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Investigating EFL teachers' TPACK competencies: A study in Northern Iraq

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ABSTRACT

The expeditious advancement of innovation has necessitated its integration into education and language teaching to improve the quality of education. The Technological, Pedagogical, and Content Knowledge (TPACK) framework offers a valuable model for merging technology with language pedagogy and subject matter. This study investigated EFL teachers' understanding of TPACK and its core knowledge domains in Northern Iraq, focusing on factors such as general knowledge, teaching experience, and academic qualifications. A mixed-methods approach was employed, combining quantitative data from 105 EFL teachers through a TPACK questionnaire and qualitative insights from 10 interviews. This study examined EFL teachers' understanding of TPACK and its core knowledge domains, considering factors such as general knowledge, teaching experience, and academic qualifications in Northern Iraq. The results revealed that teachers demonstrated stronger pedagogical and subject knowledge compared to educational technology. Interestingly, novice teachers showed greater proficiency in technology-related scales, whereas experienced teachers exhibited better knowledge of content and pedagogy. Furthermore, academic degrees influenced technological knowledge, with significant differences observed. The study's findings, derived from both qualitative and quantitative phases, yield important implications and warrant further exploration and teachers' sustainable development in education.

Contribution/Originality: This study is original in examining EFL teachers' TPACK competency by comparing perceptions and uses across experience levels and academic qualifications. Unlike previous research, it specifically investigates how BA, MA, and PhD degrees influence understanding and application of TPACK, addressing gaps in teachers' general knowledge and experience with the model.

1. INTRODUCTION

Nowadays, almost every aspect of life is affected by technology. Tools and devices are seen and used everywhere, and they have become a significant part of everyday life. Advances in technology have resulted in fundamental changes in EFL teaching and learning, making it an essential part of educational reform (Jang & Tsai, 2012). Some fields of knowledge cannot go without it or remain undevelopable. Due to the growing need for technology in almost all fields, including second and foreign language teaching and learning, investigating teachers' knowledge becomes a vitally important task. How teachers might perceive technological changes in their classrooms is a fundamental question (Hinkelman, 2018). As technological advancements continue, recent issues in language learning have arisen because

of this. Therefore, the need to investigate teachers' knowledge has become apparent. According to Chapelle and Sauro (2017), technology has become an integral part of foreign and second language learning in various contexts globally, including exposure to language users, language tests, and language use both inside and outside the classroom. Technologies, such as smart boards, computers, networks, screens, and mobile devices, are integrated into university lectures, classroom instructions, and institutional activities (Garrett, 2009). Besides, Hinkelman (2018) addressed technology while he 'redefined' in language learning to be "assumed concept in CALL that roughly equates to 'computer', 'computerization', or more recently, 'device'' (p. 45). In the process of language learning, it has been described, identified, and even named in various ways, including e-learning, digital language learning and teaching, Technology-Enhanced Language Learning (TELL), m-learning, virtual learning, etc. Hanewald and Ifenthaler (2014) have identified technological integration with language acquisition in open, distance, and flexible learning concerning language and education. Teaching and learning English for EFL learners and teachers is a challenging task. In the present era of technology, many avenues are being opened to facilitate teachers and learners (Barjestesh et al., 2025).

Technology has revolutionized the education sector over the past two decades, and all developed countries are benefiting from its advancements. It has improved the professional competence of teachers and simplified the learning process for students. New strategies and methods have redefined the fields of language, teaching, and learning, transforming the educational landscape. One of the most notable emerging features of teaching is distance learning. Consequently, technology-mediated distance learning is widespread geographically and, with ongoing innovations, offers various opportunities in both private and public settings (Chapelle & Sauro, 2017).

By adding technology to the earlier model, TPACK as a leading model by Mishra and Koehler (2006), becomes a new teaching framework. The TPACK framework builds upon Lee Shulman's construct of pedagogical content knowledge (PCK) and adds technological knowledge. In this framework, there are seven types of knowledge to be integrated to develop effective strategies for language teaching and instruction. Based on these principles, Vereshchahina, Liashchenko, and Babiy (2018) argued that teachers with a strong TPACK skill set are better equipped to utilize technologies, including computer-mediated and online tools, in their teaching environments. However, many studies have highlighted the importance of technological knowledge alongside pedagogical content knowledge (For instance, (Baser, Kopcha, & Ozden, 2016; Cheng, 2017; Jang & Chang, 2016; Jang & Tsai, 2012; Martin, 2018)). All these studies examine teachers' perceptions of TPACK and have received the least attention, especially regarding teachers' general knowledge of the model, the role of experience, and academic qualifications related to TPACK. Considering this, the present study investigates teachers' TPACK competency levels by examining their content, pedagogy, and technology knowledge. The study aims to address the following questions.

What is the competency level of teachers with a better understanding of TPACK? What are the viewpoints of experienced and novice teachers regarding TPACK, and how do they differ in their perceptions and use of TPACK and its scales?

Do academic degrees such as BA, MA, and PhD result in different perceptions, understandings, and applications of TPACK?

