

## Exploring EFL teachers' technological pedagogical content knowledge (TPACK) in digital classrooms

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**Abstract:** This study explores the application of the Technological Pedagogical Content Knowledge (TPACK) framework among English as a Foreign Language (EFL) teachers within digital classroom environments. As educational technology continues to reshape language teaching, it becomes essential to understand how EFL teachers integrate technological, pedagogical, and content knowledge in their instructional practices. Using a qualitative research design, this study employed in-depth semi-structured interviews with 30 EFL teachers from diverse educational institutions. The findings reveal nuanced patterns in teachers' integration of TPACK components, shaped by factors such as access to professional development, institutional support, individual attitudes toward technology, and contextual barriers unique to EFL digital classrooms. Notably, the study highlights inconsistencies in TPACK application, with many teachers demonstrating strong pedagogical or content knowledge but struggling with technological integration. These insights contribute to a deeper understanding of TPACK implementation in digitally mediated language instruction and underscore the need for targeted support in teacher education programs. The study concludes by offering recommendations for professional development that address the evolving demands of digital language teaching and proposes directions for future research across broader educational contexts.

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### INTRODUCTION

The integration of digital technology has increasingly redefined educational practices, particularly in English as a Foreign Language (EFL) instruction. The shift from traditional to digital teaching models—accelerated by the COVID-19 pandemic—has transformed digital tools from optional aids into essential elements for content delivery and student engagement (Zhang & Fang, 2022; Dağgöl, 2023). Yet, the mere adoption of technology does not automatically result in effective learning outcomes. Rather, successful technology integration depends on how well teachers align it with appropriate pedagogical strategies and disciplinary content.

To explain this alignment, the Technological Pedagogical Content Knowledge (TPACK) framework, developed by Mishra and Koehler (2006), offers a theoretical

foundation that integrates content, pedagogy, and technology into a unified model. This framework extends Shulman's (1986) concept of Pedagogical Content Knowledge (PCK) by recognizing technological knowledge as a core domain. TPACK has since become a widely used lens to examine teachers' capacity to implement digital tools meaningfully in education (Rahimi & Pourshahbaz, 2018).

In EFL contexts, TPACK is particularly relevant. Language educators are required to manage complex intersections between linguistic content, second language pedagogy, and digital resources that support authentic communication, collaboration, and immersive learning (Baser, Kopcha, & Ozden, 2016; Sukor, Tan, & Ompok, n.d.). Despite this relevance, many in-service EFL teachers face challenges in integrating these domains simultaneously and effectively—especially in digital-first learning environments.

While prior research has acknowledged the importance of TPACK in teacher education, critical gaps remain. Much of the literature focuses on general education or pre-service teachers, and tends to explore TPACK components in isolation rather than in practice (Andriany & Adnan, 2022; *Journal of Digital Learning in Teacher Education*, 2023). Additionally, studies that explore EFL teachers' lived experiences—their internal beliefs, struggles, and decision-making in digital instruction—are still underrepresented in scholarly discourse.

Recent empirical works have highlighted key influences shaping TPACK development among EFL teachers, such as sociocultural beliefs (Novita, Purwati, & Anam, 2022), professional cognition (Nguyen, Hitendra, & Andy, 2023), and attitudes toward digital teaching (Alhamid & Mohammad-Salehi, 2024). However, these findings have yet to be synthesized into a comprehensive understanding of how EFL teachers navigate TPACK in real-world digital classroom settings, particularly in non-Western and under-researched regions like Southeast Asia.

This study responds to these gaps by exploring the lived experiences of in-service EFL teachers as they implement TPACK in digital classrooms. Unlike prior studies that center on isolated knowledge domains or pre-service teacher training, this research investigates how EFL educators in practice conceptualize and enact the TPACK framework within evolving technological landscapes.

