



## Exploring the Impact of TPACK-based Teacher Professional Development (TPD) Program on EFL Teachers' TPACK Confidence and Beliefs

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This research explicates the impacts of the English as Foreign Language (EFL) Teacher Professional Development (TPD) program for fostering EFL teachers' technological, pedagogical, and content knowledge (TPACK) competence. The TPD program included the scaffolding framework, co-designing lessons, reviewing lessons with peers and researchers, and implementing TPACK in a real classroom. This case study examines data from EFL teachers' diaries and interviews to explore the impacts of TPACK-based TPD on EFL teachers' confidence and beliefs about technology integration. Two main findings indicate: (1) TPACK-based TPD program provided positive impacts on EFL teachers' confidence and beliefs; (2) most EFL teachers developed their confidence and beliefs about TPACK during the lesson enactment in the real classrooms mainly influenced by their personal, vicarious, social, and cultural experiences. This study provides implications for TPD programs, school stakeholders, and EFL teachers' community in developing EFL teachers' confidence and beliefs in teaching supported by the TPACK framework.

Studi ini memaparkan dampak dari program pengembangan profesionalitas guru (TPD) bagi guru Bahasa Inggris untuk meningkatkan kompetensi pengetahuan teknologi, pedagogi, dan konten (TPACK) guru bahasa Inggris. Program ini meliputi kerangka kerja, peninjauan pelajaran bersama rekan dan peneliti, dan menerapkan kerangka TPACK di dalam kelas masing-masing guru. Studi kasus ini meneliti data dari harian/diari guru bahasa Inggris dan sesi wawancara untuk mengeksplorasi dampak program tersebut pada kepercayaan dan keyakinan guru dalam mengintegrasikan teknologi. Studi ini menemukan dua temuan utama, yaitu: (1) program TPD yang berbasis pada kerangka TPACK memberikan dampak positif terhadap kepercayaan dan keyakinan guru bahasa Inggris; (2) Kepercayaan dan keyakinan guru bahasa Inggris tentang TPACK meningkat selama penerapan kerangka tersebut di dalam kelas yang mana hal tersebut dipengaruhi oleh pengalaman pribadi, pengalaman berkolaborasi dengan rekan, dan pengalaman terkait sosial-budaya mereka. Studi ini menyarankan agar program-



program TPD, pemangku sekolah, dan komunitas guru bahasa Inggris dapat meningkatkan kepercayaan dan keyakinan guru bahasa Inggris dalam mengajar berbasis kerangka TPACK.

**Keywords:** Belief, confidence, Indonesian EFL teacher, TPACK, TPD

## Introduction

In technology-enhanced classrooms, teachers are challenged to adopt different digital tools to facilitate their teaching practices and to optimize students' learning (Li et al., 2019). However, teachers' technological competence alone is inadequate to create meaningful technology-enhanced learning (Chai & Koh, 2017). Empirical evidence from prior research implies that teachers should have solid technological pedagogical content knowledge (TPACK) and strong beliefs in combining all of the TPACK components to create meaningful teaching and learning experiences with technology (Cheng & Xie, 2018; Koh et al., 2016; Oda et al., 2020). For the past decade, a wealth of research in TPACK has focused on preparing teachers to acquire the necessary knowledge and skills for teaching with technology. For instance, Voogt and McKenney (2017) explored the impact of teacher education programs to support teachers' competence in designing ICT-based instruction. The study found that teachers needed adequate teacher professional development (TPD) programs to be well-equipped with the necessary knowledge and skills in designing technology-enhanced instruction. TPD works to change teachers' knowledge, beliefs, and practices by introducing innovations that meet the teachers' teaching goals (Sansom, 2019). Similarly, Oda et al. (2019) reported the positive impacts of TPACK-based TPD on developing in-service teachers' TPACK.

