

# TPACK Framework in an EFL Context in Saudi Arabia: Relationship Between EFL Teachers' TPACK Level and Attitudes and Factors Influencing TPACK

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**Abstract**—This study aimed to explore EFL teachers' mastery of technological pedagogical and content knowledge (TPACK) and the relationship between EFL teachers' TPACK level and attitudes toward technology in middle schools in Saudi Arabia. It also aimed to examine whether Saudi EFL teachers' TPACK levels differ due to gender, educational level, years of experience, and professional development. Data were collected via a survey of 108 Saudi EFL teachers working in middle schools. According to the findings, EFL teachers had a moderate-to-high level for all TPACK dimensions. The study also found a strong and positive relationship between Saudi EFL teachers' TPACK level and their attitudes toward technology in middle schools. The results revealed a significant difference in teachers' TPACK level based on gender, teaching experience, and training. However, TPACK level did not differ significantly based on educational level. This study provided some recommendations for improving and applying TPACK in EFL classrooms and suggestions for future studies.

**Index Terms**—technological pedagogical and content knowledge (TPACK), attitudes, English as a foreign language (EFL)

## I. INTRODUCTION

Recently, the evolution of technology has transformed both the accessibility of information and ways of learning, providing ideal opportunities in education (Nunez-Canal et al., 2022). As a result, digital competence has emerged as a crucial and important skill for teachers, encompassing the ability to utilize a variety of technologies effectively to improve the teaching process (Wang, 2022). Since the current generation of students is considered "digital natives", it is essential for educators to integrate modern technologies into their classrooms (Evans & Robertson, 2020). At the same time, teachers need to acquire the necessary knowledge dimensions to thrive in these technology-driven environments (Wang, 2022). Adipat (2021) found that technological pedagogical and content knowledge (TPACK) was beneficial to EFL teachers' technology integration into their teaching. Numerous studies have indicated that using technology in English language instruction supports and promotes students' active learning, cognition, constructive thinking, and conceptual development, which contribute to improving their English language proficiency (Taopan et al., 2020; Van et al., 2021).

The COVID-19 pandemic shifted traditional in-person teaching to online instruction (Li et al., 2022). Saudi EFL teachers lacked sufficient skills and knowledge for this new teaching environment (Al-Seghayer, 2022). As a result, integrating technology into teaching and learning has become vital for all educators in Saudi Arabia, particularly in the post-pandemic era (Al-Seghayer, 2022). Currently, Vision 2030 focuses on equipping students with 21st-century skills by incorporating technology into English teaching practices to better prepare them for the job market (Ndiaye et al., 2024). One educational framework that aids teachers in achieving this goal is TPACK, which offers a new perspective. TPACK is considered an important and effective modality for guiding educators in technology-enhanced teaching practices (Drajati et al., 2021). EFL teachers must master TPACK competence to effectively integrate technology in their teaching to align with the demands of 21st-century education (Liando et al., 2023).

The TPACK framework is becoming more prevalent in research concerning teacher education, yet its application to studies on language teaching lags by over five years compared to other subjects (Tseng et al., 2020). Among the countries that conduct the most research on the TPACK framework in the English language, the United States has made the most contributions, followed by Turkey, Australia, Singapore, and Taiwan (Irwanto, 2021). Moreover, previous research has indicated that attitudes toward technology and TPACK significantly affect the integration of technology in teaching, thus requiring more investigation (Azhar & Hashim, 2022; Njiku, 2023). Nonetheless, there has been limited research into EFL teachers' TPACK and the relationship between TPACK and attitudes among EFL teachers in Saudi schools. This study aimed to address this gap by examining EFL teachers' TPACK level and the relationship between their attitudes toward technology and their TPACK level. It also aimed to explore the factors influencing TPACK in Saudi Arabia.

### A. Significance of the Study

This research opens new horizons for those interested in educational technology and teacher preparation to explore new ways of enhancing teaching and evaluating the professional performance of EFL teachers. The findings of this study offer researchers, curriculum designers, and policy makers valuable insights into EFL teachers' perceptions of their TPACK levels and the factors influencing those levels, helping to guide the development of appropriate professional training and interactive technology-based curricula. It is hoped that these results will contribute to the EFL literature in Saudi Arabia and inspire curriculum developers and education professionals to enhance their knowledge of TPACK domains, ensuring teachers possess the required knowledge and skills to improve students' learning outcomes and English language competencies.