2. REVIEW OF LITERATURE

Research shows that teachers in all subjects are continuously striving to develop the quality of the curriculum, teaching and learning procedure (Abdurrahman et al., 2019; Hartinah et al., 2020; Sriyakul, Rodboonsong, & Jermsittiparsert, 2020). As advancement in technology and second and foreign language learning continues with research and inventions, new theories aiming at a technological improvement in instruction have begun to appear. According to Shulman (1986) and Veal and MaKinster (1999), the teacher's knowledge merely relies on CK in the past. Later, with the emergence of teacher education and teacher training, changes happened. There was a shift towards teaching and pedagogical procedures but with the least connection with CK (Ball & McDiarmid, 1990).

After that, Shulman (1986) argued that pedagogical and content knowledge were treated exclusively, and he developed a model for Pedagogical Content Knowledge (PCK). As previously stated, this model represented the combination of teaching methods and subject matter knowledge so that the subject could be accessible for learners.

In doing so, it was argued that its purpose was to present and formulate the subject in such a way that it could be understandable for all. The advancement of technologies in the education sector was not properly assessed by Shulman (1986) in his model, and to address this issue, Mishra and Koehler (2006) proposed adding technology to the scope. According to them, TPACK by Shulman (1986) focused on "pedagogical content knowledge," and it was extended by incorporating technology into the "pedagogy." Therefore, by adding TK into the framework, new intersections have begun to emerge. Therefore, the TPACK framework provides three learning components that interact with each other to ensure a successful teaching and learning environment. Tseng (2018) and Graham (2011) explained that the TPACK framework identifies three core domains of knowledge, which consist of Technological Knowledge (TK), Pedagogical Knowledge (PK), and Content Knowledge. These three main domains of knowledge, with multiple integrations, form four new areas of knowledge: the seven branches of knowledge created from the interaction of the three core domains of knowledge (Koh, Chai, & Lee, 2015). So, the seven key knowledge areas that make up the TPACK framework are:

Content Knowledge (CK): a teacher's actual understanding of the concept of a subject, including fundamental knowledge, vocabulary, problem-solving strategies, and the ability to analyze and understand scientific principles (Shulman, 1986).

Pedagogical Knowledge (PK): It pertains to the knowledge teachers need to effectively implement teaching and foster learning. It includes curriculum design, lesson planning, and teaching strategies.

Technology Knowledge (TK): Technology knowledge involves understanding and proficiency in digital media. This includes skills such as using software, understanding hardware, and managing data.

Pedagogical Content Knowledge (PCK): The content knowledge within the teaching process, concerning how educators understand teaching and learning issues, brings about changes in the teaching of the intended subject.

Technological Content Knowledge (TCK): TCK refers to a teacher's understanding of technology tools and digital resources related to subject matter. It also encompasses awareness of content limitations that may influence the selection of technology.

Technological Pedagogical Knowledge (TPK): It concerns the innovative ways teachers incorporate technology into the classroom. This approach enables teachers to create more engaging and personalized learning experiences for their students.

Technological Pedagogical and Content Knowledge (TPACK): The construct manifests as seven distinct but related domains, representing the relationship between the main constituents of CK, PK, and TK. It focuses on determining and illustrating how technology-related professional knowledge is put into practice and brought into existence (Koehler & Mishra, 2009).

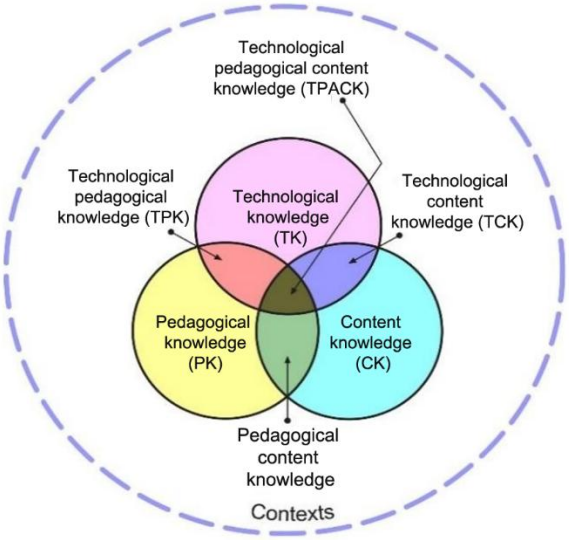

Figure 1. TPACK Mishra and Koehler (2006).

Due to the widespread adoption of technology and globalization, integrating these three domains becomes a crucial factor, and researching TPACK as a leading model in this area becomes vitally important (Figure 1). Koehler and Mishra (2009) stated that the TPACK framework offers areas for exploring teacher education and technology integration. They emphasized TPACK as "options for examining a complex phenomenon like technology integration in ways that are now suitable for analysis and development" (p. 67).

In a study by Tseng (2018), the perceptions of learners regarding their teachers' TPACK were examined among 257 high school Taiwanese students. The results showed that the teachers demonstrated better abilities in their CK than in their TK, according to the students' perceptions. Vereshchahina et al. (2018) explored university instructors' perceptions of their teachers' TPACK. The results showed that teachers' perceptions are higher in CK, PK, and PCK than in TK and TCK.

Nazari, Nafissi, Estaji, and Marandi (2019) compared beginner and skilled English language teachers' TPACK in Iran. The results showed that skilled educators have better PCK compared to less experienced ones, and beginner educators are additionally proficient in TK, TPK, TCK, and TPACK. Most of the literature reviews show studies on teachers' general TPACK, their students' perceptions of TPACK, and only quantitative data. Therefore, the present study investigates EFL teachers' TPACK using a mixed-method approach, focusing on teachers' general perception and use of TPACK and its components, comparing experienced and novice teachers' TPACK in relation to their academic degrees.

