall Agreement	0.87	Almost Perfect

To further enhance the trustworthiness of the study, several qualitative validation procedures were implemented. Member checking was conducted by returning interview transcripts and preliminary interpretations to the participants for verification, ensuring that the findings accurately represented their experiences. Source triangulation was employed by comparing narratives from teachers with advanced and below-advanced English proficiency to identify convergent and divergent perspectives regarding AI integration. In addition, an audit trail documenting every stage of data collection, transcription, coding, category development, and thematic analysis was maintained throughout the study to strengthen the dependability and confirmability of the findings. Collectively, these procedures enhanced the credibility, dependability, confirmability, and transferability of this narrative inquiry.

Data were collected through in-depth, semi-structured interviews that modified from Li et al. (2025) to allow for a comprehensive exploration of participants' personal and reflective experiences while maintaining focus on AI-based TPACK dimensions. Each participant was interviewed three times over a period of four to six weeks. The first interview explored participants' professional background and initial experiences with AI integration. The second interview focused on actual classroom practices and pedagogical adaptation processes. The third interview served as a reflection session and as part of member checking to verify the accuracy of emerging interpretations. The decision to conduct three rounds of interviews was based on the nature of narrative inquiry, which seeks to capture layered meanings and evolving professional identities over time.

Although the study involved only four participants, the depth and iterative nature of the three-round narrative interviews enabled the researchers to identify recurring patterns across the participants' accounts. Data saturation was considered to have been reached when the third round of interviews yielded no substantially new codes or themes beyond those identified in the earlier rounds, while providing further elaboration and clarification of existing themes. Saturation was assessed across cases and interview rounds rather than based solely on the number of participants. The repeated narratives across the four cases provided sufficient depth to support the interpretation of the five emergent themes and the comparison between advanced and below-advanced English-proficiency teachers.

All interviews were audio-recorded, transcribed verbatim, and analysed using thematic analysis following these steps, namely familiarization with the data through repeated readings of the transcripts, initial coding aligned

with TPACK dimensions (technological, pedagogical, and content knowledge), theme generation, clustering codes into higher-order categories such as AI integration practice, pedagogical adaptation, AI-mediated content understanding, and professional transformation, and interpretation, linking emergent themes with the conceptual framework of AI-TPACK. To enhance the trustworthiness of findings, triangulation was applied in three forms, they are source triangulation, by comparing narratives between advanced and below-advanced teachers; method triangulation, by combining interview data with reflective notes and instructional documents; and member checking, by confirming interpretations with participants to ensure accuracy of meaning. This rigorous procedure ensured that the data authentically represented teachers lived experiences and captured the multifaceted nature of TPACK transformation through AI integration in argumentative writing instruction.

RESULTS AND DISCUSSION

The narrative analysis explored how English teachers experienced the transformation of their Technological Pedagogical Content Knowledge (TPACK) through Artificial Intelligence (AI) integration in teaching argumentative writing. Across the four participants' narratives, five interconnected themes emerged that collectively explain the dynamic process of AI-supported professional development. These themes describe how participants transformed their technological, pedagogical, and content knowledge while simultaneously negotiating various implementation challenges and reconstructing their professional identities as English teachers. Although both advanced and below-advanced English teachers experienced changes across all dimensions, the nature and depth of these transformations differed according to their English proficiency, prior AI experience, and confidence in integrating emerging technologies into classroom practice.

Table 4. *Themes emerging from the narrative analysis*

Theme	Description	Representative Sub-themes	AI-TPACK Dimension / Connection	Core Interpretation	Participants
Transformation of Technological Knowledge (TK)	Participants developed new competencies in using, evaluating, and adapting AI technologies for argumentative writing instruction.	AI literacy, prompt engineering, critical evaluation of AI output, digital confidence	AI-TK	AI literacy develops from tool operation toward critical evaluation and prompt engineering	P1, P2, P3, P4
Transformation of Pedagogical Knowledge (PK)	AI integration reshaped instructional strategies, classroom interaction, and teachers' facilitative roles during the writing process.	AI-assisted scaffolding, formative feedback, collaborative learning, student-centred instruction	AI-TPK	AI reshapes pedagogical orchestration and teacher facilitation	P1, P2, P3, P4
Transformation of Content Knowledge (CK)	Teachers expanded their understanding of argumentative writing by utilizing AI-generated examples while maintaining academic accuracy and integrity.	Argument development, rhetorical organization, evidence construction, academic integrity	AI-TCK / AI-TPCK	Teachers reconstruct content knowledge through evaluation of AI-generated argumentative representations	P1, P2, P3, P4
Challenges and Adaptive Strategies	Participants encountered technical, pedagogical, and ethical challenges and developed	Prompt construction, AI hallucination, information verification,	Cross-dimensional AI-TPACK	Challenges trigger recursive recalibration across technology,	P1, P2, P3, P4