### B. Research Questions

- Q1. What is the TPACK level of Saudi EFL teachers in middle schools?
- Q2. Is there a significant relationship between Saudi EFL teachers' TPACK level and their attitudes toward technology?
- Q3. Are there any statistically significant differences in EFL Saudi teachers' TPACK level due to years of teaching experience, educational level, professional development, and gender?

## II. LITERATURE REVIEW

### A. TPACK Framework

The notion of TPACK (Mishra & Koehler, 2006) emerged as an extension of Shulman's (1987) pedagogical content knowledge (PCK) model, underscoring the essential knowledge that educators must possess for effective teaching (Zhang & Tang, 2021). Historically, teacher education predominantly emphasized content knowledge (CK) (Angeli & Valanides, 2014). However, Shulman (1986) redefined the standards of qualified educators, asserting that they must possess not only proficiency in content and pedagogical knowledge (PK) but also an understanding of how these two domains intersect, referred to as PCK. In 1986, Shulman presented a framework illustrating that successful and effective teaching necessitates the integration of both CK and PK (Graham, 2011).

Building on Shulman's concepts and considering technological advancements, Mishra and Koehler (2006) asserted that technology should not be separated from PCK. Consequently, they proposed the TPACK framework, which provides a theoretical lens for assessing a teacher's ability to design and execute technology-enhanced instruction while delineating the specific knowledge types essential for effective educational practice in technology-enhanced educational settings (Koehler & Mishra, 2009; Mishra & Koehler, 2006; Zhang & Tang, 2021).

In 2006, Mishra and Koehler developed the TPACK framework, suggesting that teaching is a complicated activity that requires different kinds of knowledge and skills (Angeli & Valades, 2014). They enhanced this concept by integrating technological knowledge (TK), demonstrating how teacher expertise and knowledge arise from the integration of PK, TK, and CK. These interconnected knowledge types comprise PCK, technological pedagogical knowledge (TPK), technological content knowledge (TCK), and TPACK (Koehler et al., 2013). Together with TK, PK, and CK, these seven knowledge domains constitute the TPACK framework (De Rossi & Trevisan, 2018; Koh et al., 2015). According to Mishra and Koehler (2006), the seven components of TPACK in Figure 1 are as follows:

1. CK: Knowledge of the content matter.
2. PK: Knowledge of various instructional approaches and methods.
3. TK: Knowledge of how to use various technology tools.
4. PCK: Knowledge of using appropriate pedagogical strategies to teach subject content.
5. TPK: Knowledge of integration of instructional strategies with technology.
6. TCK: Knowledge required to represent subject content via technology.
7. TPACK: Knowledge of using appropriate instructional methods for certain subject content with appropriate technology.

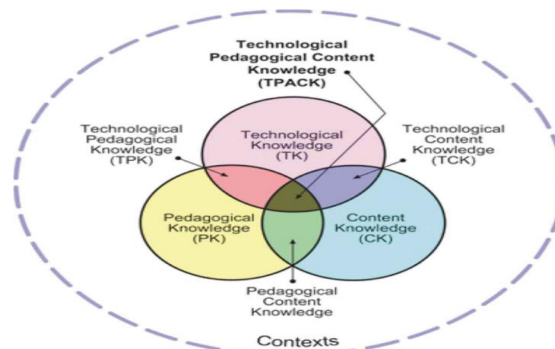


Figure 1. TPACK Framework Presented by Koehler and Mishra (2006)

### B. EFL Teachers' TPACK Level

Recently, there has been growing interest in investigating the relationship between educators and TPACK, with the aim to provide important information about teachers' TPACK level necessary for effective technology integration and to evaluate their capacity to implement TPACK across different countries, subjects, and educational systems. For example, Özdemir and Önal (2022) conducted a study that analyzed teachers' TPACK levels. Their research showed that while teachers expressed moderate satisfaction with their overall TPACK levels, they exhibited low level of self-efficacy with their TK. Teachers with more experience displayed higher confidence in all seven TPACK components. Saricoban et al. (2019) indicated that EFL teachers expressed a satisfactory level of competence in TPACK. PK received the highest rating, while TK received the lowest rating. The results also revealed that male teachers outperformed female participants in TPACK level. Additionally, the results showed that older participants were more likely to agree with the TPACK statements. In contrast, Genç and Dülger (2024) found that female EFL teachers exhibited higher TPACK levels than the male teachers. Similarly, Prasojo et al. (2020) identified significant differences in TPACK levels among Indonesian EFL teachers based on gender, though no age-related differences were found. Female participants reported higher perceptions in all TPACK domains compared to male participants, but age did not have a significant impact on TPACK level.

