EFL Instructors' Perspectives on Technological Pedagogical Content Knowledge: Insights from the Turkish University Context

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Abstract

This study explores English as a Foreign Language (EFL) instructors' perceptions of Technological Pedagogical Content Knowledge (TPACK) at the School of Languages in a Turkish foundation university, using a explanatory sequential mixed-methods design. A total of 70 out of 80 instructors completed the TPACK-EFL survey, and five instructors were selected for interviews through purposeful sampling. Quantitative findings indicated mostly high self-efficacy in TPACK, with significant differences found between instructors with and without prior technology training, particularly in Technological Pedagogical Knowledge (TPK). Qualitative results revealed varying confidence levels in technology use, a need for purposeful integration, and challenges like technical issues and time constraints. Institutional support was available but often not tailored to individual needs, while peer collaboration played a key role in overcoming barriers to technology adoption. Overall, the findings highlight the need for context-specific professional development to help EFL instructors integrate technology more effectively. Rather than relying on general workshops, targeted support aligned with instructors' goals and teaching environments can build confidence, promote meaningful classroom use, and bridge the gap between theoretical TPACK knowledge and real practice.

Keywords: EFL instructors, Technological Pedagogical Content Knowledge (TPACK), technology integration, institutional support.

Yabancı Dil olarak İngilizce Öğretmenlerinin Teknolojik Pedagojik Alan Bilgisi üzerine Düşünceleri: Türkiye Üniversite Bağlamından Bulgular

Özet

Bu çalışma, bir Türk vakıf üniversitesinin Yabancı Diller Yüksekokulu'ndaki İngilizceyi Yabancı Dil olarak Öğretme (EFL) eğitmenlerinin Teknolojik Pedagojik İçerik Bilgisi (TPACK) algılarını, açıklayıcı sıralı karma yöntemli bir araştırma tasarımı kullanarak incelemektedir. Seksen eğitmenden yetmişi TPACK-EFL anketini tamamlamış, beş eğitmen ise amaçlı örnekleme yöntemiyle seçilerek görüşmelere katılmıştır. Nicel bulgular, eğitmenlerin genel olarak yüksek düzeyde TPACK öz-yeterliğine sahip olduklarını göstermiştir. Bununla birlikte, özellikle daha önce teknoloji eğitimi almış ve almamış eğitmenler arasında Teknolojik Pedagojik Bilgi (TPK) boyutunda anlamlı farklar tespit edilmiştir. Nitel bulgular, teknoloji kullanımında değişken güven düzeylerini, amaçlı entegrasyon ihtiyacını ve teknik sorunlar ile zaman kısıtlamaları gibi zorlukları ortaya koymuştur. Kurumsal desteğin mevcut olduğu ancak çoğu zaman bireysel ihtiyaçlara göre yeterince uyarlanmadığı belirlenmiştir. Buna karşın, meslektaş iş birliğinin teknoloji benimseme sürecindeki engellerin aşılmasında önemli bir rol oynadığı görülmüştür. Genel olarak bulgular, EFL eğitmenlerinin teknolojiyi daha etkili biçimde entegre edebilmeleri için bağlama özgü mesleki gelişim programlarının gerekliliğini vurgulamaktadır. Genel atölye çalışmalarına dayanmak yerine, eğitmenlerin hedefleri ve öğretim ortamlarıyla uyumlu, hedefe yönelik desteklerin sağlanması; özgüveni artırabilir, sınıf içi anlamlı teknoloji kullanımını teşvik edebilir ve kuramsal TPACK bilgisi ile gerçek uygulama arasındaki boşluğu kapatabilir.

Anahtar Sözcükler: Yabancı dil olarak İngilizce öğretmenleri, teknolojik pedagojik alan bilgisi (TPAB), teknoloji entegrasyonu, kurumsal destek

1. Introduction

In the last fifty years, education has undergone considerable changes, reshaping core educational theories and methods of teaching and learning. Technology has played a key role in this transformation (Van-Olphen, 2008), influencing how educators design and deliver instruction. The rapid and transformative evolution of technology since the 2000s has particularly shaped how individuals, especially the younger generation, engage with the world. Today's youth, as digital natives born into a technology-driven environment, find it easier to integrate technology into their teaching and learning practices (Telecoming, 2023; Alruthaya et al., 2021). In contrast, older generations, who may have experienced the pre-digital era, face different challenges in adapting to new tools and platforms. These individuals may require additional support to effectively incorporate technology into their practices (Shandilya & Fan, 2022). While some educational institutions had previously integrated technological tools into their teaching methods, the COVID-19 pandemic significantly accelerated this shift, compelling educational systems worldwide to adopt digital solutions (Shi & Jiang, 2022).

Koehler and Mishra (2006), who coined the term TPACK, emphasize that teachers' capacity to make informed decisions about technology use is determined by their TPACK. This framework outlines the interrelated knowledge domains crucial for technology-enhanced instruction. However, as Li and Wang (2021) note that it is essential for educational institutions to provide systemic organizational support to ease the disruptions associated with transitioning to online instruction. Although many institutions have adopted technological tools, ensuring instructors are equipped with TPACK and institutional support remains crucial. Without these resources, educators may struggle to meet instructional goals effectively. Foreign Language Teaching (FLT) was among the most influenced areas, where the unexpected transition to online learning disrupted standard practices. While English as a Foreign Language (EFL) instructors had strong pedagogical content knowledge, many lacked the technological pedagogical content knowledge (TPACK) necessary for effective virtual instruction (Baran & Correia, 2014). This gap in expertise presented a challenge to the swift adoption of online education, yet it also highlighted the ongoing need for educators to integrate technology into their teaching practices effectively. The success of this integration depends on individual expertise, institutional backing, and professional development opportunities (Chai et al., 2010). This need is especially pronounced in foreign language education, where instructional materials are often digital and sourced globally. Seufert et al. (2021) emphasize that effectively integrating technology, at the right time and through sound pedagogical design, is crucial for creating engaging learning experiences and promoting meaningful academic achievement.

