

Toward AI-PCK: Reconceptualizing Pedagogical Content Knowledge Through EFL Teachers' Experiences with Artificial Intelligence

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Abstract

The increasing integration of artificial intelligence (AI) into English language teaching is reshaping how teachers understand and enact pedagogical content knowledge (PCK). This qualitative study explored English as a Foreign Language (EFL) teachers' experiences and perceptions of AI integration and examined their implications for the emerging conceptualization of Artificial Intelligence-Based Pedagogical Content Knowledge (AI-PCK). Semi-structured interviews were conducted with 12 EFL teachers from the province of Zanjan, Iran, and the data were analyzed using Braun and Clarke's (2006) thematic analysis framework with the support of MAXQDA 2024. The findings suggested that teachers perceive AI as both a pedagogical opportunity and a professional challenge. The participants reported benefits such as improved instructional efficiency, personalized learning, and enhanced classroom engagement, while also expressing concerns regarding student dependency, critical thinking, and the reliability of AI-generated content. Analysis further highlighted three interrelated dimensions of AI-informed pedagogical reasoning: AI literacy, AI-mediated pedagogical integration, and ethical and data-informed professional judgment. Collectively, these findings provide empirical support for the emerging conceptualization of AI-PCK as a context-sensitive extension of PCK in AI-mediated educational environments. The results highlight the need to reconsider how teachers are prepared, supported, and guided through educational policies as AI becomes increasingly embedded in teaching and learning.

Keywords:

Artificial Intelligence in Education, AI-PCK, Pedagogical Content Knowledge, EFL Teachers, AI Literacy.

1. INTRODUCTION

The growing adoption of artificial intelligence (AI) in education has generated significant interest among researchers and practitioners due to its potential to transform teaching practices and improve learning outcomes (Bulger & Mayer-Schönberger, 2018). AI, with its rapidly expanding capabilities, has begun to influence nearly all aspects of human life including education (Bergdahl

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& Sjöberg, 2025). Owing to its advanced capabilities, this technology has gained considerable popularity among people (Adeshola & Adepoju, 2024). The free accessibility and user-friendly interfaces of many AI tools have enabled virtually anyone with internet access to experiment with and adopt these technologies (Morris, 2020; Holmes & Miao, 2023). AI describes a range of computational technologies that mimic certain human cognitive functions by processing information, detecting patterns in data, generating outputs, and making predictions based on learned relationships (Russell & Norvig, 2010). In language education, and particularly in English as a Foreign Language (EFL) contexts, AI can support instructional design, facilitate personalized learning, generate instructional materials, and assist teachers in responding to learners' diverse needs (Esfandiari & Ghamari, 2025; Kelley & Wenzel, 2025).

The growing use of AI in educational settings is accompanied by some challenges (Ng et al., 2025). Teachers must address issues related to technological infrastructure, professional preparation, data privacy, and the pedagogical appropriateness of AI-generated content (Chen & Hsieh, 2020; Wei, 2023). More importantly, successful implementation depends less on the technology itself than on teachers' capacity to critically evaluate, interpret, and ethically regulate algorithmic outputs (Deep & Chen, 2025; Sperling et al., 2024). Consequently, AI integration requires forms of pedagogical reasoning that extend beyond traditional conceptions of teacher knowledge and professional practice.

Although AI offers considerable potential for educational innovation, its classroom adoption remains relatively limited (Viberg et al., 2025), and many teachers continue to struggle with integrating AI into their instructional practices (Choi et al., 2023; Galindo-Dominguez et al., 2024). Existing research suggests that traditional conceptions of pedagogical content knowledge (PCK) and even technology-oriented frameworks such as Technological Pedagogical Content Knowledge (TPACK) do not fully account for the epistemic and ethical complexities introduced by contemporary AI systems (Çelik, 2023; Oved & Alt, 2025). As AI becomes increasingly embedded in educational practice, teachers are required not only to integrate technological tools but also to evaluate AI-generated information, exercise professional judgment, and negotiate the relationship between human expertise and algorithmic support (Tapalova & Zhiyenbayeva, 2022). These developments raise important questions regarding the forms of pedagogical knowledge that teachers need in AI-mediated educational environments (Golnazari & Farahian, 2026).

Despite growing interest in AI in education, much of the existing research has focused on policy discussions, technological affordances, or the benefits and challenges of AI adoption. Comparatively little attention has been paid to how teachers themselves experience and interpret AI integration in their everyday professional practice, particularly in EFL settings and non-Western contexts such as Iran. Furthermore, limited empirical evidence exists regarding how teachers' pedagogical reasoning and professional knowledge may be reconfigured through sustained interaction with AI technologies.

To contribute to this underexplored area, the study drew on the thematic analysis to explore the ways in which EFL teachers understand, experience, and navigate the integration of AI within their professional practice. Specifically, the study examined how teachers perceive the opportunities and challenges associated with AI and how they interpret its influence on their pedagogical reasoning and professional practices. By foregrounding teachers' perspectives, the study seeks to contribute to the emerging conceptualization of AI-Based Pedagogical Content Knowledge (AI-PCK) and to provide context-sensitive insights that can inform teacher education, professional development, and the ethical integration of AI in EFL classrooms. Accordingly, the research was guided by these questions:

RQ1. How do EFL teachers perceive and make sense of AI use in their professional teaching practice?