3. RESEARCH METHODS

The present study investigates teachers' knowledge of TPACK and its components, including TK, CK, PK, PCK, TCK, and TPK. Additionally, it examines the TPACK of experienced and novice teachers, their components, and the role of teachers' academic degrees. The study was conducted using both qualitative and quantitative methods to assess participants' TPACK levels through a questionnaire and interviews.

The current study involved 105 participants, consisting of 71 males and 34 females, who are EFL teachers with various educational degrees in English from institutes in Erbil and Sulaimani city. The participants' ages ranged from 23 to 50 years, and they held different academic credentials: 29 with a Bachelor's degree, 56 with a Master's degree, and 20 with a PhD. To address the quantitative questions raised during the study, a TPACK questionnaire (see appendix A), developed by Baser et al., was administered. The Likert-scale survey questions typically present a declarative statement followed by a rating scale from 1 (nothing) to 9 (a great deal), comprising 39 items. The internal consistency of the TPACK survey was measured using Cronbach's alpha (Baser et al., 2016). In the study conducted, Cronbach's alpha analysis indicates that the questionnaire has a high level of reliability, with a coefficient of .92. The questionnaire addresses each of the scales of TPACK, which are described in the framework with specific components, including items TK 9, CK 5, PK 6, PCK 5, TCK 3, TPK 7, and 4 TPACK items.

The study involved 105 EFL teachers (71 male, 34 female) from various institutions in Erbil and Sulaimani, Northern Iraq, including universities, colleges, and language institutes. Participants ranged in age from 23 to 50 years and held different academic qualifications: BA (N=29), MA (N=56), and PhD (N=20). Quantitative data were collected using a validated TPACK questionnaire (Baser et al., 2016) comprising 39 items rated on a Likert scale (1 to 9). The questionnaire assessed seven TPACK domains: Technological Knowledge (TK), Content Knowledge (CK), Pedagogical Knowledge (PK), Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and TPACK. Cronbach's alpha analysis confirmed high reliability (α=0.92).

For qualitative insights, structured interviews were conducted with 10 teachers (5 novice, 5 experienced), selected based on Gatbonton (2008) criteria. Novice teachers had less than two years of experience, while experienced teachers had at least four years. The interviews, lasting 20–25 minutes, explored teachers' perceptions and practices related to TPACK.

For triangulation and consideration from different perspectives, the researchers developed a face-to-face but structured interview and its protocol. Three experts who were experienced in TEFL assessed the interview questions and modified them. Ten new and experienced teachers participated in the interviews. Moreover, to gain an in-depth understanding of the knowledge bases in the interview, namely CK, PK, and TK, participants were asked about their future development in this regard. Based on Gatbonton (2008) , the interviewees were divided into two groups: novice and experienced teachers. According to the criteria, novice or inexperienced teachers (both terms are used interchangeably here) have less than two years of experience, during which they are either currently teaching, have just finished, or are still in training. Conversely, experienced teachers have at least four years of extensive experience. This interview contains 13 items targeting TPACK traits, with questions for each. Some questions include follow-up structured questions based on participants' responses in a fixed manner.

After obtaining consent, the participants were informed that the data are needed for research purposes and should accurately represent their TPACK. The data were collected by asking participants to carefully read the questionnaire and select the answer that best describes their knowledge and use of TPACK. Participants received the questionnaire in either printed or digital format. Researchers were available on each occasion to clarify any ambiguities.

After conducting the questionnaire, face-to-face interviews were held with 10 willing teachers. The interviews were audio-recorded and lasted between 20 and 25 minutes each. Regarding confidentiality, the interviewees were informed that the data would be used for research purposes, and efforts were made to create a friendly environment to obtain genuine responses.

The quantitative data collected through the questionnaire was entered into SPSS. Descriptive statistics, independent sample t-tests, ANOVA, and multiple comparisons were conducted. Additionally, the audio-recorded interviews were transcribed and coded for analysis to identify common features and specific phenomena.

The present study aimed to determine teachers' perceptions of TPACK across three phases. First, teachers' overall perception levels were assessed to identify their TPACK and its components, using both qualitative and quantitative methods. Second, the TPACK levels of experienced and novice teachers were compared, incorporating data from questionnaires as well as their perspectives. Third, teachers' TPACK and its components were analyzed in relation to their academic qualifications (i.e., BA, MA, and PhD). Descriptive statistical analysis was applied to the quantitative data to support these findings.

4. FINDINGS

What is the teacher's competency level regarding TPACK?

Table 1. Descriptive statistical analysis of teacher's overall TPACK competency level.