Moreover, traditional mindsets among some instructors can hinder technological readiness, presenting ongoing challenges to educational outcomes. Gender and situational factors further complicate the adoption of technology. Gender norms, cultural influences, and access to resources can all shape how individuals engage with technology in education (Teo et al., 2008). Studies suggest that women may be more cautious and prefer familiar, traditional tools, while men may exhibit greater risk-taking behaviors, leading to faster adoption of new technologies (Shaouf & Altaqqi, 2018). However, these tendencies may not be absolute and vary across different contexts. Professional development (PD) opportunities that focus on TPACK can help bridge the gaps in technology adoption and integration. By aligning technology with appropriate pedagogical strategies, PD programs can provide educators with the necessary training to enhance their technical skills and integrate them with pedagogy and content knowledge. Tailored PD programs, such as induction programs, are particularly valuable for addressing the diverse needs of educators, considering factors such as age, gender, and educational background. These programs can increase educators' awareness of TPACK and its application in the classroom, ultimately improving their teaching strategies and technical proficiency (Angeli & Valanides, 2009; Koehler & Mishra, 2009). Additionally, fostering a culture of collaboration and peer support is crucial for promoting continuous improvement within institutions. Encouraging knowledge-sharing and cooperation among colleagues can create a supportive environment for the effective use of technology in teaching (Zinger, et al., 2017). Ideally, this collaborative culture would

be embedded within the institution's framework, ensuring that professional growth is supported at the organizational level, rather than relying solely on individual initiative.

1.1. Literature Review

1.1.1. Technological Pedagogical Content Knowledge

Building upon Shulman's (1986, 1987) seminal concept of Pedagogical Content Knowledge (PCK), which posits that instructional methods must be tailored to the content being taught, Mishra and Koehler (2006) conceptualized Technological Pedagogical Content Knowledge (TPACK). This integrative model incorporates the technological domain into the pedagogical-content interface, with the goal of assisting educators in effectively managing the complexities of technology-enhanced instruction (Koehler et al., 2013). According to Koehler et al. (2013), a thorough understanding of teaching requires the convergence of three crucial areas of knowledge: content expertise, pedagogical methodology, and technological knowledge. The dynamic interaction among pedagogy, content, and technology in the TPACK model resulted in the conceptual development of additional knowledge domains, namely pedagogical content knowledge (PCK), technological content knowledge (TCK), technological pedagogical knowledge (TPK) and technological pedagogical content knowledge (TPACK), each representing a unique intersection of the core components (Koehler & Mishra, 2008, p. 12). They contend that a complete separation of the interrelated components within the TPACK framework is not feasible, as these domains are inherently intertwined. They define TPACK as the essential framework for effective technology-integrated instruction, which entails the capacity to represent knowledge through technological tools to employ pedagogical practices that synergistically integrate technology to facilitate content learning to understand the learning challenges posed by specific concepts and how technological affordances can address them; to consider learners' existing knowledge and epistemological orientations; and to harness technology's potential in cultivating new understandings or reinforcing established cognitive and epistemic frameworks (Koehler & Mishra, 2009). As illustrated in Figure 1, the TPACK framework visually represents the dynamic integration of technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK). The overlapping central area represents TPACK—the knowledge base required for effective technology-integrated teaching. The framework also includes three intermediary intersections: TPK, TCK, and PCK, each highlighting different relational aspects of teaching expertise. This visual model reinforces the idea that effective instruction relies on the flexible blending of these domains rather than their isolated application. Particularly for EFL instructors, the central area—TPACK—is critical, as it underscores the challenge of merging all three knowledge bases in digital learning contexts.

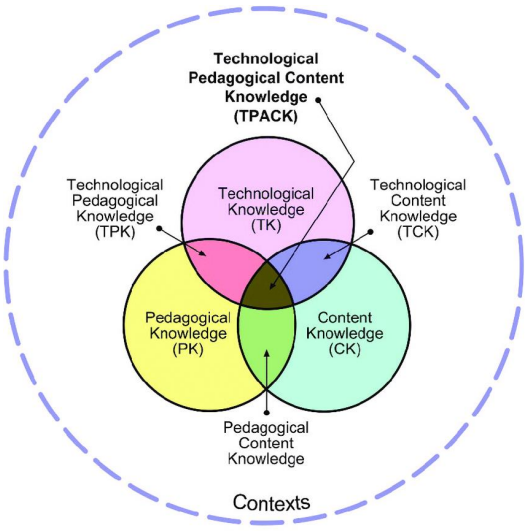

Figure 1. *The TPACK framework and its knowledge components (Koehler & Mishra, 2009)*

Considering EFL context within the TPACK framework, Chapelle (2009) emphasizes that the proficient integration of technological tools within EFL settings is pivotal to ensuring the effective teaching and learning of the target language. Incorporating technological resources into English as a Foreign Language (EFL) settings not only enhances teaching methods but also promotes more engaging and tailored learning experiences. For example, tools such as e-portfolios allow students to document and reflect on their language development, making learning more autonomous and meaningful. As such, the transformative impact of technology on EFL instruction is beyond dispute. Numerous studies identify computer literacy as a critical determinant of both professional and personal success for educators (Konan, 2010) and a key facilitator of effective and efficient teaching practices (Shapka & Ferrari, 2003). The EFL-TPACK framework thus involves the strategic use of various technologies to support learners' comprehension and application of language content. Accordingly, the central aim for language instructors is to achieve instructional efficacy by merging pedagogical foundations with technological applications in ways that enhance language teaching and learning (Rahimi & Pourshahbaz, 2017).

1.1.2. Empirical Studies on In-Service EFL Teachers' TPACK

Although TPACK research in EFL has primarily targeted pre-service teachers, many studies have begun exploring in-service EFL instructors. These studies examine TPACK through lenses such as contextual, institutional, attitudinal, and professional developmental factors. Several studies highlight how contextual and demographic variables influence TPACK development. Tseng et al. (2011) found that a CALL workshop encouraged integration among three in-service EFL teachers. However, its application remained restricted to grammar-focused lessons due to exam pressure, familiarity, novelty-guided tool selection, and contextual barriers such as limited internet access. Over time, research diversified both geographically and conceptually. Clausen et al. (2019) explored how leaders at teacher education institutions used the TPACK Leadership Diagnostic Tool to align technology initiatives with institutional goals. Leaders adapted the tool differently but found it valuable for facilitating institutional change. Collectively, these studies underline the need for leadership, infrastructure, and strategic planning to reinforce TPACK implementation.