RQ2. How do EFL teachers perceive the influence of AI on their pedagogical reasoning and professional knowledge?

RQ3. What opportunities and challenges do EFL teachers associate with the integration of AI in language teaching?

2. LITERATURE REVIEW

Pedagogical Content Knowledge (PCK)

Shulman (1986) introduced PCK to explain what distinguishes expert teaching from subject expertise alone. He argued that effective teaching requires teachers to present subject matter in ways that are meaningful and accessible to diverse learners (Levine & Turner, 2020). PCK therefore integrates knowledge of content, learners, and pedagogy to guide instructional decision-making (Park & Oliver, 2008).

Although Shulman (1986) acknowledged educational technologies, their scope and functionality were relatively limited at the time (Lim et al., 2023). Consequently, early conceptualizations of PCK did not anticipate the emergence of intelligent technologies that would later mediate teaching and learning (Creely & Carabott, 2025).

From PCK to TPACK

As educational technologies became more widespread, scholars reconceptualized PCK as a dynamic construct (Çelik, 2023). Mishra and Koehler (2006) extended Shulman's work by proposing the TPACK framework, which emphasized the interaction among content knowledge (CK), pedagogical knowledge (PK), and technological knowledge (TK) (Koehler & Mishra, 2009). According to this framework, effective teaching requires coherent integration of these three domains (Oved & Alt, 2025; Rosenberg & Koehler, 2015).

TPACK has provided an influential framework for understanding how teachers integrate pedagogy, content, and digital tools in language education (Çelik, 2023; Oved & Alt, 2025). However, it largely treats technology as a stable instructional resource intentionally selected by teachers (Prilop et al., 2025; Song et al., 2026). Contemporary AI systems, particularly generative AI applications, challenge this assumption because they generate probabilistic outputs, exhibit varying levels of reliability, and actively shape the production and dissemination of knowledge (Belkina et al., 2025). Consequently, teaching with AI requires pedagogical reasoning that extends beyond technology integration to include evaluating and regulating AI-generated content (Lee & Low, 2024).

Toward Artificial Intelligence–Based Pedagogical Content Knowledge (AI-PCK)

Contemporary AI technologies, including large language models and adaptive learning systems, differ fundamentally from earlier educational technologies (Lim et al., 2023). These systems generate probabilistic outputs that may appear fluent despite lacking conceptual accuracy (Belkina et al., 2025; Song et al., 2026). Such characteristics introduce epistemological uncertainty, ethical concerns, and issues of trust and accountability that extend beyond the explanatory scope of the TPACK framework (Golnazari & Farahian, 2026; Tapalova & Zhiyenbayeva, 2022). In response to these limitations, scholars have argued for the development of new conceptual frameworks that better capture the complexities of teaching in AI-mediated environments (Oved & Alt, 2025; Çelik, 2023). One such emerging concept is AI-PCK. AI-PCK extends traditional PCK by incorporating competencies required in algorithm-driven educational contexts.

Within this framework, AI is viewed as a generative technology whose outputs require continuous human interpretation and professional judgment (Ouyang & Jiao, 2021; Sperling et al., 2024). Accordingly, AI-PCK is conceptualized as a context-specific extension and reconfiguration of pedagogical content knowledge that emerges in AI-mediated teaching environments. Unlike traditional PCK and TPACK frameworks, AI-PCK places particular emphasis on teachers' ability to critically evaluate AI-generated information, regulate the pedagogical use of AI, and make ethical and data-informed decisions under conditions of algorithmic uncertainty. In this sense, AI-PCK extends existing models of teacher knowledge by addressing forms of pedagogical reasoning that arise when knowledge production and instructional decision-making are increasingly mediated by intelligent technologies.

Previous Research

Recent scholarship has increasingly questioned the adequacy of existing pedagogical frameworks for addressing the challenges posed by AI in education. For example, Çelik (2023) and Oved and Alt (2025) argue that TPACK does not fully account for the epistemic and ethical complexities introduced by contemporary AI technologies. Their work suggests that effective AI integration requires competencies that extend beyond traditional technology integration and include critical evaluation of AI outputs, ethical reasoning, and informed pedagogical judgment (Golnazari & Farahian, 2026). Similarly, AI literacy has emerged as an underdeveloped area of teacher education. Sperling et al. (2024) emphasize that teachers often lack sufficient preparation to critically understand and evaluate AI systems, while Gentile et al. (2023) argue that AI is reshaping teachers' professional roles and responsibilities, thereby necessitating a reconsideration of established conceptions of pedagogical knowledge.

