

Research Article

From training to transformation: The impact of online ICT training on Turkish EFL teachers' TPACK competences and innovative teaching practices

Ezgi Aydemir Altaş¹ and Tuğba Babacan²

¹Yildiz Technical University, School of Foreign Languages, Istanbul, Türkiye (ORCID: 0000-0002-0460-3322)

²Anadolu University, Faculty of Education, Eskişehir, Türkiye (ORCID: 0000-0002-9707-1029)

Pathway to innovation can be shaped more effectively if teachers are provided with the necessary knowledge and skills. Encouraging teachers to develop a growth mindset is also crucial in helping them become pioneers of change. This study aims to investigate how online information and communication technologies training affects the Technological Pedagogical Content Knowledge competencies and the use of innovative pedagogical practices among English as a Foreign Language teachers in Türkiye. For this purpose, explanatory sequential mixed-methods research was adopted. In this regard, a quasi-experimental one-group pre-test post-test design was employed, in which quantitative data were collected first, followed by an explanatory qualitative phase based on a phenomenological design. The study was guided by the Teaching for Understanding curriculum design framework and the Kirkpatrick evaluation model. In the needs analysis phase, 74 English teachers were contacted via social media, and 20 of them who were working in different schools across Türkiye were selected based on the criterion sampling method for training. Quantitative data obtained in the study were analysed using Wilcoxon matched-pairs signed-rank test, while qualitative data were analysed through content analysis. It was observed that the training helped teachers become more innovative, creative, self-confident, and open to learn. Teachers were eager to apply their new knowledge; however, they faced contextual challenges such as inadequate technical facilities, student profiles, and economic conditions, which limited the full implementation of their skills. Despite these challenges, teachers reported positive outcomes from even the limited use of information and communication technologies. Based on these results, the study recommends continuous professional development programs, cooperative learning communities, and administrative support for long-term impact and sustainable change. Further longitudinal studies are suggested to better assess the long-term impact on teaching practices.

Keywords: ICT; Innovative pedagogy; Kirkpatrick evaluation model; Online teacher education; Professional development; TPACK

Article History: Submitted 3 April 2025; Revised 28 June 2025; Published online 26 August 2025

1. Introduction

Recent technological developments have required teachers to keep up with the requirements of contemporary educational demands and to improve themselves professionally. In this regard, continuous professional development [PD] plays a crucial role in equipping educators with

Address of Corresponding Author

Ezgi Aydemir Altaş, Yıldız Technical University, School of Foreign Languages, 34210, Istanbul, Türkiye.

✉ ezgaydmr@yildiz.edu.tr

How to cite: Aydemir Altaş, E. & Babacan, T. (2025). From training to transformation: The impact of online ICT training on Turkish EFL teachers' TPACK competences and innovative teaching practices. *Journal of Pedagogical Research*, 9(4), 173-201. <https://doi.org/10.33902/JPR.202535200>

technological knowledge and focusing on any possible issues that may emerge in relation to technology use (Huang et al., 2021). Furthermore, Karimi (2011) stated that teachers who receive PD training demonstrate significantly higher levels of teaching efficacy compared to teachers who do not, which suggests that structured PD enhances teachers' sense of competence. PD training which supports teachers in various ways are shaped by individual needs and societal change. For instance, due to the various problems encountered by EFL teachers during online language teaching throughout the pandemic, research highlighted the prominence of professional development regarding the use of technology in language teaching (Atmojo, 2021; Atmojo & Nugroho, 2020; Nazari et al., 2019; Pathiranage & Karunaratne, 2023).

The shift from face-to-face education to distance learning universally due to the COVID-19 pandemic led teachers to become digitally prepared in a very short time, which turned online training into an appropriate and pedagogically strategic option (Abdel Latif, 2022). However, the abrupt transition to online education exposed a general lack of preparedness among educators, many of whom discovered that merely replicating face-to-face teaching strategies in virtual settings often resulted in ineffective teaching experiences (Stockwell & Wang, 2023). Irgashevich (2020) identified several challenges related to technology integration, including adaptation to new technological tools, integration of technology into curricula, and alignment with teaching styles. Furthermore, lack of ICT competence affects proper technology integration in educational settings (Arhin et al., 2025). Turkish EFL teachers likewise encountered considerable challenges during this period, frequently reporting inadequate training in digital pedagogy and limited confidence in incorporating technology into their teaching practices (Civelek et al., 2021; Eraslan, 2021; Tümen Akyıldız, 2020). Thus, incorporating ICT into EFL education has gained even greater significance, especially in the post-COVID-19 educational landscape. Consequently, EFL teachers are encouraged to keep up with the recent developments in educational technology by participating in professional development workshops, online training sessions, and by collaborating with their colleagues to gain a deeper understanding of digital literacy and utilize the tools by adapting them to their objectives and teaching practices (Zou & Wang, 2024).

Compared to traditional face-to-face PD sessions, online PD training provides numerous benefits for teachers. For instance, online PD training, especially asynchronous and self-paced ones, enables teachers to access to lectures and learning materials without encountering any constraints or obstacles such as location or time (Bustamante, 2019; Powell & Bodur, 2019). Since time constraints and the assumption of poor-quality PD have been identified as two of the primary deterrents to participating in face-to-face PD, online PD might increase teachers' willingness to engage (Zhang et al., 2019). Similarly, Meyer et al. (2023) emphasized that online PD decreases logistical burdens and reinforces teacher engagement.

In this shifting educational context, teachers have increasingly been recognized as facilitators who guide students in constructing knowledge through engaging and technology-enhanced learning experiences rather than as transmitters of information (Ronzhina et al., 2021). Additionally, innovative EFL teachers are distinguished by their capacity to integrate pedagogical and technological expertise in designing meaningful learning tasks that promote creativity, critical thinking, and learner autonomy both inside and outside the classroom (Demir & Akpınar, 2018; Yáñez et al., 2015). Thus, Technological Pedagogical and Content Knowledge [TPACK] model (Mishra & Koehler, 2006) which covers the complex nature of technology integration in education is a key conceptual framework that offers teachers various benefits. For example, the study of Budianto et al. (2023) revealed that an online training session improved teachers' self-assessed TPACK, intercultural competency, and problem-solving skills. Additionally, Zhang (2022) and Luo and Zou (2024) pointed out that TPACK-focused PD enhances teachers' digital fluency and virtual instructional design skills.

Therefore, it is crucial for teachers to be equipped with novel and innovative pedagogical practices to adopt and integrate emerging technologies into education in an increasingly digitalized world (Abbas et al., 2021). In this regard, educators are expected to use their techno-

pedagogical competency to innovate the current curricular delivery by integrating innovative pedagogies with technological skills to prepare learners with 21st century skills such as creativity, independence, collaboration, critical thinking (Bizami et al., 2023). Additionally, innovative pedagogical practices regarding educational technology integration can improve language skills and foster essential cognitive abilities, thereby promote lifelong learning (Tümen Akyıldız & Şahin, 2024). The literature also suggests that teachers develop positive attitudes toward innovative teaching practices through frequent use and practical experience in integrating educational technologies (Lawrence, 2022; Shagrir, 2010). This research defines innovation as intentional educational technology implementation that encompasses students-centred approaches based on TPACK and Teaching for Understanding [TfU] frameworks.

Notably, the studies have highlighted the need for effective training models and frameworks to support professional development and enrich innovative teaching approaches (Fragkoulis et al., 2019; Xu & Zhu, 2023; Zadtyi et al., 2021). TPACK-based instructional models aim at improving technology integration but lack support during implementation, which emphasizes the need for an approved model consisting of both TPACK elements and a common instructional design framework (Bajracharya, 2021). In line with this, the Teaching for Understanding framework and educational technologies support each other as TfU guides teachers' intentional technology use leading to a constant progress. The TfU framework (Wiske et al., 2005), which emphasizes deep conceptual learning through active engagement and reflective thinking, is claimed to enhance engagement, improve teacher satisfaction, and foster new professional skills (Shaharabani & Faiger, 2017). Regarding these benefits of TfU framework, it can be asserted that this process designed based on TfU helps teachers to integrate their technological competence into instructional design. Previous research (Perkins & Blythe, 1994) has highlighted its capacity to enhance conceptual understanding; however, its impact on practical instructional competencies, particularly those associated with the TPACK framework and pedagogical innovation, has not been extensively investigated (Manso et al., 2011). Therefore, the TfU framework was used in this study for the instructional design of the training containing practical applications and performance tasks, which required reflection, creativity, and autonomy in teachers. These tasks, designed geared toward TfU components, were also aligned with TPACK domains.

Evaluating the effectiveness of professional development programs requires comprehensive models that capture both immediate and long-term impacts on teaching practices. Research highlights the use of Kirkpatrick evaluation model, specifically in TPACK-based training sessions (Kavitha & Anitha, 2025; Mahmoodi et al., 2019). This study employs the Kirkpatrick Evaluation Model (Kirkpatrick & Kirkpatrick, 2006), which examines program impact across four key dimensions: reaction, learning, behaviour, and results. Although Kirkpatrick's evaluation model intersects instructional design and organizational development, limited studies where Kirkpatrick's model has been used have focused on professional ICT-related development (Jati, 2023; Wu et al., 2016). In this study the researchers have chosen, and followed, Kirkpatrick's evaluation model, to monitor and evaluate teachers' knowledge, skills and attitudes to transfer to their instructional design after the technological pedagogical knowledge-based professional development. This evaluation model allows for a more sophisticated analysis of immediate learning gains and longer-term behaviour and institutional implications; areas that have often been omitted in previous research focus. Kirkpatrick's four-level model allows for the analysis of the impact of an education program in a more holistic manner in that it shows the interrelationship of participant reactions, learning outcomes, behaviour changes and results.

The study also addresses growing critiques in the literature regarding the drawbacks of short-term professional development programs, which often fail to generate long-lasting changes in teaching practices (Darling Hammond et al., 2017). Furthermore, this study adopts a theoretically comprehensive and methodologically sound approach to evaluating teacher professional development by integrating the TPACK framework, the TfU model, and the Kirkpatrick evaluation framework, which remain underexplored in previous research. While TPACK serves as

the basis to develop teachers' techno-pedagogical integration skill, the TfU model guides instructional design towards deep understanding through performance-based and student-centred tasks. The training program converted innovation into specific tasks which made participants apply digital tools to facilitate student independence and critical thinking alongside formative assessment processes. The educational approaches matched the requirements of TfU which focused on deep learning and the TPACK model which needed equal attention to content, pedagogical methods and technological components. The concept of innovation functioned as both a mindset and practice that people could develop through systematic training and group-based reflection sessions. The Kirkpatrick evaluation method then bridges both evaluations by providing a complete tool to evaluate the training program in learning outcomes, behavioural changes, and impact at the training level. The combination of these models reinforces coherence, active engagement, sustainability, and evidence-based evaluation (Darling Hammond et al., 2017).

In this study, a syllabus focusing on TPACK and innovative teaching was designed and implemented based on a needs analysis conducted with EFL teachers involved in curriculum implementation. The participants remained actively engaged throughout the process, with both formative and summative assessments used to support and evaluate their progress. In this regard, it could be claimed that this study is a pioneer in the field due to the significance of keeping the participants active, collecting data at certain time intervals, conducting both a theoretical and practical study in EFL setting. Taken together, this study stands apart from previous research by offering practical insights and recommendations that can help stakeholders design more effective and responsive curriculum and training programs for teacher education. Therefore, the following research questions were addressed:

RQ 1) Is there a statistically significant difference in English language teachers' TPACK competencies before and after the training?

RQ 2) Is there a statistically significant difference in English language teachers' innovative pedagogical practices before and after the training?

RQ 3) What are the participants' views on the impact of the training?

RQ 4) To what extent have teachers' teaching practices transformed in the post-training process?

The sections that follow are organized to provide a comprehensive account of the study. The literature review presents relevant theoretical frameworks and prior research. The methodology describes the research design, participants, instruments, and procedures for data analysis. This is followed by the presentation and discussion of the findings, interpreted in light of the existing literature. The final section concludes the study with implications for practice, policy, and directions for future research.