Thus far, substantial research has suggested that teachers' lack of self-efficacy and beliefs are critical barriers to integrating technology into teaching and learning (Tsai & Chai, 2012). Alemdag et al. (2019) argued that TPD programs are one of the ways to ensure the development of teachers' TPACK competence, confidence (Shriner, 2010), and belief (Samson, 2019). Lately, Bustamante (2020) expanded the literature on TPACK-based TPD in the field of foreign language instruction. He investigated the impact of online TPD on Spanish teachers' TPACK competence and found that the participating teachers change their belief toward integrating technology into their classes as a consequence of their participation in the TPD. Draji et al. (2023) revealed that teachers need continuous TPD programs that provide intensive coaching to help teachers gain confidence in implementing new strategies and combining TPACK components in their classes. As such, there is a growing body of interest in exploring the relationship between TPD; and teachers' TPACK development, confidence, and belief. However, little attention has been paid to unpack how teachers shape their confidence and beliefs to apply TPACK in practice as a result of participating in TPACK-based TPD.

With this backdrop, the present study aimed to explore how EFL teachers build their confidence and beliefs in teaching with technology by participating in a 2-year TPD program. We, the researchers, developed a TPD program to help experienced EFL teachers become more proficient in integrating technology, content, and pedagogical knowledge. Detailed descriptions of the TPD program are elucidated in the methodology. This study addresses the following research question:

1. How did the TPACK-based TPD program impact EFL teachers' confidence and beliefs in implementing the TPACK framework?
2. How did the EFL teachers apply the TPACK gained from the TPD to their teaching practices?

## Literature Review

### TPACK for EFL Teachers

The Technological Pedagogical Content Knowledge (TPACK) framework has become a useful construct for examining the types of teacher knowledge necessary for meaningful technology integration (Brantley-Dias, & Ertmer, 2013; Xie et al., 2023). The concept of TPACK originated from Pedagogical Content Knowledge (PCK) proposed by Shulman (1986), which describes the intricate relationship between teachers' pedagogical and content knowledge to teach effectively in a subject matter. Shulman argued that teachers not only need to master the subject area and understand how the related knowledge is organized within the subject area but also need to master how such content knowledge can be represented in different ways for effective instruction. Based on Shulman's PCK, Koehler and Mishra (2008) defined TPACK as "teachers' understanding of how technology and PCK interact with one another to produce effective teaching with technology" (p. 12). The TPACK framework consists of three core components: content knowledge (CK), pedagogical knowledge (PK), and technological knowledge (TK). CK refers to teachers' understanding of the subject areas to be taught, including theories, concepts, ideas, practices, and approaches to building such knowledge (Mishra & Koehler, 2006; Shulman, 1986). PK is teachers' knowledge of the concepts and methods of teaching and learning while TK refers to teachers' knowledge of operating technology for teaching and learning (Mishra & Koehler, 2006).

Beyond the mastery of individual areas of knowledge, TPACK also encompasses a deep understanding of intricate relationships among content, pedagogy, and technology, as shown in Figure 1. Pedagogical content knowledge (PCK) – the mastery of how to transform content for effective teaching; technological content knowledge (TCK) – the knowledge of how technology is used to better represent content to promote understanding; and technological pedagogical content knowledge (TPK) – the knowledge on how different uses of technology may influence ways of teaching (Mishra & Koehler, 2006). Finally, the paramount knowledge is TPACK itself, which goes beyond the mere combination of each knowledge type.

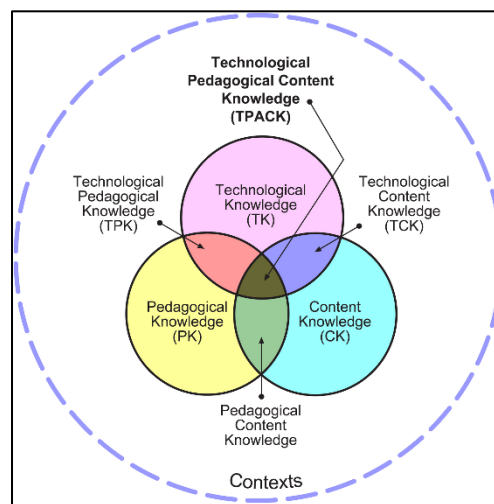


Figure 1. TPACK components. (source: tpack.org)

For the past years, research on TPACK has been extensively conducted in various subject areas, including English education programs in the ESL/EFL context. In particular, research about in-service EFL teachers investigated different perspectives on the use of TPACK in classroom instruction, some of which focused on teachers' beliefs and perceptions of the TPACK integration in EFL classes (e.g., Raygan & Moradkhani, 2022; Roussinos & Jimoyiannis, 2019). These research studies had a different focus from this present study regarding ESL/EFL English teachers' perspectives and beliefs towards TPACK

integration in teaching practices. The above research investigated EFL teachers' perception regarding their skills and knowledge of TPACK, concerning some influential factors such as school climate, teachers' attitudes, training, and experiences. A case study by Alemdag, et al. (2019) took a similar perspective to the present study. It designed and implemented a TPD program based on the TPACK framework and Design-Based Learning (DBL) in a public education center in Turkey and evaluated the program's impact. The TPD program resulted in teachers' improvements in TPACK as well as changes in their teaching practices.

