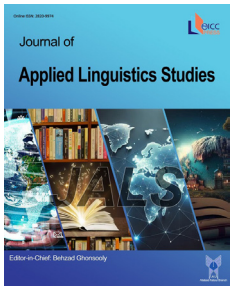

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Iranian EFL Teachers' TPACK Competency and Perception

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Abstract:

Examining EFL teachers' Technological, Pedagogical, and Content Knowledge competency and perception seems to be crucial. This survey research (also called descriptive research) followed an explanatory sequential design and used both "non-experimental quantitative" and "basic qualitative research" methods to gather information regarding TPACK competency and perception among Iranian EFL teachers while taking their educational degree and teaching experience into account. To accomplish so, 104 male (40) and female (64) Iranian EFL teachers from various branches of the Iran Language Institute were chosen through convenience sampling to participate in this study. The TPACK Self-Assessment Questionnaire (Baser et al., 2016) was used to assess the TPACK score of the participants in the quantitative part of the study. For the qualitative part of the research, through convenience sampling, 6 male (3) and female (3) participants voluntarily took part in a structured interview session regarding EFL teachers' perceptions towards TPACK. The results of the One-Way ANOVA Test revealed that there was not any significant difference in total TPACK score among participants of different educational levels. The results of the Independent Samples T-test showed that the more experienced participants outperformed the less experienced ones in terms of their total TPACK score. Thematic content analysis of the interview transcriptions using the MAXQDA software (a qualitative analysis software for text, memos, images, video segments (Ary et al., 2013)) revealed not only the participants' perceptions regarding the definition, importance, and the ways of improving TPACK, but also their ideas about the correlation between EFL teachers' TPACK level and their educational degree and teaching experience. The findings of the quantitative part of the study implicated the necessity of holding TPACK workshops for less experienced EFL teachers who need additional training in this area. The qualitative findings implicated that EFL teachers need to broaden their understanding of new technological tools, contemporary language pedagogy trends, and subject matter expertise.

Keywords: Content Knowledge, Pedagogy Knowledge, Technology Knowledge, TPACK Competency, TPACK Perception

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INTRODUCTION

It seems necessary to investigate the potential relationship among the EFL teachers' educational degree, teaching experience, TPACK competency and TPACK Perception. Connecting EFL teachers' qualifications and years of teaching experience to their TPACK competency is essential and the inattention to this relationship might be counterproductive. Although it is known that investigating the EFL teachers' TPACK competency and TPACK perception may improve their teaching process, only a few studies in the field of TEFL have addressed this issue. A few studies have used questionnaires, interviews, and

observations to investigate and overcome the challenges regarding EFL teachers' TPACK competency and their perceptions towards TPACK.

Chai et al. (2010) have focused on teachers' abilities in using ICT (information and communication technology) in their teaching process due to developments in technology and technological improvements in education. A study on the knowledge and attitudes of EFL/ESL teachers towards technology use have been conducted in order to discover how teachers perceive technology integration into their instruction (Zhao & Tella, 2002). Research has been done to investigate teachers' perspectives on technology-supported learning environments (Koh et al., 2010; Schmidt et al., 2009; Yurdakul et al., 2012). The majority of previous studies were only interested in determining whether teachers' attitudes towards technology were positive or negative (Jahanban-Isfahlan et al., 2017; Saglam & Sert, 2012). Previous research has also focused on teachers' beliefs and attitudes towards technology integration, as well as the problems they face in the classroom (Albirini, 2006; Dehqan et al., 2017; Gilakjani et al. 2015). When teachers begin to apply technology in their classes, they face challenges such as a lack of technological knowledge, a lack of time, a lack of support, and a lack of sufficient computers (Salehi & Salehi, 2012). It is believed that teachers are active agents of revision, so they should decide whether or not to integrate technology into their educational activities (Vrasidas & McIsaac, 2001). According to Ertmer et al. (1999), when researchers look for reasons why teachers can't effectively use technology, they must consider what teachers have (internal factors) and what they don't have (external factors). Ertmer and Ottenbreit-Leftwich (2010) found that three internal factors can have a greater influence on teachers' decisions about technology use in educational contexts where contextual barriers are removed. These are teachers' self-efficacy, knowledge, and pedagogical beliefs regarding integration of technology.