More broadly, this inquiry contributes to global conversations about teacher capacity in digitally mediated education. As educational systems worldwide continue to prioritize technology integration, understanding how teachers develop robust TPACK in language instruction is critical—not only for local adaptation, but also for shaping internationally relevant teacher education programs and policy interventions.

## METHOD

### Research Design

This study employed a qualitative research design with a phenomenological approach to explore the lived experiences of EFL teachers in implementing the Technological Pedagogical Content Knowledge (TPACK) framework within digital classrooms. The phenomenological method was chosen to capture the essence of

participants' perceptions, interpretations, and reflections regarding the integration of technology, pedagogy, and content in their teaching practices (Creswell & Poth, 2018). This design enabled an in-depth understanding of how teachers experience and make sense of their instructional decisions in digitally mediated environments.

Qualitative inquiry was deemed appropriate for this study as it facilitated rich, contextualized accounts of the challenges, strategies, and perceptions associated with TPACK. Rather than quantifying competencies, this approach emphasized meaning-making processes and allowed the researcher to investigate how contextual and individual factors influence the enactment of TPACK in real teaching settings

### **Participants**

Thirty EFL teachers were purposively selected from diverse educational institutions across North Sumatra, Indonesia, including public and private schools at elementary, secondary, and tertiary levels. A maximum variation sampling strategy was employed to ensure a broad representation of gender, institutional type, and teaching experience. The inclusion criteria required participants to have a minimum of three years of EFL teaching experience and to have been actively teaching in digital classrooms for at least one academic year.

The sample included 19 female and 11 male teachers. Their teaching experience ranged from 3 to 22 years, with an average of 9.2 years. Seventeen teachers held bachelor's degrees in English Education, while thirteen possessed master's degrees in the same field. Participants represented varied technological readiness: some had received formal training in digital pedagogy, while others had developed their skills through self-directed learning or institutional workshops. In terms of institutional background, 17 participants were employed at public schools and 13 at private institutions, reflecting varied levels of infrastructure and policy support for digital learning.

### **Data Collection**

Data were collected using semi-structured, in-depth interviews to explore teachers' narratives regarding TPACK implementation. An interview guide was developed based on the core components of the TPACK framework, covering themes such as technology integration strategies, pedagogical adaptations, content representation, and institutional support. Questions were open-ended to allow participants to elaborate on their experiences and reflections. Each interview lasted between 45 to 60 minutes and was conducted either in person or via video conferencing, depending on participants' availability and location.

All interviews were audio-recorded with participants' consent and transcribed verbatim for analysis. Field notes were also taken to capture contextual observations and non-verbal cues during the interviews.

### **Data Analysis**

Data were analyzed using thematic analysis following Braun and Clarke's (2006) six-step framework: (1) familiarization with the data, (2) generating initial codes, (3) searching for themes, (4) reviewing themes, (5) defining and naming themes, and (6) producing the report. NVivo 12 software was used to assist in the organization and coding of data. Initial coding was conducted inductively, allowing themes to emerge

directly from participants' narratives, while remaining informed by the theoretical lens of TPACK.

### **Trustworthiness and Rigo**

To ensure the credibility of findings, member checking was employed by sharing preliminary themes with selected participants for verification. Triangulation was achieved through the use of field notes, interview transcripts, and reflective journaling by the researcher. Dependability was addressed by maintaining a detailed audit trail of decisions made throughout the research process, and confirmability was strengthened by engaging in peer debriefing with two qualitative research experts.

Ethical approval was obtained from the institutional ethics committee, and all participants provided informed consent. Confidentiality and anonymity were assured through the use of pseudonyms and secure data storage.

## **RESULTS AND DISCUSSION**

### **Result**

The analysis of in-depth interviews with 30 EFL teachers uncovered four major themes that describe their experiences with TPACK implementation in digital classroom environments. These themes reflect the dynamic and evolving nature of teachers' understanding and use of technology, pedagogy, and content knowledge in the context of digital EFL instruction.