## **TPACK for Teacher Professional Development (TPD)**

Integrating TPACK into teaching practices is closely related to Teacher Professional Development (TPD) (Alemdag et al., 2019). Teacher Professional Development (TPD) is embedded in the teaching profession as teachers seek to improve their teaching skills and expertise. TPD refers to an ongoing process in which teachers engage voluntarily to learn how best to tailor their teaching to the students' needs (Diaz-Maggioli, 2003). TPD is not a single, one-time action; instead, it is a lifelong endeavor, a way of being, and a perspective (Wong, 2011). Teachers need to reflect on their existing knowledge to develop teaching expertise according to students' needs and other external factors such as educational technology, which expectedly improve students' learning achievement. Such efforts to reform teachers' practices are conducted through TPD activities such as workshops, seminars, classroom modeling, courses, and training programs for in-service teachers (Joyes & Chen, 2006; Margolis et al., 2017).

As reported by Alemdag et al. (2019), effective TPD programs for developing EFL teachers' TPACK should consider whether (a) the TPACK framework is appropriate for EFL teachers to understand the knowledge domains of technology integration; (b) teachers in the TPD program should have an active and critical role in learning technology integration; and (c) support and feedback should be given to teachers while they are developing their TPACK and integrating technology into their classrooms. Other findings from Hew and Brush (2007) explained that effective TPD for technology integration includes (a) technological knowledge and skills, (b) technology-supported pedagogical knowledge and skills (the ability to see a clear connection between the technology being used and the subject content being taught), and (c) technology-related classroom management knowledge and skills. The effective features of TPD programs can help teachers to understand how students learn specific content and how specific instructional practices and tools can support student learning outcomes. Binnie and Wedlock (2022) maintained that students' outcome improvement is influenced by how much teachers could develop their professionalism.

## **Teachers' Confidence and Beliefs in Technology Integration**

The theoretical foundation of the present study is based on Ertmer and Ottenbreit-Leftwich's (2010) description of teachers' changes in technology integration. They identified changes that influence teachers' efforts to use technology, which has been widely adopted in guiding empirical research, policymaking, and classroom integration for technology integration (Ding et al., 2019; Lee et al., 2017). Teachers' confidence and beliefs are commonly investigated variables for integrating technology in classrooms (Corry & Stella, 2018).

EFL teachers' confidence plays a significant role in integrating TPACK into instructional practices. Some research found that self-confidence is more important than skills and knowledge (Corry & Stella, 2018). For example, Wozney et al. (2006) found that one of the two most significant predictors of teachers' technology use was their confidence to achieve instructional goals using technology. Ertmer and Ottenbreit-Leftwich (2010) also found an interrelationship between self-efficacy, self-confidence, and TPACK integration, implying that promoting teachers' confidence in technology is necessary to achieve students' learning objectives.

Besides teachers' confidence, their beliefs in implementing technology are crucial to successful TPACK implementation (Ottenbreit-Leftwich et al., 2018). The use of technology in classrooms is limited when

teachers do not have positive beliefs in integrating technology into their teaching practices. Miranda and Russell (2012) found that two of the most critical factors in increasing teachers' use of technology were teachers' beliefs about the benefits of technology and their perceived importance of technology for teaching. Based on a causal model between teachers' beliefs and their technology integration practices, Inan and Lowther (2010) suggest that teachers should have positive beliefs about being better prepared to overcome external barriers to technology implementation in their classrooms.

Positive confidence and beliefs can be gained in several ways, among others, by helping teachers gain personal mastery, vicarious experiences, persuasion, participating in the professional community, and joining the TPD program (Ertmer & Ottenbreit-Leftwich, 2010). Among them, the most powerful strategy in helping teachers gain positive confidence and beliefs is through successful experiences in using technological tools in classroom practices (i.e., personal mastery). Teachers who witnessed how technology facilitates student success showed increased confidence (Ottenbreit-Leftwich, 2007).