TPACK scales	N	Mean	Std. Deviation
Subject matter expertise	105	81.44	122.45
Pedagogical content knowledge	105	78.11	113.47
Pedagogical knowledge	105	75.84	121.55
Technological pedagogical knowledge	105	72.93	129.75
Technological content knowledge	105	71.71	141.88
Technological knowledge	105	67.20	160.90
Technological, pedagogical, and content knowledge (TPACK)	105	65.09	157.65

In Table 1, the results show that teachers have higher CK and PCK with means of 8.14 and 7.81, respectively. Additionally, teachers recorded the lowest means in TPACK at 6.50 and TK at 6.72. Regarding the items with the highest and lowest means, it was found that item 13 (mean=8.33), item 10.0 (mean=8.20), and item 12.0 (mean=8.15) have the highest means. Notably, these three items are in the CK category. Conversely, the items with the lowest means are item 8 (mean=4.88), item 7 (mean=5.52), and item 36 (mean=6.10). The first two lowest items belong to

TK, and the third is a TPACK item. Overall, teachers demonstrated better CK (mean=8.14) and PCK (mean=7.81), while recording the lowest means in TPK (mean=6.50) and TK (mean=6.72).

The interview was also conducted to assess teachers' knowledge and perceptions of TPACK and its components. Although some teachers provided clues about PK, the interview revealed that most teachers failed to define what PK is, and PK was primarily addressed as subject knowledge and viewed as merely a communicative approach in language teaching. For instance, when asked to provide keywords related to PK, they mentioned "authentic English," "linguistic knowledge," and "subject among the students."

Concerning knowledge and perception of CK, teachers have better addressed CK, and nearly all of them linked CK to language services and subskills, connecting the four main skills with other aspects of language, including pronunciation, vocabulary, conversation, and grammar. According to comments from a few respondents, cultural competence (CK) is knowledge of culture, context, native speakers' backgrounds, and the instructor's background knowledge.

In response to the importance of technology integration, the interviewee provides various reasons, including facilitating learning, activating students, its widespread use nowadays, and students' preference for it. Examples of technology used by learners include smartphones, iPads, social media, websites, etc. Additionally, the significance of integrating technology is emphasized as a crucial facilitator for useful activities, being very helpful in teaching and entertainment, and motivating students.

TPK is another subscale of TPACK, and two main areas were examined. It was asked whether teachers taught their classes effectively using new technology and how they could utilize this data for language development. Additionally, they supported learners in engaging with the language collaboratively. Most interviewees agreed and elaborated that they recommend providing general guidelines and information to facilitate this. Their suggestions include assigning tasks such as watching specific videos and discussing their content, encouraging students to listen to the radio in English, assigning activities through messenger groups, using emails and messenger groups to communicate, and encouraging the use of messenger groups and YouTube.

Table 2. Mean of difference between experienced and novice teachers' TPACK.

	Experience	N	Mean	Std. deviation	Sig.
Technological, pedagogical, and content knowledge	Experienced	77	65.42	160.97	0.69
	Inexperienced	28	64.19	150.62	
Technological knowledge	Experienced	77	69.69	158.61	0.706
	Inexperienced	28	60.35	149.25	
Pedagogical knowledge	Experienced	77	77.55	115.61	0.251
	Inexperienced	28	71.13	127.09	
Content knowledge	Experienced	77	83.24	107.31	0.125
	Inexperienced	28	76.5	147.93	
Pedagogical content knowledge	Experienced	77	79.53	111.53	0.948
	Inexperienced	28	74.21	111.46	
Technological content knowledge	Experienced	77	72.68	148.48	0.488
	Inexperienced	28	69.04	120.3	
Technological pedagogical knowledge	Experienced	77	74.19	134.39	0.225
	Inexperienced	28	69.49	111.01	

Another area highlighted in the study is teachers' TCK, how teachers share the content to be covered in a certain language learning environment through technology. To achieve this, the respondents commented that they suggest links, offline dictionaries, online groups, sending them the content, online vocabulary learning, and using other technological means that are listed in Table 2. In contrast, when asked if they can teach without technology (i.e., PCK), teachers fall into two categories. Some remarked that teaching without technology is "boring" or that they "cannot teach without technology," while others are comfortable ignoring it. One respondent thought it is important because learners naturally have a strong "desire" to engage with technology.

After all the subscales of TPACK were elicited, it is time to illustrate participants' knowledge and assumptions of the model itself. To achieve a clear image of the data, certain parts were devoted to understanding and differentiating what TPACK means to the teachers both theoretically and practically. Teachers are not fully aware of what the concept of TPACK entails; more interestingly, very few participants use the word technology when they define it. Even though the participants were encouraged to express their understanding of TPACK, a few of them simply say that it is a framework or a way of teaching without further explanation. The overall responses to practical TPACK were unexpectedly rooted in what the model seeks to attain in language teaching.

What is the difference between experienced and novice teachers' stance regarding TPACK, and how do they differ in their perceptions and use of TPACK and its scales?

As mentioned earlier, in the present study, novice teachers have less than two years of actual teaching experience or have just started teaching; on the other hand, experienced teachers have at least four years of teaching experience. First, let us begin by analyzing the questionnaire to identify the differences and similarities based on descriptive statistics.

As the tables illustrate, here we have a notable difference between experienced and novice teachers regarding TK, CK, PK, and PCK, i.e., $p<0.05$. The table also suggests that insignificant differences exist between experienced and novice teachers regarding TCK, TPK, and TPACK is which $p>0.05$. Overall, the total scores showed a statistically detectable difference between performance of experienced and inexperienced participants, $p<0.05$.