	strategies to overcome them.	ethical AI use		pedagogy, and content	
Professional Identity Transformation	Teachers redefined their professional roles as facilitators, mentors, and reflective practitioners in AI-supported learning environments.	Teacher as facilitator, lifelong learning, AI mentor, reflective practice	AI-TPCK + human–AI collaboration	AI-TPACK development reshapes teachers' professional agency and role	P1, P2, P3, P4

As presented in Table 4, the five themes are closely interconnected and collectively illustrate teachers' experiences of integrating AI into argumentative writing instruction. The findings suggest that AI adoption extended beyond technological utilization, influencing instructional practices, conceptual understanding of writing, responses to implementation challenges, and teachers' perceptions of their professional roles. The following sections present each theme in greater detail.

Transformation of Technological Knowledge (TK)
The analysis revealed that the integration of AI substantially transformed teachers' technological knowledge beyond the acquisition of digital tools. Participants described AI as a catalyst that reshaped how they interacted with technology, evaluated AI-generated information, and designed technology-enhanced writing instruction. Although all teachers demonstrated improvements in technological competence, the depth of transformation varied according to their English proficiency and previous experience with AI applications.

Teachers with advanced English proficiency described AI as a professional partner rather than merely a technological tool. Their narratives demonstrated an evolving understanding of prompt engineering, AI output evaluation, and the pedagogical affordances of generative AI. Rather than accepting AI-generated responses uncritically, they emphasized evaluating the quality, credibility, and contextual relevance of AI-generated arguments before introducing them into classroom instruction. One participant explained:

> "Initially, I used ChatGPT simply to generate writing examples. Over time, I realized that the quality of AI responses depended heavily on how prompts were designed. Learning to write effective prompts became a new professional competence for me." (P1)

Similarly, another advanced teacher stated:

> "AI does not replace my teaching. Instead, it expands my ability to demonstrate multiple perspectives in argumentative essays and helps students evaluate competing arguments critically." (P2)

In contrast, teachers with below-advanced English proficiency initially perceived AI primarily as a tool for correcting grammar and generating writing ideas. Their technological transformation occurred gradually as they became more familiar with different AI applications.

> "At first, I depended on Grammarly because it was easier. Later, I started experimenting with ChatGPT and Gemini, although I sometimes felt unsure whether the answers were correct." (P3)

Another participant commented:

> "I often copied AI responses directly before I learned that they still needed revision. Now I compare several AI responses before using them in class." (P4)

These findings show that technological knowledge evolved from basic operational competence toward a more reflective form of AI literacy. Advanced teachers demonstrated greater confidence in critically evaluating AI-generated content, whereas below-advanced teachers experienced a gradual increase in confidence through continuous experimentation and classroom implementation.

From an AI-TPACK perspective, this transformation indicates that technological knowledge in AI-supported teaching is no longer limited to knowing how to operate digital tools. It increasingly involves understanding how AI generates, limits, and reshapes instructional content. The distinction between the two proficiency groups further suggests that AI-TK development is mediated by teachers' capacity to interrogate AI-generated language and content. Advanced-proficiency teachers moved more rapidly toward critical evaluation and strategic

prompt engineering, whereas below-advanced teachers initially used AI primarily for linguistic support before developing more evaluative practices. This finding extends emerging AI-TPACK scholarship by suggesting that AI-related technological knowledge is not merely an additional technical competence but a reflective knowledge domain that develops through teachers' interaction with AI-generated outputs. This interpretation is consistent with recent AI-TPACK research emphasizing the importance of AI-specific knowledge, evaluation, and human oversight in teacher competence (Aldemir et al., 2025; An et al., 2026).