The other way to improve teachers' confidence and beliefs is through vicarious learning, such as viewing the performances of other teachers, and reflecting on what types of actions are effective or non-effective for enacting a task (Ertmer, 2005). Vicarious experiences have been used to increase teachers' confidence in performing tasks similar to those performed by the observed models (Bandura, 1986), starting with small successful experiences of their colleagues (Ertmer, et al., 2003; Ottenbreit-Leftwich, 2007).

The context of technology integration also influences teachers' use of technology. Teachers' beliefs are heavily influenced by the subject and school culture in which they are situated in (Ertmer & Ottenbreit-Leftwich, 2010). Windschitl and Sahl (2002) found that teachers' beliefs strongly influenced their technology integration whereas the context of their institutions and professionals shaped these beliefs. How those teachers eventually integrated technology into classroom instruction is powerfully mediated by their interrelated belief systems about what constitutes "good teaching" in the context of the institutional culture, and the role of technology in students' life. Teachers are not free agents for teaching and learning since it depends on the interlocking cultural, social, and organizational contexts in which they live and work (Somekh, 2008). A culture conducive to technology integration increases teachers' confidence and beliefs in effective teaching that includes the notion of technology as an essential tool for facilitating student learning.

Somekh (2008) describes the characteristics of schools that support the development of positive teachers' confidence and beliefs such as: (1) schools were well-equipped with ICT, (2) their focus was on changing the process of learning using ICT, (3) skills were acquired as part of the process of using them purposefully, (4) schools provided support, (5) teachers had opportunities to discuss problems with peers and facilitators and explore solutions over time, (6) the nature of students' learning changed along with the established epistemologies.

To facilitate positive confidence and beliefs for teachers, TPD programs need to allow teachers to apply their TPACK within authentic contexts and support them during this process, as teachers may encounter difficulty putting their TPACK into action (Pamuk, 2012). The TPD program should facilitate teachers to collaborate with other teachers and stakeholders to solve authentic problems (Koehler et al. 2011), and to build artifacts for certain subjects' matters and instructional goals (Koehler & Mishra 2005). The collaboration of the TPD program initiators and district stakeholders can provide more resources, support, time, and training to build teachers' technology confidence and belief, which enables them to share knowledge, co-create new understandings, clarify and elaborate their ideas about issues in a case (Ertmer, 2006).

## Methods

We used a case study design (Yin, 2018) to explore the impact of participating in the TPACK-related TPD program on Indonesian EFL teachers' belief and confidence in integrating technology into classrooms.

## Context and Participants

The participants of this study include ten experienced EFL teachers with 10-20 years of teaching experience in high schools in Indonesia. They volunteered to participate in the TPD program to implement ICT-integrated lessons with the TPACK framework, forming a pedagogical notion of TPACK as the pedagogical element for ICT integration (Koh et al., 2016). All the EFL teachers had a bachelor's degree in English Language Teaching (ELT). The consent form that informed teachers of the study's aims was obtained from the EFL teachers. The EFL teachers had the right to withdraw from the study without any risk. In this study, pseudonyms are used for the EFL teachers' names.

In the first year, two face-to-face workshops were conducted in one university in Indonesia: the first workshop focused on understanding the TPACK framework and implementation issues through discussions with the researchers and peers. The second workshop focused on designing a lesson with the TPACK framework that the EFL teachers had to implement in their classrooms. In the second year, two workshops were conducted to help further the EFL teachers strengthen their TPACK competence. In the first workshop, the researchers extended the TPACK framework to 21st-century skills related to technology integration, and the EFL teachers practiced designing a lesson. In the second workshop, EFL teachers learned about TED-Ed and multimodal learning. The researchers and the participants co-designed a lesson with the TPACK and 21st-century skills framework to implement in their classrooms. EFL teachers discussed the design and implementation-related issues with the researchers through various communication modes such as school visits, emails, and phone messages.