The group of teachers who achieved higher scores across TPACK components was used for an independent sample t-test. The results show that experienced teachers have significantly higher CK, PK, TK, and PCK. The table also indicates that experienced teachers have higher levels across all the scales, although these differences are not significant at TPK, TCK, and TPACK.

Besides having a comprehensive understanding of novice and experienced teachers' perceptions of TPACK, ten teachers were interviewed. Five of them were experienced, and the others were novice teachers; all held master's degrees in various English language fields. After the interviews, the collected data were transcribed and coded. Since the interview was structured, there were specific items for each scale of the model and for understanding and utilizing the model itself.

In the interview, first, participants PK were examined and compared, and teachers misunderstood what PK is. Experienced teachers stated that subject knowledge helps students understand concepts, communicative language teaching and strategies, and learners' autonomy. In contrast, novice teachers added psychology and authentic English to what experienced teachers claimed. Although some teachers noted that PK is a teaching method or approach, none of them have arrived at a comprehensive definition covering major areas in the field of language education.

Regarding respondents' CK, the experienced teachers stated that it is a basic understanding of language, and it requires the skills and subskills of linguistics, vocabulary, connotation, and circumstantial awareness. Unexpectedly, almost half of the interviewees argued that CK is knowledge about our surroundings, environment, and teaching skills and strategies, while these qualities are actually part of PK. This misconception of CK also arose among novice teachers, and their focus was on teaching skills, culture, being a talented speaker, trust, and background knowledge.

Unlike previous scales of TPACK, both experienced and novice teachers demonstrate a thorough understanding of what TK is. While experienced teachers mentioned that technology facilitates and motivates teaching, they also use it because it is very common, and students use it daily. Conversely, although they agree that technology facilitates learning and motivates learners, new teachers expressed concern and eagerness to use it within a complete structure.

In response to how they combine technology and pedagogy in teaching, accomplished teachers said that they teach words, give instructions, and provide outlines to learners to integrate technology into learning; many students even recognize the tools and operations to be used. Teachers have a broad spectrum of knowledge in their field and appear to provide additional examples besides assigning homework, outlines, and encouragement through technology.

Regarding unified subject knowledge with the integration of technology, most participants seem to understand TCK very well, as they provide various examples to illustrate this. Although experienced teachers are more likely to use online technologies such as messenger, email, and Zoom meetings, both groups of teachers explain and share their experiences of how they relate to and communicate better through the latest technology alongside CK, even when face-to-face pedagogy is not present. New teachers, or some in that group, do not consider technology a proper part of education. They even feel comfortable ignoring technology and do not understand its importance.

Addressing theoretical and practical aspects of TPACK, respondents' perceptions of it, and its implementation as a teaching model, some teachers only discussed its importance. In contrast, others elaborated by providing examples from their teaching contexts. Overall, two-thirds of the participants responded adequately. However, experienced teachers demonstrated better knowledge and application of TPACK compared to novice teachers.

To use technology, novice teachers cite more reasons, including making authentic materials available, creating an enjoyable environment, motivating learners, and saving time. Experienced teachers also benefit significantly from integrating technology into course design, which helps create a more engaging learning environment for learners. It is effective, saves time, and satisfies learners. However, while teachers are asked how they keep up with technological advancements, both agree that they use online sources and attend seminars.

There are many different types of technology, each with unique functions that aim to make certain processes more efficient. The participants listed common technologies used nowadays, including online and offline sources, e-books, tablets, mobiles, computers, etc. However, few teachers identified three specific programs they use in their teaching: Zoom Meeting, Kahoot, and Edmodo. Interestingly, almost all experienced and novice teachers resorted to using social media apps, including Viber, Facebook Messenger, Telegram, and YouTube, as technological tools for teaching. It should be emphasized that many interviewees expressed a strong interest in using messenger groups to stay connected with learners.

Do academic degrees such as BA, MA, and PhD result in different perceptions, understandings, and applications of TPACK?

It is hypothesized that different academic degrees yield varying levels of competence and ability. Therefore, it is important to test these degrees and determine how teachers differ and which traits of TPACK are more prominent. In the quantitative phase, 105 teachers from undergraduate and postgraduate degrees, such as BA (N=29), MA (N=56), and PhD (N=20), participated in this study. After completing the questionnaire, the data were analyzed using descriptive statistics, ANOVA, and multiple comparisons. The table below presents a descriptive analysis of teachers' perceptions across each TPACK scale.

Table 3. Descriptive statistics for academic degrees.

		N	Mean	Std. Deviation	Sig.
Technological, pedagogical, and content knowledge	PhD	20	69.75	141.86	0.001
	MA	56	64.95	160.14	
	BA	29	62.15	160.73	
	Total	105	65.09	157.65	
	PhD	20	74.61	136.04	
	MA	56	69.02	142.87	
Technological knowledge	BA	29	58.58	176.7	0.001
	Total	105	67.2	160.9	
	PhD	20	79.41	0.84	
	MA	56	75	137.95	
Pedagogical knowledge	BA	29	75	107.36	0.347
	Total	105	75.84	121.55	
	PhD	20	84.9	0.82	
	MA	56	81.28	131.86	
Content knowledge	BA	29	79.37	125.14	0.300
	Total	105	81.44	122.45	
	PhD	20	82.5	0.86	

		N	Mean	Std. Deviation	Sig.
	MA	56	77.85	118.95	
Pedagogical content knowledge	BA	29	75.58	113.68	0.107
	Total	105	78.11	113.47	
	PhD	20	77.83	101.61	
	MA	56	70.41	150.29	
Technological content knowledge	BA	29	70	141.7	0.099
	Total	105	71.71	141.88	
	PhD	20	77	0.95	
	MA	56	72.8	139.27	
Technological pedagogical knowledge	BA	29	70.39	127.99	0.216
	Total	105	72.93	129.75	

To evaluate any significant differences between the sample data of participants with different degrees of BA, MA, and PhD regarding TPACK and its components, an ANOVA table was established and is shown in Table 3..