Recent studies have documented both the opportunities and implications of AI for teaching and learning. Studies report that AI can reduce teachers' workload, support personalized learning, and improve instructional efficiency (Choi et al., 2023; Hary & Sayudin, 2023; Hoya et al., 2024; Yao & Wang, 2024). At the same time, AI appears to shift teachers' responsibilities from information delivery toward evaluating and regulating AI-supported learning processes. However, most of this evidence is derived from quantitative investigations and focuses primarily on technological effectiveness rather than teachers' lived experiences and pedagogical meaning-making processes.

Collectively, the literature reveals an important theoretical tension. While current frameworks such as TPACK provide valuable insights into technology integration and AI-related competencies, they offer limited explanations of how teachers exercise pedagogical judgment in environments characterized by algorithmic uncertainty, ethical complexity, and AI-generated knowledge. This gap motivates the exploration of AI-PCK as a context-sensitive extension of teacher knowledge in AI-mediated educational settings.

3. METHODOLOGY AND DESIGN

Design

This study adopted a qualitative research design employing the thematic analysis following the six-phase framework proposed by Braun and Clarke (2006). The thematic analysis provides a systematic, yet flexible method for identifying, analyzing, and interpreting patterns of meaning within qualitative data. This approach was selected because it enabled the researchers to explore the participants' perceptions and experiences of AI integration in teaching while identifying recurring themes across their accounts. Given the aim of the study which is examining EFL

teachers’ perceptions of AI and its perceived impact on their pedagogical practices, the thematic analysis offered an appropriate framework for generating rich and contextually-grounded insights from the interview data.

Participants

The participants were selected through purposive sampling and consisted of EFL teachers from the province of Zanjan, Iran. Their selection was guided by their firsthand experience with AI in EFL teaching, ensuring the collection of detailed and contextually relevant perspectives on the phenomenon being examined. In addition, the principle of maximum variation was applied to capture a broad range of perspectives and professional experiences. The final sample consisted of 12 participants. Sample adequacy was determined based on the study's qualitative aims and the richness and relevance of the information provided by the participants rather than statistical representativeness, consistent with the principle of information power in qualitative research (Malterud et al., 2016). The selected participants provided diverse and information-rich accounts of AI integration in EFL teaching, allowing recurrent patterns and shared meanings to emerge from the data. The sample included teachers with varying levels of professional experience, allowing the study to capture a range of perspectives regarding the opportunities, challenges, and pedagogical implications of AI use in language education. The participants’ teaching experience ranged from six to 36 years, representing novice, mid-career, and experienced teachers. The sample comprised eight male and four female teachers. All participants took part in the study voluntarily. A detailed overview of the participating teachers' background information is presented in Table 1.

Table 1: Participants’ Identification Codes

Participant Code	Gender	Experience	Explanation
T1	Male	15	Public school English Language Teacher
T2	Female	12	Public school English Language Teacher
T3	Female	25	Public school English Language Teacher
T4	Male	6	English Language Teacher of Shahed school
T5	Male	36	Gifted school English Language Teacher
T6	Female	29	Selective public school English Language Teacher
T7	Male	22	Selective public school English Language Teacher
T8	Male	16	Gifted school English Language Teacher
T9	Male	14	Public school English Language Teacher
T10	Male	22	Selective public school English Language Teacher
T11	Female	12	Public school English Language Teacher
T12	Male	28	Gifted school English Language Teacher

Data Collection

Data were collected through semi-structured interviews. The interview guide was developed based on previous research and the study objectives. The interviews focused on the following guiding questions:

1. As an EFL teacher, what opportunities has AI created for you, and how do you use AI capabilities in your teaching practice?

2. What Challenges has AI created for you, and how do you deal with these challenges in your teaching practice?
3. In what ways, if any, has AI influenced your teaching practices, instructional decision-making, or professional role as a teacher?

Expert judgement was used to ensure the content validity of the interview questions. Three experts in the realm of EFL and AI has confirmed the questions. Each interview lasted approximately 30 minutes. Before the interviews, rapport was established and the participants were given a brief overview of the study. With the participants' consent, all interviews were audio-recorded and transcribed verbatim. The participants were assured of confidentiality and informed that participation was voluntary and that they could decline any questions or withdraw at any time. Consent was also obtained to use anonymized quotations.

Data Analysis

The interview data were analyzed using [Braun and Clarke's \(2006\)](#) thematic analysis framework. The analysis followed six interrelated phases. The researchers repeatedly read the transcripts to familiarize themselves with the data and identify preliminary patterns. Then, they generated initial inductive codes by examining passages that reflected how participants understood, experienced, and interpreted the use of AI in their teaching practice. Coding remained closely grounded in the participants' accounts, and the themes were developed inductively from the dataset rather than being predetermined by the interview questions or theoretical framework. Although the interview questions focused broadly on the teachers' experiences of AI-related opportunities, challenges, and pedagogical implications, the coding process was not structured around these categories. Instead, the themes were developed from the recurring patterns of meaning identified across participants' accounts and were refined through iterative comparison of codes, subthemes, and the broader dataset. Third, the related codes were examined and grouped into broader candidate themes based on conceptual the similarities and recurring patterns of meaning across the dataset. Fourth, the themes were subsequently reviewed and refined to ensure coherence and clear distinctions. Finally, the themes were defined and named. The themes were, then, interpreted in relation to the research questions and theoretical framework. MAXQDA 2024 was used to facilitate data management, coding, and theme development.