2. Literature Review

2.1. Professional Development in Technology Integration

Professional development has become increasingly significant, as teachers are now accounted for qualified education (Zhou et al., 2022). Darling Hammond et al. (2017) stated that effective PD includes seven essential characteristics: it focuses on content learning, incorporates active participation, fosters collaboration, models effective teaching practices, provides professional coaching, facilitates feedback and self-reflection, and is sustained over time. PD also improves teacher learning and efficacy by enhancing content knowledge, teacher attitude, and the education process (Zhang, 2022). Recent studies have investigated the impact of the shift on teacher education and pedagogical innovation. According to Santagata et al. (2024), the transition to virtual teaching has opened new possibilities for teacher innovation because PD programs have established collaborative community.

Philipsen et al. (2023) highlighted the necessity of sustained, interactive, and pedagogically grounded training to promote long-term instructional development. In this regard, research demonstrates that current PD programs help teachers build digital literacy skills and teaching

abilities (Tuzahra et al., 2021) while boosting their confidence levels (Ansyari, 2015) and developing TPACK competency (Caromawati, 2017). For instance, Masry Herzallah (2025) found significant positive correlations between TPACK, technological self-efficacy, and perceived efficiency in online teaching among Israeli educators during the COVID-19 pandemic. In line with this, Ilahude et al. (2023) described the successful application of the TPACK framework by English language teachers in a comprehensive systematic review, particularly as a critical response to the instructional challenges arising due to the pandemic.

Regarding the global context, for instance UK, Perry (2023) stated that there has been an increasing adoption of hybrid and online PD models since the pandemic due to key benefits such as flexibility and scalability. Across European contexts like Italy, Spain, and Türkiye, teachers emphasized the fundamental role of peer collaboration and networking in restructuring instructional practices and strengthening teacher agency during times of disruption (Eradze et al., 2023). In the United States, elementary school teachers reported an increase in their digital confidence and the adoption of innovative instructional practices following their participation in school-wide online professional development during the COVID-19 pandemic (Santagata et al., 2024). Additionally, Civelek et al. (2021) investigated Turkish EFL teachers' perceptions of online instruction during the pandemic. Their findings revealed a general recognition of its necessity; however, many teachers felt unprepared due to limited training and insufficient resources. The study called for the integration of online instructional methodologies into teacher preparation programs and emphasized the need for targeted in-service training to enhance teachers' digital teaching competencies.

Despite the increasing recognition of online in-service teacher training [INSET] that is an indispensable part of professional development for language teachers, it could be stated that there are still gaps in both theoretical and practical issues. The research in Türkiye and Iran (Amirian et al., 2016; Doğrul et al., 2022; Sefer & Demirel, 2022) is indicative of the fact that EFL and L2 teachers have many needs in common, which are technological competencies, pedagogical support, and the sustained development of teaching skills. Unfortunately, these investigations are not always able to provide theory-based models of research and practice. To be more specific, theory-based frameworks like TPACK or TfU have hardly been used in the creation of online INSET programs (Manso et al., 2011). Thus, the initiatives being more coherent at the pedagogical level and the scaling-up of them are restricted. Besides, while teachers' opinions regarding online training are regularly surveyed, most of the studies provide only short-term assessments without any longitudinal evidence for the changes. Another critical gap, especially in Türkiye, lies in the lack of needs analysis, feedback mechanisms for the professional development trainings, theory-based trainings, and improper evaluation and measurement (Yurtseven Yılmaz & Sever, 2021). Based on these gaps, this study contributes to the current literature as it is practical, addresses needs of teachers, is structured according to TfU framework, responsive to feedback from teachers through Kirkpatrick evaluation model, and monitors teachers for a long period of time.

2.2. TPACK model

The main challenge for teachers in using technology is how to integrate it to enhance the quality of education (Rolf et al., 2019). In this respect, the TPACK framework, which was developed by Mishra and Koehler (2006) based on Shulman's PCK (Pedagogical Content Knowledge) theory (Shulman, 1986) aims to clarify how teachers can enhance their digital competency. Additionally, this framework emphasizes the integration of educational technology into the teaching process in a proper way. Shulman (1986) asserted that teaching competency is not only based on "content knowledge" but also on "curriculum knowledge," "subject knowledge," and "pedagogical content knowledge". Due to the technological advancements in the context of education, Mishra and Koehler (2006) emphasized the fact that possessing technological knowledge is not sufficient on its own as technology needs to be integrated meaningfully, purposefully, and effectively into

education and added that content, pedagogy, and technological expertise are the main elements of efficient technology-based instruction, and it is crucial for them to be in harmony.

The concept of TPACK includes six dimensions. Technological Knowledge [TK] is the teachers' competency in using various technologies for instructional aims; Pedagogical Knowledge [PK] indicates their ability to select appropriate teaching strategies to enhance their students' learning; Content Knowledge [CK] refers to their mastery of their subject; Technological Pedagogical Knowledge [TPK] indicates how well they are able to choose and apply technology in accordance with a suitable pedagogical approach; Technological Content Knowledge [TCK] is related to how well they utilize technology to support learners' knowledge of subject matter; Pedagogical Content Knowledge [PCK] is concerned with their knowledge and application of diverse teaching strategies to support content knowledge. As a whole, TPACK maintains that educators help their students learn the subject matter using appropriate teaching strategies and technologies in tandem (Mishra & Koehler, 2008).

Relevant research indicates that rapidly developing technology necessitates educators' technological competence to meet their students' diverse needs (Sing et al., 2021; Tseng et al., 2022). In EFL settings, TPACK supports the use of technology in combination with suitable teaching strategies to deliver language content (Quyen, 2022). Therefore, these findings suggest that TPACK plays a crucial role in promoting a supportive and engaging learning environment for both teachers and students. Numerous studies have investigated TPACK in EFL contexts (Arslan, 2020; Tseng et al., 2022). Most of these studies have focused on evaluating the TPACK levels and perceptions of in-service (Ansyari, 2015; Chen et al., 2022; Hsu et al., 2020; Lai et al., 2022; Nazari et al., 2019) or pre-service EFL teachers (Farhadi & Öztürk, 2023; Koçoğlu, 2009; Kurt et al., 2013; Tseng et al., 2019). In Turkish EFL settings, for instance, Koçoğlu (2009) investigated pre-service EFL teachers' perceptions of TPACK and stated that Computer-Assisted Language Learning [CALL] courses reinforced their TPACK development. Additionally, Kurt et al. (2013) reported that a 12-week TPACK development program significantly increased pre-service teachers' TPACK levels. These studies demonstrate that TPACK is useful in assessing and promoting professional development by encouraging teachers to adopt innovative pedagogical strategies.

Relevant studies in the literature mostly focused on TPACK levels of pre-service EFL teachers, yet there are also valuable studies conducted with in-service teachers. For instance, Ansyari (2015) conducted a design-based study to generate and evaluate a PD programme aimed at improving EFL lecturer's TPACK levels in an Indonesian university setting. The participants involved 12 English lecturers, and the implementation process lasted for 3 weeks. The study emphasized the efficacy of integrated, collaborative, and curriculum aligned PD models to foster technology integration in language instruction. Chen et al. (2022) offer a valuable perspective into how in-service EFL teachers cultivate TPACK through participation in interconnected activity systems, their findings provide limited evidence on how such development transfers into concrete pedagogical innovation. Additionally, previous studies regarding with in service EFL teachers conducted as descriptive. For instance, Hsu et al. (2020) investigated the structural relationships among teachers' TPACK-G, attitudes towards games and actual teaching usage, Lai et al. (2022) examined the relation between school culture, PD, and TPACK over teaching and learning beliefs, and Nazari et al. (2019) investigated the perceptions of teachers on TPACK. On the contrary, research such as Budianto et al. (2023) and Mahmoodi et al.'s (2019) studies on online in service training involved high school EFL teachers.

Although literature focusing on in-service teachers' TPACK development (Ansyari, 2015; Chen et al., 2022; Mahmoodi et al., 2019) is growing, relatively fewer studies investigate the integration of TPACK with constant instructional models such as TfU and long-term evaluation frameworks like Kirkpatrick in EFL contexts. This design reflects TPACK as a construct whose focus is in the interaction of content, pedagogy, and technology, whereas TfU insisted that these interact in meaningful tasks. These levels helped to see how much of the actual pedagogical change was induced by the TPACK-informed instructional design through TfU. As for Kirkpatrick evaluation

model, the first two levels captured teachers' satisfaction and knowledge gains, and the third and fourth, behaviour and results, were intended to detect whether the practices taught transferred to classroom instruction and remained there over time. In brief, Kirkpatrick gave a framework to assess the impact of the TPACK-TfU integrated training design. In addition to the combination of these frameworks, this study contributes to literature by investigating a variety of K12 EFL teachers throughout Türkiye and by conducting a long-term implementation process with follow-up sessions, which strengthened the design of the study.

2.3. Innovative Pedagogy Practices Supported by Technology

Previous literature focuses on three dimensions regarding innovative pedagogical practices: student-centred teaching strategies, online teaching strategies and educational technology use, and assessment and feedback strategies (Suyo Vega et al., 2024). Considering the first dimension, Ampa and Nurqalbi (2021) defined innovative pedagogy as an instructional method that diverges from traditional approaches, aiming to promote student learning by enhancing engagement, effectiveness, and efficiency. Looney (2009) also emphasizes that innovative teaching approaches are typically student-centred and rooted in constructivist theory. Additionally, Mahdi et al. (2020) pointed out the fact that developing proper pedagogical practices enhances students' critical thinking, enabling them to learn meaningfully. In this regard, the TfU framework, which was developed by Perkins and Blythe (1994), supports this motive by guiding teachers toward the design of authentic and meaningful tasks. It requires learners to apply conceptual knowledge across diverse contexts rather than traditional transmission-based instruction (Kivunja, 2015). Additionally, Bilbao et al. (2021) suggested that the TfU framework is effective in addressing fundamental professional proficiencies of educators, including flexibility, deep conceptual understanding, interdisciplinary thinking, autonomy, and problem-solving skills.

As for the second dimension, innovative pedagogy was described as the meticulous use of creative teaching strategies through educational technology integration (Nancy et al., 2020; Okolie et al., 2021; Omeh et al., 2022). In this regard, TPACK describes the intersection of pedagogical, technological, and content knowledge necessary for effective teaching (Vásconez Paredes et al., 2021), which is connected to innovative pedagogical practices. Bizami et al. (2023) presented a map of innovative pedagogical practices involving the use of technological tools such as Webex, Zoom, Padlet, etc. Additionally, Abbas et al. (2021) demonstrated the intersection between innovative pedagogical practices and TPACK with the use of augmented reality, artificial intelligence and gamification, which allows personalized learning and a promising instructional design. Furthermore, Ojong and Addo (2024) stated that when implemented successfully, innovative practices such as flipped learning, autonomous learning, and blended instruction can extend learning beyond the classroom and increase student motivation and engagement in EFL settings.

The literature indicated that more empirical studies fostering teachers' instructional pedagogical design skills aligning with educational technology integration are needed (Bizami et al., 2023; Choi & Young, 2021). There are some empirical studies in the literature and the findings indicate that both TPACK and innovative pedagogical practices contribute to effective teaching. For example, Kusuma (2022) investigated the impact of a TPACK-oriented program on pre-service EFL teachers' ability to plan flipped classroom lessons and found out that they improved their use of innovative pedagogical practices by integrating technology into their lesson plans. Additionally, Kaliappen et al. (2021) investigated a lecturer's perceptions on using Wizer.me and Socrative applications as innovative teaching method integrating TPACK. The study revealed that these kinds of innovative pedagogical practices fostered effective teaching.

From these studies, it could be concluded that these innovative pedagogical practices with TPACK improve teaching; however, further empirical studies would contribute to the literature.

Considering the third dimension, combining strategies using technological tools and innovative methodologies not only enables accessible education but also provides rapid and effective feedback to students in their learning process (Suyo Vega et al., 2024). In line with this, the study of

Botuzova et al. (2023) revealed that the preparedness of teachers to use pedagogical assessment by applying digital technologies could expand the scope of feedback and assessment strategies to areas that were previously inaccessible to them. Additionally, the study indicated that the digital technology-enriched evaluation enabled teachers to integrate monitoring and teaching functions and individualize pedagogical assessment. For instance, Tapalova and Zhiyenbayeva (2022) examined a framework established from AI-based education. The findings revealed that expert systems for education improved the efficacy of instruction, fostered the excellence in curriculum development; intelligent mentors and agents reinforce individualized learning means in accordance with student needs and preferences.