Transformation of Pedagogical Knowledge (PK)

Participants consistently reported that AI integration transformed not only the technologies they employed but also the pedagogical approaches they adopted in teaching argumentative writing. The findings suggest that AI encouraged teachers to redesign classroom activities, modify instructional roles, and create more student-centred learning environments where students actively interacted with AI-generated information. Advanced teachers integrated AI into multiple stages of the writing process, including brainstorming, outlining, drafting, peer review, and revision. Rather than allowing students to depend entirely on AI-generated texts, they intentionally designed learning activities requiring students to critique, compare, and revise AI-generated arguments. One participant explained:

> "Students should not simply accept AI suggestions. I ask them to compare AI responses with academic references and justify which arguments are stronger." (P2)

Another participant stated:

> "AI changed my lesson planning because I now prepare activities requiring students to evaluate AI responses rather than merely produce essays." (P1)

Teachers with below-advanced English proficiency also modified their instructional strategies, although they initially focused on AI-assisted grammar correction and vocabulary development. As their familiarity with AI increased, they gradually incorporated collaborative learning, reflective writing, and guided discussion into classroom activities. These findings demonstrate that AI integration encouraged a pedagogical shift from teacher-centred instruction toward facilitative learning. Teachers increasingly viewed themselves as learning designers who scaffolded students' critical thinking rather than solely delivering writing knowledge.

Theoretically, this finding illustrates the AI-TPK dimension of AI-TPACK: teachers' pedagogical knowledge is transformed not simply because AI is introduced, but because teachers must redesign learning activities around what AI can and cannot do. In this sense, AI becomes pedagogically meaningful only when teachers establish boundaries between machine-generated assistance and human cognitive engagement. The teachers' shift toward activities involving critique, comparison, justification, and revision indicate a movement from technology adoption toward pedagogical orchestration. This extends the findings of (Guo et al., 2025), who demonstrated that teachers' professional knowledge shapes how chatbots are integrated into argumentative writing instruction. While Guo et al. focused on lesson-planning approaches, the present narrative findings reveal how teachers' pedagogical knowledge is experienced and reconstructed through continued classroom engagement with AI. Thus, AI-TPK transformation involves the capacity to position AI as a scaffold while preserving teachers' responsibility for instructional judgment.

Transformation of Content Knowledge (CK)

The findings further revealed that AI integration influenced teachers' understanding of argumentative writing as instructional content. Participants described improvements in explaining rhetorical organization, constructing evidence-based arguments, addressing counterarguments, and promoting academic integrity. AI enabled teachers to present multiple examples of argumentative texts while encouraging students to evaluate the strengths and weaknesses of AI-generated responses. Advanced teachers emphasized that AI broadened their instructional resources by providing alternative perspectives and diverse writing models. One participant commented:

> "Previously I usually prepared one sample essay. Now AI allows me to generate several alternative arguments so students can analyse strengths and weaknesses." (P1)

Another participant explained:

> "Students learn that strong arguments are not generated automatically by AI. They still need evidence, logic, and academic credibility." (P2)

Teachers with below-advanced English proficiency similarly acknowledged that AI helped them explain argumentative writing more clearly, although they remained cautious regarding inaccurate or fabricated information generated by AI. Collectively, these narratives suggest that AI functioned as a complementary instructional resource that enriched teachers' content knowledge while reinforcing the importance of human judgment in evaluating academic quality and credibility.

From an AI-TPACK perspective, the transformation of content knowledge is particularly significant because AI-generated writing introduces teachers to multiple representations of argumentative discourse while simultaneously creating new epistemic risks. Teachers therefore do not simply acquire more examples of argumentative writing; they reconstruct their understanding of what counts as a credible argument, adequate evidence, and academically appropriate language in an AI-mediated environment. This suggests that AI-TCK involves not only the ability to use AI to represent disciplinary content but also the ability to critically evaluate whether AI-generated representations accurately reflect disciplinary norms. The findings consequently position human judgment as a constitutive element of AI-TPACK rather than an external safeguard added after AI use.

Challenges and adaptive strategies

Despite recognizing numerous benefits of AI integration, participants consistently reported encountering technical, pedagogical, and ethical challenges throughout the implementation process. These challenges varied according to teachers' technological competence and English proficiency. Advanced teachers primarily highlighted concerns related to instructional design, academic integrity, and students' overreliance on AI, whereas below-advanced teachers experienced additional uncertainty in interpreting AI-generated responses and determining their linguistic and academic appropriateness.

