

## Reconceptualising TPACK in The Age of Generative AI: Implications for English Language Teaching in EFL Contexts

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**Annotation** *The rapid development of generative artificial intelligence (GenAI) is creating new opportunities for English language teaching, from generating reading materials and designing vocabulary activities to providing feedback and simulating conversations. However, having access to these tools does not necessarily mean that learning will become more effective. The real challenge for teachers is to decide when AI can support learning, how its output should be evaluated, and how it can be integrated into lessons without reducing learners' independence. This conceptual article examines the relevance of the Technological Pedagogical Content Knowledge (TPACK) framework to English language teaching in the age of generative AI. Drawing on 15 academic publications, including theoretical studies, empirical research and systematic reviews, the article explores developments in TPACK, AI-TPACK, language education, teacher competence and responsible AI use. The analysis suggests that the traditional TPACK framework remains valuable, but teachers' technological knowledge now needs to encompass a more critical understanding of AI-generated content. English teachers must be able to evaluate linguistic accuracy, adapt materials to learners' needs, address ethical concerns and make informed pedagogical decisions. The review also highlights an imbalance in existing research: GenAI studies in language education have focused largely on higher education and writing, while school-level EFL classrooms and other language skills remain less extensively investigated. In response, the article proposes a conceptual extension of TPACK that brings together technological, pedagogical and content knowledge with critical AI literacy, ethical knowledge and teacher agency. It argues that meaningful AI integration depends not on the amount of technology used, but on whether that technology serves clear learning objectives and supports teachers' professional judgement and learners' active participation.*

**Keywords:** *TPACK, generative artificial intelligence, AI-TPACK, English language teaching, EFL, educational technology, teacher competence, AI literacy, digital pedagogy*

### Introduction

Technology has become a familiar part of English language teaching. Teachers use digital platforms, online dictionaries, videos and interactive resources to make lessons more engaging and provide learners with additional opportunities to practise English. Yet the presence of technology does not automatically make a lesson more effective. A digital activity is valuable only when it helps learners achieve a meaningful educational goal.

This issue has become particularly important with the emergence of generative artificial intelligence (GenAI). Unlike many earlier educational technologies, GenAI can produce new content in response to a teacher's or learner's instructions. Within seconds, it can generate a reading passage, prepare comprehension questions, suggest vocabulary exercises or simulate a conversation. These possibilities are attractive to English teachers, especially when they need to prepare materials for learners with different proficiency levels. At the same time, AI-generated content may contain errors, reflect cultural assumptions or provide answers that learners accept without questioning.[1]

To understand how teachers can use such technologies effectively, it is useful to return to the Technological Pedagogical Content Knowledge (TPACK) framework. Developed from the idea of

pedagogical content knowledge, TPACK emphasises the relationship between technological knowledge (TK), pedagogical knowledge (PK) and content knowledge (CK). Effective teaching with technology depends on how these forms of knowledge interact rather than on technological competence alone [2]

For example, an English teacher may know how to use an AI tool to generate a reading passage. However, effective use requires additional decisions: Is the text suitable for the learners' proficiency level? Does it contain accurate information? Does it support the lesson objective? Will the activity help students develop reading comprehension, or will they simply copy answers generated by the tool? These questions demonstrate why technological knowledge cannot be separated from pedagogical and subject knowledge.

Harris et al. [3] similarly emphasise the importance of connecting technology with curricular content and learning activities. Their perspective remains relevant because teachers need to select technologies according to what learners are expected to understand and do, rather than allowing the availability of a tool to determine the lesson.

GenAI makes this relationship more complex. A teacher is no longer simply choosing between an online worksheet and a printed one. The teacher may need to evaluate several AI-generated versions of a text, identify linguistic inaccuracies, consider potential bias and decide how much assistance learners should receive. Mishra et al. [4] argue that the emergence of ChatGPT and generative AI requires educators to reconsider the meaning of technological knowledge within TPACK.