The first theme that emerged from the data was the teachers' conceptualization of TPACK integration. Rather than viewing technology, pedagogy, and content knowledge as separate domains, many participants—especially those with more digital teaching experience—perceived them as interdependent and constantly interacting. These teachers expressed that their lesson planning involved simultaneous consideration of digital tools, instructional strategies, and language content. For example, one teacher noted that when designing a lesson on narrative texts, she immediately considered which digital platforms could enhance student understanding, how to create collaborative online tasks, and how best to assess learning in a digital format. In contrast, less experienced teachers often described a more compartmentalized view, treating technology as an external addition rather than as an integrated component of teaching. This finding highlights a progression in teachers' TPACK maturity, from isolated domain thinking to integrated, context-sensitive pedagogical decision-making.

The second major finding involved the developmental stages of TPACK growth, which could be described as a journey from "survival" to "innovation." In the early stage—referred to as the survival stage—teachers reported being overwhelmed with the technical demands of digital platforms, often focusing solely on getting through each lesson with minimal disruptions. One Private school teacher described how he initially struggled just to share his screen and manage audio settings, with little energy left to consider instructional design. As they gained more familiarity and confidence with technology, teachers entered the adaptation stage, attempting to translate traditional, in-person activities to digital platforms, though not always successfully. This period often involved

trial and error. In the integration stage, teachers began achieving a more seamless connection between technology, pedagogy, and content knowledge. These individuals demonstrated fluency in selecting tools that aligned with their instructional goals and student needs. A few participants even reached the innovation stage, where they created entirely new, digitally enhanced learning experiences that were not possible in traditional settings. These innovative teachers often became mentors to their colleagues, sharing resources and offering guidance.

The third theme centers on the contextual factors that influenced TPACK implementation. The institutional environment played a major role: teachers working in schools with robust IT infrastructure, access to digital tools, and professional development support reported more success in implementing TPACK. In contrast, those in less supportive contexts encountered technical difficulties that hindered their instructional goals. Teachers also noted that student factors shaped their TPACK practices. For example, those teaching digitally literate students felt challenged to innovate and match student expectations, while those teaching students with limited access or digital skills faced barriers to equitable participation. Cultural expectations also influenced technology use. In contexts where teacher authority and traditional instruction were highly valued, some educators struggled to adopt student-centered digital strategies that emphasized collaboration and autonomy.

The fourth theme involved the role of professional learning and community support in facilitating TPACK development. Participants consistently emphasized that high-quality professional development needed to integrate both technical skills and pedagogical applications. Workshops that allowed teachers to practice lesson planning with digital tools and reflect on their pedagogical implications were described as the most effective. However, many criticized one-time, tool-focused training that did not address instructional strategy. Informal learning networks—such as WhatsApp groups, peer mentoring, and social media communities—emerged as powerful sources of ongoing support. These spaces allowed teachers to share resources, troubleshoot problems, and gain confidence through collective experience. Self-directed learning also played a significant role, with many teachers turning to YouTube, blogs, and online courses to fill immediate knowledge gaps. Nevertheless, this type of learning sometimes lacked the pedagogical depth needed to make informed instructional decisions.

In sum, the findings reveal that EFL teachers' experiences with TPACK are shaped by an interplay of personal development, institutional context, student readiness, and professional support systems. Teachers do not progress through TPACK stages in a linear way, but rather in response to changing circumstances and opportunities for growth. The transition from surviving digital instruction to innovating with digital pedagogy is facilitated by integrated professional development, supportive institutional environments, and a culture of collaboration and reflection.

## Discussion

The findings of this study provide valuable insights into EFL teachers' integration of TPACK in digital learning environments. However, the discussion remains largely descriptive and requires deeper engagement with theoretical frameworks, particularly TPACK. For instance, while teachers demonstrated content knowledge (CK) and



pedagogical knowledge (PK), their technological knowledge (TK) and the intersectional domains of TPACK were inconsistently evident across interview narratives. This suggests that the integration of TPACK is still fragmented, supporting the findings of Chai, Koh, and Tsai (2013), who emphasized the difficulty teachers face in simultaneously developing technological, pedagogical, and content knowledge.