Although the studies highlighted the significance of innovative teaching practices regarding TPACK in education, it can be concluded that there is still a need for more empirical studies. Additionally, some of the studies focused on the efficacy of a limited number of applications (Bizami et al., 2023; Kaliappen et al., 2021). In contrast, the design of this present study combined all the three dimensions of innovative pedagogical practices by following TfU framework. Therefore, this study contributed to the current literature with its comprehensive design.

2.4. Kirkpatrick Evaluation Model

The Kirkpatrick Evaluation Model (Kirkpatrick & Kirkpatrick, 2006), which is often used to assess training effectiveness, offers a useful framework for evaluating PD programs. It emphasizes four levels: participant reaction, learning, behavioural change, and results. Reaction level refers to participants' attitudes concerning the program they participate in and involves elements such as the subject, teachers, materials, instruments, activities, etc.; learning level addresses the evaluation of learning effect regarding knowledge and skills provided (Mahmoodi et al., 2019); the third level, behaviour, aims to find out whether the acquired knowledge is transferred to the workplace (Smidt et al., 2009); and the last level, result, is the most challenging one as it deals with the final outcome of the training session and investigates the significance in participants' performances and learners' achievements (Brewer, 2011). At each level, it enables researchers to triangulate research by employing various data collection tools (Mahmoodi et al., 2019). Therefore, it could be valuable for assessing not only whether teachers acquired the input of the training sessions, but also whether they applied them and produced measurable classroom change.

Despite the fact that it enables comprehensive evaluation, few studies evaluating TPACK-based professional development explicitly adopt the Kirkpatrick evaluation model. For instance, Orhak (2023) investigated the effectiveness of an asynchronous Digital Teachers Project [DTP] by implementing Kirkpatrick's four-level evaluation model and pointed out that the training increased the teachers' digital skills, improved teaching practices, and supported knowledge transfer within schools, emphasizing the efficacy of structured online professional development programs. Moreover, Wu et al. (2016) examined ICT professional development of Chinese instructors throughout an ICT blended module by using question surveys and the findings revealed an increase in their TPACK levels. As for EFL context, Mahmoodi et al. (2019) investigated the impact of INSET courses on high school EFL teachers applying Kirkpatrick evaluation model and pointed out the efficacy of INSET programs. Additionally, Jati (2023) examined whether an asynchronous technology-focused teacher PD improved technology integration skills of 200 EFL teachers' by applying Kirkpatrick evaluation model.

Based on the studies mentioned above, it has been noticed that Kirkpatrick evaluation was used to evaluate generally trainings conducted in blended learning environments and in an asynchronous format. In contrast, this study was designed to provide ICT training to a small but diverse group to conduct and evaluate the process more comprehensively. Although studies applying Kirkpatrick evaluation model is growing, further studies involving the evaluation model are still needed to foster enhanced pedagogical practices for other in-service training sessions (Orhak, 2023). By adopting Kirkpatrick's model to evaluate the training, the present study aims to address this gap by investigating the impact of online ICT training on technological integration

and innovative pedagogical practices among Turkish EFL teachers. By applying all four levels of Kirkpatrick model, this mixed-methods study incorporated both formative and summative assessments, allowing for a participant-focused evaluation that sheds light on the training's lasting impact, which highlights its overall significance.

3. Method

3.1. Research Model

In this study, an explanatory sequential mixed-methods design (Creswell & Creswell, 2023) was applied, incorporating both quantitative and qualitative approaches. A quasi-experimental one-group pre-test post-test design was used to collect quantitative data first. This was followed by an explanatory qualitative phase, based on a phenomenological design, to gain a deeper understanding of participants' experiences and feelings throughout and after the training. According to the model, data collection and analysis followed two different paradigms, ensuring methodological triangulation as a validity strategy through a multi-method research approach. In the quantitative phase, the experimental group consisted of in-service Turkish EFL teachers from across Türkiye. Since participants volunteered in the study and came from diverse backgrounds and educational settings across the country, creating a truly comparable control group was not considered methodologically appropriate. To address this limitation, multiple data sources-including qualitative data collection phases-were used to support the credibility of the findings.

3.2. Participants

A poster displaying information about the training was emailed to all K12 schools in Türkiye and sent to colleagues via social media platforms. Only 74 teachers volunteered for the training and shared their views on what kind of content would best meet their professional needs. The participants were selected according to the criterion sampling method based on the criteria of region, school type, grade, and gender. Micro and macro-level contextual factors, ranging from local school contexts to individual teaching experience, are often noted in the literature as influencing the effectiveness of teachers' professional development (Köpsén & Andersson, 2015; Van der Pers & Helms Lorenz, 2021). Importantly, the aim was to include a group of participants who reflect the everyday realities of teachers working across a range of educational settings in Türkiye. While applying the selection criteria, native English-speaking teachers working in private schools were excluded, since the training was specifically designed for Turkish EFL teachers. Moreover, gender diversity was a key consideration in the participant selection process. Since the number of male applicants was quite limited, deliberate efforts were made to include as many male teachers as possible. Indeed, in some instances, male applicants were given priority over female applicants in order to improve the overall gender balance of the group. Although the researchers tried to balance the demographic characteristics, the number of female participants exceeded the male ones, as most of them were reluctant to spare time.

The number of participants was deliberately limited to twenty-five to make it possible to monitor each teacher's progress and offer them individualized feedback throughout the training. Rather than aiming for broad generalizability, the focus of this study was to engage in-depth with a small group, allowing time and space for more personalized support. During the first two weeks, five teachers asked to drop out due to various personal circumstances. As a result, twenty (n=20) participants remained in the procedure. Demographic characteristics of the participants are provided in Table 1.

According to Table 1, most participants are female and have over 11 years of teaching experience. The participants have taught across multiple grade levels, primarily in public schools located in the Central Anatolia region of Türkiye.

Table 1
Demographic Characteristics of the Participants

<i>Categories</i>	<i>f</i>	<i>%</i>
Gender		
Male	15	75
Female	5	25
Teaching Experience		
1-5 Years	3	15
6-10 Years	4	20
11 Years and Above	13	65
Grade		
Primary School	1	5
Secondary School	1	5
High School	8	40
More Than One Grade	10	50
School Type		
Public School	16	80
Private School	4	20
Region		
Marmara	5	25
Black Sea	2	10
Central Anatolia	9	45
Mediterranean	2	10
Southeastern	1	5
Aegean	1	5

3.3. Instruments

The study was conducted following ethical guidelines, with approval obtained from the Ethical Committee of Yıldız Technical University, Türkiye on 03.05.2023 (Ref. No. 2023.05). Prior to training, informed consent forms were signed by all participants. These forms provided detailed information regarding the purpose of the study, voluntary participation, and the data collection methods, including audio and video recordings. Participants were assured that their responses would remain confidential and anonymous. The quantitative data were collected via two scales.

3.3.1. TPACK-Deep Scale

Develeoped by Kabakçı Yurdakul et al. (2012), the scale comprises 33 items in a 5-point Likert-type scale and has a four-factor structure confirmed by EFA. These factors are named in accordance with existing literature as design, exertion, ethics, and proficiency. The Cronbach's alpha coefficient for the whole scale was found to be .95, and test-retest reliability coefficient of the scale was calculated as .80.

3.3.2. Innovative Pedagogical Practices Scale for Teachers

This scale was developed by Süer and Oral (2021) and consists of 46 items on a 5-point Likert-type. It demonstrated high internal consistency, with a Cronbach's alpha coefficient of .95.

Both instruments are considered highly reliable and valid according to expert review and have been used repeatedly in the Turkish context. The scales were shared with the participants as pre-test and post-test measures, and they were given a one-week timeframe to complete.

In the qualitative phase, semi-structured online interviews were conducted with ten participants, in two phases: one immediately after the training and another as a follow-up one month later. The interview protocol, which consisted of seven open-ended questions based on relevant literature, was reviewed by two experts in educational sciences and two in educational technology to ensure content and construct validity. The experts were asked to evaluate the clarity,

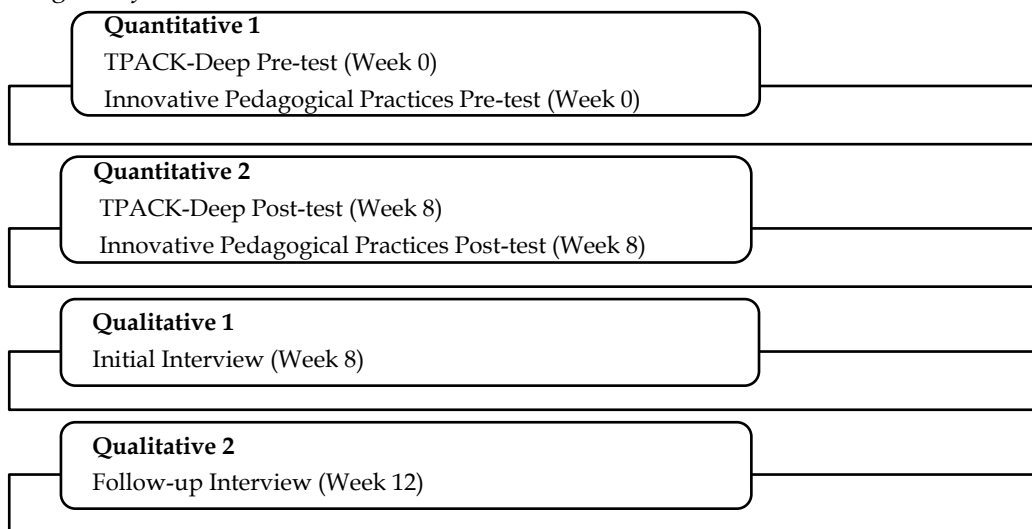
relevance, and consistency with the TPACK framework and innovative pedagogical practices. Based on their feedback, several questions were rephrased for clarity, particularly those that were too long or contained more than one idea. Also, potentially confusing terms were revised. After content and construct validity phases were completed, the revised questions were piloted with two preservice teachers and one in-service teacher. The initial interviews focused on how participants integrated their technological knowledge into pedagogy, the innovative teaching practices they applied, and the skills they developed. For instance: ‘What does “innovation” mean to you as a teacher from now on?’ (Conceptualization of innovation); ‘Could you tell me how you designed a lesson that successfully combined pedagogy, content, and technology?’ (TPACK integration). The interviews lasted between 20 and 55 minutes.

Additionally, a follow-up interview series consisting of four questions, was conducted 12 weeks later with the same participants. This timeframe was chosen to allow sufficient time for implementation and reflection, ensuring participants could provide more comprehensive insights. The follow-up interview protocol focused on teachers’ post-training transformation, their implementation process, and experiential reflections. Questions were reviewed by one expert in curriculum and instruction and one from a foreign language school. After that phase, participants were asked questions such as “What are the challenges you face when trying to balance content, pedagogy, and technology?” (Barriers to TPACK implementation), and “What innovative techniques have you applied recently in your teaching?” (Actual use of innovative practices). The follow-up interviews lasted between 10 and 25 minutes. Both interview series were video-recorded upon consent of the participants for data analysis and reliability assurance. To enhance trustworthiness, direct participant quotations were included to illustrate key themes.

The data collection process is summarized in Figure 1.

Figure 1

Diagram of Data Collection Process



3.4. Procedure

This study was structured according to the problem-centred program design. Although, goals have been set for the teachers’ digital competencies and innovative pedagogy to meet today’s needs by UNESCO guidelines (Cukurova & Miao, 2024), studies on EFL teachers, particularly during the COVID era, revealed a pedagogical gap for effective teaching and need for ICT training (Civelek et al., 2021; Şahin & Aykaç, 2022; Pathiranage & Karunaratne, 2023).

To address this gap, an open-ended survey was conducted with 74 Turkish EFL teachers to determine the needs. The needs analysis revealed that EFL teachers demanded practical trainings on effective technology integration, creating interactive materials, designing and improving their lesson plans, and samples of innovative approaches. Based on these needs, the researchers

designed a five-phase training using the Teaching for Understanding framework (Wiske et al., 2005). This framework was chosen as it promotes deep understanding of conceptual knowledge, supports professional development and enhances teaching with technology. The steps followed were (1) Generative topics: Identifying contents to be integrated into the training design. (2) Understanding goals: Teachers will internalize and design effective technology-integrated lessons. (3) Performances of understanding: Teachers will create materials, complete tasks, and reflect on their work. (4) Ongoing assessment: Trainers will provide peer/self-assessments, quizzes, discussions, and feedback. (5) Reflective collaborative communities: The teachers will engage in discussions, work collaboratively in breakout rooms, prepare materials together and learn from each other. Lastly, two experts reviewed the program for validation.