Participants explained that constructing effective prompts capable of producing relevant argumentative texts remained one of the most demanding aspects of AI use. They also expressed concerns regarding the accuracy of AI-generated information, the possibility of AI hallucination, and the need to verify AI outputs using reliable academic sources. Teachers further emphasized the importance of preventing students from relying excessively on AI-generated essays without engaging in critical analysis or independent writing. One participant stated:

> "Sometimes I cannot decide whether ChatGPT's explanation is academically appropriate, so I still consult textbooks before using it." (P3)

In response to these challenges, participants gradually developed adaptive strategies through continuous experimentation and professional reflection. They reported comparing outputs generated by different AI platforms, cross-checking information using academic references, incorporating peer discussions, designing reflective writing activities, and explicitly teaching students about ethical AI use and proper citation practices. Overall, these findings indicate that successful AI integration depends not only on teachers' technological competence but also on their ability to exercise critical judgment, pedagogical flexibility, and ethical responsibility. Participants viewed implementation challenges as opportunities to refine their instructional practices and strengthen their AI literacy rather than as barriers to technology adoption.

The challenges reported by participants are theoretically important because they reveal that AI-TPACK transformation occurs through iterative processes of calibration rather than through straightforward technology adoption. Prompt difficulties primarily required technological knowledge, while hallucination and credibility concerns required the simultaneous mobilization of technological, pedagogical, and content knowledge. Similarly, decisions about whether and how students should use AI required teachers to negotiate pedagogical objectives, disciplinary expectations, and ethical responsibilities. The adaptive strategies reported by participants therefore represent moments of TPACK reconfiguration in which teachers continuously recalibrated the relationship among AI capabilities, instructional purposes, and argumentative writing content. This finding supports the view that AI competency and TPACK are mutually connected rather than independent capacities; recent empirical work similarly indicates that TPACK plays an important role in translating teachers' AI

competency into effective teaching practice (Tan et al., 2025).

Professional identity transformation

Beyond transforming technological, pedagogical, and content knowledge, AI integration also influenced how participants perceived their professional identities as English teachers. The narratives consistently reflected a gradual shift from viewing teachers primarily as knowledge transmitters toward recognizing themselves as facilitators, mentors, learning designers, and critical evaluators in AI-supported learning environments. One advanced teacher reflected:

> "Before AI, I believed my responsibility was to explain writing concepts. Now my responsibility is helping students think critically about what AI produces." (P2)

Similarly, a below-advanced teacher commented:

> "Initially I was afraid AI would replace teachers. Now I believe teachers are more important because students still need guidance to judge whether AI is correct." (P4)

Participants further emphasized that AI integration encouraged continuous professional learning and increased awareness of ethical responsibilities associated with technology-enhanced education. Rather than perceiving AI as a threat to their profession, they increasingly regarded it as a catalyst for pedagogical innovation and lifelong professional development. These findings demonstrate that AI-supported TPACK transformation extends beyond acquiring technological competence. The participants experienced a broader professional transformation characterized by reflective practice, adaptive expertise, and an evolving understanding of teachers' roles in contemporary English language education. This transformation illustrates how AI can function not only as an instructional tool but also as a catalyst for continuous professional growth and pedagogical innovation.

This study explored how English teachers experienced the transformation of their Technological Pedagogical Content Knowledge (TPACK) through AI integration in teaching argumentative writing. The findings demonstrate that AI adoption extends beyond technological implementation and contributes to a multidimensional transformation encompassing technological competence, pedagogical innovation, content knowledge development, adaptive problem-solving, and professional identity reconstruction. These findings reinforce the argument that TPACK is a dynamic framework that evolves through teachers' continuous interaction with emerging educational technologies rather than remaining a static body of knowledge (Fontyn et al., 2025; Nguyen et al., 2025).