Trustworthiness

Several procedures were employed to enhance trustworthiness. Member checking was conducted by sharing preliminary interpretations with the participants for verification. To strengthen analytical rigor, peer debriefing was conducted with two researchers experienced in language education and qualitative research. They independently reviewed portions of the coding and theme development processes and provided feedback that refined the analysis. The field notes and reflective memos were maintained to document methodological decisions and emerging insights. These records enhanced the transparency of the analytic process. Coding and theme refinement continued until a coherent thematic structure was achieved. [Figure 1](#) presents the progression from the coded data to the subthemes and the main themes.

4. RESULTS

The findings presented in this section were derived from the thematic analysis of the semi-structured interviews conducted with EFL teachers regarding their experiences and perceptions of AI integration in language teaching. The analysis generated three interrelated themes reflecting the

participants' perceptions of AI-related opportunities, challenges, and implications for pedagogical reasoning and professional practice. For analytical clarity, the findings are organized according to these emergent themes, illustrating the patterns of meaning identified across the participants' accounts.

Reconfiguring Teaching Through AI-Supported Practices

The participants described AI as reshaping their instructional practices by expanding pedagogical possibilities and influencing how they plan, deliver, and evaluate instruction.

Many participants reported that AI reduced cognitive and administrative demands, enabling greater attention to classroom interaction and engagement. As one teacher explained:

“Because of its speed and accuracy, AI prevents a huge amount of time from being wasted in the classroom” (T3, October 14, 2025).

The participants also reported that AI facilitated lesson planning and material preparation, increasing their preparedness and confidence.

“I can prepare lesson materials in a very short time, and this allows me to spend more time thinking about how I should teach the lesson” (T9, October 30, 2025).

Teachers reported that AI-supported materials increased students' interest and participation and created more dynamic classrooms. One participant noted:

“Using AI has helped my students learn more easily and effectively, and at the same time it has made teaching easier for me” (T11, November 3, 2025).

Similarly, another teacher explained:

“I create very engaging instructional materials using AI, and that has helped me manage my classroom much better” (T7, November 13, 2025).

Several teachers used AI to design assessments, analyze performance, and identify learners' strengths and weaknesses more efficiently. These practices enabled more individualized feedback.

“AI helps me prepare quizzes and analyze students' mistakes much faster, so I can give feedback that is more specific to their needs” (T8, October 28, 2025).

Personalized instruction also emerged as a salient benefit of AI integration. The teachers described using AI to adapt materials to learners' differing abilities and needs, enhancing instructional flexibility. Furthermore, several participants also emphasized that AI promoted self-directed learning among teachers and students. One teacher reflected:

“One of the advantages of AI is that it has increased self-directed learning in my students and even in myself. Through simple question-and-answer interactions with AI, we can find answers to many of our questions and learn about different topics” (T9, October 30, 2025).

Overall, the participants viewed AI as enhancing instructional efficiency, learner engagement, and opportunities for personalized and self-directed learning. Tables 2 and 3 present the coding structure underlying the teachers' perceived opportunities of AI integration. Table 2 provides illustrative quotations and initial codes, whereas Table 3 summarizes the progression from initial codes to subthemes and the main theme.

Table 2: Extracting Initial Codes Through Thematic Analysis of the Participating Teachers' Reflections to Interview Questions – Theme 1

Representative Quotation	Initial Codes
"Because of its speed and accuracy, AI prevents a huge amount of time from being wasted in the classroom"	Saving time in lesson preparation
"One of the advantages of AI is that we can proceed classroom activities a lot faster"	Faster classroom activities
"Thanks to AI, a lot of time could be saved in the class"	Reducing routine workload
"AI has increased self-directed learning in my students and even in myself and because of that teachers have got less work to do"	Less administrative burden
"Now, I can do my lesson planning anytime"	Easier lesson planning
"Using AI in English teaching really helps students learn more deeply. For example, using AI-created videos and games has improved both their grades and their interest in the class"	More attractive materials
"I create very engaging instructional materials using AI and this helps the students to engage more in classroom activities"	Increased student participation
"Since the time I'm using AI in my classes, students seem to pay more attention to the content"	Higher student attention
"AI has helped me manage my classroom much better"	Better classroom management
"Using AI has helped my students learn more easily and effectively, and at the same time it has made teaching easier for me"	More dynamic lessons
"AI helps me prepare quizzes and analyze students' mistakes much faster, so I can give feedback that is more specific to their needs"	Creating quizzes quickly
"It's very interesting that with AI, I have the ability to better recognize students' weaknesses"	Identifying students' weaknesses
"AI has increased the speed of giving feedback"	Providing faster feedback
"I check students' progress with Gemini"	Monitoring learning progress
"AI enables us to adapt our instruction to students' diverse needs"	Adapting instruction to learners' needs
"ChatGPT helps me scaffold my weak students"	Supporting weaker students
"Everybody can learn with AI, no matter what type of learning they used to"	Individualized learning experiences
"With the assistance of AI, I can provide content for any proficiency levels"	Tailoring materials to proficiency level
"One of the advantages of AI is that it has increased self-directed learning in my students and even in myself"	Learning independently through AI
"Through simple question-and-answer interactions with AI, we can find answers to many of our questions and learn about different topics"	Students asking AI questions
"These days, thanks to AI, I am more knowledgeable about teaching procedures"	Teachers learning through AI
"Another advantage of AI is that it has provided us with continuous learning about my career"	Continuous professional learning