The goal of the online training was to familiarize the teachers with the latest ICT tools, recent methods and approaches, and how to integrate them into their lessons to keep up with the innovative pedagogical practices with the TPACK framework in mind. Theoretical knowledge was reinforced through practical applications. The online training sessions lasted eight weeks and each week a ninety-minute online training session (except Week 7) was delivered by the trainer via Zoom. Pre-training surveys assessed participants' levels and identified additional needs. They were also asked about their expectations from the training content. No additional needs were reported, so the training began. The training design is summarized in Table 2.

Participants prepared and submitted one-hour lesson plans integrating their preferred innovative teaching practices in Week 7. Finally, in Week 8, the training concluded with a one-to-one feedback and question-and-answer session facilitated by the trainer. Sessions included knowledge transfer and hands-on practice with websites, Web 2.0 tools, and AI tools/models. Lastly, this learning process was reinforced with ongoing feedback.

After the intervention, post-tests, initial interview, and follow-up interview were conducted to evaluate training effectiveness. The Kirkpatrick model (Kirkpatrick, 1998) guided training evaluation during and after implementation. The updated model is used with its four levels to evaluate implementation and design efficiency (Kirkpatrick & Kirkpatrick, 2006). For the reaction level evaluation, participants shared their feelings after each session. The teachers reported that although the training sessions took place in the evenings after work, they felt refreshed, they gained self-confidence and motivation, and they were excited to apply what they had learned. They reported transforming into lifelong learners and becoming more innovative educators. Novice participants reported growing confidence and engagement as sessions progressed. These points were also revealed in the interviews.

For the learning level, participants collaborated weekly, creating and sharing tasks using new tools. As for the behaviour level, at the end of the training the participants were asked to prepare a lesson plan by using the knowledge they acquired and submitted it to the trainer in Week 7. Trainers provided ongoing support during this process. In the end, each of them received one-to-one feedback for their lesson plans and they had a group discussion and provided peer feedback. Moreover, the initial interviews were conducted with 10 participants via Zoom in Week 8 to observe behavioural change of the participants.

Lastly, for the results level, the scales were administered as post-tests and follow-up interviews were conducted in Week 12. Direct observation was impractical with nationwide participation. Therefore, the follow-up interview was preferred as an indirect observation option. The researchers evaluated how participants transferred their understanding into their teaching to examine the long-term impact of the intervention on a small group. Thus, the 12-week online ICT program addressed all model requirements.

3.5. Data Analysis

In the analysis of the quantitative data, Wilcoxon matched-pairs signed-ranks test was performed using SPSS 22. Additionally, the effect size (r) for the Wilcoxon signed-rank test was calculated using the formula $r = Z/\sqrt{N}$.

Table 2
The Implementation Process of the Training

Week	Generative Topic	Understanding Goals	Performances of Understanding	Ongoing Assessment	Reflective Practice
Week 1	Creating Concept Maps and Mind Maps	Teachers will gain knowledge about creating Mind Maps and Concept Maps.	Creating a Mind Map of the first week's content using Padlet, Lucidchart etc. Using Canva to create a Concept Map collaboratively.	Peer feedback on maps given on discussion boards and trainer feedback. Self-assessment using a rubric.	Reflecting on how maps and Concept Maps could help students brainstorm for essays and comprehend complex topics.
Week 2	Interactive Videos, Presentations, and Images	Teachers will grasp how multimedia improves engagement and understanding for EFL learners.	Using Edpuzzle or Nearpod to create a video and presentation with embedded questions. Designing interactive images on ThingLink or Genially. Writing a script and generate a short interactive video collaboratively.	Discussion board: Sharing the materials they have designed and criticizing each other's products. Quiz on how to integrate multimedia in EFL lessons efficiently.	Reflecting on how interactive videos, presentations and images can enhance students' listening and visual comprehension skills.
Week 3	Interactive Worksheets and Games	Teachers will understand how to create engaging activities, especially for grammar and vocabulary practice.	Creating a vocabulary game by using Wordwall, Live Worksheets or Learning Apps. Using Canva to create an interactive worksheet.	Discussion board using Padlet: Peer feedback for the created games and worksheets. Trainer feedback on one of the creations of each participant.	Reflecting on how effective gamified learning and interactive worksheets are in terms of motivating students.

Table 2 continued

Week	Generative Topic	Understanding Goals	Performances of Understanding	Ongoing Assessment	Reflective Practice
Week 4	Augmented Reality, Mobile Technologies, and AI Tools	Teachers will understand how emerging technologies can transform material and lesson design in EFL lessons.	Exploring AR apps (e.g., Quiver) for language tasks. Using ChatGPT, Diffit, or MagicSchoolAI to create an activity. Planning a mobile-based activity.	Gamified quiz on using AR, AI, and mobile tools in EFL education. Sharing a material design idea on Padlet for peer review.	Reflecting on how these technologies could make EFL lessons more interactive and accessible.
Week 5	Online Assessment and Flipped Learning Model	Teachers will comprehend effective online assessment methods and the Flipped Learning Model.	Creating a short formative assessment activity using Kahoot, Quizizz, Booklet. Designing a lesson plan involving interactive videos and in-class materials collaboratively.	Peer feedback on the quality and design of the assessments. Trainer feedback on the lesson designed using flipped learning. Additionally, preparing a flipped lesson assigned as homework for the next session.	Reflecting on how flipped learning can promote self-paced learning and how online assessments can be used to measure the actual performance.
Week 6	Lesson Plan Submission and Getting Feedback	Teachers will design a flipped lesson plan and prepare all the pre-lesson and in-class materials for the design.	Submission of a flipped lesson plan incorporating at least two ICT tools learned during the training. Presenting the lesson plans to peers in breakout rooms for feedback.	Trainer feedback on lesson plans and suggestions to improve the quality of the designs. Self-reflection on the challenges faced while preparing the lesson design.	Reflecting on the impact and efficiency of lessons designed using flipped learning model and potential student performance in flipped lessons.
Week 7	Lesson plan submission				
Week 8	Feedback on lesson plans				

Note: This table summarizes the weekly instructional focus and activities implemented during the training process. Week 7 and 8 were primarily allocated for final submission and feedback.

In qualitative analysis, interview data were analyzed with content analysis described by Patton (2002). First, all interviews were transcribed. Once transcription was completed, the approximately 75 pages of data were coded by the researchers. Initial codes were generated directly from the transcripts. The coding process continued until a consensus emerged between researchers. In this phase, two independent researchers coded the data to ensure reliability. Specifically, the first 30% of the initial dataset and 30% of the follow-up dataset were coded independently by a second researcher who was not involved in the primary analysis. Miles and Huberman's (1994) formula was applied, and the researchers identified an 85% agreement rate for the initial dataset. Of 74 codes, 63 (85%) showed agreement while 11 differed. Researchers applied the same procedure to the follow-up dataset and calculated an agreement rate of 77%. Out of the 23 codes reviewed, 18 were coded consistently by both coders, while the remaining 5 codes showed differences. Codes were then grouped into related categories. After that, themes were recognized within the framework of these categories. Initial interview analysis yielded four main themes with 23 categories (247 codes). For the follow-up interviews, which were analyzed using the same process, two key themes emerged along with 8 categories and 76 codes. Furthermore, to enhance reliability, several steps such as gathering expert reviews, utilizing multiple methodological paradigms and reflecting the process in detail were adopted.

4. Findings

4.1. Quantitative Findings

The Wilcoxon matched-pairs signed-ranks test was conducted to evaluate changes in EFL teachers' TPACK competencies and innovative pedagogical practices. The findings are presented in Table 3 and Table 4.

Table 3

Wilcoxon Matched-Pairs Signed-Ranks Test Results for Pre-test and Post-test Scores of TPACK-Deep

Test Type	<i>n</i>	Mean rank	Sum of ranks	<i>z</i>	<i>p</i>
Pre-test	20	2	2	-3.848	<.001
Post-test	20	10.95	208		

According to Table 3, a significant difference in EFL teachers' TPACK competencies was found post-training [$z = -3.848$; $p < .001$]. The effect size was calculated as 0.86 by dividing the z value by the square root of N . Therefore, the finding indicates that a large effect size was found using the Cohen's criteria as .1=small effect, .3=medium effect, .5=large effect (Pallant, 2016). This suggests teachers' TPACK competencies improved significantly post-training.

Table 4

Wilcoxon Matched-Pairs Signed-Ranks Test Results for Pre-test and Post-test Scores of Innovative Pedagogical Practices

Test Type	<i>n</i>	Mean rank	Sum of ranks	<i>z</i>	<i>p</i>
Pre-test	20	9	9	-3.585	<.001
Post-test	20	10.58	201		

Table 4 shows a significant improvement in participants' innovative pedagogical practices post-training [$z = -3.585$; $p < .001$]. The effect size was calculated as 0.80 by dividing the z value by the square root of N . Therefore, the finding indicates that a large effect size was found using the Cohen's criteria as .1=small effect, .3=medium effect, .5=large effect (Pallant, 2016). This reveals that teachers' innovative pedagogical practices improved significantly post-training.

4.2. Qualitative Findings of the Initial Interviews

The initial interviews, conducted shortly after the final training session, examined Turkish EFL teachers' perceptions of innovative pedagogical practices and self-assessed competencies,

particularly through comparisons between their COVID-19 emergency remote teaching experiences and current practices. The interviews also enabled for a deeper understanding of how previous training and the current program contributed to their professional growth and instructional transformation. A thematic map of the themes, categories, and codes is presented in Table 5.

Table 5

A Thematic Map of Coding Process

<i>Themes</i>	<i>Categories</i>	<i>Codes</i>
Essential qualities of innovative teachers	Continuous professional growth, open-minded, keeping up to date, adaptive, digital competence, creative	Lifelong learner, innovative mindset, ongoing updating, flexible to change, digital fluency, problem-solving ...
Online teaching challenges	Technological incompetence, inadequacy of teachers, lack of student motivation, students' technological knowledge inadequacy, technical infrastructure problems, lack of opportunities for students	Lack of digital skills, inability to manage online classrooms, disengaged students, digital inexperience, unstable internet, unequal access...
Quality of in-service training	Inadequacies of in-service training, one-shot sessions, theoretical, unappealing, insufficient to meet their needs, lacking meaningful feedback mechanisms	Short-term training, unengaging training, irrelevant content, ignored needs, no follow-up, no feedback, lack of interaction, irrelevant examples...
Teacher transformation	Self-efficacy, self-confidence, increased motivation, transformative leaders, teaching spirit	Classroom autonomy, renewed enthusiasm, pioneering leaders, technological confidence, inspiring colleagues...

Note. Themes were generated inductively and some of the codes that reflect recurring patterns identified in the initial interviews were shown.

4.2.1. Essential qualities of innovative teachers

Regarding the teaching profession, several qualities that denote an innovative teacher were described by participants. A further recurring theme is the creation of an atmosphere in which continuous growth at the professional level is needed for innovation. For instance, Teacher 1 stated, "...I can't say that I'm done and complete. Learning is an ongoing cycle, so we need to keep improving ourselves continuously." Hence, the interviewees seem to be holding the view that innovation is not an achievement but rather a developing process that requires constant self-renewal and development. Innovation was then defined as a mindset of openness. Teacher 8 shared, "...I realized that I need to be open to different practices. It's important to offer variety for students," highlighting how flexibility and willingness to try new strategies are seen as essential for engaging diverse learners.

Adaptability was viewed as another essential quality. Some of the participants indicated the importance of keeping up with altering student demands and social changes. For example, Teacher 2 noted, "This generation is different, their needs and learning styles are diverse too. That's why we have to keep up with them. A teacher needs to be capable of adapting to various student profiles and the needs of future generations..." This is an indicator of a philosophy that teachers should develop with their students. Teacher 5 echoed this sentiment when referring to the pandemic: "...We had no choice but to learn digital tools during the pandemic, but over time, we figured out how to use them effectively. We have to adapt to the conditions we're in. Otherwise,

we'll be left behind." These accounts show that adaptability, whether by external requirement or in self-development, is what the participants consider to be a feature of innovation.