As the table shows, one-way ANOVA analysis illustrated that three sampled groups, which have different expertise in their fields and TPACK scores $p<0.05$. When we study this one-way analysis, we find that these three individual groups have their own competencies and technological awareness $p<0.05$. On the other hand, the other components show no prominent or significant differences in all observations.

In the results, which groups show different outcomes, a Tukey post hoc test was conducted. The examination of participants' total scores revealed that only the difference between BA and PhD degree holders was significant. Regarding technological knowledge, the post hoc analysis indicated a notable difference, with PhD participants demonstrating a higher level of TK and a mean value of 1.60. These findings clearly show a difference between BA and MA participants, with MA respondents exhibiting better ability and use of TK, reflected in a mean of 1.04. No significant difference was observed between MA and PhD participants.

5. DISCUSSION

Previously, data elicited from participants through quantitative and qualitative means was analyzed and presented. As a result, many points and controversies came to attention. In the present section, teachers' perceptions and understandings, the stance of new and experienced teachers in TPACK, and the impact of an academic degree on TPACK, especially regarding the use of technology, will be addressed and discussed.

As the first level of TPACK, there are some misconceptions about CK. Although no differences were observed concerning experience and academic degree in the study's quantitative phase, teachers hold conflicting views of what CK is. For instance, some teachers described it as general knowledge about the language, the four skills, vocabulary, communication, and speaking. Others failed to define CK, with one teacher stating that it is "pronunciation, planning for designing activities, and understanding students' attitudes and culture, as well as the culture of the target language." Yet, another described CK as "the four skills," emphasizing that "teachers must know about the English language, culture, and the circumstances of native speakers of English."

Although most teachers failed to define CK properly, experienced teachers provide more grounded points. This might be because they have been teaching for a longer period and have more experience in various content areas. Overall, when general perceptions of teachers were considered regardless of experience and degree, CK had the highest mean among all components of TPACK, although misunderstandings arose in the interview when defining CK. This suggests that teachers believe they have a substantial amount of CK, but they may be familiar with CK without being able to articulate an exact term to categorize their knowledge.

Regarding the concepts of pedagogy and PK, teachers tend to define different types of knowledge. Interestingly, they referred to both PK and CK when responding to questions about PK. Consequently, teachers were unable to

provide a clear understanding of PK, with some linking it to skills or strategies they use. For example, one teacher stated:

In my estimation, the first step of groundwork to educate a fresh mind of a student is to set up his mind psychologically. After that, we can educate them with the basic and linguistic knowledge of English. In my opinion, mental preparation is most important. A ready-to-receive mind could better absorb information and then practice it. If I have options between language and communication, I will always choose the communication approach first. A meaningful approach to communication is the only way to educate learners to understand and speak actual English or any other language.

Besides labeling content or subject matter knowledge as PK, some participants, including the one quoted above, even stated that PK is a Communicative Language Teaching approach. For instance, a teacher said that it is about how to teach using a specific strategy such as CLT (Communicative Language Teaching). It is assumed that those teachers have prioritized this method as the whole language teaching, or it may be more focused in their teaching development courses than other methods, which is why they cannot differentiate them. Misunderstanding CK and PK in definition may suggest that it is difficult for teachers to distinguish them, and they regard them as one entity, as they see and embody teaching (i.e., PK) and the subject together, mostly in their classes. Overall, teachers are more focused on defining PK but list more components when describing CK: language properties. Although teachers can be labeled as having similar CK and PK, experienced teachers have significantly higher scores for both types of knowledge in the questionnaire, especially in CK. This is because of their past teaching experience, which leads them to understand CK concepts better and feel more secure about their teaching abilities. These results align well with the work of Jang and Chang (2016). They discovered that experienced teachers demonstrate better subject knowledge and instructional strategies, resulting in better outcomes than new teachers.

It should be noted that teachers were first questioned about perceptions of PK and CK during the interview. There was not a single teacher involved in discussions about educational technology as part of pedagogy until it was time to ask about TK and its uses. Hence, this implies that exploiting technology is not considered an important factor in their pedagogy, and nothing described it, even if they misunderstood the concept of pedagogy and subject matter expertise.