## Data Collection and Analysis

In-depth interviews lasting 60–90 minutes were conducted with the participants to elicit their perceptions and experiences concerning technology-integrated lessons. The interview questions focused on how the TPACK-based TPD program impacted them, especially their perceived competence and beliefs about teaching with technology. The interview protocol questions are:

1. After joining the TPACK-based TPD program, did you feel more confident about using technology in your classroom? If so, please explain.
2. How did your beliefs about teaching English with technology change after joining the TPACK-based TPD program?
3. How did you apply TPACK in your teaching?
4. Did you have any barriers to implementing TPACK in your school? If so, please explain.
5. How did you solve the barriers to implementing TPACK in your school?

Based on Ertmer and Ottenbreit-Leftwich (2010), thematic analysis was used in finding and generating themes (Braun & Clarke, 2006). Ertmer and Ottenbreit-Leftwich (2010) mentioned that teachers' confidence and beliefs in technology integration are built upon three dimensions/orientations: personal experiences, vicarious experiences, and cultural experiences. The thematic analysis included: transcribing the interviews, reading and re-reading the data, coding and generating patterns, building themes, reviewing and defining themes, and reporting. In the first stage of analysis, we familiarized the data by transcribing while reading the data. We read the data repeatedly while coding them by commenting on the phrases or sentences representing teachers' beliefs and confidence. After that, we put notes in the comments to find and build possible themes and then described the results presented in the findings of this study. We finally had member checks to confirm the credibility of the findings (Lincoln & Guba, 1985).

## Results and Discussion

The present study unpacks how integrating technology in teaching and learning impacted EFL teachers' professional development in ICT integration competencies. In this section, we present the results regarding the EFL teachers' confidence and beliefs in TPACK (see Table 1) as support to their professional development.

TABLE 1  
*Overview of Themes Impacting EFL Teachers' Confidence and Beliefs in TPACK Implementation*

Themes	Sub-themes	Teachers' responses
Confidence and beliefs growth	Personal experience	Alternate between theory and practice
		Technological content
		Pedagogical content
TPACK elements facilitating professional development growth	Vicarious experience	English content
		Prior teaching experience
		motivation
TPACK elements facilitating professional development growth	Socio/cultural experience	Sharing experience
		Group discussion
		In the students' role
TPACK elements facilitating professional development growth	Technology	school supports
		Web resources
		Course organization
TPACK elements facilitating professional development growth	Pedagogy	Pedagogical strategies
		Content
TPACK elements facilitating professional development growth	Content	Teaching materials

### Personal Experiences

We found that nine EFL teachers in this study were confident and had positive beliefs in using TPACK in the classroom after joining the TPD program. We introduced a new application for learning, such as TED-Ed, and assisted in using it as their teaching tool. Teachers' confidence and beliefs were built upon their personal experiences since they could utilize the application for their teaching tools prior to teaching in their classroom. For instance, Anna who taught at a senior high school used to practice technological tools given in the TPD program before applying them to the classroom. She tried the tool with her family and learned about what to do if she encountered any possible difficulties. Her personal experience affected her confidence and beliefs about using technology in her classroom, as she said in the interview:

*I try and learn about how to use this application, the TED-Ed. I practiced it with my family before I applied it to my teaching. It helped me, and I had more confidence to apply it in the classroom. My students could understand more about the English lesson after they watched the video in the TED-Ed. They were also active in giving opinions about the Ted-Ed contents in the classroom. (Anna)*

Based on this statement, Anna used Ted-Ed as the technological tool for teaching and the active learning method as the pedagogy in teaching English.

Further, Lisa, an EFL teacher in senior high school, also mentioned that using TPACK helped her create a more meaningful learning environment where her students enjoyed participating in learning activities. As such a belief broke down her fear, she became more confident integrating technology into her teaching. She mentioned:

*My students felt happy because it was a new experience for them to watch videos on TED-Ed. They said it was exciting because they could explore and produce more awesome project work based on the Ted-Ed content. They could collaborate with others. I, too, felt happy because I could create meaningful learning. (Lisa)*

This statement showed that Lisa used Ted-Ed as the technological tool for her classroom and project-based learning as the pedagogical tool for teaching English.