Teachers' experience and training play significant roles in determining their TPACK level. Abubakir and Alshaboul (2023) found that teachers had high levels across all TPACK dimensions. While CK elicited the highest rating from EFL teachers, TPACK was the lowest among all the TPACK domains. The findings indicated significant differences in TPACK levels among EFL teachers based on their experience and training. Specifically, teachers with 1–5 years of experience obtained the highest TPACK level, while those who received professional development outperformed other participants in their TPACK level. Wang (2022) found that EFL teachers reported high TPACK levels. Additionally, experienced EFL teachers scored significantly higher TPACK level than those with no teaching experience. Thus, EFL teachers with no teaching experience had lower TPACK levels than the other groups with experience. Similarly, Ali and Mohammadzadeh (2022) reported that experienced teachers demonstrated significantly higher TPACK levels compared to novice teachers. Additionally, Ph.D. participants showed greater TPACK confidence than those with a bachelor's degree. Li et al. (2022) found that implementing training courses for teachers with less teaching experience and a lower educational level could enhance their confidence in utilizing technology to boost their teaching effectiveness.

### C. EFL Teachers' Attitudes and TPACK

Teachers' attitudes significantly impact the successful integration of technology into educational settings (Raygan & Moradkhani, 2022). As a result, teachers' attitudes toward using technology play a vital mediating role in influencing TPACK levels (Bai et al., 2024). Understanding the relationship between EFL teachers' attitudes and their TPACK level is crucial. Giles (2019) found that negative attitudes toward technology often lead to a lack of motivation to incorporate it into classroom practices. However, Giles (2019) argued that knowledge and proficiency in technology do not necessarily correlate with positive attitudes toward its use.

Some studies have revealed differing degrees of association between TPACK level and attitudes toward technology. For instance, Baturay et al. (2017) identified a low-level correlation between Turkish teachers' TPACK level and their attitudes toward technology. This finding suggests that, despite possessing some technological competencies, these teachers may still require further support in the content and pedagogical areas. However, some studies indicated a strong relationship between TPACK level and attitudes toward technology (Azhar & Hashim, 2022; Njiku, 2023; Zhang & Chen, 2022). For instance, Njiku (2023) explored the relationship between teachers' attitudes and TPACK level in Tanzanian schools, finding a strong positive correlation between the two. The dimensions of attitude and TPACK were identified as predictors of each other. Similarly, Azhar and Hashim (2022) examined the level of TPACK and attitudes toward technology among EFL teachers in Malaysia. The results revealed that EFL teachers exhibited high TPACK levels, with a significant correlation between their TPACK level and attitudes toward technology. This suggests that the more positive the attitude, the greater the TPACK level. Thus, the attitude toward technology affects one's TPACK abilities. Furthermore, Alhamid and Mohammad-Salehi (2024) showed a moderate positive correlation between teachers' attitudes and the TPACK domains. Teachers with positive attitudes tended to have a more favorable perception of their TPACK. Consequently, the combination of high TPACK level and positive attitudes toward technology among EFL teachers contributes to effective technology integration in English teaching and successful language acquisition.

The TPACK framework is becoming increasingly prevalent in research on teacher education; however, its application to language teaching studies has lagged by over five years compared to other subjects (Tseng et al., 2022). Several of these studies were conducted globally to assess EFL teachers' TPACK levels (Abubakir & Alshaboul, 2023; Wang, 2022). Among the countries researching the TPACK framework in language teaching, the United States is leading, followed by Turkey, Australia, Singapore, and Taiwan (Irwanto, 2021). Additionally, previous research has indicated that attitudes toward technology and TPACK significantly affect the integration of technology in teaching, which needs more investigation (Azhar & Hashim, 2022; Njiku, 2023). As the literature review indicates, there is a lack of research on EFL teachers' TPACK levels and the TPACK–attitude relationship among EFL teachers in Saudi schools, particularly after the changes in Saudi education in the post-pandemic era. This study aimed to address the identified

research gap by exploring EFL teachers' TPACK level and the relationship between their attitudes toward technology and TPACK level. It also sought to examine the factors influencing the level of TPACK in Saudi schools.