Mishra and Koehler (2006) developed the technological, pedagogical, and content knowledge (TPACK) theoretical framework. TPACK has been recognized as an effective framework for describing and comprehending integration of technology in a wide range of educational settings, including EFL classes. Seven TPACK components defined by Mishra and Koehler (2006) were TK (Knowledge of how to use technology tools), PK (Knowledge of instructional methods and strategies), CK (Knowledge of subject matter), PCK (Knowledge of applying appropriate instructional strategies to teach subject matter), TCK (Knowledge of representing subject matter with technology), TPK (Knowledge of applying technology to employ instructional strategies), and TPCK (Knowledge of facilitating students' learning of a specific content through appropriate pedagogy and technology). An elegant TPACK can influence teachers' understanding of the best methods to conduct instruction enhanced by technology, ultimately leading to improved student learning (Graham, 2011; Niess, 2008; Shih & Chuang, 2013).

The current study examined the TPACK competency of Iranian EFL teachers concerning their educational degree and teaching experience. The present study also investigated the perceptions of Iranian EFL teachers' towards TPACK and its components. This study will answer the critical question of whether the TPACK competency of Iranian EFL teachers is related to their educational degree and teaching experience, which might be helpful in showing the extent to which these teachers with different levels of educational degree and teaching experience need further training and workshops in the field of TPACK to gain the required competency in such an area. Knowing about EFL teachers' competency in TPACK and also their perceptions about TPACK and relating it to their educational degree and teaching experience could be beneficial not only for the Iranian EFL teachers but also for other language teachers worldwide. The findings of the current study alert language institutes, universities, and schools to hold some workshops in the field of TPACK for teachers who need more instructions in this area.

LITERATURE REVIEW

THEORIES BEHIND TPACK

Teaching necessitates the use of complex knowledge structures in a variety of cases and contexts (Mishra et al., 1996; Spiro & Jehng, 1990). Flexible access to enough, efficient, and combined knowledge from various areas is required for effective teaching (Putnam & Borko, 2000; Shulman, 1986, 1987), including students' thinking and learning knowledge, content knowledge, and knowledge of technology.

Shulman proposed the pedagogical content knowledge (PCK) framework in the 1980s, when educational technologies and resources were few and far between. The PCK concept placed a strong emphasis on how teaching is related to pedagogy and content. Mishra and Koehler (2006) proposed adding technological knowledge (TK) as a new constituent to address the PCK framework's impediment. By incorporating this third knowledge base and attempting to define the strong and dynamic relations between technology, pedagogy, and content knowledge, they established a model named Technological, Pedagogical, and Content Knowledge (TPACK). The aim of their idea was to address the fact that novel technologies have influenced or have the potential to change the nature of the classroom. The TPACK framework builds on Shulman's (1986, 1987) definitions of PCK to explain in what way teachers' understanding of PCK and educational technologies interact to produce effective technology-based teaching. Koehler and Mishra (2005) proposed a framework for describing teachers' comprehension of the complex interplay among technology, pedagogy, and content. They built on Shulman's (1986, 1987) work describing PCK in their framework to emphasize the importance of TPACK for understanding effective technology-enabled teaching. There are three areas of knowledge at the heart of their framework: technology, pedagogy, and content. Technology (T) includes both

recent technologies like the Internet, computers, and digital video, as well as traditional technologies such as overhead projectors. Pedagogy (P) refers to the collection of teaching and learning methods, strategies, and procedures. It also consist of understanding of the goals of instruction, student learning, and assessment. The content to be taught/learned is referred to as content (C). Mishra and Koehler (2006) developed the TPACK model, which includes various types of knowledge associated with technology integration practices: technological knowledge (TK), pedagogical knowledge (PK), content knowledge (CK), pedagogical content knowledge (PCK), technological content knowledge (TCK), technological pedagogical knowledge (TPK), and technological pedagogical content knowledge (TPCK). The TPACK framework was useful in guiding teachers in the incorporation of content, pedagogy, and technological knowledge (Niess, 2008). When all three components (Technology, Pedagogy, and Content) are considered together, we get TPACK. Negotiating and understanding the relationships among these three elements of knowledge is what technology integration is all about (Bruce & Levin, 1997). Mishra and Koehler (2006) identified two possible paths to TPACK. The first considers the direct effects of TK, CK, and PK, whereas the second takes into account the effects of intervening PCK, TCK, and TPK knowledge components.

RELATED STUDIES ON TPACK

A study conducted by Mishra and Koehler (2006) provided an explanation for TPACK as a model for effective teaching. Based on their study, effective teaching originated from the interactions between and among TPACK components and the teachers' ability to apply these factors in the classroom. Through interaction with students in technology-supported learning environments, Niess (2008) emphasized the importance of learners' understanding in shaping teachers' TPACK.