Building on these foundations, in 2020 several studies further examined TPACK development in EFL contexts. For instance, Alharbi (2020) examined Saudi EFL teachers' CK, PK, and TK levels, finding high CK in productive and moderate technological skills. Female teachers scored higher in PK and TK, while secondary-level teachers reported the highest TPACK overall. Similarly, Raygan and Moradkhani (2020), studying Iranian EFL teachers, reported that attitude was the strongest predictor of technology integration. Although school climate did not directly influence TPACK, it affected teacher attitudes, indirectly promoting technology use. Furthermore, Nazari et al. (2020) found that an online professional development (PD) course improved participants' TPACK—especially in TPK, TCK, and TK—with novices showing greater relative gains and experienced teachers achieving higher overall post-test scores. Feedback praised the course's multimedia flexibility but noted technical delays. Taken together, these studies highlight the importance of attitude, experience, and targeted professional development in shaping teachers' TPACK growth.

Following these findings, researchers continued to explore teachers' reflection, contextual adaptation, and professional growth. Sari et al. (2021) categorized Indonesian EFL teachers' reflections into reflection-in-action, on-action, and for-action, revealing that both novice and experienced teachers integrated technology more meaningfully over time, though lesson innovation remained challenging. Extending this line of inquiry, Zhang and Fang (2022) examined flipped classroom practices among Chinese university EFL instructors. Teachers initially struggled with pre-class materials and institutional barriers but later enhanced learning outcomes by integrating CK, PK, and TK, with younger educators showing stronger efficacy. In the same year, Zhang and Chen (2022) linked TPACK to Chinese teachers' attitudes and technology usage across teaching modes, finding that TPACK predicted technology use in both face-to-face and online settings, whereas attitudes affected only face-to-face contexts.

Complementing these perspectives, other studies conducted in 2022 provided further insight into the technological and pedagogical disparities among EFL instructors. To illustrate, Shi and Jiang (2022) found that Chinese EFL teachers were confident in CK and PK but less so in TPK and TCK, using technology primarily for content delivery rather than interactive learning. Notably, younger teachers displayed greater confidence in technology use. In a related study, Ali and Mohammadzadeh (2022) discovered that Iraqi EFL teachers felt more competent in CK and PCK than in TK and TPACK. While experience correlated with higher scores in most domains, novice teachers demonstrated more enthusiasm and provided concrete examples of technology integration, whereas advanced academic qualifications were linked to higher TK and TPACK. Furthermore, Najjari et al. (2022) reported that TPACK workshops enhanced over 81% of Iranian teachers' digital literacy and teaching practices, despite persisting barriers such as time constraints, limited technical skills, and curricular misalignment. Likewise, Chen et al. (2022) confirmed that engagement in professional communities and continuous reflection enabled Chinese EFL teachers to progress from basic to pedagogically rich uses of technology. Overall, these studies emphasize that sustainable TPACK development relies not only on structured training but also on reflective practice, collaboration, and institutional support.

With the onset of the COVID-19 pandemic, the focus of research shifted toward rapid digital adaptation and technology-mediated instruction. Aniq et al. (2022) reported increased technology use among Indonesian EFL teachers, particularly in writing instruction for brainstorming and assessment. Yet, inconsistencies between beliefs and classroom practices persisted, often due to rigid lesson plans and synchronous teaching constraints. As institutions adapted to post-pandemic realities, Hsu and Chen (2023) found that TK strongly influenced overall TPACK among Taiwanese EFL teachers. While school-level support improved TPACK through Diffusion of Innovation principles, it negatively affected TK due to top-down management. CALL/TELL training enhanced TPACK, though infrastructure limitations remained. Similarly, Alamri and Awjah (2023) observed that most Saudi EFL teachers employed TPACK in vocabulary instruction, primarily using multimedia tools and applications. Although teachers valued TPACK, they expressed concerns regarding its overall effectiveness and called for more targeted professional development.

More recent research has continued to address institutional and socio-contextual barriers in online education. Golzar et al. (2023) studied Afghan EFL teachers transitioning to online teaching and found weak technological and pedagogical knowledge, identity conflicts, and resistance to e-learning. Limited infrastructure and heavy workloads were key barriers, but peer collaboration and creative use of digital platforms helped teachers adapt. In parallel, Rosyidi et al. (2024) emphasized the importance of integrated knowledge domains, showing that PCK, TPK, and TPACK predicted teaching success, whereas CK, PK, TK, and TCK did not when examined in isolation. The authors highlighted the need for professional development supporting full integration of technological, pedagogical, and content knowledge.

In the Turkish context, TPACK research has grown steadily, reflecting national educational technology policies and institutional reform efforts. Early studies identified demographic and training-related differences in teachers' technology integration capacities. Kozikoğlu and Babacan (2019) surveyed 721 Turkish EFL teachers and found high TPACK and positive technology attitudes. Gender and participation in the FATIH Project influenced TPACK scores, with trained and female teachers scoring higher. A weak but significant correlation was found between attitudes and TPACK. Building on these findings, Özdemir and Önal (2022) examined TPACK and Web 2.0 perceptions among 227 Turkish teachers. While CK and PCK were strong, TK and TPK remained weaker. Educational background, school type, and prior training influenced self-efficacy. Although teachers viewed Web 2.0 tools positively, actual classroom use was limited due to gaps in technology-related knowledge. The study called for more focused digital pedagogy training. Similarly, Yapıcı and Mirici (2023) found that instructors had a self-reported "sufficient" level of practical TPACK. They effectively used ICT to deliver content but demonstrated weaknesses in technology-integrated assessment and tracking. Instructors with MA or PhD degrees outperformed BA

holders in assessment, and private university teachers scored higher in specific domains. Experience did not show statistical significance, but those with 6–10 years performed best overall. Expanding this research further, Dinçer et al. (2024) used TPACK-EFL and Technology Integration Self-Efficacy (TISE) scales to study Turkish university instructors. Findings showed that strong self-efficacy predicted higher TPACK scores, suggesting the importance of building technology confidence in EFL training programs. Finally, Arpaci and Bergil (2024) examined the perceived TPACK of Turkish EFL teachers before and after the pandemic across both face-to-face and online contexts. Teachers rated their TPACK significantly lower for online teaching, emphasizing the need for enhanced digital instruction support.