Table 3: Thematic Analysis of the Participating Teachers' Reflections to Interview Questions – Theme 1

Initial Codes	Subthemes	Main Theme
Saving time in lesson preparation	Efficiency and instructional streamlining	Reconfiguring Teaching Through AI-Supported Practices
Faster classroom activities		
Reducing routine workload		
Less administrative burden		
Easier lesson planning		
More attractive materials	Engagement and classroom management	
Increased student participation		
Higher student attention		
Better classroom management		
More dynamic lessons		
Creating quizzes quickly	Assessment and feedback	
Identifying students' weaknesses		
Providing faster feedback		
Monitoring learning progress		
Adapting instruction to learners' needs		
Supporting weaker students	Personalized learning	
Individualized learning experiences		
Tailoring materials to proficiency level		
Learning independently through AI		
Students asking AI questions	Self-directed learning	
Teachers learning through AI		
Continuous professional learning		

Negotiating Challenges and Professional Tensions

Despite recognizing the benefits of AI integration, the participants also described significant challenges and professional tensions. Teachers frequently questioned the authenticity of students' work and whether AI-generated responses reflected genuine learning. One participant explained:

“Sometimes I cannot be sure whether the student has really learned the material or whether the answer is completely generated by AI” (T6, November 6, 2025).

This issue complicated assessment and the evaluation of learners' actual linguistic abilities. The participants also perceived a decline in students' critical thinking and creativity. Several teachers argued that excessive AI use encouraged students to prioritize quick answers over deeper engagement. As one participant noted:

“I have noticed that some students rely so heavily on AI that they no longer take the time to think through a problem on their own” (T8, October 28, 2025).

To address this issue, teachers redesigned tasks, increased in-class activities, and discussed appropriate AI use with students.

The participants also expressed uncertainty about the appropriate use of AI. In the absence of clear guidelines, teachers felt responsible for deciding when and how AI should be used. One participant stated:

“There is no clear instruction about how much we should use AI, so I have to decide this myself in each situation” (T1, October 9, 2025).

The participants also emphasized that AI outputs were not always accurate, unbiased, or suitable for their learners. Consequently, teachers frequently verified and adapted AI-generated materials before using them in instruction.

“Sometimes the information generated by AI looks correct, but when I check it carefully, I realize that it contains mistakes or examples that are not appropriate for my students” (T4, November 1, 2025).

Importantly, the participants did not portray themselves as passive recipients of technological change. Instead, they developed coping strategies, including establishing classroom norms, redesigning assessments, engaging in self-directed learning, and exercising caution in AI integration. Interestingly, although most participants viewed AI positively, several expressed reservations regarding its pedagogical value. A few participants reported using AI cautiously, arguing that excessive reliance on it might reduce opportunities for authentic language use and independent problem-solving.

“I use AI carefully because I don't want my students to become dependent on it. Sometimes learning happens through struggle, and AI can remove that process” (T3, October 14, 2025).

These findings suggest that teachers' experiences with AI are characterized by both enthusiasm and caution and involve ongoing negotiation between pedagogical opportunities and professional concerns.

Tables 4 and 5 present the coding structure underlying teachers' perceptions of AI-related challenges. Table 4 provides representative excerpts and initial codes, whereas Table 5 summarizes the progression from the initial codes to the subthemes and the main theme.

Table 4: Extracting Initial Codes Through Thematic Analysis of the Participating Teachers' Reflections to Interview Questions – Theme 2

Representative Quotation	Initial Codes
"Most of my students just copy and paste from AI"	Students copy from AI
"Sometimes I cannot be sure whether the student has really learned the material or whether the answer is completely generated by AI"	Difficulty determining authentic work
"I've used AI carefully because I don't want my students to become dependent.	Dependence on AI-generated answers
"I have noticed that some students rely so heavily on AI that they no longer take the time to think through a problem on their own"	Students accept first answer immediately
"They accept it without evaluating the data"	Less reasoning
"My students seem to be more creative back then"	Reduced creativity
"AI did most of the students' homework, not themselves"	Superficial engagement with tasks
"There is no clear instruction about how much we should use AI"	No guidelines for AI use
"I have to decide how to use AI myself in each situation without having any guidelines"	Teachers deciding independently
"It usually gets really hard for me to determine an authentic work of my students. Therefore, it made me very confused about how we can use AI appropriately"	Confusion about appropriate use
"I always have to check whether a student has done his/her assignment independently or used AI and this is a little bit demanding for me"	Cognitive burden of decision-making
"Not everything AI gives you is accurate"	AI gives inaccurate information
"AI gets its information from all sorts of websites and databases around the world, but not everything out there is accurate or unbiased."	Biased information
"Sometimes the information generated by AI looks correct, but when I check it carefully, I realize that it contains mistakes or examples that are not appropriate for my students"	Inappropriate content for learners
"The most important thing is to check where AI is actually getting its info from."	Need to verify AI outputs
"I sometimes get compelled to change the material I get from AI"	Need to modify AI-generated materials