Recent studies have begun to explore this issue directly. Ning et al. [5] examine teachers' AI-TPACK and the relationships between different knowledge elements. Liu and Zhong investigate GenAI-supported learning from a TPACK perspective, highlighting the importance of pedagogical scaffolding. Yang et al. also identify a positive relationship between TPACK and teachers' willingness to integrate GenAI, while showing that negative emotions can influence this relationship.

The issue is especially relevant to English as a Foreign Language (EFL) education. GenAI can help teachers produce examples, adapt texts, create conversation prompts and offer additional language practice. Nevertheless, the quality of these resources cannot be assumed. Teachers must judge whether the generated language is accurate, natural and appropriate for the learning context.

Recent reviews provide a clearer picture of the research landscape. Li et al. reviewed 144 empirical studies published between 2023 and 2024 and found that research was concentrated in higher education, with writing receiving substantial attention. School-level contexts and other language skills were less extensively represented. Lee et al. [6] similarly reviewed empirical research on GenAI in language classrooms and examined its educational applications and limitations.

Another concern is the representation of English itself. English is used in many different cultural and communicative contexts, but AI-generated materials may not always reflect this diversity. Lee et al. (2025b) discuss GenAI from a Global English perspective, drawing attention to questions about language representation and the implications of AI for English language teaching.

Teachers therefore need more than the ability to generate materials. They need to evaluate those materials critically and decide how they fit into a particular learning environment. Mikeladze et al. (2024) highlight the broader knowledge and competencies required for educators to work with AI. In EFL education, Zhou et al. [7] identify professional-development needs related to teachers' ability to integrate technology into language instruction.

Ethical considerations add another layer of responsibility. Nguyen et al. discuss principles including privacy, fairness, transparency and accountability in AI-supported education. These issues matter when learners submit personal writing to AI systems, use generated content in assignments or rely on information that has not been checked.

Finally, GenAI raises questions about the changing role of teachers. Rather than simply delivering information, teachers may increasingly need to guide learners in evaluating AI-generated content, making responsible choices and using technology independently. Zhai examines teacher agency,

knowledge and practices in the GenAI era, reinforcing the importance of teachers' professional judgement.

Although research on AI and education is expanding, questions remain about how TPACK should be interpreted in the context of GenAI-supported English language teaching. In particular, it is necessary to clarify which competencies teachers need beyond basic technological knowledge and how these competencies can inform classroom practice.[8]

This article addresses three research questions:

1. How does generative AI challenge and extend the traditional understanding of TPACK in English language teaching?
2. What knowledge and competencies do English language teachers need to integrate GenAI meaningfully?
3. What implications does an AI-enhanced understanding of TPACK have for EFL teaching and teacher professional development?

The article aims to develop a conceptual perspective on TPACK in the GenAI era. It synthesises existing research rather than reporting an original classroom intervention or claiming to measure the effects of AI on learners.

## **Materials and Methods**

### **Research design**

This article uses a conceptual literature review to examine how the TPACK framework can inform English language teaching in the age of GenAI. This approach was selected because the field is developing rapidly and researchers are still examining the knowledge, skills and professional responsibilities required for effective AI integration. Unlike an empirical classroom study, this article does not involve original participants, intervention lessons, tests or questionnaires. Its purpose is to bring together existing theoretical and research-based perspectives, identify recurring issues and develop a conceptual argument about teacher knowledge.[9]

### **Scope of the literature**

The review draws on 15 academic publications addressing three connected areas: the foundations of TPACK, AI competence and AI-supported education, and the application of GenAI to language teaching and learning. Foundational TPACK publications provide the theoretical basis for understanding the relationship between technology, pedagogy and content. More recent studies examine AI-TPACK, teachers' willingness to use GenAI, ethical considerations, professional development and applications in language education. The selected publications include conceptual discussions, empirical studies and systematic reviews. This combination makes it possible to consider both the theoretical principles underlying technology integration and the challenges emerging from recent AI research.