Overall, studies across contexts highlight the dynamic interplay between technological, pedagogical, and content domains shaped by institutional support, teacher attitudes, and demographics. Early research focused on contextual barriers, whereas recent work emphasizes sustainable professional development and reflective practice. In Turkey, findings align with global trends but reveal local challenges such as uneven digital infrastructure and limited technology-based assessment. Together, these studies provide a foundation for understanding how EFL instructors perceive and apply TPACK across diverse educational settings.

2. Method

2.1. Research Design

The primary objective of this study is to conduct a mixed-methods analysis of EFL instructors' perceptions of Technological Pedagogical Content Knowledge (TPACK) at the School of Languages of a foundation university to explore potential significant relationships among various variables and demographic factors. The research was designed as a sequential explanatory mixed-methods study to achieve this. In the quantitative phase, participants were asked to complete the EFL TPACK Scale (Baser et al., 2016) and provide relevant demographic information. The qualitative component was implemented to offer a deeper and more nuanced understanding of the research problem by integrating the strengths of both quantitative and qualitative approaches (Creswell, 2018). By analyzing survey data with qualitative interview data, the study deals with statistical trends in teachers' perceptions of TPACK and contextualized experiences that form technology integration practices in the classroom. As Creswell and Plano Clark (2017) noted, mixed-methods research facilitates a comprehensive analysis of complex educational phenomena.

2.2. Setting and Participants

The study takes place at a foundation university's School of Languages, accredited by an internationally recognized body based in Europe. This accreditation makes the university the first in Türkiye to receive that accreditation recognition twice, positioning the research as a notable case study. It assesses institutions across key quality domains, including management, quality assurance, communication, course design, teaching and learning, assessment, academic resources, student services, staff development, employment terms, and the learning environment.

The School of Languages aims to become a leading language institution in Türkiye, with a focus on continuous development to maintain high standards. It places significant emphasis on professional growth, offering ongoing development opportunities through a Professional Development Unit (PDU). This unit includes instructors with ICELT (In-service Certificate in English Language Teaching), CELTA Certificates and DELTA Diplomas from Cambridge Assessment English. Professional development is viewed as a continuous, voluntary process driven by needs and goals, fostering an environment where both educators and learners are empowered to shape their own growth.

The PDU plays a crucial role in this process by enhancing teaching and learning quality. It facilitates development through an induction program for new instructors, which lasts one academic year. This programs introduces new staff to the institution’s mission, culture, systems, and structure. Mentors guide new instructors through an observation cycle, offering constructive feedback on their teaching practices.

The program covers areas such as curriculum design, assessment, lesson planning, effective teaching strategies, technology integration, performance management, and peer observation. After completing the induction year successfully, instructors continue to receive yearly observations aligned with their developmental needs.

To support continuous development, the PDU organizes regular Professional Development Sessions during free times, offering a range of workshops tailored to diverse common needs. These sessions are repeated to accommodate varying schedules and include in-house activities like research discussions and reading clubs, as well as guest speaker events featuring notable figures from the ELT community. Additionally, the PDU hosts instructor-led workshops where educators share best practices or external research findings. These sessions foster collaboration and innovation within the school.

The university offers a diverse range of faculties, providing students with opportunities across various disciplines, including the Faculty of Business, Faculty of Engineering, Faculty of Social Sciences, Faculty of Aviation and Space Sciences, Faculty of Architecture and Design, and Faculty of Applied Sciences. All departments use English as the medium of instruction, necessitating a strong command of the language, which underscores the importance of the School of Languages. The school offers the English Preparatory Program, the Undergraduate English Program, and the Modern Languages Program. The Preparatory Program includes courses at A2, B1, and B2 levels, with B2 graduates taking an Academic English proficiency exam. The program employs around 80 instructors and enrolls approximately 700 students. Each level of the program consists of 280 lecture hours.

As for participants, the study involves 70 instructors to explore their perceptions and attitudes towards TPACK, In the quantitative phase, all participants completed a survey, while in the qualitative phase, five instructors were purposefully selected based on their EFL-TPACK survey scores for follow-up interviews. Purposeful sampling in the qualitative phase enables a deeper understanding of the quantitative findings and examines how participant characteristics influence their perceptions (Creswell et al., 2003).

Table 1 provides a demographic breakdown of teaching experience, age, gender, and technology training among 70 instructors who participated in the quantitative phase of the study, consisting of 59 females and 11 males. Regarding age, 24 participants are between 25-34 years old, 32 are in the 35-44 age range, and 14 are between 45-54 years. In terms of teaching experience, the participants comprised 23 instructors with 11–15 years of teaching experience, 22 with 6–10 years, 9 with 16–20 years, 14 with over 20 years, and 2 instructors with 1–5 years of teaching experience. Regarding their tenure at the current institution, 42 individuals have been employed for 1-5 years, with 13 having 6-10 years and 15 having 11-15 years, reflecting a mix of recent and long-term faculty members. Lastly, the table shows that 39 participants have attended technology training, while 31 have not, highlighting a significant portion of the group with prior technological exposure, although a notable number have not received such training.

Table 1.

Demographic Information of Survey Participants

Gender	Age	Years of Teaching Experience	Years of Experience at Current Institution	Technology Training Before
Female N=59 Male N=11	25-34 years N=24 35-44 years N=32 45-54 years N=14	1-5 years N=2 6-10 years N=22 11-15 years N=23 16-20 years N=9 20+ years N=14	1-5 years N=42 6-10 years N=13 11-15 years N=15	attended N=39 not attended N=31

Table 2 presents the demographic details of five interviewees included in the qualitative phase of the study. The group consists of four females and one male, with ages ranging from 36 to 40 years. Their years of teaching experience vary between 11-20 years, and their tenure at the current institution ranges from 2 to 14 years. Among the interviewees, P1 has not attended any technology training, while the others (P2, P3, P4, and P5) have prior experience with technology training. This demographic distribution reflects a mix of teaching experience, institutional tenure, and technology preparedness among the interviewees.