Another often mentioned dimension was innovation and creativity with the use of digital competence in instructional practices. Teacher 6 stated, "Teachers must have the features we call innovative, creative. Effective teaching requires integrating these skills into lessons using today's technology." By saying this, the participants seem to associate innovation with the use of technology not just for technology's sake but to provide a good platform for more engaging and effective learning activities. Similarly, Teacher 7 remarked, "I can define them as teachers who can teach with various appealing activities, develop new ways and embrace creativity," showing how creativity is associated with developing varied, student-centred teaching methods.

Taking all the above statements into account, some adopt the view that teaching in an innovative manner is multi-layered and has a living dimension-one that cannot be set; rather, it involves an ongoing growth, openness to new ideas, attention to students, and the use of digital and creative tools. They did not see innovation as a single skill or strategy. Instead, it was viewed as a professional stance that advanced through practice and reflection, but as a professional stance that evolves through practice and reflection.

4.2.2. Online teaching challenges

Participants detailed various challenges they faced in transitioning to online teaching; such challenges often exposed limitations in the digital competence of themselves or their students. Many teachers expressed a common realization during the COVID-19 period: they became aware that they were not well-prepared for online teaching. For instance, Teacher 10 reflected on how the inadequacy of teachers in digital pedagogy led to a lack of student motivation during online teaching, sharing: "The students were demotivated, they didn't turn on their cameras or microphones, so I wasn't even sure if I was reaching them. I didn't have enough knowledge of digital pedagogy to make my lessons engaging. If I had known then what I know now, I could have managed the process much better." This reflection indicates that the lack of training in digital pedagogy negatively affected the teacher's self-confidence, classroom management, student engagement, and motivation. Similarly, Teacher 5 reflected on his personal growth, using a before-and-after comparison to highlight how far he had come: "...If I compare myself to how I was during the pandemic, I was practically nothing back then. Now, I truly feel like I've come a long way." His remark implies that, despite the struggle, the first experience brought out positive results in terms of professional growth in digital teaching.

Besides the adaptation required for their own professional learning, participants also brought forth the challenges faced by the students. Teacher 1 commented on the assumption that students are naturally tech-savvy, stating: "I mean, students may seem like they know a lot about technology, but when it comes to using educational technology in meaningful ways, they really struggle..." This observation implies that the overall experience of students with technology does not always lead to the productive use of digital learning tools, which creates another challenge to teachers who are attempting to reach out to them online.

The role of the contextual and structural factors was also highlighted by the participants, especially in the context of the COVID-19 period which reduced the effectiveness even of the best teaching attempts. For example, Teacher 3 highlighted the digital disadvantages caused by technical infrastructure problems, particularly during the COVID-19 period, sharing: "The internet kept cutting out, and some students couldn't join the lessons at all. For those in rural areas, it was nearly impossible. That's why proper conditions are essential for effective online teaching." Likewise, Teacher 1 pointed to the lack of support in students' home environments: "It was a bit difficult for the child to install and use an application without the teacher's help. Meanwhile, some parents were indifferent, which led to adaptation issues. The teaching process was hindered by these problems." This is an indication of how lack of parental interest and access to digital technology posed serious barriers to the engagement of learners.

All in all, these reflections show that professional growth in digital pedagogy is critical, but its success largely depends on bigger factors like infrastructure, student preparedness, and parental encouragement. The participants were aware that teacher training could not be the only solution in comparing with external barriers shaping the online learning process.

4.2.3. Quality of in-service training

Participants emphasized the inadequacies of in-service training sessions they had previously attended. They pointed out that these trainings were often delivered as one-shot sessions, which they felt limited their long-term impact. Teacher 3 reflected on the contrast between previous and current training experiences, stating: "Generally, the in-service trainings we get are one-shot; not long-lasting. Maybe you will learn something, but temporarily. The difference of your training was that it was long-lasting. I think, this made the learning much more permanent. When it's longterm, inevitably, the motivation and the effect on the mind are deeper as it increases retention." In her description, she emphasizes a perceived correlation between the length of the training process and the depth of learning with the assumption that the duration and consistency of the training process contribute to greater motivation and retention.

Beyond duration, the participants also criticized the arrangement of past training sessions and the delivery style. Teacher 5 shared his views on previous in-service training sessions, describing them as too theoretical and unappealing, offering little that could be translated into actual classroom practice. He emphasized the need for more hands-on and practice-oriented experiences, stating: "The in-service training sessions are really a bit more theoretical, passive and not interactive; I generally cannot integrate them into my lessons. But after this training, I was able to apply flipped learning and the other things I learned. It changed my perspective and I improved myself professionally..." His story is a reminder of the need to have practice-based training that relates directly to the instructional situations and invites instant action.

A number of participants also pointed to the mismatch between what they really needed and what past in-service programs contained. Teacher 9 expressed frustration, stating: "They don't offer what we really need. I think Ministry of National Education [MONE] just presents whatever is already prepared. I don't think anyone really cares about what we actually need. It feels like the goal is simply to meet training quotas" This quote is representative of a more general dissatisfaction with generic top-down training methods that disregard the context and the views of the teacher. Similarly, Teacher 1 emphasized the absence of feedback, explaining: "We just watch a pre-recorded video, and that's it. There's no hands-on practice, no one checks whether we've really learned anything. So naturally, we don't know what we did right or wrong, or how we can improve. But the feedback we received from you really helped me develop." With her comment, it is possible to see how the existence of feedback and interaction during the present training helped to contribute to her feeling of professional development.

In combination, these reflections suggest that the participants strongly preferred sustained, interactive, needs-based training that involved constructive feedback. Their remarks imply that passive training formats carried out as one-shots can be of rather little use, and practical, responsive, and ongoing training might result in more interesting growth and actual classroom influence.

4.2.4. Teacher transformation

Participants illustrated how they transformed through the training, developing a stronger sense of agency and a more empowered professional identity. For example, Teacher 5 showed how the training supported himself in developing self-efficacy, noting: "...You showed us how to use applications step by step as we used them at the same time. Now, with this, I feel more efficient in my teaching. In that sense, I think it improved my self-confidence in integrating technology into my lessons." His remark highlights the importance of active engagement and real-time assistance in the development of teaching confidence in the digital world. In addition to this, Teacher 9 explained how she gained self-confidence, stating: "Before, I was passive and did not feel

confident and relied on my colleagues, but after the training, I gained autonomy and had the courage to join an eTwinning project. When asked to create a Canva poster, I confidently handled it, which boosted my self-confidence. I used to fear failure, but this training broke down those walls of self-doubt and increased my confidence in collaboration." Her experience shows how the training not only provided her with technical knowledge but also with confidence to get into professional teamwork. Increased intrinsic motivation to learn also became a common result. Teacher 2 recognised this shift in attitude, saying: "My motivation to learn has increased. I used to think, I'm doing fine with what I already know. Yet, after this training, I can say that you encouraged me and gave me the confidence to try new things." This observation indicates that the training broke a comfort zone of professional complacency and fostered an attitude to openness to development.

Some participants not only experienced personal growth but also began taking initiatives that positively influenced those around them, demonstrating qualities of transformative leaders and a strong teaching spirit. For instance, Teacher 6 reflected on a renewed passion for teaching, saying: "I decided to change my teaching approach with renewed enthusiasm, and I believe what I learned from this training will enhance the way I teach." This feeling of being renewed was followed by instances of peer influence. Teacher 9 noted: "My colleagues appreciated the practices I shared and began integrating them into their own lessons." Teacher 4 added: "Now, I'm planning to create a website to share what I've learned and hopefully inspire and support my colleagues as well." These reflections suggest a shift from personal development to a broader sense of responsibility for community impact, which implies an increase in leadership characteristics and an enhanced professional identity.

Collectively, these stories show that the training helped participants not only in developing confidence and motivation but also in adopting more empowered and innovative actions for instructional process. The change was not merely technical skill but also professional independence, a renewed sense of mission, and an interest in making a difference to the teaching profession as a whole.

4.3. Qualitative Findings of the Follow-up Interviews

A follow-up interview was conducted four weeks after the training to assess the long-term impact of the training sessions on the development of the teachers. Therefore, they were asked to reflect on their classroom performances. A thematic map of the themes, categories and codes was presented in Table 6.

Table 6

A Thematic Map of Coding Process

<i>Themes</i>	<i>Categories</i>	<i>Codes</i>
Contributions of the training	Enhanced student motivation, improved awareness, increased student performance	Fun learning, self-learning, student engagement, conscious use of tools, better instruction following, skill-based development....
Contextual constraints	Inadequate technical facilities, lack of practical application opportunities at school, student profiles, economic constraints, positive outcomes despite limited ICT	Smartboard malfunction, phone bans, low readiness, test-oriented curriculum, lack of internet, lack of sources, asynchronous use of tools....

Note. Themes were generated inductively and some of the codes that reflect recurring patterns identified in the follow-up interviews were shown.

4.3.1. Contributions of the training

Participants demonstrate how the training positively influenced their students, most notably by enhancing motivation, raising awareness, and improving overall performance. Teacher 5 shared: "Using new tools was both more fun and more motivating for them. While it is an inevitable fact that students love technology, it was also a pleasure for me to support them with such tools and improve their self-learning." His reflection reveals how the combination of technology led to achieving a more pleasant and autonomous learning process which in its turn results in student engagement.

Besides motivation, educators indicated enhancement of student and teacher awareness, especially with regard to the learning and evaluation process. Teacher 9 mentioned that the use of digital tools helped to conduct the evaluation process more easily, even in the case of younger learners: "I did not face any problem in monitoring the outputs of my students even though they are young. So, we all enjoyed the evaluation process." This suggests that digital platforms not only supported assessment but also made the process more transparent and enjoyable for both teachers and students. Similarly, Teacher 6 observed that, "The training helped me develop a better awareness of how to use technological tools more effectively and purposefully." This statement shows a transition to more purposeful, pedagogically oriented use of digital tools, which implies the growth of professional knowledge, which also influenced classroom practice.

Finally, increased student performance was another significant outcome emphasized by participants. Teacher 10 shared: "Thanks to this training, I observed that my students understood and followed the instructions better. I have seen that the four basic skills in foreign language classes could be taught more effectively with online lessons during the pandemic. I can say that this training guided me on what to do and how to do it." This report demonstrates how the improved teacher preparation resulted in the more precise instruction and more efficient learning processes, particularly in reference to language learning.

All these reflections suggest that the training generated significant ripple effects: as teachers grew more confident and competent in the process of educational technologies integration, students showed higher motivation, better understanding, and better results. The positive student outcomes mentioned by the participants are an indication of how professional development can be used to expand its influence beyond the teachers to the classroom learning environments themselves.

4.3.2. Contextual constraints

Although participants expressed strong motivation to apply what they learned, they revealed that a range of contextual challenges, such as limited resources, scheduling disruptions, and student-related factors, prevented them from sustaining what they gained through the training.

For instance, Teacher 1 mentioned inadequate technical facilities such as unexpected breaks and scheduling disruptions, saying: "Due to school breaks, and my Erasmus+ mobility, I couldn't implement the tools in to my class as I intended." Her experience illustrates how even motivated teachers may struggle to apply new methods without consistent instructional time. Likewise, Teacher 6 mentioned the lack of practical application opportunities at school, expressing: "What I learned was incredibly valuable, and I definitely wanted to put it into practice... but I didn't get the chance, because the smartboard at school wasn't working properly, and students weren't allowed to bring their phones. I couldn't find a solution." This shows that the constraints on classroom technology and restrictive policies can produce considerable barriers even where the teacher wants to be innovative.

There were issues in student-related factors in certain instances. Teachers explained that teacher and student preparedness levels, curriculum demands, and financial issues reduced their training practice abilities. For example, Teacher 7 shared, "The low readiness level of my students made it difficult to apply what I had learned." pointing to a mismatch between pedagogical intentions and learners' capacities. Similarly, Teacher 3 described the challenges of working with exam-focused

12th graders, saying, “To be honest, I did not have the opportunity to practice much. Mine were 12th grade foreign language classes. As you know, we have an exam-oriented curriculum and their focus on solving tests. What I learned is very valuable information, and I would definitely like to apply it.” This is her response concerning the way stiff curricular demands limit experimentation, especially during high-stakes exam years. In addition, Teacher 4 emphasized how economic conditions limited student participation, stating, “Some of our students couldn’t access online activities due to a lack of internet or necessary materials. Because of this, they were unable to complete the assignments I gave them.” This highlights the influence of bigger socioeconomic motives in determining the reality of technology-enhanced instruction being practical or not.