### III. METHODS

#### A. Instruments

To answer the research questions regarding teachers' TPACK level and the TPACK–attitude relationship among Saudi EFL teachers, the current study used a quantitative method. Two main instruments were used in this study. One was the TPACK Implementation Scale, which was developed and validated by Baser et al. (2016). It consists of seven components: PK, TK, CK, PCK, TPK, TCK, and TPACK. The questionnaire uses a four-point Likert scale with the following options: strongly disagree (1), disagree (2), agree (3), and strongly agree (4). In the present study, the Cronbach's alpha score for the TPACK scale was 91, indicating that items had a high degree of reliability. The second instrument used was the Attitude Toward Technology Scale developed by Yavuz (2005). This measure was specifically designed to assess EFL teachers' attitudes toward technology. This instrument consists of 19 items on a four-point Likert scale. The Cronbach's alpha for the scale was 87 and found to be 83 in the present study.

#### B. Data Collection and Analysis

The questionnaire was shared online among different EFL teachers through various social media platforms to encourage broad access and participation. Data collection was conducted during the fall semester of 2024, and all data analysis was conducted using SPSS software. First, descriptive statistics were calculated, with a focus on means and standard deviations, to examine Saudi EFL teachers' TPACK level. Then, Pearson product–moment correlation coefficients were calculated for the second question to determine the relationship between teachers' TPACK level and attitudes toward technology. For the third question, the independent t-test was conducted to explore the differences in the level of TPACK according to gender and professional development variables, and one-way analysis of variance (ANOVA) was conducted for educational level and teachers' experience variables.

#### C. Participants

The research population consisted of EFL teachers employed in middle schools in Saudi Arabia. The participants were selected using a random sampling method. The survey was distributed online to 212 EFL teachers in middle schools, and 108 of them completed the questionnaire. The descriptive statistics showed that of the 108 participants, 40% did not receive professional development, and 59% had received professional development; 50% were male, and 58% were female. Most of the participants in this study (68.5%) reported that they had a bachelor's degree, followed by participants with a master's degree (27.7%) and a Ph.D. (3.8%). Most of the participants (37%) had over 20 years of teaching experience, followed by participants with 11–20 years of teaching experience (35.2%) and participants with 0–10 years of teaching experience (27.8%) (Table 1).

TABLE 1  
EFL TEACHERS' CHARACTERISTICS

Measure	Item	Total Number	Percentage
Gender	Male	50	46.3%
	Female	58	53.7%
Educational Level	Bachelor	74	68.5%
	Master	30	27.7%
	Ph.D.	4	3.8%
Years of teaching experience	0–10	30	27.8%
	11–20	38	35.2%
	21–more	40	37%
Professional Development	Yes	68	63%
	No	40	37%

### IV. RESULTS

#### A. EFL Teachers' TPACK Level

The first research question was designed to examine Saudi EFL teachers' TPACK level. A high score indicated a high TPACK level, while a low score indicated a low TPACK level. EFL teachers' TPACK level was measured using seven components: TK, CK, PK, TCK, PCK, TPK, and TPACK. As shown in Table 2, the total mean for all TPACK dimensions was 3.18, indicating that Saudi EFL teachers had moderate-to-high levels for all TPACK dimensions. The results also showed that CK elicited the highest rating from respondents, with a mean of 3.34, while the lowest-rated item was TPACK, with a mean of 3.06. In general, Saudi EFL teachers had a good TPACK level (Table 2).

TABLE 2  
EFL TEACHERS' TPACK LEVEL

Item	Mean	St. Deviation
Content knowledge	3.34	0.644
Pedagogical knowledge	3.24	0.653
Technological knowledge	2.17	0.623
Pedagogical content knowledge	3.22	0.672
Technological content knowledge	3.16	0.637
Technological pedagogical knowledge	3.18	0.633
Technological pedagogical content knowledge	3.06	0.678
TOTAL LEVEL	3.18	0.623

*B. Correlations Between EFL Teachers' TPACK Level and Attitudes Toward Technology*

The attitudes of EFL teachers toward technology were measured using five dimensions: using technological tools in education, not using technological tools in education, teaching how to use technological tools, the effects of technology in educational life, and evaluating technological tools. As seen in Table 3, the total mean for Saudi EFL teachers' attitudes toward technology was 3.01, indicating that Saudi EFL teachers had positive attitudes toward technology in middle schools. The results also show that "effects of technology in educational life" elicited the highest rating from respondents, with a mean of 3.20, while the lowest-rated item was "not using technological tools in education," with a mean of 2.02. (Table 3).