Table 2.
Demographic Information of Interviewees

Interviewees No	Gender	Age	Years of Teaching Experience	Years of Experience at Current Institution	Technology Training Before
P1	Female	36	11-15	2	No
P2	Female	37	11-15	10	Yes
P3	Male	37	11-15	8	Yes
P4	Female	37	11-15	14	Yes
P5	Female	40	16-20	8	Yes

This research seeks to address the following questions, framed within the local context of the School of Languages, which emphasizes professional development and technology integration. The school's commitment to enhancing teaching quality through its Professional Development Unit (PDU) provides a unique setting to explore how in-service EFL instructors perceive and apply Technological Pedagogical Content Knowledge (TPACK). By examining these questions, the study aims to identify both instructors' technology integration practices and their professional development needs, offering insights to improve support for educators in the digital age.

Research Questions:

1. What are the self-perceived levels of Technological Pedagogical Content Knowledge (TPACK) among in-service EFL instructors?
2. Is there a statistically significance regarding in-service EFL instructors' TPACK perceptions based on demographic variables?
3. How do in-service EFL instructors describe their experiences and attitudes toward integrating technology into their teaching practices?

3.1. What challenges and institutional supports do in-service EFL instructors identify in relation to technology integration?
3.2. What are the perceived professional development needs of in-service EFL instructors regarding TPACK and technology integration?

2.3. Data Collection

This study utilized both a survey and a set of interview questions to gather data from the participants. The survey employed was the TPACK-EFL survey developed by Başer et al. (2015). Cronbach's alpha demonstrated that the TPACK instrument was internally consistent, with high reliability coefficients ranging from .81 to .92 for the items within each TPACK construct. In this study, the overall reliability for all items (n=39) is .96, indicating excellent internal consistency for the scale. This high Cronbach's alpha value suggests that the subscales and the overall TPACK instrument are reliable measures for assessing the knowledge of in-service EFL instructors. A demographic section was included at the end of the survey to categorize participants and facilitate successful inferential statistical analysis. The interviews were designed

using semi-structured questions, developed through a comprehensive literature review, and tailored to align with the specific objectives of the study. Each interview, lasting approximately 30 minutes, was audio-recorded and transcribed verbatim by the author. To ensure the reliability of the data, an expert review was conducted, where a second researcher independently checked the interview transcripts for accuracy and consistency. Additionally, an intercoder agreement process was employed to verify the consistency of coding across different researchers. Following the interviews, participants were also invited to provide feedback on the findings, ensuring the validity and trustworthiness of the interpretations. These measures were taken to strengthen the credibility of the results and to maintain rigor throughout the qualitative data analysis process. The alignment between each research question, the corresponding data collection instrument, and the analysis method is presented in Table 3 below.

Table 3.
Data Collection and Analysis Procedures by Research Questions

Research Question	Instrument	Data Analysis Technique
RQ1.	TPACK-EFL Survey (Baser et al., 2015)	Descriptive statistics
RQ2.		Inferential statistics
RQ3. *RQ 3.1.* *RQ 3.2.*	Semi-structured interviews	Thematic analysis

2.4. Data Analysis

IBM SPSS Statistics 21 was used to analyze the quantitative data. Discovering data is normally distributed has led to applying parametric analysis for the quantitative step (Brown, 2006). In the very first step, mean scores for each subscale were calculated. As for inferential analysis, One-Way Analysis of Variance (ANOVA) and Independent Sample T-test were used. Thematic analysis was utilized for qualitative data. The process of identifying themes in the data followed a thorough and systematic approach. Initially, the researchers familiarized themselves with the interview transcripts by reading through them multiple times. Open coding was then applied on Excel where key statements or ideas related to TPACK were highlighted. The codes were grouped into broader categories, and common patterns were identified across the responses. Through this qualitative data analysis process, each theme was carefully examined, refined, and validated to ensure it accurately represented the participants' perspectives. Ultimately, the themes were organized and supported by direct quotes from the interviews, offering a clear and rich understanding of the participants' experiences with technology integration in teaching.

3. Findings

3.1. In-service EFL Instructors' Perceived TPACK Levels

In the initial step, mean scores for each subscale were calculated. As shown in Table 3, the descriptive statistics for the TPACK survey, administered to 70 participants, reveal the following: TK has a mean score of 7.93 (SD = 0.98), ranging from 4.44 to 9.00, with good internal consistency (Cronbach's $\alpha = 0.88$). CK has a higher mean of 8.82 (SD = 0.45), ranging from 6.40 to 9.00, demonstrating excellent internal consistency (Cronbach's $\alpha = 0.94$). PK has a mean of 8.45 (SD = 0.58), with a range from 6.67 to 9.00, showing adequate reliability (Cronbach's $\alpha = 0.83$). PCK has a mean of 8.50 (SD = 0.65), ranging from 6.60 to 9.00, indicating good reliability (Cronbach's $\alpha = 0.88$). TCK has a mean of 8.05 (SD = 0.93), with a range from 5.00 to 9.00, exhibiting acceptable internal consistency (Cronbach's $\alpha = 0.77$). TPK has a mean of 8.24 (SD = 0.89), with a range from 4.57 to 9.00, reflecting strong internal consistency (Cronbach's $\alpha = 0.91$). TPACK has a mean score of 7.47 (SD = 1.26), ranging from 4.00 to 9.00, with good internal consistency (Cronbach's $\alpha = 0.82$). The overall TPACK survey mean score is 8.21 (SD = 0.67), with a range from 5.95 to 9.00, showing excellent reliability (Cronbach's $\alpha = 0.96$). These findings suggest that

participants collectively perceive themselves as highly efficacious in EFL-TPACK.