Table 5: Thematic Analysis of the Participating Teachers' Reflections to Interview Questions – Theme 2

Initial Codes	Subthemes	Main Theme
Students copy from AI Difficulty determining authentic work Dependence on AI-generated answers Students accept first answer immediately	Student overreliance on AI	Negotiating Challenges and Professional Tensions
Less reasoning Reduced creativity Superficial engagement with tasks	Erosion of critical thinking and creativity	
No guidelines for AI use Teachers deciding independently Confusion about appropriate use Cognitive burden of decision-making AI gives inaccurate information Biased information	Uncertainty regarding appropriate AI use	
Inappropriate content for learners Need to verify AI outputs Need to modify AI-generated materials	Evaluating AI-generated outputs	

Emerging Dimensions of AI-Informed Pedagogical Reasoning

Beyond its opportunities and challenges, the participants reported that AI influenced their professional roles and pedagogical responsibilities. The teachers increasingly viewed themselves as guides and regulators of AI use. One participant stated:

“Even children are using AI now, so as a teacher, I have to teach my students how to use this technology properly” (T4, November 1, 2025).

The participants also assumed greater responsibility for monitoring students' AI use and distinguishing independent work from AI assistance. As one teacher explained:

“I always have to check whether a student has done his/her assignment independently or used AI” (T12, November 29, 2025).

The participants further emphasized professional judgment in deciding whether, when, and how to use AI. One participant stated:

“It is very important for me to know when I should use AI in my teaching and when I should not” (T2, October 12, 2025).

Several participants also distinguished AI from previous educational technologies, arguing that it requires competencies beyond general technological proficiency. As one teacher explained:

“I am good at using technology in my teaching, but AI requires additional skills”
(T11, November 24, 2025).

The participants frequently referred to the need to critically evaluate AI-generated information, regulate students’ use of AI, and make ethical and pedagogically-informed decisions about its integration into classroom practice.

“I feel responsible for teaching students how to use AI ethically because they often accept everything the system says without questioning it” (T1, October 9, 2025).

Finally, several participants also reported increased confidence and professional growth as they became more familiar with AI. They perceived AI as encouraging them to reconsider existing practices, develop new competencies, and adopt more reflective approaches to instruction. Overall, these findings suggested that the participants perceived AI as influencing their pedagogical reasoning, professional responsibilities, and instructional decision-making. Collectively, these experiences point toward emerging forms of AI-informed pedagogical practice that contribute to the conceptualization of AI-PCK.

Tables 6 and 7 present the coding structure underlying the teachers' perceptions of the influence of AI on pedagogical content knowledge. Table 6 provides the illustrative quotations and the initial codes, whereas Table 7 summarizes the progression from the initial codes to the subthemes and the main theme.

Table 6: Extracting Initial Codes Through Thematic Analysis of the Participating Teachers' Reflections to Interview Questions – Theme 3

Representative Quotation	Initial Codes
"I feel responsible for guiding my students the right way to make use of AI."	Teaching students how to use AI
"We should teach students how to use AI ethically in their daily lives"	Guiding responsible AI use
"They often accept everything the system says without questioning it"	Supervising AI practices
"I fully explain the threats of AI to my students"	Protecting students from misuse
"I always have to check whether a student has done his/her assignment independently or used AI"	Monitoring independent work
"I always ask questions from the works done by my students to make sure "	Preserving critical thinking
"We should teach students how to use AI ethically"	Evaluating ethical implications
"Before starting any class, I set rules for AI usage of my students"	Setting classroom rules for AI use
"It is very important for me to know when I should use AI in my teaching and when I should not"	Knowing when to use AI
"You need to know in which context you should use AI"	Selecting appropriate contexts for AI
"AI age required us to make careful decisions in the class"	Making informed pedagogical decisions
"I am good at using technology in my teaching, but AI requires additional skills."	AI requires additional skills
"It's one of your duties as a teacher to check AI outputs before presenting them to your students"	Evaluating AI outputs
"One of the important things for teachers these days, I believe, is to be familiar with AI"	Understanding AI
"They often accept everything the system says without questioning it. It's really dangerous"	Critical AI literacy
"Knowing the capabilities of AI makes me calmer and more confident"	Increased confidence using AI
"with AI, I feel more able to teach"	Improved teaching competence
"I benefited a lot from ChatGPT. It helps me be more prepared for any types of classrooms"	Greater preparedness
"Sometimes I just use AI to assess students' performance in an exam or giving feedback"	Reflective teaching practices