TABLE 3  
EFL TEACHERS' ATTITUDES TOWARD TECHNOLOGY

Item	Mean	St. Deviation
Not using technological tools in education	2.02	0.755
Using technological tools in education	3.10	0.687
Effects of technology in educational life	3.20	0.933
How to use technological tools	3.10	0.690
Evaluating technological tools	3.02	0.726
TOTAL ATTITUDES	3.01	0.525

The second research question was designed to evaluate the relationship between Saudi EFL teachers' TPACK level and their attitudes toward technology. Table 4 showing the results of Pearson's correlation coefficient analysis demonstrates that EFL teachers' TPACK level ( $r(108) = .701, p = .000$ ) is strongly and positively correlated with EFL teachers' attitudes toward technology. Hence, the overall correlation between Saudi EFL teachers' TPACK level and their attitudes toward technology is significant.

TABLE 4  
PEARSON'S CORRELATION COEFFICIENTS FOR EFL TEACHERS' TPACK LEVEL AND THEIR ATTITUDES

Item	TPACK Level
Attitude Toward Technology	Pearson Correlation .701**
	Sig. .000
	N 108

*C. EFL Teachers' TPACK Level According to Gender*

An independent t-test was used to examine whether differences exist between male and female EFL teachers in their level of TPACK. As shown in Table 5, the results indicated significant differences ( $p = 0.02$ ) in TPACK levels between males and females. Specifically, Saudi female EFL teachers reported higher TPACK levels ( $M = 3.35, SD = 0.56$ ) than male teachers ( $M = 3.00, SD = 0.64$ ) (Table 5).

TABLE 5  
T-TEST STATISTICS OF EFL TEACHERS' TPACK LEVEL BASED ON GENDER

Item	Gender	Mean	Std. Deviation	t	Sig.
TPACK Level	Male	3.00	0.640	-3.01	.002
	Female	3.35	0.564		

*D. EFL Teachers' TPACK Level According to Teaching Experience*

A one-way ANOVA was used to examine whether significant differences in EFL teachers' TPACK levels existed based on years of teaching experience (three groups: 0–10 years, 11–20 years, and 21 years and more). As shown in Table 6, there were significant differences in teachers' TPACK levels based on teaching experience ( $p = 0.00$ ) (Table 6).

TABLE 6  
ANOVA FOR EFL TEACHERS' TPACK BY TEACHING EXPERIENCE

Item		Sum of Squares	df	Mean	F	Sig.
TPACK Level	Between Groups	15.275	2	7.63	13.415	.000
	Within Groups	92.800	163	.569		
	Total	108.07	165			

To examine where significant differences occurred, a Tukey post hoc test was conducted. The results indicated that Saudi EFL teachers who had 21 and more years of experience showed significantly higher scores in TPACK level than those with 0–10 years of experience (mean diff. = 7.367,  $p$ -value = 0.000). Additionally, among those who had 11–20 years of experience, the scores in the level of TPACK were significantly higher than those who had 0–10 years of experience (mean diff. = 6.499,  $p$ -value = 0.000). However, those who had 11–20 years of experience did not significantly differ from those who had 21 and more years ( $p$ -value = 0.75) (Table 7).

TABLE 7  
POST HOC TEST (TUKEY HSD)

Dependent Variable	Teaching Experience	Mean Difference	Std. Error	Sig.	95% Confidence Interval		
					Lower	Upper	
TPACK level	0–10 years	11–20 years	-6.4990 *	1.4155	0.000	-9.864	-3.134
		21–more	-7.3677*	1.3495	0.000	-1.0576	-4.159
	11–20 years	0–10 years	6.4990 *	1.4155	0.000	0.3134	9.864
		21–more	-0.8686	1.2239	0.758	-3.778	2.041
	21–more	0–10 years	7.3677 *	1.3495	0.000	4.159	1.0576
		11–20 years	0.8686*	1.2239	0.758	-2.041	3.778

#### E. EFL Teachers' TPACK Level According to Educational Level

A one-way ANOVA was used to determine the differences in EFL teachers' TPACK levels based on their education level (three groups: bachelor's degree, master's degree, and Ph.D.). As shown in Table 8, there was no significant difference in teachers' TPACK level based on educational level ( $p > 0.05$ ). TPACK level did not change according to EFL teachers' educational level (Table 8).