### **Analytical approach**

The publications were examined thematically, with attention to five areas:

1. The relationship between TPACK and effective technology integration;
2. Changes in technological knowledge associated with genai;
3. Applications of genai in English language teaching;
4. Teacher competence, professional development and agency;
5. Critical AI literacy and ethical responsibility.[10]

The themes were then considered in relation to the research questions. Particular attention was given to the competencies that appear necessary when teachers move from using conventional digital

resources to working with AI systems that generate content. On this basis, the article proposes a conceptual extension of TPACK. The proposal is intended to support further discussion and empirical investigation; it is not presented as an already validated or universally accepted model.

## **Results and Discussion**

### **Results**

#### **TPACK remains relevant, but technology cannot stand alone**

A central idea emerging from the reviewed literature is that TPACK remains a useful framework for understanding technology integration. Koehler and Mishra explain that effective technology-supported teaching depends on the interaction between technological, pedagogical and content knowledge. Koehler et al. further clarify the importance of these interconnected knowledge domains.

This perspective challenges the assumption that teachers become more effective simply by learning to use more digital tools. A teacher may be confident with technology but still struggle to choose activities that support learning. Similarly, an engaging digital resource may have limited educational value if it is not connected to the lesson objective. Harris et al. [11] highlight the importance of aligning technology with curricular content and learning activities. Applied to ELT, this means that teachers should begin with the language skill or learning outcome they want to develop and then decide whether a particular tool can contribute to that goal.

GenAI makes this principle especially important because its ability to produce content quickly can encourage teachers to focus on what the tool can generate rather than on what learners need to learn.

#### **GenAI expands the meaning of technological knowledge**

The second theme concerns the knowledge teachers need to work effectively with AI-generated content. With conventional digital resources, teachers often select materials that already exist. GenAI introduces a different task: teachers can generate materials, but they must also evaluate the output before using it. Mishra et al. argue that GenAI requires educators to reconsider technological knowledge within TPACK. Knowing how to access an AI tool is only the starting point. Teachers must also understand its capabilities and limitations and recognise that a fluent response is not necessarily accurate. Ning et al. [12] examine AI-TPACK as a way of understanding the knowledge required for AI-supported teaching. Liu and Zhong also demonstrate the relevance of TPACK to GenAI-supported learning, particularly the importance of pedagogical scaffolding.

For English teachers, this expanded technological knowledge includes the ability to generate suitable materials, check linguistic and factual accuracy, recognise limitations and decide how AI output should be incorporated into a lesson.

Consider a teacher who asks GenAI to prepare a B1-level reading text. The resulting passage may appear appropriate, but it could contain unfamiliar vocabulary, overly complex sentence structures or misleading information. The teacher needs sufficient technological understanding to work with the tool and sufficient pedagogical and linguistic knowledge to decide whether the text is suitable.

This example illustrates why technological knowledge in the GenAI era involves more than operating an application. It requires informed judgement about the quality and educational value of what the application produces.

#### **Opportunities for English language teaching**

GenAI offers several potential applications in ELT. It can help teachers generate reading passages, create vocabulary exercises, prepare grammar examples, suggest writing prompts and simulate conversations. It can also provide additional opportunities for learners to practise language outside the classroom. For writing, learners may use AI-generated feedback to identify possible improvements in grammar or organisation. In speaking activities, conversational AI can provide opportunities to rehearse dialogues or explore everyday situations. In vocabulary teaching, teachers can request

examples that illustrate how words are used in context. These possibilities are useful, but their value depends on how they are incorporated into teaching. If learners simply copy an AI-generated answer, the activity may provide little opportunity to develop independent language skills. By contrast, if learners compare a generated answer with their own work, identify weaknesses and explain their revisions, AI can become a resource for reflection.

Lee et al. examine several roles that GenAI can perform in language education, including providing feedback, supporting tutoring, stimulating thinking and facilitating interaction. These different roles show the flexibility of the technology, but they also demonstrate why teachers need to decide which role is appropriate for a particular learning objective.

The research landscape also reveals an imbalance. Li et al. [13] found that writing received substantial attention in empirical GenAI research, while reading, listening and speaking were less extensively represented. Their review also identified the dominance of higher education. Further research is therefore needed to understand how GenAI can support language development among school-age EFL learners.