The transformation of professional identity can be interpreted as an outcome of the teachers' evolving AI-TPACK rather than as a separate phenomenon from knowledge transformation. As teachers became more capable of evaluating AI outputs, redesigning learning activities, and critically mediating AI-generated content, their professional role shifted from transmitting established knowledge toward orchestrating human–AI learning interactions. This suggests that AI-TPACK transformation has an identity dimension: developing AI-related knowledge changes not only what teachers know and how they teach, but also how they understand their professional responsibility. In this respect, the findings extend AI-TPACK conceptualizations that emphasize human–AI collaboration by showing that teachers' professional identity is reconstructed around uniquely human functions such as contextual judgment, ethical mediation, critical evaluation, and pedagogical decision-making (An et al., 2025). Theoretically, AI therefore does not simply add a new technological component to teachers' knowledge; it redistributes the boundaries between technological capability, pedagogical judgment, content expertise, and professional agency.

This finding can be further interpreted through the human-AI distinction proposed in the AI-TPACK model of An et al. (2026). As AI increasingly performs functions such as generating explanations, examples, and feedback, teachers' professional roles are not necessarily displaced but reconfigured around forms of expertise that remain fundamentally human. The participants' narratives demonstrate this reconfiguration: their roles increasingly centred on evaluating AI outputs, contextualizing information, mediating ethical use, and designing learning experiences. Professional identity transformation can therefore be understood as an important dimension of AI-TPACK development, in which teachers learn not only how to use AI but also how to define the boundaries between machine assistance and human pedagogical agency.

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AI as a catalyst for technological knowledge transformation

The findings indicate that teachers' technological knowledge evolved from basic operational skills toward a more sophisticated form of AI literacy characterized by prompt engineering, critical evaluation of AI-generated outputs, and informed technology selection. This transformation was more evident among teachers with advanced English proficiency, who demonstrated greater confidence in evaluating AI-generated content, whereas below-advanced teachers experienced a more gradual learning trajectory through continuous experimentation.

These findings support previous studies reporting that AI integration enhances teachers' digital competence and encourages the development of higher-order technological knowledge (Koehler et al., 2014; Li et al., 2025). However, unlike earlier quantitative studies that primarily measured TPACK improvement through survey instruments, the present study illustrates how technological competence develops through teachers lived experiences and reflective interactions with AI during instructional practice. This narrative perspective provides a deeper understanding of how AI literacy is constructed over time within authentic teaching contexts (Kleine et al., 2025; Wang, 2025; Yuan et al., 2025).

Pedagogical transformation beyond technology adoption

Another important finding concerns the pedagogical transformation experienced by participants. Rather than merely incorporating AI as an instructional aid, teachers redesigned learning activities to encourage critical thinking, collaborative learning, and reflective writing. AI was positioned as a learning scaffold instead of a substitute for students' cognitive engagement.

This finding is consistent with research emphasizing that successful AI integration depends largely on teachers' pedagogical decisions rather than technological availability (Schmidt et al., 2009; Tan et al., 2025). The participants' experiences demonstrate that AI can facilitate more student-centred learning environments when teachers intentionally design activities that require students to evaluate, revise, and justify AI-generated responses. Therefore, pedagogical knowledge remains central to meaningful AI integration despite rapid technological advancements.

Expanding content knowledge through AI-supported writing instruction

The findings also suggest that AI enriched teachers' content knowledge by providing diverse argumentative writing models, multiple perspectives, and authentic examples that supported classroom explanation. Nevertheless, participants consistently emphasized that teachers remained responsible for evaluating the accuracy, credibility, and ethical appropriateness of AI-generated content before using it for instructional purposes.

This finding aligns with previous studies showing that generative AI enhances writing instruction by supporting idea generation, rhetorical organization, and feedback provision (Karataş & Ataç, 2025; Nazari et al., 2021). However, the present study extends existing knowledge by demonstrating that AI contributes not only to students' writing performance but also to teachers' conceptual understanding of argumentative writing. Consequently, AI should be viewed as a complementary instructional resource that enriches content knowledge while preserving teachers' professional judgment.

Challenges as drivers of professional learning

Although participants acknowledged numerous benefits of AI integration, they also encountered challenges related to prompt construction, information verification, academic integrity, and students' overreliance on AI. Rather than hindering technology adoption, these challenges encouraged teachers to develop adaptive strategies such as cross-checking AI outputs, integrating reflective activities, and promoting ethical AI use.

These findings support previous research highlighting concerns regarding AI hallucination, algorithmic bias, and responsible AI implementation in education (Harintama & Muslimin, 2024; Ismail & Alharkan, 2024; Lambert et al., 2023). Nevertheless, the participants in this study perceived these challenges as opportunities for continuous professional learning rather than barriers to innovation. This suggests that teachers' adaptive capacity plays an essential role in sustaining AI-supported instructional practices.