Table 7: Thematic Analysis of the Participating Teachers' Reflections to Interview Questions – Theme 3

Initial Codes	Subthemes	Main Theme
Teaching students how to use AI		
Guiding responsible AI use	Expanding professional responsibility	
Supervising AI practices		
Protecting students from misuse		
Monitoring independent work		
Preserving critical thinking		
Evaluating ethical implications	Ethical regulation and pedagogical oversight	
Setting classroom rules for AI use		
Knowing when to use AI		
Knowing when not to use AI	Professional judgment and decision-making	Emerging Dimensions of AI-Informed Pedagogical Reasoning
Selecting appropriate contexts for AI		
Making informed pedagogical decisions		
AI requires additional skills		
Evaluating AI outputs	AI-specific professional competencies	
Understanding AI		
Critical AI literacy		
Increased confidence using AI		
Improved teaching competence	Professional growth and self-efficacy	
Greater preparedness		
Reflective teaching practices		

To facilitate understanding of the thematic structure emerging from the data, a hierarchical coding map was generated using MAXQDA. The figure provides a visual representation of the relationships between the main themes and subthemes identified during the analysis.

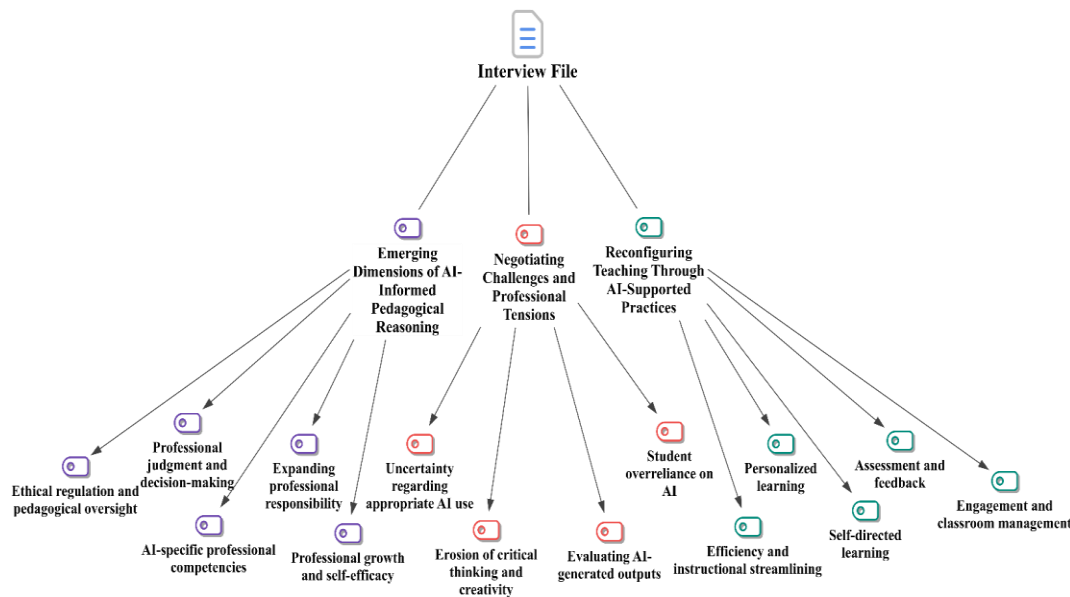


Figure 1. Hierarchical Representation of the Thematic Structure Emerging from the Interview Data

Note. Initial codes have been omitted due to their large number in order to preserve the clarity and visual comprehensibility of the figure.

5. DISCUSSION

The findings of this study indicated that the EFL teachers perceived AI as both a pedagogical opportunity and a professional challenge. The participants reported that AI improved instructional efficiency, personalized learning, classroom engagement, and assessment practices. These findings are consistent with previous studies such as [Banihashem et al. \(2025\)](#), [Daher \(2025\)](#), and [Hary and Sayudin \(2023\)](#). At the same time, they expressed concerns regarding student dependency, reduced critical engagement, and the reliability of AI-generated content. Similar concerns have been reported by [Esfandiari and Ghamari \(2025\)](#), [Pashae et al. \(2025\)](#), [Taşçı and Tunaz \(2024\)](#), and [Wei \(2023\)](#). These findings suggest that AI integration is experienced not as a purely technological innovation, but as a process requiring continuous pedagogical and ethical negotiation. Viewed through [Shulman's \(1986\)](#) framework, these experiences suggest that AI influences how teachers transform content into pedagogically meaningful learning experiences. The participants described adapting instructional materials, monitoring learner engagement, and making decisions regarding AI use. These activities illustrate how AI increasingly shapes pedagogical reasoning.

The findings further suggested that sustained engagement with AI involves forms of pedagogical reasoning not fully captured by PCK or TPACK. Echoing the observations reported by [Prilop et al. \(2025\)](#) and [Song et al. \(2026\)](#), the participants repeatedly emphasized the need to evaluate the reliability of AI-generated information, determine the pedagogical appropriateness of AI use, and regulate students' engagement with AI in relation to learning goals. Similar observations have been reported in studies emphasizing teacher preparedness, professional development, and informed pedagogical decision-making in AI-mediated environments ([Lan, 2024](#); [Rahman & Watanobe, 2023](#)). These responsibilities require continuous professional judgment under conditions of algorithmic uncertainty and ethical complexity.