Due to technological advancements, teachers are more direct and present their ideas with enthusiasm, especially novice teachers. This finding aligns with Lam (2000), who commented that participants in his study welcomed discussing technology and did not feel threatened by its advancement. In comparison, the quantitative analysis shows that teachers generally possess better content knowledge (CK) and pedagogical knowledge (PK), with the lowest means for technological knowledge (TK) and technological pedagogical knowledge (TPK). This supports the findings of Vereshchahina et al. (2018), who stated that academic staff have higher CK and PK than TK and TPK during their academic work. Additionally, it indicates that teachers face challenges in implementing new technology in their learning environments. From the qualitative analysis, novice teachers tend to take a more active role and feel more comfortable integrating technology. For example, one teacher explains, "TK is definitely a crucial need to incorporate technology into teaching because it facilitates instruction and helps students learn faster and more effectively." Another teacher adds,

It is essential to use and integrate technology in our teaching because teaching without it will be challenging and less effective. Using it, students can more easily understand the subject. It also facilitates and motivates teaching and learning, saves time, and makes lessons more practical. It motivates students to practice English at home by using it to search for more materials related to the content.

In contrast, experienced teachers, while acknowledging that current technology facilitates learning and motivates students, reported that they use technology primarily because it is being used, rather than out of necessity for their teaching. For example, an experienced teacher commented, "We must use and integrate it into our teaching because we now live in the 21st century, and all students are using it, so we cannot deny it at all."

Most teachers have stated that they motivate students to use technology as a critical tool for language learning and further explained that they utilize technological tools, links, and websites. It is noteworthy that only one teacher discussed providing feedback on technological integration. She, a novice teacher, mentioned, "I support them by encouraging the use of technology, and I tell them that including additional information in their presentations and videos can earn them higher scores."

Regarding the latest technology that could be used in classrooms, the interviewee mentioned social media channels as tools for better understanding between teachers and students. On the other hand, students interact with Messenger, Viber, and Telegram. These channels are used to socialize with ordinary people and are not learning-oriented applications at all. The point to be made here is that using these channels in groups leads to unrelated topics of communication and results in long pieces of unnecessary texts, especially when learners switch to their L1 or the conversation becomes more personal in the group chats. In conclusion, most learners get lost and find it difficult to identify which parts of the conversation are important for them. This may cause demotivation, and learners may feel pleased to leave these groups. The findings also highlighted that teachers are more concerned about how technology might make learning more engaging and enjoyable. This kind of learning not only saves time but also motivates students. However, respondents did not develop a method or specific procedures to demonstrate how they use technology. It can be concluded that they are more focused on the results than the process. Overall, novice teachers provide more detailed reasons for using technology. One of them said that she usually "gives them assignments such as watching a specific video and then asking them to discuss the subject of the video." Perhaps this is because novice teachers are younger than experienced teachers. Therefore, it is presumed that they are more interested in technology. To illustrate this, a novice teacher commented on the following.

Proper use of technology in English classes makes the learning process more authentic. Technology also enables students to see the real English-speaking world instead of relying on boring textbooks and rigid information. Tutorial videos can be played or displayed in class. Original footage of native speakers could be a better replacement for boring lectures, and it also makes actual communication more precise because students learn authentic communication skills and pronunciation.

I think sometimes we use technology as a motivational tool for students to improve their English. However, if misused, it can be both a distraction and a disaster. Therefore, its usefulness depends on the circumstances. I am a strong supporter of the positive use of technology as a better resource.

However, an experienced teacher stated that he "shows them many websites and teaches them how to use online and offline dictionaries and YouTube." Thus, comparing this comment with those of novice teachers, it can be inferred that exploiting technology is of limited use to this experienced teacher. Despite their experience, teachers are involved but not leading the integration. When teachers are not pleased with this, an experienced teacher remarked that she "always recommends them to use technology in their teaching, such as telling them to use a recorder on their smartphones to record my lectures. We also use speakers, emails, and messenger groups to contact each other."

It is worth mentioning that when academic degrees were also investigated in the quantitative phase, the participants differed in terms of TK. To illustrate, PhD and master's degree holders had higher TK than BA participants, with means of 1.60 and 1.04, respectively. Several reasons appear to cause these differences, including their degrees. PhD and MA participants have more exposure to technological use contexts, as they have more opportunities to use educational technology in their teaching methods. Additionally, we observed no difference between PhD and MA participants, partly because they are more similar to each other and mostly teach in similar contexts.

Regarding TPK, it is important to note that the verbs used by novice and experienced teachers to discuss managing technology differ. Concerning verb usage, experienced teachers stated that they create lesson plans with the help of MS Excel, recommend easy and varied methods of delivering information, encourage new ideas, teach through self-learning, sharing, and discussing ideas. Conversely, novice teachers mentioned that they assign tasks, encourage students, watch movies, read e-books, tell, ask, and instruct. This provides a clearer picture of a classroom

where novice teachers play a more active role in integrating technology into their teaching compared to experienced teachers, who have many other options for creating a better technology-based educational environment.

Both types of teachers make similar claims until it comes to TK, TCK, and TPK. For instance, their statements about PCK show no difference, even though experienced teachers are significantly better in PCK because of the quantitative measure.

As mentioned earlier, experience should involve a substantial amount of teaching, leading to improved teaching ability and more related to CK. The results indicate that experienced teachers with high levels of PK and PCK are similar to those described by Nazari, Nafissi, Estaji, and Marandi (2019); Jang and Tsai (2012); Cheng (2017) and Jang and Chang (2016). Conversely, when technology is the main focus or part of the interview, novice teachers tend to show more interest and explore various areas. Interestingly, during the quantitative phase, the results showed that experienced teachers scored significantly higher in TK. This may be because they are more experienced. They are likely to have greater confidence in their stance, including the use of technology, while questioning their proficiency in TK. Novice teachers, on the other hand, are considerably more interested in employing both educational and non-educational technologies.