Table 3.
Descriptive Statistics for Technological Pedagogical Content Knowledge

n = 70	Mean	Min	Max	SD	Skewness	Kurtosis	Cronbach's α
TK	7.93	4.44	9.00	.98	-1.55	2.40	.88
CK	8.82	6.40	9.00	.45	-3.45	1.18	.94
PK	8.45	6.67	9.00	.58	-1.03	.65	.83
PCK	8.50	6.60	9.00	.65	-1.25	.75	.88
TCK	8.05	5.00	9.00	.93	-1.11	1.15	.77
TPK	8.24	4.57	9.00	.89	-1.56	3.02	.91
TPACK	7.47	4.00	9.00	1.26	-.91	.51	.82
Overall	8.21	5.95	9.00	.67	-1.42	1.74	.96

Table 4.
Survey results of Interviewees

No	Gender	Age	Years of Teaching Experience	Years of Experience at Current Institution	Technology Training Before	Overall	TK	CK	PK	PCK	TCK	TPK	TPACK
P1	Female	36	11-15	2	No	7.62	6.89	8.80	8.00	8.00	8.00	7.00	7.50
P2	Female	37	11-15	10	Yes	7.54	6.33	9.00	9.00	9.00	5.67	7.71	5.50
P3	Male	37	11-15	8	Yes	8.59	8.22	9.00	7.67	9.00	9.00	8.86	9.00
P4	Female	37	11-15	14	Yes	8.62	7.56	9.00	9.00	9.00	8.33	9.00	9.00
P5	Female	40	16-20	8	Yes	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00

The results of the interview analysis also revealed several key themes:

Theme 1: Overall Confidence in Integrating Technology

Participants displayed varying levels of confidence in using technology for teaching. While all acknowledged their ability to integrate technology, their degrees of confidence differed. Some expressed high levels of certainty, whereas others were more cautious in their confidence.

> P2: *"I feel confident. I strive for perfection... But overall, I've used many different tools over the years."*
> P5: *"I'm very confident. Of course, there might be some tools I have not used... But I believe I would adapt quickly if given the opportunity."*

Theme 2: Balance and Purposeful Use of Technology

A key focus for some participants was to use technology purposefully and with clear objectives rather than just using it for its own sake. This indicates a strategic approach to technology use, where instructors aim to use technology for their educational goals and needs.

> P1: *"I don't just use technology for the sake of it — I focus on whether it truly supports my teaching objectives."*
> P4: *"We need to learn how to create materials using various technological tools... You have to be aware of your goals and adapt to what the AI gives you."*

Theme 3: Adaptability and Learning

Some participants place an emphasis on adapting and being ready to explore new technologies, even if they have not used them before. This indicates openness to learning and adaptation to new tools, even if the instructors do not yet have direct experience.

> P5: *"I believe I would adapt quickly if given the opportunity to use [smart boards]."*
> P4: *"We need to explore different tools that help with material production and support classroom interaction."*

Theme 4: Perception of Challenges and Limitations

Participants also admit the challenges and limitations related to technology integration. The answers point out that while participants feel confident, they realize the dynamic nature of technology and the continuous demand for adaptation and growth.

> P3: *"There are still some grey areas that I need to revisit and explore further."*
> P4: *"With technology, anything can happen, and things change quickly."*

Overall, participants show a range of confidence levels in integrating technology into their teaching. While most express confidence, some balance this with a purposeful approach to technology use. A key theme is the adaptability and willingness to learn new tools as required. However, challenges such as rapid technological shifts and the need for ongoing exploration of new tools are also recognized, emphasizing the complexity of technology integration in teaching. Participants show a range of confidence levels in integrating technology into their teaching.

3.2. TPACK Perceptions and Demographic Factors

The results showed a significant difference between genders regarding technological knowledge, with males outperforming females (Male = 8.26, Female = 7.87, $p \leq 0.05$).

Table 5.
The result of independent sample t-test on EFL TPACK Scale and gender

F: 59 / M:11	Gender	M	SD	*t*	*df*	*p*
TK	Female	7.87	1.04	-2.01	32.8	.05
	Male	8.26	.46			
CK	Female	8.79	.49	-.99	68	0.9
	Male	8.94	.12			
PK	Female	8.47	.58	1.06	68	.96
	Male	8.27	.56			
PCK	Female	8.48	.67	-.44	68	.22
	Male	8.58	.55			
TCK	Female	8.05	.93	-.03	68	.82
	Male	8.06	.98			
TPK	Female	8.21	.95	-.73	32.2	.46
	Male	8.35	.43			
TPACK	Female	7.47	1.33	-.01	68	.23
	Male	7.47	.88			
TOTAL	Female	8.19	.72	-.92	41.3	.36
	Male	8.31	.27			

The results also reveal a statistically significant difference between instructors who have undergone technology training and those who have not, concerning their TPK scores (overall) ($p < 0.05$). Specifically,

instructors with prior technology training achieved higher TPK scores (M = 8.44) than those without (M = 7.98).

Table 6.

The result of independent sample t-test on EFL TPACK Scale and Technology Training

Yes (n=39) No (n=31)	Technology Training	M	SD	*t*	*df*	*p*
TK	Yes	8.05	.99	1.19	68	.23
	No	7.77	.96			
CK	Yes	8.85	.45	.64	68	.52
	No	8.78	.46			
PK	Yes	8.54	.56	1.57	68	.12
	No	8.32	.59			
PCK	Yes	8.59	.58	1.36	68	.17
	No	8.38	.72			
TCK	Yes	8.14	.84	.92	68	.35
	No	7.93	1.04			
TPK	Yes	8.44	.68	2.20	68	.03
	No	7.98	1.05			
TPACK	Yes	7.69	1.03	1.70	68	.09
	No	7.18	1.47			
TOTAL	Yes	8.34	.56	1.79	68	.07

Regarding age, although no significant differences were analyzed in the overall TPACK scores, the results revealed a statistically significant difference in the technological knowledge of instructors.

Table 7.

Clusters of Age Groups according to Subscales of EFL-TPACK (Technological Knowledge)

Age Group	N	TK Mean	SD	Min.	Max.
25-34 (A)	24	8.02	.72	6.33	9.00
35-44 (B)	32	8.01	.94	5.33	9.00
45-54 (C)	10	7.71	1.46	4.44	8.89
Total	70	7.93	.98	4.44	9.00

Table 8.

Technological Knowledge Level Differences among four age groups

Age Group	Sum of Squares	*df*	Mean Square	F	*p*	Direction
Between Groups	2.614	3	.87	.892	.45	A > B > C $p < 0.05$
Within Groups	64.455	66	.97			
Total	67.069	69				

Note. The mean difference is significant at the 0.05 level.

The overall teaching experience was also analysed to identify any significant differences among groups; however, no significant differences were found. In contrast, when the instructors' experience at their current institution, with a professional development unit, was examined, specifically, regarding TPK, the results indicated a significant difference based on the time instructors taught at their current institution. The instructors with 11-15 years of experience at the institution had higher TPK scores (M = 8.68) compared to

those with 1-5 years of experience (M = 8.05), with a statistically significant difference ($p \leq 0.05$). However, no significant differences were found on other scales.