On the contrary, a few participants managed to implement what they had learned and achieved positive outcomes despite limited ICT access. For example, Teachers 2 and 10 explained how, although school policies prohibited the use of phones, they still found creative ways to integrate technology into their teaching. As Teacher 10 shared: “Our students were prohibited from using phones in school, but I introduced the applications and asked my students to use them in their performance assignments. It made the learning process more fun and motivating for them, and I truly enjoyed supporting them with these tools.” Her story shows that instructional innovation can survive in circumstances when teachers can create flexibility in the regulations. Similarly, Teacher 2 added: “...We overcame this by using asynchronous content. I also noticed that many of my students became more engaged in the course.” The focus on adaptive interventions like out-of-class tasks or content flexibility indicated in her comment may help to boost the level of student engagement even in the situation of limitation.

Collectively, these stories suggest a strong interest on part of participants to apply what they had learned, but the realities of school environments that can negatively affect sustained innovation. Most found barriers in the form of structural or contextual conditions, but some could do this translation of training into practice as they reconsidered how and when to use digital tools in the teaching process.

5. Discussion

This study examined how online ICT training affected the TPACK competencies and the use of innovative pedagogical practices among Turkish EFL teachers. In this section, the quantitative and qualitative data findings are discussed in line with relevant literature according to the sequence of research questions. As for the first and the second research questions investigating whether there is a statistically significant difference in English language teachers’ TPACK and innovative pedagogical practices before and after the trainings, the findings indicated that Turkish EFL teachers’ TPACK competencies and innovative pedagogical practices improved after the training. In line with the findings of this study, Ansyari (2015) also presented that a systematically designed PD training significantly enhanced EFL teachers’ technological integration competence and instructional practices, which led to improved TPACK skills and more effective use of digital tools in the classroom. Similarly, studies of Istiningsih (2022) and Tuzahra et al. (2021) coincided with this study and emphasized the impact of ICT training on TPACK competencies and innovative pedagogical practices of teachers. Therefore, it can be concluded that online ICT training provides valuable contribution to TPACK skills and innovative pedagogical practices of teachers, which could enhance effective instructional design within curriculum.

Considering the third research question examining the participants’ views on the impact of the training, the qualitative findings revealed that, unlike the one-shot training typically offered by the MONE, the long-term training provided in this study enabled participants to engage in hands-on practice, receive continuous feedback, reflect in depth, and learn collaboratively. These findings align with existing literature that emphasizes the importance of designing technology-based professional development programs aimed at enhancing teachers’ digital literacy, self-efficacy, and attitudes toward ICT use, while also promoting innovative pedagogies through sustained professional collaboration (Xu & Zhu, 2023; Zadtyi et al., 2021). Additionally, the study

demonstrated that practice-oriented training programs with interactive feedback and improvement mechanisms are effective in fostering teachers' individual and professional development. This finding aligns with Fragkoulis et al. (2019), who stated that effective training programs focused on innovative teaching practices intended for English teachers significantly enhance the quality of teaching. However, Yurtseven Yılmaz and Sever (2021) underlined that while MONE's training programs in Türkiye seem to be well-designed in theory, they function inadequately in practice. This issue was highlighted by most of the participants in this study, who pointed out a similar gap between design and impact of professional development activities.

Additionally, the participants indicated that during the COVID-19 era, they felt inadequate in integrating technology into education and expressed a need for renewal following theoretical training. However, through their engagement in this study's interactive learning with peers from across Türkiye, they transformed into more autonomous, motivated, and self-confident individuals. In line with this, Zhou et al. (2022) emphasized the powerful impact of professional development on EFL teachers' teaching skills and self-perceived capabilities. This study highlights the importance of collaboration among colleagues from diverse backgrounds in forming an interactive learning community that fosters both professional and personal development, including greater self-efficacy. In this regard, Xu and Zhu (2023) and Zhang (2023) noted that teachers who engage in enriched professional learning communities with colleagues outside their schools not only contribute to their self-efficacy and professional development but also utilize ICT effectively. Similarly, Andayani et al. (2020) stated that creating innovative educational environments in schools influences teachers' use of techno-pedagogical practices and enhances their self-efficacy. This study shows that as teachers developed new skills, being part of a supportive and interactive learning community played a key role in their growth. Working closely with colleagues from different backgrounds helped them not only improve professionally but also feel more motivated and connected in their teaching.

The findings suggest that the training fostered key outcomes such as confidence, creativity, and a willingness to reinforce innovation among teachers. However, regarding the fourth research question investigating to what extent teachers' teaching practices have transformed in the post-training process, the follow-up findings point to a persistent gap between professional growth and classroom implementation. This disconnect suggests that the effectiveness of long-term professional development programs is influenced not only by the quality of both content and duration, but also by the presence of sustained institutional support and supportive conditions that enable teachers to transfer newly acquired knowledge into instructional practice.

Although the participants initially demonstrated a strong willingness to integrate innovative teaching methods into their instructional practices, this motivation remained largely theoretical and failed to materialize in sustained classroom implementation over time. These constraints should be understood as institutional limitations that undermine professional development outcomes. For example, even the most enthusiastic teachers, such as those who felt inspired to launch projects or design online tasks, were forced to revert to traditional methods when faced with incompatible school contexts. This tendency to regress to familiar routines may stem not only from contextual barriers but also from limited peer modelling, a standardized curriculum, and restrictive school culture. Consistent with these findings, Lawrence (2022) and Maja (2023) emphasized that maintaining teachers' innovative skills in using educational technologies depends not only on self-efficacy and awareness of TPACK but also on institutional factors, including financial and emotional support, technological facilities, and accessibility provided in their schools. The findings are also supported by Admiraal et al. (2021), who argue that sustainable professional development is only possible when schools are structurally aligned with collaborative and interactive learning principles. To facilitate lasting instructional change, professional development must be supported by ongoing mentorship, institutional encouragement for cooperative and school-wide efforts that embed innovation into the broader teaching culture, rather than treating it as an isolated outcome of individual initiative.

All in all, the findings of this study revealed that even though the teachers were eager to apply these innovative teaching practices, they gave up because of both technical and contextual barriers. These included inadequate infrastructure, student absences during the second semester due to exam preparation, and restrictions on phone usage in schools. These findings highlight how external factors beyond teachers' control can significantly hinder the implementation of innovative practices, despite their initial enthusiasm and commitment. In this respect, the literature shows that contextual barriers, lack of technological infrastructure, and accessibility issues pose significant challenges to sustaining the use of educational technologies (Ngodu et al., 2024; Zadtyi et al., 2021). This indicates that training programs or technological resources alone are insufficient for teachers to effectively integrate educational technologies into their instructional practices and sustain their knowledge and skills. To overcome such persistent barriers, teachers must not only adapt their practices creatively within existing constraints but also actively engage in dialogue with school administration to advocate for structural changes that support sustainable innovation.

6. Conclusion

This study revealed an improvement in the participants' personal and professional skills after the training they received. Due to inadequate prior remote teaching experience, participants felt self-conscious about integrating technology into their lessons. However, it was observed that after they experienced practical, interactive, and long-lasting training that built on their initial theoretical knowledge, the ICT training led to significant improvements. Teachers became more motivated and self-confident in integrating ICT into their teaching. Despite these positive changes, many teachers faced contextual challenges that led them to return to traditional teaching methods. These challenges included limited technical resources, school restrictions, and students' digital skills and engagement levels, which hindered their ability to fully implement the innovative practices they had learned. This indicates that besides the teachers' technological awareness and practical knowledge, institutional support mechanisms are crucial in sustaining teachers' improvements.

7. Implications

The findings of this study highlight the critical need for long-term, continuous, and practice-based training to support teachers' TPACK development and innovative pedagogical practices. Taking this into consideration, it is recommended for policy to design long-term, mentor-based training sessions with feedback and especially creating a community of practice as it is vital for enhancing teachers' innovative teaching practices and make the impacts of such training programs more effective. Incentive mechanisms should be created to enable teachers to participate in practical workshops where they can share their experiences with each other and showcase their best practices. Furthermore, professional development programs should be designed with sensitivity to real-world classroom constraints, providing teachers with adaptable strategies suited to low-resource environments and time-restricted conditions. In addition, fostering teacher leadership and advocacy through structured feedback mechanisms can help ensure that school administrators remain informed about classroom realities and work collaboratively with teachers to cultivate supportive conditions for sustained pedagogical innovation.

It is recommended that future research conduct action research to examine the factors that hinder teachers' professional growth. Moreover, reaching out to larger groups with professional development programs customized in accordance with the needs of participants and extending such research to international contexts will contribute to a deeper understanding of this issue. Overall, more practice-based studies are recommended in the literature to further investigate effective professional development strategies.

8. Limitations

The present study has several limitations, including the selection of participants on a voluntary basis, a limited number of participants, chosen to allow for individual feedback, and the inclusion of teachers from across Türkiye without the use of a control and experimental group for comparison. The literature suggests conducting mixed-method studies on the effectiveness of integrating technology into the teaching process (Fragkoulis et al., 2019). In addition, Boeve-de Pauw et al. (2022) recommend designing long-term training programs instead of one-shot training sessions, emphasizing the importance of addressing school-specific contexts and collaborating with stakeholders to support teachers' professional development. Despite these limitations, this study contributes meaningfully to the literature.

Author contribution: Ezgi Aydemir Altaş: Conceptualization, Methodology, Investigation, Formal analysis, Validation, Writing – original draft. Tuğba Babacan: Conceptualization, Methodology, Investigation, Formal analysis, Validation, Writing – review & editing.

Data availability: The data gathered and analyzed during this study is restricted publicly; yet can be made available upon request.

Declaration of interest: The authors declare no competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Ethical declaration: Ethical approval was obtained from the Ethical Committee of Yıldız Technical University, Türkiye on 03.05.2023 (Ref. No. 2023.05. Informed consent forms were distributed to the participants, and their approvals were formally obtained throughout the study.

Funding: No funding was obtained for this study.

References

- Abbas, A., Hosseini, S., Núñez, J. L. M., & Sastre Merino, S. (2021). Emerging technologies in education for innovative pedagogies and competency development. *Australasian Journal of Educational Technology*, 37(5), 1–5. <https://doi.org/10.14742/ajet.7680>
- Abdel Latif, M. M. (2022). Coping with COVID-19-related online English teaching challenges: Teacher educators' suggestions. *ELT Journal*, 76(1), 20–33. <https://doi.org/10.1093/elt/ccab074>
- Admiraal, W., Schenke, W., De Jong, L., Emmelot, Y., & Sligte, H. (2021). Schools as professional learning communities: What can schools do to support professional development of their teachers? *Professional Development in Education*, 47(4), 684–698. <https://doi.org/10.1080/19415257.2019.1665573>
- Amirian, S. M. R., Moghadam, R. G., & Nafchi, A. M. (2016). Evaluation of EFL teachers opinions about online in-service teacher training programs in Iran. *International Journal of Humanities and Cultural Studies*, 2(4), 124–143.
- Ampa, A. T., & Nurqalbi, N. (2021). Innovative learning strategies to increase students' participation and quality of English teaching and learning process. *Technium Social Sciences Journal*, 26, 314–325. <https://doi.org/10.47577/tssj.v26i1.5195>
- Andyani, H., Setyosari, P., Wiyono, B., & Djatmika, E. (2020). Does technological pedagogical content knowledge impact on the use of ICT in pedagogy? *International Journal of Emerging Technologies in Learning*, 15(3), 126–139. <https://doi.org/10.3991/ijet.v15i03.11690>
- Ansyari, M. F. (2015). Designing and evaluating a professional development programme for basic technology integration in English as a foreign language (EFL) classrooms. *Australasian Journal of Educational Technology*, 31(6), 699–712. <https://doi.org/10.14742/ajet.1675>
- Arhin, J., Bayucca, S. A., & Ofori-Dwumfuo, G. (2025). Teachers' ICT attitudes as a mediator of the relationship between ICT integration and students' mathematics achievement. *Journal of Pedagogical Sociology and Psychology*. Advance online publication. <https://doi.org/10.33902/jpsp.202530649>
- Arslan, A. (2020). Reliability and validity of instruments measuring English teachers' TPACK. *International Journal of Assessment Tools in Education*, 7(3), 343–360. <https://doi.org/10.21449/ijate.679876>