### **Supporting differentiated instruction in mixed-ability classrooms**

One particularly promising application of GenAI is the preparation of differentiated learning materials. In mixed-ability EFL classrooms, learners may work towards the same learning objective while needing different levels of linguistic support.

For instance, a teacher preparing a reading lesson might use GenAI to draft a text with additional vocabulary explanations for learners who need support, a standard version for the main class and an extended version for learners ready for greater challenge. The teacher might also generate comprehension questions at different levels of difficulty.

However, generating several versions of a text is not the same as effective differentiation. The materials must remain accurate, age-appropriate and connected to the lesson objective. If a simplified text removes the information needed to understand the main idea, the adaptation may undermine the learning goal. This is where the interaction between technology, pedagogy and content becomes essential. GenAI can help produce possible resources, but the teacher must decide which adaptations are educationally appropriate. The importance of pedagogical scaffolding identified by Liu and Zhong [14] supports this approach.

AI should therefore be treated as an assistant in the preparation of differentiated materials, not as a substitute for teachers' understanding of learners' needs.

### **Critical AI literacy and the evaluation of language**

Another important theme is the need for critical AI literacy. AI-generated responses may sound convincing even when their content is inaccurate, their examples are inappropriate or their language does not fit the intended context. Mikeladze et al. highlight the need to consider AI competence more broadly than basic operational skills. Teachers need to understand AI capabilities and limitations and make informed decisions about its use. This issue is particularly relevant to English language teaching. A sentence can be grammatically correct but still sound unnatural in a particular conversation. Similarly, a text may present a cultural assumption as if it were universally accepted. Teachers need to consider these questions when evaluating AI-generated materials.

The Global Englishes perspective discussed by Lee et al. [15] adds an important dimension to this issue. English is used across diverse linguistic and cultural contexts, and teaching should not assume that a single variety represents all legitimate English use. Teachers can turn these limitations into learning opportunities. Students might compare an AI-generated dialogue with an authentic conversation, identify expressions that sound unnatural, examine cultural assumptions or discuss which version better suits a particular communicative situation. Liu et al. examine how GenAI and large language models may influence critical thinking in EFL education. Their review highlights the possibility that AI can support critical engagement but may also encourage dependence when learners accept generated responses without evaluation.

Developing critical AI literacy should therefore be part of language learning itself. Learners need opportunities to question, compare, verify and improve AI-generated language rather than simply consume it.

### **Ethical responsibility in AI-supported teaching**

The use of GenAI also raises questions about privacy, fairness, transparency and academic integrity. Nguyen et al. identify these principles as important considerations in AI-supported education.

For English teachers, the issues are practical. Students may upload personal writing to AI systems, submit generated work without acknowledgement or rely on answers that contain errors. Teachers therefore need to establish clear expectations about appropriate AI use and help learners understand why checking generated content matters. Ethical AI knowledge involves more than telling students not to copy AI-generated answers. It includes discussing responsible use, protecting personal information, recognising bias, acknowledging assistance where appropriate and ensuring that learners continue to develop their own skills.

The aim should not be to prohibit every use of AI, nor to accept every use without question. Instead, teachers need to make decisions based on the learning objective, the learners' needs and the potential risks.

### **Teacher agency and professional development**

The final theme concerns the teacher's role in AI-supported education. GenAI can reduce the time needed to draft certain materials, but it does not remove the need for professional judgement. Teachers remain responsible for deciding what learners should learn, which materials are appropriate and how learning should be assessed. Zhai examines teacher agency and professional practices in the GenAI era. Yang et al. in a study involving 1,348 teachers, found a positive relationship between TPACK and willingness to integrate GenAI. Their findings also indicate that negative emotions can weaken this relationship. These findings suggest that teachers need both competence and support. Introducing AI tools without providing time for practice, opportunities for discussion and guidance on responsible use may leave teachers uncertain about how to integrate them into their work.

The professional-development needs identified by Zhou et al. [16] reinforce this point. Basic technological skills do not necessarily prepare teachers to design effective technology-supported language lessons. Teachers need opportunities to connect tools with pedagogy, evaluate learning materials and reflect on the results of their decisions.