Professional identity reconstruction in the AI era

The most significant contribution of this study lies in illustrating how AI integration reshaped teachers' professional identities. Participants no

longer perceived themselves primarily as knowledge transmitters but increasingly adopted the roles of facilitators, learning designers, mentors, and critical evaluators who guide students in navigating AI-supported learning environments.

This finding resonates with recent discussions suggesting that AI is redefining teachers' professional roles rather than replacing them (Ebadi & Amini, 2024; Teng, 2024). However, unlike previous studies that predominantly examined AI acceptance or technology readiness, the present narrative inquiry demonstrates how teachers gradually reconstructed their professional identities through everyday classroom experiences (Dilzhan, 2024; Utami et al., 2023). The findings therefore highlight that successful AI integration involves not only technological competence but also continuous reflection, pedagogical adaptation, and identity development.

Overall, this study contributes to the growing body of AI-TPACK research by demonstrating that teachers' professional transformation is a multidimensional and ongoing process. The narrative accounts illustrate that technological knowledge, pedagogical knowledge, content knowledge, and professional identity evolve simultaneously through sustained engagement with AI-supported teaching practices. These findings suggest that future teacher professional development programs should move beyond technical AI training and instead promote reflective practice, ethical awareness, and pedagogical innovation that support teachers' long-term professional growth.

A cross-case comparison further indicates that English proficiency influenced the trajectory of teachers' AI-supported TPACK transformation rather than determining whether transformation occurred (Erito, 2023; Meyer et al., 2024; Wiboolyasarin et al., 2024). Teachers with advanced English proficiency tended to adopt AI more strategically by emphasizing prompt engineering, critical evaluation, and pedagogical innovation, whereas those with below-advanced proficiency initially relied on AI for linguistic support before gradually developing broader instructional applications. Nevertheless, both groups demonstrated progressive growth across the technological, pedagogical, and content knowledge domains, suggesting that AI-supported professional development is accessible to teachers with varying levels of English proficiency when accompanied by continuous reflection and instructional practice.

AI-TPACK as a lens for interpreting TPACK transformation

The five themes can be interpreted collectively through the emerging AI-TPACK perspective, which extends conventional TPACK by recognizing that artificial intelligence does not merely function as another technological tool but changes the relationships among technological, pedagogical, and content knowledge. In this study, AI-TPACK is used as an interpretive lens rather than as a newly developed framework. The findings indicate that teachers' transformation occurred through the continuous interaction between AI capabilities, pedagogical purposes, disciplinary knowledge, and human professional judgment.

Recent AI-TPACK scholarship provides a more differentiated conceptual basis for interpreting this transformation. An et al. (2026) conceptualize AI-TPACK by distinguishing knowledge associated with the human teacher from knowledge associated with AI as a machine teacher. Their model includes AI-TK, AI-TCK, AI-TPK, and AI-TPCK dimensions, with the latter two further distinguishing human-teacher and machine-teacher knowledge. This distinction is particularly relevant to the present findings because participants did not simply learn to use AI; they increasingly learned to determine which instructional functions could be delegated to AI and which required human expertise. For example, participants used AI to generate examples, provide alternative formulations, and support feedback, while retaining responsibility for evaluating accuracy, rhetorical appropriateness, ethical use, and pedagogical relevance. Thus, the findings suggest that AI-TPACK transformation involves the development of a complementary relationship between machine capabilities and human teacher expertise.

This human-AI distinction also provides a theoretical explanation for the professional identity transformation identified in the fifth theme. As AI assumed some functions traditionally associated with teachers, participants increasingly positioned themselves as facilitators, mentors, learning designers, and critical evaluators (Wang et al., 2024; Yang, 2025). Their professional roles were therefore not diminished by AI. Rather, they were reoriented toward functions that require contextual judgment, ethical reasoning, disciplinary expertise, and pedagogical decision-making. In this sense, AI-TPACK transformation involves not only the acquisition of AI-related knowledge but also the

reconstruction of teachers' professional agency in human–AI instructional environments.