- Atmojo, A. E. P. (2021). EFL teachers' online teacher professional development experiences amidst the COVID-19 pandemic: Practices and perceptions. *Englisia: Journal of Language, Education, and Humanities*, 9(1), 1-18. <https://doi.org/10.22373/ej.v9i1.9127>
- Atmojo, A. E. P., & Nugroho, A. (2020). EFL classes must go online! teaching activities and challenges during COVID-19 pandemic in Indonesia. *Register Journal*, 13(1), 49-76. <https://doi.org/10.18326/rjt.v13i1.49-76>
- Bajracharya, J. R. (2021). Technology integration models and frameworks in teaching and training. *Journal of Training and Development*, 6(1), 3-11. <https://doi.org/10.3126/jtd.v6i01.41674>
- Bilbao, N., Garay, U., Romero, A., & López de la Serna, A. (2021). The European competency and the teaching for understanding frameworks: Creating synergies in the context of initial teacher training in higher education. *Sustainability*, 13(4), 1810. <https://doi.org/10.3390/su13041810>
- Bizami, N. A., Tasir, Z., & Kew, S. N. (2023). Innovative pedagogical principles and technological tools capabilities for immersive blended learning: A systematic literature review. *Education and Information Technologies*, 28(2), 1373-1425. <https://doi.org/10.1007/s10639-022-11243-w>
- Boeve de Pauw, J., Olsson, D., Berglund, T., & Gericke, N. (2022). Teachers' ESD self-efficacy and practices: A longitudinal study on the impact of teacher professional development. *Environmental Education Research*, 28(6), 867-885. <https://doi.org/10.1080/13504622.2022.2042206>
- Botuzova, Y., Iievliev, O., Okipniak, I., Yandola, K., & Charkina, T. (2023). Innovative approaches to assessment in pedagogical practice: New technologies, methods and development of objective assessment tools. *Brazilian Journal of Education, Technology and Society*, 16(2), 386-398. <https://doi.org/10.14571/brajets.v16.n2.386-398>
- Brewer, E. W. (2011). Evaluation models for evaluating educational programs. In H. B. Longenecker & J. P. Cummings (Eds.), *Assessing and evaluating adult learning in career and technical education* (pp. 106-126). IGI Global.
- Budianto, L., Arifani, Y., Wardhono, A., & Poedjiastutie, D. (2023). The TPACK level of in-service EFL teacher online professional training: The perspectives of teachers, students, and trainers. *Journal of Digital Learning in Teacher Education*, 39(2), 87-101. <https://doi.org/10.1080/21532974.2023.2167024>
- Bustamante, C. (2019). TPACK and teachers of Spanish: Development of a theory-based joint display in a mixed methods research case study. *Journal of Mixed Methods Research*, 13(2), 163-178. <https://doi.org/10.1177/1558689817712119>
- Caromawati, C. (2017). Evaluating a synchronous online teacher development program on creating CALL teaching materials. *Indonesian EFL Journal*, 3(2), 159-170. <https://doi.org/10.25134/ieflj.v3i2.663>
- Chen, J., Li, D., & Xu, J. (2022). Sustainable development of EFL teachers' technological pedagogical content knowledge (TPACK) situated in multiple learning activity systems. *Sustainability*, 14(14), 8934. <https://doi.org/10.3390/su14148934>
- Choi, B., & Young, M. F. (2021). TPACK-L: Teachers' pedagogical design thinking for the wise integration of technology. *Technology, Pedagogy and Education*, 30(2), 217-234. <https://doi.org/10.1080/1475939X.2021.1906312>
- Civelek, M., Toplu, I., & Uzun, L. (2021). Turkish EFL teachers' attitudes towards online instruction throughout the COVID-19 outbreak. *English Language Teaching Educational Journal*, 4(2), 87-98. <https://doi.org/10.12928/eltej.v4i2.3964>
- Creswell, J. W., & Creswell, J. D. (2023). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage.
- Cukurova, M., & Miao, F. (2024). *AI competency framework for teachers*. UNESCO Publishing. <https://doi.org/10.54675/ZJTE2084>
- Darling Hammond, L., Burns, D., Campbell, C., Goodwin, A. L., Hammerness, K., Low, E. L., McIntyre, A., Sato, M., & Zeichner, K. (2017). *Empowered educators: how high-performing systems shape teaching quality around the world*. Wiley.
- Demir, K., & Akpınar, E. (2018). The effect of mobile learning applications on students' academic achievement and attitudes toward mobile learning. *Malaysian Online Journal of Educational Technology*, 6(2), 48-59. <http://dx.doi.org/10.17220/mojet.2018.04.004>
- Doğrul, H., Gülle, A., & Akay, C. (2022). Determining teacher's needs for in-service teacher training in Turkey: a meta synthesis study (2011-2020). *Journal of Kesit Academy*, 8(30), 157-180. <https://doi.org/10.29228/kesit.54915>
- Eradze, M., De Martino, D., Tinterri, A., Albó, L., Bardone, E., Sunar, A. S., & Dipace, A. (2023). After the pandemic: Teacher professional development for the digital educational innovation. *Education Sciences*, 13(5), 432. <https://doi.org/10.3390/educsci13050432>

- Eraslan, A. (2021). English language teaching and learning during COVID-19: A global perspective on the first year. *Journal of Educational Technology & Online Learning*, 4(2), 349–367. <https://doi.org/10.31681/jetol.907757>
- Farhadi, S., & Öztürk, G. (2023). Technological pedagogical content knowledge (TPACK) level and needs of pre-service English as a foreign language (EFL) teachers: Evidence from Turkey. *Revista Educación*, 47(1), 187–203. <http://dx.doi.org/10.15517/revedu.v47i1.51920>
- Fragkoulis, I., Valkanos, E., & Keramida, A. (2019). English teachers' views and attitudes toward training programmes in innovative teaching practices and ICT: An empirical research. *International Journal of Sciences*, 8(2), 25–31. <https://doi.org/10.18483/ijSci.1894>
- Hsu, C. Y., Liang, J. C., Chuang, T. Y., Chai, C. S., & Tsai, C. C. (2020). Probing in-service elementary school teachers' perceptions of TPACK for games, attitudes towards games, and actual teaching usage: A study of their structural models and teaching experiences. *Educational Studies*, 47(6), 734–750. <https://doi.org/10.1080/03055698.2020.1729099>
- Huang, F., Teo, T., & Guo, J. (2021). Understanding English teachers' non-volitional use of online teaching: A Chinese study. *System*, 101, 102574. <https://doi.org/10.1016/j.system.2021.102574>
- Ilahude, F. F., Inawati, I., & Pratolo, B. W. (2023). Teachers' TPACK development in English language teaching: A systematic review. *Premise: Journal of English Education and Applied Linguistics*, 12(3), 911–934. <https://doi.org/10.24127/pj.v12i3.7429>
- Irgashevich, D. A. (2020). Methods of using cloud technologies in Islamic education institutions. *Methods*, 7(5), 89–98.
- Istiningsih, I. (2022). Impact of ICT integration on the development of vocational high school teacher TPACK in the digital age 4.0. *World Journal on Educational Technology: Current Issues*, 14(1), 103–116. <https://doi.org/10.18844/wjet.v14i1.6642>
- Jati, A. G. (2023). MOOC as a technology-focused TPD for EFL teachers in Indonesia. *Indonesian Journal of Applied Linguistics*, 13(2), 270–282. <https://doi.org/10.17509/ijal.v13i2.63067>
- Kabakçı Yurdakul, I., Odabaşı, H. F., Kılıçer, K., Çoklar, A. N., Birinci, G., & Kurt, A. A. (2012). The development, validity and reliability of TPACK-deep: A technological pedagogical content knowledge scale. *Computers & Education*, 58(3), 964–977. <https://doi.org/10.1016/j.compedu.2011.10.012>
- Kaliappen, N., Ismail, W. N. A., Ghani, A. B. A., & Sulisworo, D. (2021). Wizer.me and Socrative as innovative teaching method tools: Integrating TPACK and social learning theory. *International Journal of Evaluation and Research in Education*, 10(3), 1028–1037. <https://doi.org/10.11591/ijere.v10i3.21744>
- Karimi, M. N. (2011). The effects of professional development initiatives on EFL teachers' degree of self-efficacy. *Australian Journal of Teacher Education*, 36(6), 50–62. <https://doi.org/10.14221/ajte.2011v36n6.4>
- Kavitha, D., & Anitha, D. (2025). TPACK based blended learning model to improve engineering graduate attributes—A case study with Kirkpatrick evaluation. *Journal of Applied Research in Higher Education*, 17(1), 421–438. <https://doi.org/10.1108/JARHE-08-2023-0340>
- Kirkpatrick, D. L. (1998). The four levels of evaluation. In C. J. Bean (Ed.), *Evaluating corporate training: Models and issues* (pp. 95–112). Berrett-Koehler.
- Kirkpatrick, D., & Kirkpatrick, J. (2006). *Evaluating training programs: The four levels*. Berrett-Koehler.
- Kivunja, C. (2015). Teaching for understanding: Spotlighting the Blythe and Associates pedagogical model. *Cultural and Pedagogical Inquiry*, 7(1), 84–99.
- Koçoğlu, Z. (2009). Exploring the technological pedagogical content knowledge of pre-service teachers in language education. *Procedia-Social and Behavioral Sciences*, 1(1), 2734–2737. <https://doi.org/10.1016/j.sbspro.2009.01.485>
- Köpsén, S., & Andersson, P. (2015). Reformation of VET and demands on teachers' subject knowledge: Swedish vocational teachers' recurrent participation in a national CPD initiative. *Journal of Education and Work*, 30(1), 69–83. <https://doi.org/10.1080/13639080.2015.1119259>
- Kurt, G., Mishra, P., & Kocoglu, Z. (2013). Technological pedagogical content knowledge development of Turkish pre-service teachers of English. In R. McBride & M. Searson (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference* (pp. 5073–5077). AACE.
- Kusuma, I. P. I. (2022). How does a TPACK-related program support EFL pre-service teachers' flipped classroom? *LEARN Journal: Language Education and Acquisition Research Network*, 15(2), 300–325.
- Lai, C., Wang, Q., & Huang, X. (2022). The differential interplay of TPACK, teacher beliefs, school culture and professional development with the nature of in-service EFL teachers' technology adoption. *British Journal of Educational Technology*, 53(5), 1389–1411. <https://doi.org/10.1111/bjet.13200>