## **Discussion**

### **Why TPACK needs to be reconsidered in the GenAI era**

The reviewed research does not suggest that TPACK has become obsolete. On the contrary, its emphasis on the relationship between technology, pedagogy and content provides a useful foundation for understanding GenAI integration. What has changed is the nature of the technological knowledge teachers need. When a technology generates content, teachers must evaluate not only how it works but also whether its output is reliable, appropriate and educationally useful.

The findings discussed above point to three additional areas that deserve particular attention: critical AI literacy, ethical AI knowledge and teacher agency. These areas do not replace the established TPACK components. Rather, they highlight responsibilities that become more visible when teachers work with generative systems.

On this basis, the article proposes the following conceptual relationship:

Technological Knowledge + Pedagogical Knowledge + Content Knowledge + Critical AI Literacy + Ethical AI Knowledge + Teacher Agency → AI-TPACK → Purposeful AI Integration → Learner-Centred EFL Learning

This proposed perspective draws on research into AI-TPACK the relationship between TPACK and teachers' willingness to integrate GenAI and the importance of pedagogical scaffolding in AI-

supported learning [17]

The proposal is intended to support further theoretical discussion and empirical investigation. It should not be interpreted as an already validated model.

### **Understanding the proposed AI-TPACK perspective**

The proposed perspective retains the three central TPACK components while drawing attention to additional competencies relevant to GenAI.

Technological knowledge involves understanding how AI tools work, what they can generate and where their limitations lie. Teachers need to know how to use these tools and how to assess the reliability of their outputs.

Pedagogical knowledge concerns the decisions that make AI use educationally meaningful. Teachers must decide whether an AI-supported activity contributes to the intended learning outcome and how much support learners need.[18]

Content knowledge enables teachers to judge the accuracy and appropriateness of generated language. In ELT, this includes evaluating grammar, vocabulary, register, discourse and cultural relevance.

Critical AI literacy involves questioning generated responses, checking information and recognising potential bias. It also includes helping learners understand that AI output should be evaluated rather than automatically accepted.

Ethical AI knowledge concerns privacy, fairness, transparency, academic integrity and responsible use. These issues should inform lesson planning and classroom expectations.

Teacher agency means retaining professional control over instructional decisions. Teachers should be able to decide when AI is useful, when it needs to be adapted and when a different approach would better serve learners.

Together, these areas provide a way of thinking about the knowledge needed for responsible and purposeful GenAI integration. Their precise relationships and practical implications, however, require further empirical investigation.

### **The changing role of the English teacher**

The emergence of GenAI does not make the teacher less important. It changes some of the work teachers do and may increase the importance of their ability to evaluate and organise learning experiences. For example, a teacher might ask an AI system to prepare a reading text for intermediate learners. The teacher would then need to check the vocabulary, sentence complexity, factual accuracy and relevance of the text. After adapting the material, the teacher might design questions that encourage learners to identify the main idea, interpret details and justify their answers.[19]

In this example, AI assists with material preparation, but the teacher determines what counts as suitable material and how it should be used. The educational value comes from the relationship between the generated resource and the learning activity, not from generation alone.

Teachers can also use AI output as a starting point for critical language work. Students might identify awkward expressions, compare different versions of a dialogue or discuss how language changes according to context. Such activities give learners opportunities to practise English while developing the ability to evaluate AI-generated material.

This is particularly relevant when considering linguistic diversity. As Lee et al. discuss, a Global Englishes perspective encourages teachers to question narrow assumptions about English and consider the range of ways in which the language is used.

The teacher's role is therefore not simply to introduce AI into the classroom. It is to create conditions in which learners can use technology critically, responsibly and purposefully.

### **Implications for English teacher education**

Teacher education programmes need to prepare teachers for more than the technical operation of AI

tools. The focus should be on integrating AI into teaching decisions.