TABLE 8  
ANOVA FOR EFL TEACHERS' TPACK BY EDUCATIONAL LEVEL

Item		Sum of Squares	df	Mean	F	Sig.
TPACK Level	Between Groups	3.957	3	1.319	2.052	.109
	Within Groups	104.11	162	.643		
	Total	108.07	165			

#### F. EFL Teachers' TPACK Level According to Professional Development

An independent t-test was performed to examine whether significant differences existed among Saudi middle school EFL teachers' TPACK levels based on receiving TPACK professional development. The results, shown in Table 9, indicated a statistically significant difference ( $p = 0.00$ ) in the level of TPACK between teachers who received professional development and those who did not. Specifically, EFL teachers who received professional development in using technology reported higher TPACK levels ( $M = 3.40$ ,  $SD = 0.44$ ) than teachers who did not receive professional development ( $M = 2.38$ ,  $SD = 0.57$ ) (Table 9).

TABLE 9  
EFL TEACHERS' TPACK LEVEL BASED ON PROFESSIONAL DEVELOPMENT

Item	PD	Mean	Std. Deviation	t	Sig.
TPACK Level	Yes	3.40	0.442	9.01	.000
	No	2.38	0.571		

## V. DISCUSSION

This study examined Saudi EFL teachers' TPACK level and the relationship between EFL teachers' attitudes toward technology and TPACK level. Additionally, it investigated whether EFL teachers' TPACK levels differ based on these factors: gender, educational level, teaching experience, and training. Since the Ministry of Education required the increased use of technology and online learning post-pandemic, these changes have unquestionably affected the teaching and learning process in the Saudi education system. Therefore, it is important that Saudi EFL teachers possess a good level of TPACK competencies, which impacts technology integration in EFL teaching. The outcomes demonstrated that Saudi middle school EFL teachers reported generally good TPACK levels. The results align with the studies of Saricoban et al. (2019), Genç and Dülger (2024), and Azhar and Hashim (2022), who reported that EFL teachers had good TPACK levels that influenced their TPACK practice.

The results also indicated that most EFL teachers had positive attitudes toward technology in middle schools. They reported that technology had positive effects on educational life. According to Bai et al. (2024) and Raygan and Moradkhani (2022), teachers' positive attitudes toward technology affect and ease the successful integration of TPACK into learning activities. Thus, it is important to pay attention to EFL teachers' attitudes toward technology in Saudi schools. The current study's results revealed a strong and positive relationship between Saudi EFL teachers' TPACK level and their attitudes toward technology in middle schools. These findings are consistent with previous studies (Alhamid & Mohammad-Saleh, 2024; Azhar & Hashim, 2022; Njiku, 2023) indicating a correlation between EFL teachers' TPACK and skills and attitudes toward technology and that attitude toward technology had an effect on one's TPACK. Moreover, the dimensions of attitude and TPACK were identified as predictors of each other. Thus, having Saudi EFL teachers with positive attitudes toward technology and good TPACK levels could be considered as a good finding in terms of incorporating technology in EFL classrooms and promoting students' English language skills. Hence, it can be said that Saudi EFL teachers must continue to develop positive attitudes toward technology so they can integrate technology effectively into English teaching.

The third question analyzed how Saudi EFL teachers' TPACK levels differed based on gender, educational level, received professional development, and teaching experience. In such contexts, training programs that provide educators with digital skills and knowledge to effectively integrate technology and reflect TPACK in their practices become more important. This is especially true given the results that revealed a significant difference in TPACK levels between teachers who received professional development that comprises TPACK concepts and skills and those who did not. Specifically, EFL teachers who received professional development had higher TPACK levels than teachers who did not. In this study, 40% of Saudi EFL participants reported that they had not received professional development, which could have affected their TPACK competence and practice. These results align with Abubakir and Alshaboul's (2023) study that revealed that teachers who received professional development outperformed other participants in their TPACK level. According to Elmaadaway and Abouelenein (2023), all educators believe that adaptive training that comprises TPACK concepts helps them to build technology-integrated teaching and reflect their TPACK in their practice.