The findings further suggest that AI-TPACK transformation is reflective and iterative. Teachers encountered limitations in AI-generated content, prompt construction, hallucination, and student overreliance, and responded by experimenting, evaluating outputs, revising instructional strategies, and developing ethical guidelines. These cycles of action, evaluation, and adjustment indicate that AI integration is not a one-time technological adoption process but an ongoing process of professional learning (Ning et al., 2024; Özmen & Aydın, 2025; Tan et al., 2025). Accordingly, the present study extends the emerging AI-TPACK literature by showing how AI-TPACK transformation is experienced through teachers lived narratives and how technological, pedagogical, content-related, and professional identity changes develop in an interconnected manner.

Importantly, English proficiency appears to influence the trajectory of this transformation. Advanced-proficiency teachers tended to engage more confidently in critical evaluation and strategic AI use, whereas below-advanced teachers initially relied more heavily on AI for linguistic support before gradually developing broader pedagogical and evaluative practices (Chan & Tang, 2024). English proficiency therefore appears to shape the pace and depth of AI-TPACK transformation rather than determine teachers' ability to integrate AI. This finding adds a contextual dimension to AI-TPACK scholarship by suggesting that teachers' linguistic resources may influence how they negotiate the relationship between AI-generated language, disciplinary content, and pedagogical judgment.

Despite these contributions, this study has several limitations. First, the study involved only four EFL teachers, which limits the transferability of the findings to broader populations and institutional contexts. Although the three rounds of interviews provided rich narratives and recurring patterns across cases, the findings should be understood as contextually situated accounts rather than statistically generalizable evidence. Second, English proficiency was examined through TOEFL ITP scores and may not fully capture teachers' broader linguistic, pedagogical, and digital capabilities. Third, the study relied primarily on participants' narratives and reflective accounts, which may not fully represent the complexity of their actual classroom practices. Future research could therefore employ larger and more diverse samples, longitudinal designs, and multiple data sources, including classroom observations, teaching artifacts, and student learning outcomes, to further examine the development and transferability of AI-TPACK across contexts.

CONCLUSION

This study explored how English teachers experienced the transformation of their Technological Pedagogical Content Knowledge (TPACK) through AI integration in teaching argumentative writing. The findings reveal that AI supported multidimensional professional growth by enhancing teachers' technological, pedagogical, and content knowledge while simultaneously reshaping their professional identities. Although teachers with advanced English proficiency demonstrated greater confidence in utilizing AI for instructional innovation, teachers with below-advanced proficiency also exhibited progressive TPACK development through continuous practice and reflective adaptation. These findings suggest that English proficiency influences the pace and depth of AI-supported professional transformation rather than determining teachers' capacity to integrate AI effectively.

The findings also provide specific implications for teacher education and professional development. AI-TPACK development should be embedded in continuous professional learning rather than treated as a one-time technical training program. First, teacher education programs should provide structured opportunities for teachers to develop AI-related technological knowledge through hands-on activities involving prompt design, AI-output evaluation, fact-checking, and responsible tool selection. Second, professional development should integrate AI with pedagogical decision-making by engaging teachers in designing and revising AI-supported lesson plans, particularly activities that require students to critique, compare, justify, and revise AI-generated content. Third, AI-TPACK training should be content-specific, enabling teachers to evaluate AI-generated disciplinary content in relation to rhetorical organization, evidence, argumentation, and academic integrity. Fourth, teacher education programs should incorporate reflective cycles in which teachers experiment with AI, evaluate its pedagogical consequences, and revise their practices based on classroom experiences. Finally, professional development should explicitly address teachers' professional

identity and human agency by helping them establish appropriate boundaries between AI assistance and teacher judgment. Such an integrated approach can support teachers in developing AI-TPACK as an ongoing capacity for critical, ethical, and pedagogically purposeful human–AI collaboration.

The study contributes to the growing body of AI-TPACK research by providing a narrative perspective on teachers lived experiences of AI integration, highlighting that successful implementation requires not only technological competence but also pedagogical reflection, critical evaluation, and ethical awareness. Practically, the findings imply that teacher professional development programs should move beyond technical AI training and promote sustained support for AI literacy, pedagogical innovation, and reflective teaching practices. Future research may involve a larger and more diverse sample, incorporate classroom observations or longitudinal designs, and examine how AI-supported TPACK transformation influences students' writing outcomes across different educational contexts.

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