First, teachers need practical opportunities to explore AI tools and understand their capabilities and limitations. Second, they should learn to design lessons around clear learning objectives. Rather than beginning with a tool and looking for something to do with it, teachers should identify the intended learning outcome and decide whether AI can make a useful contribution. Third, professional development should include the evaluation of AI-generated materials. Teachers need practice identifying linguistic inaccuracies, inappropriate examples, factual errors and content that does not match learners' needs. Fourth, training should address ethical use, privacy, academic integrity and learner autonomy. Teachers need clear principles for deciding when AI assistance is appropriate and how to explain these decisions to learners. Finally, teachers need opportunities to experiment, discuss challenges and reflect on their practice. Professional development should not present AI integration as a simple checklist of tools to master. It should help teachers develop the confidence and judgement to make informed decisions in their own educational contexts.

These priorities align with the professional-development needs discussed by Zhou et al. and the broader AI competence issues examined by Mikeladze et al.

### **Implications for EFL education in Uzbekistan**

The proposed perspective may be useful for EFL education in Uzbekistan, particularly in classrooms where learners have different proficiency levels and require different forms of support. However, its practical value needs to be examined in local educational settings rather than assumed.

One potential application is the preparation of differentiated materials. Teachers may use GenAI to draft reading texts at different levels, generate vocabulary support or create comprehension questions with varying degrees of difficulty. These materials can then be reviewed and adapted to suit the learners and curriculum. For example, learners working with the same topic might receive different levels of vocabulary support while pursuing a shared reading objective. More advanced learners could be asked to interpret implications or evaluate the writer's argument, while learners who need additional support could focus on identifying key information and understanding unfamiliar words.

The important point is that AI should assist the teacher in preparing these materials, not determine the learning process independently. Teachers need to check that the materials are accurate, appropriate and genuinely differentiated. GenAI may also create opportunities for independent language practice. Learners can use it to rehearse conversations, explore vocabulary or receive suggestions on their writing. However, students need guidance on checking responses and maintaining responsibility for their own work. The concerns about critical thinking and overreliance discussed by Liu et al. are relevant to this issue.

Professional development is therefore essential. Teachers need practical training that connects AI tools with the teaching of reading, writing, speaking, listening, grammar and vocabulary. They also need opportunities to discuss ethical questions and develop classroom expectations for responsible AI use.

Finally, teachers should consider whether AI-generated materials reflect the linguistic and cultural contexts relevant to their learners. The Global Englishes perspective discussed by Lee et al. [20] offers a useful starting point for examining these questions.

The central principle is straightforward: learning objectives should guide pedagogy, and pedagogy should guide the use of technology. GenAI is valuable when it supports meaningful learning, not simply when it makes lesson preparation faster.

### **Conclusion**

Generative artificial intelligence offers English teachers new ways to prepare learning materials, support language practice and provide additional opportunities for learners. Yet the availability of these tools does not guarantee better teaching or learning. Their value depends on the decisions

teachers make about when to use them, how to evaluate their outputs and how to connect them with educational objectives. TPACK remains a useful framework because it places technology within the broader relationship between pedagogy and subject content. However, GenAI makes the evaluation of generated content, ethical responsibility and professional judgement particularly important. Teachers need to understand not only how to use AI tools but also when their use is appropriate and how learners can benefit without becoming dependent on them.

This article proposes a conceptual extension of TPACK that brings together technological, pedagogical and content knowledge with critical AI literacy, ethical knowledge and teacher agency. The proposed perspective offers a basis for further discussion about the competencies needed for meaningful GenAI integration in English language teaching.

The review also highlights the need for more research in school-level EFL contexts and across language skills beyond writing. Future empirical studies should investigate how teachers apply AI-related knowledge in practice and how AI-supported activities influence learners' language development and independence.

Ultimately, the central issue is not whether English teachers should use AI in every lesson. It is whether they can make informed decisions about when AI adds value and when learners need other forms of support. GenAI should strengthen teachers' professional judgement and create meaningful opportunities for learners, rather than replace either. Effective AI-supported English language teaching therefore depends on thoughtful pedagogy, critical evaluation and responsible use.

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