Table 9.

Clusters of Teaching Experience at current institutions according to Technological Pedagogical Knowledge

Experience	N	TPK Mean	SD	Min.	Max.
1-5 years (A)	42	8.05	.98	4.57	9.00
6-10 years (B)	13	8.32	.81	6.29	9.00
11-15 Years (C)	15	8.68	.47	7.43	9.00
Total	70	8.23	.89	4.57	9.00

Table 10.

Technological Pedagogical Knowledge Level Differences among Teaching Experience at current institutions

Experience	Sum of Squares	*df*	Mean Square	F	*p*	Direction
Between Groups	4.584	2	2.292	3.033	.00	C > B > A
Within Groups	50.629	67	.756			$p < 0.05$
Total	55.213	69				

Note. The mean difference is significant at the 0.05 level

The interviewees were asked a few questions regarding demographic information. The analysis of participants' responses revealed several key themes:

Theme 1: Impact of Background and Education on Technology Use

Participants highlight that their educational background, training, and personal experiences play an important role in shaping their comfort with technology. This influence is particularly evident in those who have pursued studies related to technology or distance learning. With this theme, it could be concluded that formal education and training, especially in related fields, prepare individuals with the skills and mindset necessary to incorporate digital tools effectively in pedagogical practices.

> P1: *"I purchased a MacBook Air and started using it intensively... That period pushed me to explore and adopt digital tools more actively."*
> P3: *"My MA is in a related field — specifically distance education technologies... I've always used technology in some form in my classes."*
> P4: *"We were trained that way. That was what we saw during our training. This is also what is expected from us."*

Theme 2: Differences in Technology Use Among Colleagues

According to participants, differences in their colleagues' adoption and use of technology were linked to individual attitudes rather than age-based or generational explanations. This concept stresses the distinctions in technology usage among instructors, affected more by personal attitudes and openness to learning than by age or generational factors.

> P1*: "Some older or more experienced teachers are very open to learning new tools... Others... are quite resistant."*

P3*: "Some of my colleagues aren't familiar with very basic digital tasks... I'm often asked questions like these."*
P4*: "Some teachers frequently use online games... others are more hesitant."*

Theme 3: Generational Gap in Technology Use

Some interviewees believe that generational differences in technology adoption, while they also mention that this gap is not always clear-cut and can be influenced by personal interest and professional dedication. These findings reflect that age may contribute to difference tendencies in technology use also it may shape comfort levels, intrinsic factors such as curiosity, motivation, and exposure to training.

P3*: "The older instructors tend to be less comfortable with using technology, while the younger ones are more confident and adaptable."*
P2*: "Younger instructors tend to prefer allowing students to use laptops... That might be a small generational difference."*
P5*: "I haven't noticed any major differences based on age, so I can't say there is a generational gap in our context."*

Theme 4: Influence of Personal Interest and Attitude

One of the noticeable themes in the study is that intrinsic motivation such as personal interest, openness to learning and curiosity are determining factors for individuals to adapt to new technologies rather than age, experience or external factors. This situation highlights how important it is for instructors to keep up with technological developments with intrinsic motivation and a proactive approach to learning. Participants discuss how their educational backgrounds, personal interests, and attitudes toward technology affect their comfort and ability to integrate digital tools into the classroom. While there is generational differences in adopting technology, the data implies that factors such as individual attitudes, and peer learning have an effect on how they engage with technology. Some instructors are more open to technology due to their training or personal interest, while others may resist or struggle with its integration, regardless of age.

P5*: "If a teacher is curious and enjoys learning, they'll naturally improve themselves."*
P4*: "There's a lot of peer learning going on... people learn from each other."*

In addition, participants were asked about the difficulties they face when using technology in teaching and the support their institutions provide to assist. In the analysis of the answers, the following themes were encoded:

Theme 5: Challenges in Technology Integration

Participants identify various problems that make the use of technology more difficult in teaching. These include the relevance of tools, technical problems, time constraints, and problems with the physical classroom environment. This highlights the practical and contextual barriers that teachers face when incorporating technology. These difficulties range from the incompatibility of tools with teaching objectives to infrastructure problems that hinder classroom use.

P1*: "Some platforms present vocabulary or grammar in isolation, without meaningful real-life context or interactive input."*
P3*: "Sometimes, certain platforms or tools — like Edpuzzle... are not easily accessible due to technical restrictions or institutional limitations."*
P4*: "Time is a major factor. Sometimes I avoid tools if I think they'll take a lot of time for my students to understand how to use."*

P5*: "Sometimes the classroom setup makes using technology harder... the placement of the white curtain or projection screen is not ideal."*

Theme 6: Institutional Support for Technology Integration

When reporting the support they receive from the institution, there is a perception that this support is limited or insufficiently personalized, especially according to their needs, ongoing professional development perspective, qualifications. With this theme, it was revealed that while there is some institutional support (e.g., access to equipment), it often lacks personalization and continuity. There is also a need for more practical, hands-on training that link directly to teaching needs.

P1*: "There isn't any direct encouragement... But there was no personal follow-up... I appreciate that we're given the freedom to decide for ourselves."*
P3*: "I've experienced meaningful peer support and some institutional support, but I believe there is still room for more structured and innovative tech integration, especially at the department level."*
P4*: "When I think about the current sessions related to technology, they're not as practical... There should be a rationale behind using each tool."*
P5*: "They do provide some support... For instance, they give us a laptop... However, when it comes to software, I think there is a gap."*

Theme 7: The Role of Peer Support and Collaboration

Peer learning and collaboration emerge as key factors in overcoming obstacles to technology integration. Participants report that working with colleagues who are experienced with technology may ease adopting new tools. It highlights the importance of peer support in improving technology adoption. Collaborative efforts allow teachers to learn from each other and see practical examples of how to integrate tools effectively.