Moreover, the limited professional development opportunities mentioned by participants echo the concerns raised by Uerz, Volman, and Kral (2018), where a lack of sustained training hinders meaningful TPACK development. Teachers often relied on trial-and-error strategies to adapt digital tools, indicating a need for structured support and mentorship programs (Koehler, Mishra, & Cain, 2013). These findings align with Harris and Hofer (2011), who assert that without collaborative models of instructional design, technology use remains superficial.

Despite these relevant insights, the study has several limitations. First, the small sample size limits generalizability. All participants were from the same geographic and institutional context, potentially introducing bias. The self-report nature of the interviews may also reflect socially desirable responses rather than authentic teaching practices. These issues have also been noted in previous research on teacher beliefs and technology use (Li, 2021).

Furthermore, while themes were identified through coding, the analysis lacks transparency regarding how codes were refined, clustered, and validated. There is no mention of triangulation or member checking to enhance trustworthiness, which weakens the study's credibility (Nowell et al., 2017). Future research should consider incorporating classroom observations or artifacts such as lesson plans to strengthen data triangulation and provide a more comprehensive view of TPACK enactment.

Importantly, the study does not fully explore the broader implications of its findings. In the context of global digital transformation, the underdevelopment of TPACK in EFL settings may hinder teachers' capacity to prepare students for 21st-century literacy demands (Voogt et al., 2013). Professional development programs must address not only digital tool proficiency but also critical pedagogical strategies for integrating such tools into language instruction meaningfully.

In conclusion, while this study contributes to understanding TPACK practices among Indonesian EFL teachers, it calls for more rigorous, theory-driven inquiry into how TPACK is developed and enacted. Addressing these gaps will be essential for advancing teacher competence in digital pedagogy both locally and globally.

## CONCLUSIONS

This qualitative study provides nuanced insights into EFL teachers' lived experiences with TPACK implementation in digital classroom environments, emphasizing the multifaceted, context-specific, and developmental nature of technology integration in language education. Through in-depth narratives from 30 teachers, the study underscores that TPACK development is not a linear progression but a dynamic professional journey encompassing stages from survival to innovation.

The findings highlight that successful technology integration extends beyond technical competence. It requires pedagogical reasoning, contextual sensitivity, and the ability to align digital tools with specific language learning goals. Teachers demonstrated that effective use of technology is grounded in thoughtful decision-making about content, pedagogy, and learner needs. Three major conclusions emerge:

First, professional development must evolve beyond standalone training. It should embed opportunities for experimentation, contextualized practice, and sustained pedagogical and technical mentoring. Second, institutional support must be comprehensive, offering not only infrastructure but also structured collaboration, recognition, and time allocation for professional learning. Third, teacher preparation programs should prioritize real-world exposure to digital language teaching and the cultivation of integrated TPACK competencies.

Despite these insights, the study acknowledges limitations such as potential participant bias, reliance on self-reported narratives, and the limited generalizability of findings beyond the sampled institutions. These limitations invite caution in overgeneralizing the results.

Future research should explore TPACK implementation across broader geographic and cultural settings, including under-resourced or rural schools, to understand contextual enablers and barriers more comprehensively. Comparative studies involving other subject areas or education systems may also yield transferable insights into how TPACK evolves in varying pedagogical cultures.

Policy-wise, the study advocates for multi-level support mechanisms: national and institutional policies should not only invest in infrastructure but also prioritize long-term professional learning, promote cross-disciplinary TPACK innovation, and incentivize teacher-led experimentation.

Finally, the study's implications reach beyond EFL settings. The findings offer a framework for understanding how digital pedagogy can be advanced in diverse educational contexts, emphasizing that meaningful technology integration must always be adaptive, context-sensitive, and pedagogy-driven.

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