Unlike Anna and Lisa, Bella experienced difficulties integrating technology in the classroom. In the TPD program, while she could understand clearly how to use the new technological tools for teaching, she found technological barriers for implemented the TPACK framework in the classroom. Her personal experience negatively impacted her beliefs in applying TPACK. Although she had learned much about using and integrating technology, she realized that integrating technology, pedagogy, and content was challenging:

*In the workshop, I got new knowledge about technology integration. The researchers told me how to plan, design, and practice TPACK. At first, I thought I understood and could use the technology in my classroom. Unfortunately, it was hard to apply in practice. The Internet connection was unstable, and I wasted a lot of time waiting for the application to work steadily. I was confused and had no idea what to do. (Bella)*

This implied that while Bella had the confidence to apply technology in the classroom, the difficulties she experienced affected her beliefs to use technology in her subsequent teaching.

This study showed that teachers' personal experiences strongly impacted teachers' confidence and beliefs in technology integration in the classroom. This finding is in line with the prior studies revealing the influence of teaching experience on teachers' confidence (Graham et al., 2009; Tondeur et al., 2019; Valtonen et al., 2019) and beliefs (Ding et al., 2019; O'neal, Gibson & Cotton, 2017; Ottenbreit-Leftwich et al., 2018). Overall, the results of this study implied that while teachers could shape their beliefs to integrate technology into their teaching, they lacked the confidence to use technology in the classroom. Nelson and Hawk (2020) argued that teachers' beliefs in technology integration are highly grounded in classroom teaching experiences where teachers often encounter problems in teaching practices. Such negative experiences (i.e., practical problems arising from practices) should be framed as a raw image of the enactment process. Nine EFL teachers who participated in the TPD program had both confidence and positive beliefs about TPACK, mainly derived from their personal teaching experience. Ertmer et al. (2012) also identified that EFL teachers perceive their success in using technology in the classroom mainly due to their experience (e.g., problem-solving ability and confidence in technological knowledge). This study's results mirror the prior study regarding how EFL teachers possessed confidence in technological knowledge and shaped their beliefs in technology integration in the classroom for future teaching.

However, one in ten EFL teachers showed a negative belief in TPACK though she had reasonable confidence in TPACK in the early practice stage. Valtonen et al. (2019) found that while EFL teachers are confident about their TPACK, they also found it challenging in practice. EFL teachers were concerned that technology would distract their teaching focus, allowing students to surf other web pages beyond the content areas. Briefly, the current study provides more comprehensive depictions that EFL teachers' confidence did not guarantee their belief in technology due to the obstacles faced during their teaching practice based on personal experiences. O'neal et al. (2017) claimed that both EFL teachers and students need to understand the core of 21<sup>st</sup>-century skills to shape more positive beliefs about technology integration in a classroom to achieve intended learning goals. TPACK-based TPD and continuous support from colleagues and guidance from trainers help EFL teachers gain more confidence and develop positive beliefs in teaching with technology.

Overall, we understand that EFL teachers' confidence in technological knowledge is built upon their belief in TPACK enactment in a classroom. The successful implementation of the TPACK framework in a classroom entails EFL teachers' confidence and belief in teaching with technology. As Ertmer and Ottenbreit-Leftwich (2010) suggested, EFL teachers' successful teaching with technology denotes their mastery, assisting them to gain confidence and beliefs in technology integration in teaching. Support from the training program (e.g., motivation, group discussion, and continuous guidance) could consistently help teachers be more confident in enacting TPACK-based instructional design in their future teaching (Park & Donald, 2022).



## Vicarious Experiences

In this study, four EFL teachers were confident and built positive beliefs about technology integration through their vicarious experiences by discussing with or observing other EFL teachers' successful implementation of TPACK in their classes. EFL teachers in the same different schools supported and shared their experiences with each other (e.g., through group discussion and sharing via social media like WhatsApp) during the TPACK implementation. For instance, Diana received support (e.g., sharing the successful implementation as well as the tips to execute technology-based teaching) from fellow teachers in the same school about applying TPACK in her teaching. Such experiences helped significantly to develop her confidence and positive beliefs in implementing TPACK since the other teachers showed how TPACK matched teaching goals, fostering students' learning motivation, leading students to have 4Cs, helping teachers in designing meaningful learning, and bringing positive learning environments in the classroom. In the interview, she mentioned that:

*My fellow teacher also teaches in the same grade. We usually discuss, share our problems, and observe each other's lessons, asking about how we deliver the materials and what method is suitable for our students to implement new strategies in my class successfully. I am so lucky to know TPACK, and I will use it little by little” (Diana)*

Similarly, Sarah developed her confidence and beliefs in TPACK from other teachers at different schools who participated in the training program. Sarah discussed many ideas with other teachers to find directions about what activities and technologies might be appropriate to the content she taught. In the interview, she mentioned:

*Firstly, to know whether it works for me or not, I followed the other teachers' strategies and applications used in their classes. (Sarah)*

She texted other teachers and asked about what they had given to their students since they were not in the same school.