Regarding other components, TCK is another scale in which technology is integrated with the subject. Here, to make PK absent, teachers were asked how to facilitate learning when a student is at home. Although two-thirds of teachers are available online to clarify or answer questions, remarks from novice teachers implied that they are more concerned about doing so. As noted earlier, this inconsistency occurs mainly because of age; novice teachers are generally younger and, as a result, more inclined to employ technology. Quantitatively, the scales discussed so far show that teachers have a higher level of PK and CK, and when technology becomes a foundational or integrated part of knowledge, the meaning diminishes. This supports Chen and Jang (2014)'s finding, which ranked TPACK components in ascending order as CK, PK, PCK, TCK, TPK, TPACK, and TK, respectively.

Concerning the model itself, teachers demonstrate their abilities through different interpretations and understandings of what TPACK means both theoretically and practically. First, regarding the question of what TPACK is, some teachers refer to teaching and technology or the required teaching knowledge. Interestingly, half of the participants identified content, technology, and pedagogy as significant components of TPACK. A novice teacher stated, "It calls for integrating technology with content and strategy in teaching, and I think it is a very useful approach." Another teacher an experienced educator commented, "TPACK is about using and integrating technologies, pedagogies, and content together." Others described it as a method or approach to teaching, without mentioning any specific components. This may indicate a lack of awareness of the model itself and its foundational principles.

Regarding practicing TPACK, most of the respondents succeeded in providing illustrative examples from their classrooms. During both the qualitative and quantitative stages, the study mainly supports Nazari, Nafissi, Estaji, and Marandi (2019) findings. They stated that experienced teachers tend to demonstrate much greater skills in PK and PCK, while novice teachers have higher T TCK and TPK.

Finally, whenever teachers mention technological tools, devices, and applications, they mostly refer to common technologies used in everyday life by ordinary people. This indicates that, although there is technological advancement in business and communication, language teaching lacks specific equipment and applications designed explicitly for language learning. An additional point raised by some teachers at the end of the interview is that their institutions and universities lack courses and seminars to incorporate effective educational technology into their teaching environments.

6. CONCLUSION

The current study examined how teachers understand and develop better scenarios to apply TPACK and its components. Teachers' educational backgrounds, general assumptions, and academic degrees were considered. Based

on teachers' overall TPACK, it was found that both novice and experienced teachers have difficulty identifying and distinguishing between CK and PK in interviews. However, when responding to questionnaires, teachers demonstrated better knowledge and ability in CK and PCK, respectively, with the least understanding in TPK. In TK or other scales that include TK as part of the knowledge, teachers showed greater ability and interest. Additionally, novice teachers expressed better perceptions and demonstrated a deeper understanding during interviews.

Statistical analysis shows that experienced teachers possess greater knowledge across all seven scales of TPACK, with significant differences observed in PK, CK, TK, and PCK. The results from both quantitative and qualitative analyses indicate that experienced teachers tend to be more confident, likely due to their years of teaching experience. Although some teachers did not demonstrate a comprehensive understanding of TPACK, most provided reasonable procedures for integrating pedagogy, technology, and subject knowledge in their classrooms.

Novice teachers have a better perception of technology; they show more interest in using technology in both online and offline modes, and they use applications that facilitate better communication. This is especially important when misunderstandings arise or questions are raised in a group, which are then shared with other learners or the teacher to find a solution or reach a conclusion. When discussing the technology they use to connect with learners, teachers frequently mention Messenger, Viber, and Telegram. However, these are not learning-oriented apps, and learners often get lost in the multitude of unrelated topics raised by some group members.

We found that PhD and MA participants have a higher TK level regarding teachers' academic degrees than BAs. This may be because of better opportunities they have to use technology in their contexts. Regarding deficiencies in technology, two issues

We were raised. Some teachers raise awareness of the lack of educational technology in their institutions and universities. In contrast, others prefer courses and seminars to develop their ability to keep pace with technological advancements. It is suggested that institutes and universities should introduce more progressive courses in their curricula to incorporate emerging and existing technologies and their applications, guiding teachers on how to utilize them effectively. Additionally, teachers should provide students with feedback on how they utilize technology and make current technologies accessible to them, fostering practical application. Novice teachers face significant challenges, especially in the classroom, time management, and a lack of pedagogical methods and techniques. Conversely, experienced teachers require additional support in the field of technology; collaboration between both groups appears beneficial. Ultimately, proficiency in educational technologies can play a crucial role in enhancing learning, particularly in language education. Therefore, scientific and educational committees should prioritize integrating technology into the classroom environment and provide feedback to teachers and learners to support ongoing improvement.

6.1. Limitations and Future Directions

The study has been conducted on teachers in Northern Iraq. Further investigation could examine teachers with different academic degrees. Additionally, it is important to research teachers' perceptions of TPACK in public schools versus private schools, exploring opportunities to utilize technological tools. For both suggested studies, it is essential to include voices from students and teachers. In the current study, the interviewees are MA holders; this study replicates interviews with teachers holding various academic degrees.

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