The outcomes of this study revealed significant gender-based differences among the Saudi EFL teachers in their TPACK levels. Female EFL teachers reported higher TPACK levels than male teachers in middle schools. It can be interpreted that female EFL teachers have better TPACK competence and are better at using TPACK in their teaching practice than male teachers. This study also found that 65% of female teachers had received technology training, which could be a contributing factor to female teachers' higher TPACK competence. These results align with those of Genc and Dulger (2024) who found that female EFL participants reported higher perceptions across all TPACK domains compared to male participants. However, this outcome was inconsistent with some studies that found that male teachers had higher TPACK levels than female teachers (Saricoban et al., 2019). The results demonstrated no significant differences in Saudi EFL teachers' TPACK levels based on their educational level. However, a portion of the present study was inconsistent with these results and suggested that teachers with a higher educational level had greater TPACK than those with a lower educational level (Ali & Mohammadzadeh, 2022). Ph.D. participants reported higher TPACK competencies than those with a bachelor's degree (Ali & Mohammadzadeh, 2022). Additionally, the current findings highlighted the effects of teaching experience on EFL teachers' TPACK levels. EFL teachers with 21–30 years of experience had higher TPACK competence than those with less teaching experience (0–10 years). These findings are consistent with Wang's (2022) study that revealed that experienced EFL teachers demonstrated significantly higher TPACK levels compared to novice teachers. Therefore, as Li et al. (2022) indicated, implementing training courses for teachers with fewer years of teaching experience could promote their confidence and competence in utilizing technology in their teaching practice.

## VI. CONCLUSION

Teachers' TPACK can influence their teaching and students' learning. Therefore, the TPACK framework has increasingly been examined and implemented across various countries and educational settings in recent years, as it highlights the essential skills and knowledge educators need to incorporate technology effectively into their instruction. In the post-pandemic era, some changes made in teaching and learning in Saudi schools have significantly impacted the educational process. Consequently, it is important for educational policymakers and curriculum designers in Saudi Arabia to consider the factors that influence teachers' knowledge levels and competencies in the implementation of any changes to the teaching and learning process. EFL teachers in middle schools had a good TPACK level, which, in turn, affected their teaching practice in EFL classrooms. The results of this study also indicated a strong correlation between teachers' attitudes toward technology and TPACK level, enabling them to implement TPACK effectively into their teaching and positively affect students' English language acquisition.

In this case, it could be observed that attitudes toward technology significantly influenced TPACK levels. To foster positive attitudes and enhance TPACK levels, it is recommended to prioritize the importance of using technology in in-service and pre-service teacher education programs and provide targeted training in this area. Additionally, the present study adds to the growing body of TPACK literature by emphasizing the need to account for various teacher characteristics, such as background and experience, and their impact on TPACK competencies. Given the differences in TPACK abilities linked to factors like teaching experience, prior training, and gender, tailored support strategies should

be provided to meet the needs and characteristics of teachers at different levels. Special attention should be directed toward improving the TPACK competencies of male EFL teachers and those with fewer years of teaching experience by offering comprehensive training programs focused on TPACK concepts and skills. Teachers who underwent training demonstrated a notable advantage in their TPACK levels. This highlights the importance of teacher sustainability, as the rapid evolution and diversity of technology demands skill enhancement through continuous sustainability (Almufarreh & Arshad, 2023). The Ministry of Education should ensure that Saudi EFL teachers have access to effective, sustainable, and ongoing professional development programs that encompass all TPACK domains. These initiatives would enable teachers to improve their teaching practices, master new skills, and successfully integrate TPACK into their teaching. This will require interactive and continuing engagement, allowing EFL educators to observe new techniques in action, share expertise, and benefit from more experienced colleagues.

Future research could examine EFL teachers' TPACK level while considering other variables that could impact their TPACK, such as type of school (public/private) and teachers' self-efficacy. Moreover, more in-depth qualitative research within a specific context or environment is recommended to explore the critical relationship between these factors. The findings of further research can enhance the quality of EFL teaching via the effective integration of TPACK practices into education.

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