- Lawrence, J. E. (2022). The strategic drivers influencing teachers' integration of ICT in teaching and learning environment. *The Educational Review*, 6(7), 300–311. <https://doi.org/10.26855/er.2022.07.004>
- Looney, J. W. (2009). *Assessment and innovation in education* (OECD Education Working Papers No. 24). OECD. <https://doi.org/10.1787/19939019>
- Luo, S., & Zou, D. (2024). A systematic review of research on technological, pedagogical, and content knowledge (TPACK) for online teaching in the humanities. *Journal of Research on Technology in Education*, 56(3), 332–346. <https://doi.org/10.1080/15391523.2022.2139026>
- Mahdi, O. R., Nassar, I. A., & Almuslamani, H. A. I. (2020). The role of using case studies method in improving students' critical thinking skills in higher education. *International Journal of Higher Education*, 9(2), 297–308. <https://doi.org/10.5430/ijhe.v9n2p297>
- Mahmoodi, M., Rashtchi, M., & Abbasian, G. R. (2019). Evaluation of in-service teacher training program in Iran: Focus on the Kirkpatrick model. *Education and Self Development*, 14(4), 20–38. <https://doi.org/10.26907/esd14.4.03>
- Maja, M. (2023). Using ICT-based pedagogy to teach English first additional language during the COVID-19 pandemic: A rural case study. *Teacher Education through Flexible Learning in Africa*, 4(1), 1–27. <https://doi.org/10.35293/tetfle.v4i1.4185>
- Manso, M., Garzón, M., Rodríguez, C., & Pérez, P. (2011). Digital educational contents that promote the effective integration of information and communication technologies. *Digital Education Review*, 19, 56–67.
- Masry Herzallah, A. (2025). TPACK, technological self-efficacy, gender, and online teaching effectiveness: Insights from the COVID-19 crisis. *Humanities and Social Sciences Communications*, 12(1), 1–9. <https://doi.org/10.1057/s41599-025-04546-z>
- Meyer, A., Kleinknecht, M., & Richter, D. (2023). What makes online professional development effective? The effect of quality characteristics on teachers' satisfaction and changes in their professional practices. *Computers & Education*, 200, 104805. <https://doi.org/10.1016/j.compedu.2023.104805>
- Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. Sage.
- Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, 108(6), 1017–1054. <https://doi.org/10.1111/j.1467-9620.2006.00684.x>
- Mishra, P., & Koehler, M. J. (2008, March). *Introducing technological pedagogical content knowledge* [Paper presentation]. Annual Meeting of the American Educational Research Association, New York.
- Nancy, W., Parimala, A., & Livingston, L. M. (2020). Advanced teaching pedagogy as innovative approach in modern education system. *Procedia Computer Science*, 172, 382–388. <https://doi.org/10.1016/j.procs.2020.05.059>
- Nazari, N., Nafissi, Z., Estaji, M., & Marandi, S. S. (2019). Evaluating novice and experienced EFL teachers' perceived TPACK for their professional development. *Cogent Education*, 6(1), 1632010. <https://doi.org/10.1080/2331186X.2019.1632010>
- Ngodu, A., Ndibalema, P. M., & William, F. (2024). Context-relevant strategies for ICT integration in teaching and learning science subjects in Tanzania secondary schools. *Educational Technology Quarterly*, 2024(1), 20–37. <https://doi.org/10.55056/etq.704>
- Ojong, A. S., & Addo, E. H. (2024). Innovative pedagogical strategies: Fostering inclusion and motivation in the ESL classroom. *International Journal of English Language Studies*, 6(2), 177–187. <https://doi.org/10.32996/ijels.2024.6.2.26>
- Okolie, U. C., Igwe, P. A., Mong, I. K., Nwosu, H. E., Kanu, C., & Ojemuyide, C. C. (2021). Enhancing students' critical thinking skills through engagement with innovative pedagogical practices in Global South. *Higher Education Research & Development*, 41(4), 1184–1198. <https://doi.org/10.1080/07294360.2021.1896482>
- Omeh, C. B., Odelewe, C. J., & Nwangwu, E. C. (2022). Impact of teaching computer programming using innovative pedagogy embedded with live online lectures and related tools: A randomized control trial. *Computer Applications in Engineering Education*, 30(5), 1390–1405. <https://doi.org/10.1002/cae.22527>
- Orhak, S. (2023). *A Kirkpatrick model perspective on the transformative power of the Digital Teachers Project* (Publication no. 834777) [Master's thesis, Middle East Technical University]. Council of Higher Education Thesis Center.
- Pallant, J. (2016). *SPSS survival manual: A step-by-step guide to data analysis using IBM SPSS* (6th ed.). Allen & Unwin.
- Pathirana, A., & Karunaratne, T. (2023). Teachers' agency in technology for education in pre- and post-COVID-19 periods: A systematic literature review. *Education Sciences*, 13(9), 917. <https://doi.org/10.3390/educsci13090917>

- Perkins, D., & Blythe, T. (1994). Putting understanding up front. *Educational Leadership*, 51(5), 4-7.
- Perry, E. (2023). Teacher professional development in changing circumstances: The impact of COVID-19 on schools' approaches to professional development. *Education Sciences*, 13(1), 48. <https://doi.org/10.3390/educsci13010048>
- Philipsen, B., Tondeur, J., Blicek, Y., & Vanslambrouck, S. (2023). Teacher professional development for online teaching: An update of insights stemming from contemporary research. In J.M. Spector, B.B. Lockee, & M. D. Childress (Eds.), *Learning, design, and technology: An international compendium of theory, research, practice, and policy* (pp. 527-554). Springer. https://doi.org/10.1007/978-3-319-17461-7_167
- Powell, C. G., & Bodur, Y. (2019). Teachers' perceptions of an online professional development experience: Implications for a design and implementation framework. *Teaching and Teacher Education*, 77, 19-30. <https://doi.org/10.1016/j.tate.2018.09.004>
- Quyen, P. T. (2022). An investigation into EFL teachers' application of TPACK: Insights within a high school context of a city in Vietnam. *International Journal of Science and Management Studies*, 5(5), 301-322. <https://doi.org/10.51386/25815946/ijsms-v5i5p125>
- Rolf, E., Knutsson, O., & Ramberg, R. (2019). An analysis of digital competence as expressed in design patterns for technology use in teaching. *British Journal of Educational Technology*, 50(6), 3361-3375. <https://doi.org/10.1111/bjet.12739>
- Ronzhina, N., Kondyurina, I., Voronina, A., Igishev, K., & Loginova, N. (2021). Digitalization of modern education: Problems and solutions. *International Journal of Emerging Technologies in Learning*, 16(4), 122-135. <https://doi.org/10.3991/ijet.v16i04.18203>
- Santagata, R., Villavicencio, A., Wegemer, C. M., Cawelti, L., & Gatlin-Nash, B. (2024). "I have been pushed outside of my comfort zone and have grown as a result": Teacher professional learning and innovation during the pandemic. *Journal of Educational Change*, 25(4), 699-726. <https://doi.org/10.1007/s10833-023-09491-9>
- Sefer, A., & Demirel, M. V. (2022). Online in-service teacher training: Perspectives of Turkish L2 lecturers. *International Online Journal of Educational Sciences*, 14(2), 419-431. <https://doi.org/10.15345/iojes.2022.02.010>
- Shagrir, L. (2010). Professional development of novice teacher educators: Professional self, interpersonal relations and teaching skills. *Professional Development in Education*, 36(1-2), 45-60. <https://doi.org/10.1080/19415250903454809>
- Shaharabani, Y. F., & Faiger, H. (2017). Teaching for understanding in an academic course: Experienced lecturer's challenges and benefits. In L. Gómez Chova, A. López Martínez, & I. Candel Torres (Eds.), *Proceedings of the 10th annual International Conference of Education, Research and Innovation* (pp. 4881-4884). IATED. <https://doi.org/10.21125/iceri.2017>
- Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15(2), 4-14.
- Sing, L. P., Din, W. A., Mohamed, N. Z. N., & Swanto, S. (2021). Current trends in TPACK research in English language education: A systematic review of literature from 2017 to 2021. *International Journal of Education, Psychology and Counseling*, 6(43), 219-234. <https://doi.org/10.35631/IJEP.748015>
- Smidt, A., Balandin, S., Sigafoos, J., & Reed, V. A. (2009). The Kirkpatrick model: A useful tool for evaluating training outcomes. *Journal of Intellectual and Developmental Disability*, 34(3), 266-274. <https://doi.org/10.1080/13668250903093125>
- Stockwell, G., & Wang, Y. (2023). Exploring the challenges of technology in language teaching in the aftermath of the pandemic. *RELC Journal*, 54(2), 474-482. <https://doi.org/10.1177/00336882231168438>
- Suyo Vega, J. A., Fernández Bedoya, V. H., & Meneses La Riva, M. E. (2024). Beyond traditional teaching: A systematic review of innovative pedagogical practices in higher education. *F1000Research*, 13(22), 1-28. <https://doi.org/10.12688/f1000research.143392.2>
- Süer, S., & Oral, B. (2021). Innovative pedagogical practices scale for teachers: A study of validity and reliability. *Mersin University Journal of the Faculty of Education*, 17(1), 132-147. <https://doi.org/10.17860/mersinefd.694938>
- Şahin, H., & Aykaç, N. (2022). Evaluation of foreign language teachers' opinions about the problems experienced in distance education during the COVID-19 pandemic. *Journal of Education*, 12(2), 1087-1105. <https://doi.org/10.24315/tred.1005966>
- Tapalova, O., & Zhiyenbayeva, N. (2022). Artificial intelligence in education: AIED for personalised learning pathways. *Electronic Journal of e-Learning*, 20(5), 639-653. <https://doi.org/10.34190/ejel.20.5.2597>

- Tseng, J. J., Chai, C. S., Tan, L., & Park, M. (2022). A critical review of research on technological pedagogical and content knowledge (TPACK) in language teaching. *Computer Assisted Language Learning*, 35(4), 948–971. <https://doi.org/10.1080/09588221.2020.1868531>
- Tseng, J. J., Cheng, Y. S., & Yeh, H. N. (2019). How pre-service English teachers enact TPACK in the context of web-conferencing teaching: A design thinking approach. *Computers & Education*, 128, 171–182. <https://doi.org/10.1016/j.compedu.2018.09.022>
- Tuzahra, F., Sofendi, S., & Vianty, M. (2021). Technology integration of the in-service EFL teachers: A study at a teacher profession education program. *Indonesian Journal of EFL and Linguistics*, 6(1), 317–339. <https://doi.org/10.21462/ijefl.v6i1.396>
- Tümen Akyıldız, S. (2020). EFL teachers' views on the pandemic distance education (a focus group discussion). *RumeliDE Journal of Language and Literature Studies*, 21, 679–696. <https://doi.org/10.29000/rumelide.835811>
- Tümen Akyıldız, S., & Şahin, F. (2024). Voices from the classroom: Integrating 21st century skills in Turkish private school EFL education—A qualitative perspective. *International Journal of Current Approaches in Language, Education and Social Sciences*, 6(2), 178–210. <https://doi.org/10.35452/caless.1523283>
- Van der Pers, M., & Helms-Lorenz, M. (2021). The influence of school context factors on the induction support as perceived by newly qualified teachers. *Frontiers in Education*, 6, 744347. <https://doi.org/10.3389/feduc.2021.744347>
- Vásconez Paredes, C.D., & Inga, E.M. (2021). The TPACK learning model and its impact on educational innovation from a bibliometric analysis. *INNOVA Research Journal*, 6(3), 79–97. <https://doi.org/10.33890/innova.v6.n3.2021.1773>
- Wiske, M. S., Franz, K. R., & Breit, L. (2005). *Teaching for understanding with technology*. Wiley.
- Wu, B., Hu, Y., Gu, X., & Lim, C. P. (2016). Professional development of new higher education teachers with information and communication technology in Shanghai: A Kirkpatrick's evaluation approach. *Journal of Educational Computing Research*, 54(4), 531–562. <https://doi.org/10.1177/0735633116636719>
- Xu, J., & Zhu, Y. (2023). Factors influencing the use of ICT to support students' self-regulated learning in digital environment: The role of teachers in lower secondary education of Shanghai, China. *Psychology in the Schools*, 60(11), 4312–4331. <https://doi.org/10.1002/pits.22938>
- Yáñez, C., Okada, A., & Palau, R. (2015). New learning scenarios for the 21st century related to education, culture and technology. *International Journal of Educational Technology in Higher Education*, 12(2), 87–102. <https://doi.org/10.7238/rusc.v12i2.2454>
- Yurtseven Yılmaz, H., & Sever, S. (2021). A professional development analysis for Turkish language teachers: What did they expect? What have they found? *Journal of Pedagogical Research*, 5(1), 88–113. <https://doi.org/10.33902/JPR.2021067243>
- Zadtyi, H., Petrus, I., & Vianty, M. (2021). EFL teachers' capability and barriers in using information and communication technology (ICT). *English Review: Journal of English Education*, 10(1), 213–222. <https://doi.org/10.25134/erjee.v10i1.5385>
- Zhang, B. (2023). The connotation and construction paths of novice college English teachers' professional identity development. *Open Journal of Modern Linguistics*, 13(5), 692–710. <https://doi.org/10.4236/ojml.2023.135041>
- Zhang, S., Shi, Q., & Lin, E. (2019). Professional development needs, support, and barriers: TALIS US new and veteran teachers' perspectives. *Professional development in Education*, 46(3), 440–453. <https://doi.org/10.1080/19415257.2019.1614967>
- Zhang, W. (2022). The role of technology-based education and teacher professional development in English as a foreign language classes. *Frontiers in Psychology*, 13, 910315. <https://doi.org/10.3389/fpsyg.2022.910315>
- Zhou, X., Padron, Y., & Waxman, H. (2022). Exploring the relationship between professional development experience and skills in educational technology integration among primary EFL teachers. *Contemporary Educational Technology*, 14(1), ep328. <https://doi.org/10.30935/cedtech/11365>
- Zou, D., & Wang, Y. (2024). EFL teachers in the digital era: A journey of adaptation. *OALib*, 11(4), 1–12. <https://doi.org/10.4236/oalib.1111434>