*I texted them and asked 'What are you going to give the kids?.' My friend knew that I was poor at using sophisticated tools, so they told me the easiest way; for poetry materials, they used project-based learning, asked their students to create their poetry and canvas to design the poetry background, and Instagram applications to post the result of the poetry. Then other students must comment on their friends' Instagram. Then I tried it, and it worked for me too. I think I will continue to use it since I have many teachers who could give me the insight to design my class. (Sarah)*

While Sarah was not confident enough to find updated applications for her teaching, her friends from other schools understood her situation and were willing to give her guidance to implement TPACK in their classes. She built her confidence gradually, which also shaped her positive belief about technology integration in her teaching.

This study shows that EFL teachers' vicarious experiences have the potential to shape their confidence and positive beliefs in implementing TPACK. Discussing and observing other teachers' successful efforts strongly influenced their confidence and belief in technology integration. This finding is in line with the prior studies revealing that sharing teachers' success stories within the teacher community was the first step for teachers to build up their confidence and positive belief about technology integration (Ertmer & Ottenbreit-Leftwich, 2010). Observing the successful practices of others as a model helps teachers understand new practices and lead teachers to recognize the need for change (Lai & Lin, 2018; Zhao & Cziko, 2001).

Besides, lesson study that teachers carry out activities collaboratively with other teachers in designing, conducting, observing, and reflecting on learning, can significantly change teachers' TPACK and their beliefs. Chai and Koh (2017) suggest that teachers' beliefs in the new learning culture developed after participating in substantial lesson design activities. One way to accomplish this is to provide opportunities for EFL teachers to collaborate in implementing TPACK in their classes. To strengthen their beliefs concerning the implementation of TPACK, schools can focus on their collaboration activities on the specific uses of TPACK. It may also help teachers with weak TPACK beliefs to develop a lesson plan, practice instructional strategies in their classes, and reflect on how constructivist strategies may help them to develop beliefs (De Vries et al., 2008). The socio-cognitive learning theory by Bandura (1986) informs the power of teachers' social networks. Individual teachers achieve effective learning by modeling each other, which may enable prospective teachers to learn how to use TPACK for instructional purposes. Thus, EFL teachers should be provided with more opportunities for TPD such as workshops, seminars, or learning communities that facilitate their understanding of the implementation of TPACK (Ertmer et al., 2012). Since teachers' beliefs take time to develop, teachers need ongoing support and necessary effort from TPD programs to build their positive beliefs or change their negative to positive ones (Jimoyiannis & Komis, 2007).

### Socio-Cultural Experiences

Another influential dimension that shapes EFL teachers' confidence and beliefs in implementing TPACK is socio-cultural experience. The EFL teachers' confidence and beliefs were affected by students' active participation and school policy. The EFL teachers experienced positive confidence and beliefs when their school supported full facilities of computer and Internet access, flexible school policies to use a mobile device in school, and the students had positive responses (e.g., students' active engagement) toward the technology-integrated teaching strategy.

Students actively participated during the TPACK-based classroom activities. Moreover, students who had good technological skills helped EFL teachers to operate technologies during the classes. For instance, Hanna felt fortunate that her school environments, such as students' participation and school policy, positively supported her in integrating technology into her teaching.

*We are fortunate to be in a modern school that completely facilitated all the students' needs. I could design my lessons based on TPACK whenever I want by using many applications and devices. I am optimistic about using technology (Hanna)*

The excerpt from Hanna's interview indicated her belief in TPACK positively developed as a result of the student's participation during her TPACK enactment.