P3*: "I remember back in 2019... My partner not only helped me with the lesson planning but also gave feedback on students' online submissions."*
P4*: "I presented Edpuzzle... I demonstrated how we can include contemporary video content... That kind of specific, practical example is what we need."*

Theme 8: Need for More Specific and Tailored Training

Several participants express dissatisfaction with the general nature of training sessions provided by their institutions. They emphasize the need for more specialized, context-specific training sessions that address the in-class needs of EFL instructors. Teachers want professional development that is not only relevant to their discipline but also practical and focused on specific classroom needs.

The challenges in technology integration for teaching range from the relevance and accessibility of tools to physical infrastructure and time constraints. Although institutions provide some support, particularly through occasional training sessions, many instructors feel that the support is insufficiently tailored to their specific needs. Peer collaboration plays a vital role in overcoming these challenges, and they express a strong desire for more structured, targeted training that offers practical examples and clear guidance on using technology meaningfully in the classroom.

P2*: "Most of them are general sessions offered by the university, and not necessarily tailored to our EFL context."*
P4*: "If you're providing a session for instructors, you shouldn't just bombard them with a long list of tools... You should say, 'This tool is good because it helps students do this."*

4. Discussion and Conclusion

This study offers valuable and context-specific insights into the TPACK perceptions of in-service EFL instructors within Turkish tertiary education. Quantitative findings demonstrated consistently high self-efficacy in CK and PK domains, which is broadly consistent with previous research indicating that language instructors often feel more confident in content and pedagogy than in technology-related knowledge (Ali & Mohammadzadeh, 2022; Özdemir & Önal, 2022) However, comparatively lower mean scores in TK, TPK, and integrated TPACK domains reveal persistent gaps in technology-oriented dimensions, highlighting a continuing need for structured, context-specific professional development programs. Male instructors reported significantly higher TK scores than females, a finding that diverges from Alharbi (2020) and emphasize how gendered sociocultural factors may shape instructors' confidence and opportunities for technology use.

Instructors with prior technology training scored significantly higher in TPK, supporting the premise that training quality, not only access, determines meaningful pedagogical use of technology. This reinforces the evidence that sustained, and contextually grounded professional learning enhances pedagogical technology integration (Nazari et al., 2020; Najjari et al., 2022). Those with 11–15 years of experience at the current institution also showed stronger TPK, suggesting that long-term engagement with the institutional professional development facilitates deeper integration of pedagogical and technological knowledge (Hsu & Chen, 2023). This result adds nuance to prior studies by showing that institutional tenure—rather than total teaching experience—may be a more significant predictor of TPK growth.

Qualitative findings further deepened these statistical patterns, revealing that instructors' classroom experiences are shaped by intentional, pedagogically aligned uses of technology. Themes such as purposeful integration, adaptability, and peer collaboration revealed that while digital literacy is present, instructors require structured opportunities to connect technological tools with specific EFL learning objectives. These reflections echo Koehler and Mishra's (2009) emphasis of the dynamic interplay between TK, PK, and CK, reinforcing that effective technology use is situated, iterative, and context-dependent.

Participants consistently emphasized adaptability and collaboration as essential drivers of technological growth, a finding parallel to Chen et al. (2022) and Sari et al. (2021), who argue that peer interaction fosters sustainable digital practices. Despite acknowledging some degree of institutional support, participants expressed a desire for more personalized, EFL-specific training, which aligns with Rosyidi et al. (2024) and Alamri and Awjah (2023) that emphasize that effective professional development must be discipline-specific and practice-based.

Challenges such as including time constraints, tool irrelevancy, infrastructure gaps, and unoptimized classroom settings mirrored barriers noted in Golzar et al. (2023) and Aniq et al. (2022). These recurring findings show that technical training alone is insufficient for effective technology integration, and that systemic, institutional solutions—such as policy alignment, infrastructural investment, and workload support—are equally necessary. This finding expands on earlier EFL-TPACK studies by showing that contextual barriers remain even in institutions with moderate digital.

Individual traits—such as openness, motivation, and self-efficacy—emerged as stronger predictors of effective TPACK integration than demographic variables. This supports Raygan and Moradkhani's (2020) findings and points to the need for fostering reflective, agency-driven professional cultures. While demographic factors like gender, age, and prior training continue to influence technology use, the observed gender gap in TK reflects unequal systemic and sociocultural influences rather than inherent differences.

Professional experience also revealed a complex interplay between resistance and growth. Although some experienced instructors initially resisted change, sustained mentoring and exposure contributed to more confident adoption over time. Overall, the findings collectively suggest that effective TPACK integration emerges through the dynamic interaction of personal agency, institutional scaffolding, and contextually responsive professional culture.

These findings carry important implications for EFL-oriented teacher education. Institutions should move beyond generic workshops toward long-term, tailored specifically for disciplines, and reflective TPACK-based development and adopt as professional learning ecosystems. Embedding mentoring systems, structured feedback cycles, and peer demonstration sessions can help build an institutional culture that values experimentation and contextual innovation in technology use. Teacher development models grounded in TPACK principles can thus transform technology integration from a compliance task into an evolving pedagogical habit.

On the research front, the study highlights the need for longitudinal inquiry into how sustained, contextualized development shapes TPACK evolution. Future studies should compare public versus private and urban versus rural institutions to better understand how varying contexts shape technology use in language education. Additionally, research should explore the differential impacts of TPACK-oriented interventions in both pre-service and in-service teacher education, investigating how program design, mentoring, and institutional culture influence teachers' technological integration trajectories over time. Comparative studies across teacher education models, induction programs, and professional learning communities would provide a fuller picture of how TPACK develops and is enacted in diverse educational settings.

By focusing on the underexamined context of Turkish tertiary EFL instruction, this study adds to the growing body of TPACK research. While instructors demonstrated confidence in CK and PK, their relatively lower TPACK and TK levels—along with contextual constraints—underscore areas requiring continued reform and targeted institutional attention. Though limited by sample size and reliance on self-report data, the study nonetheless offers a foundation for future research using triangulated data sources such as classroom observations or learner outcomes.

Ultimately, meaningful technology integration is not merely about technical skills—it is an evolving process shaped by reflective practice, institutional ecosystems, and pedagogical intent. Institutions that embrace collaborative, adaptive, and contextually grounded teacher development are best positioned to support EFL instructors in navigating the digital demands of contemporary language education.

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The authors confirm that ethical approval was obtained from Çanakkale Onsekiz Mart University (Approval Date: 05 /05/2023).

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