Across the participants' accounts, three interrelated capacities appeared particularly important: understanding AI systems and their limitations, integrating AI into pedagogical

practice, and exercising ethical and professional judgment regarding AI use. Although these capacities did not emerge as independent themes, they were consistently reflected across the dataset and were central to teachers' pedagogical reasoning. Together, they provide empirical support for the conceptualization of AI-PCK as a context-sensitive extension of pedagogical content knowledge.

Importantly, AI-PCK is not proposed as a replacement for PCK or TPACK frameworks. Rather, it offers a conceptual lens for understanding how AI literacy, pedagogical integration, and ethical judgment become intertwined within teachers' instructional decision-making when teaching is increasingly influenced by intelligent technologies. In this sense, AI-PCK highlights forms of pedagogical reasoning that are not fully captured by existing frameworks, particularly teachers' responsibilities for evaluating, interpreting, and regulating AI-generated content and for exercising professional judgment under conditions of algorithmic uncertainty. The proposed AI-PCK model is illustrated in [Figure 2](#).

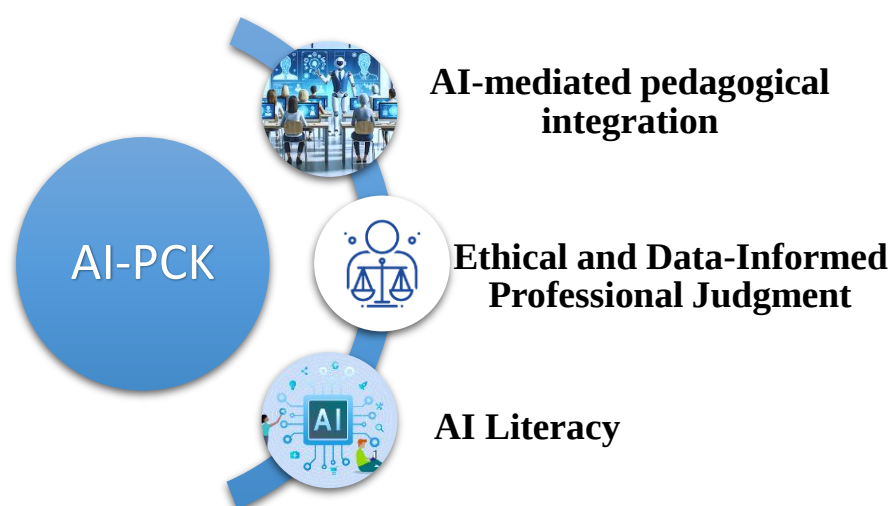


Figure 2: An Emerging Conceptualization of Artificial Intelligence-Based Pedagogical Content Knowledge (AI-PCK)

The findings also suggest that AI integration is associated with changes in teachers' professional roles. The participants increasingly perceived themselves as facilitators, evaluators of AI-generated information, and guides responsible for supporting ethical AI use. Rather than diminishing teacher expertise, AI expanded the scope of professional judgment required in classroom practice. This interpretation aligns with research indicating shifts in teachers' roles, responsibilities, and pedagogical decision-making in AI-mediated environments ([Azimi, 2025](#); [Gentile et al., 2023](#); [Lan, 2024](#)).

Taken together, the findings suggested that the educational significance of AI lies in the new forms of pedagogical reasoning it demands from teachers. By showing how EFL teachers interpret, evaluate, and regulate AI in practice, this study contributes to discussions of teacher knowledge in the age of generative AI and provides empirical support for the emerging conceptualization of AI-PCK.

6. CONCLUSION

This study explored the EFL teachers' perceptions of AI integration and its influence on their pedagogical practices and professional knowledge. The findings suggest that AI is perceived not merely as an instructional tool, but as a factor shaping pedagogical reasoning, instructional decision-making, and professional responsibilities. The participants highlighted the importance of AI literacy, ethical and data-informed judgment, and AI-mediated pedagogical integration. The findings contribute to the emerging conceptualization of AI-PCK. Rather than replacing traditional PCK, AI-PCK is proposed as a context-sensitive extension of teacher knowledge that emphasizes evaluating AI-generated outputs and making informed pedagogical and ethical decisions under conditions of algorithmic uncertainty.

The study also has practical implications for teacher education, professional development, and educational policy. Preparing teachers for AI-mediated environments requires support for AI literacy, ethical awareness, and pedagogically-grounded approaches to AI integration. Several limitations should be acknowledged. The findings are based on self-reported perceptions of EFL teachers from a single context and are, therefore, not statistically generalizable. Future research should examine AI integration across diverse settings and incorporate classroom observations, instructional artifacts, and longitudinal designs to further investigate AI-informed pedagogical knowledge and practice.

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