On the other hand, Tony had a different experience that shaped his negative belief. While he had confidence in using technology for teaching, he realized that his school was located in a rural area with no Internet access, and insufficient computer facilities. He started to think that TPACK may not be suitable for his school environment since the culture of silence mode in the teaching and learning process was still prevalent in his school:

*My students know about technology tools more than I do. This gives me confidence in using TPACK since I thought my student could follow my instruction. But other teachers thought we were bothering them since my class was so hectic. They kept talking to me to make my students calm. My students worked in groups and needed to walk around to have a discussion. I felt uncomfortable because I thought that I disturbed other teachers. So, in the future, perhaps I will go back to my old teaching method. (Tony)*

Teachers are likely to have solid pedagogical beliefs that resist change (Ertmer & Ottenbreit-Leftwich, 2010). Teachers' beliefs are related to their teaching experiences (Pajares, 1992; Roehrig, Kruse, & Kern, 2007). However, school culture affects how teachers integrate technology, pedagogy, and knowledge into teaching (Olofson, Swallow, & Neumann, 2016). Ajzen (2001) and Raygan and Moradkhani (2022) highlight that teachers' belief in implementing TPACK is influenced mainly by their school climate's positive or negative feedback. If teachers are encouraged and comfortable with their school climate, they can build positive confidence and belief toward TPACK implementation. As a result, teachers can feel free to accept and integrate technologies into their classes with specific pedagogy and content. On the other side, perceived difficulties aligned with environmental factors hinder the creation of positive beliefs.

EFL teachers' beliefs toward TPACK were formed by the school climate in which they work and factors such as institutional support toward technology integration. Technology access and school climate are associated with positive confidence and belief in technology and TPACK integration (Banas, 2010; Ertmer, 2010). Dong et al. (2020) stated that support from the school environment is a key force in promoting teachers' intention to integrate technology in their classrooms. A strong infrastructure is important to facilitate easy use of technology in classrooms, which improves not only teachers' level of ICT literacy but also their level of confidence in using the technology. Overall, the more teachers find their school climate supportive, the higher their willingness toward technology integration and TPACK implementation.

## Conclusion and Implication

This study examined how the TPD program fostered the ten EFL teachers' confidence and beliefs about TPACK integration after they joined the TPACK-based TPD and implemented TPACK in their classroom practice. The study results revealed that the EFL teachers had more confidence in designing and practicing the TPACK-based instruction and developed a new belief about the enactment of technology in language teaching and learning. Seven of 10 EFL teachers could develop both confidence and beliefs during their practice of TPACK in their classrooms. The rest could not develop a strong belief in TPACK though they had some confidence to design and practice the TPACK framework. We further found that this failure to build up strong beliefs was due to various causes, such as challenges faced during practices and lack of environmental support (e.g., teacher-partners and school climates). On the whole, this study indicates that EFL teachers' confidence did not guarantee their beliefs in technology due to various obstacles experienced on the personal implementation trajectory.

Based on Ertmer and Ottenbreit-Leftwich's (2010) claim, we found three sequences of how EFL teachers develop their confidence and beliefs in TPACK, namely personal, vicarious, and socio-cultural experiences. First, EFL teachers' personal experience was the starting point where they could gain confidence and beliefs to teach with technology in the classroom. Second, EFL teachers were willing to share and discuss ideas with other teachers in the EFL teacher community. Such sharing activities would lead other teachers to start trying TPACK in the classroom. We call this second sequence, i.e., the vicarious experience. These processes would then be ended by creating a new culture influencing the environment conducive to changes in teaching and learning practices. As EFL teachers' personal, vicarious, and socio-cultural experiences impact their confidence and beliefs in TPACK enactment, we suggest that TPD programs need to consider these elements that help teachers grow better in teaching competence.

This study provides two important implications. First, when experienced EFL teachers need to learn about new teaching methods, they require theoretical and hands-on knowledge that can be easily implemented in the classroom. Second, experienced EFL teachers realized that integrating TPACK gave new beliefs about how this impacted their teaching. They further recognized that they needed to improve themselves before encouraging students to learn. By co-designing lessons with the mentors during the training program, the EFL teachers could become more self-directed in implementing TPACK into their language teaching.

It should be noted that there are some limitations of the present study. First, this study focused only on exploring experienced EFL teachers who have been teaching for years. Results will be different if such TPD programs are designed to measure pre-service teachers who might have taken a digital literacy course. Second, the limited number of participants is another consideration in generalizing findings to other research contexts and teacher profiles. We encourage future research to examine how TPD programs can help EFL teachers with various profiles advance their digital competence and self-efficacy.

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