In a study, Koçoğlu (2009) investigated pre-service EFL teachers' perspectives on TPACK. The study involved 27 pre-service EFL teachers teaching at the Department of Foreign Language Education. His study discovered that CALL courses were beneficial in creating and supporting pre-service teachers' TPACK.

Ansyari (2012) conducted a study in which the researcher provided a technology blending course based on professional development with a focus on 12 EFL teachers. Participants had excellent experiences with TPACK professional development workshops, however limitations were discovered in terms of time, technology exploration, and student participation.

Voogt et al. (2013) undertook an analysis of TPACK-related papers and text book chapters published from 2005 to 2011. They stated that the review's goal was to look into the theoretical foundations and practical applications of TPACK. The authors followed the framework's development from its inception to its initial publication in scientific journals. The analysis identified two major areas of research and academic specialization in the literature: those looking into and developing the theoretical foundation of TPACK, and those addressing practical measurement challenges and teacher professional development.

Chang et al. (2015) investigated learners' opinions of their instructors' TPACK in Taiwan and China over the course of one semester. Data was gathered using the TPACK questionnaire, interviews, and observations. Students' perceptions of their teachers' teaching performance, according to the findings, helped teachers reflect on their instruction and improve a number of their strategies.

Some research attention has been paid to the investigation of students' perceptions of teachers' TPACK (Shih & Chuang, 2013; Tseng, 2014). Tseng (2014) investigated EFL learners' attitudes toward their teachers' TPACK. Participants in the study included 257 high school students from Taiwan. According to the study's findings, students believed that their teachers were better at three kinds of basic knowledge (technological, pedagogical, and content knowledge) than at interacting with them. It was discovered that students thought their teachers' subject matter knowledge outperforms their TPACK.

Chuang et al. (2018) looked into high school students' opinions of their English teachers' knowledge of technology-enhanced classrooms. They administered a validated scale to 287 Taiwanese students using structural equation modeling. Subject matter knowledge, student understanding knowledge, technology knowledge, and TPACK were the four components of the validated scale. Content knowledge and students' understanding knowledge were found to be indirectly related to TPACK.

According to Kiray et al. (2018), TCK, TPK, and PCK had significant, direct, and positive influences on TPACK. PCK had the greatest influence on TPACK. Furthermore, science teachers' CK had a direct and positive impact on their TCK and PCK, which was a stronger influence than the effect of TK and PK.

Nazari et al. (2019) used a mixed-methods research design to evaluate differences in perceived TPACK and its impact on professional growth among novice and experienced EFL teachers. According to the quantitative results, experienced teachers performed much better on the pedagogical knowledge and pedagogical content knowledge subscales. In comparison, novice teachers performed much better in terms of technological knowledge, technological content knowledge, technological pedagogical knowledge, and TPACK. The qualitative findings suggested that both novice and experienced EFL teachers preferred diverse professional development programs that were suited to their unique requirements. Similarly, they believed that collaborating in professional development courses will help them fill the knowledge gap.

Additionally, Nazari et al. (2020) looked into how an online professional development course with a TPACK focus affected EFL teachers' TPACK. With the exception of pedagogical content knowledge in the novice group and content knowledge in both the novice and experienced groups, the results showed that the online course significantly affected the TPACK of EFL teachers.

Experienced teachers gained more from the online course in terms of TPACK and pedagogical content knowledge. The qualitative results showed that every interviewee had favorable opinions of the course.

Najjari et al. (2021) found significant differences in participants' TPACK literacy before and after TPACK workshops in an effort to evaluate and improve the TPACK of Iranian EFL teachers. Additionally, it was found that TPACK seminars changed participants' perspectives on TPACK literacy.

Mahmoudi et al. (2021) investigated the influence of in-service education and training courses on teachers' TPACK development. The findings showed statistically significant differences in the participants' knowledge base components before and after the courses. Semi-structured interviews were also employed to get participants' perspectives on the course content. Teachers' perspectives during interview sessions revealed that they mentioned some issues about the course content and offered some suggestions.

Using Mishra and Koehler's (2006) TPACK framework, Mohammad-Salehi and Vaez-Dalili (2022) examined how Iranian EFL teachers viewed Web 2.0 technology. With the exception of one construct, the findings showed that the second-level knowledge bases (technological pedagogical knowledge, pedagogical content knowledge, and technological content knowledge) were positively and directly impacted by Web 2.0 technological knowledge, pedagogical knowledge, and content knowledge as core knowledge components. The development of EFL teachers' TPACK, on the other hand, was not aided by the statistically insignificant effects of technological, pedagogical, and subject matter knowledge on TPACK. Additionally, the development of TPACK was found to be influenced by technological pedagogical knowledge, technological content knowledge, and pedagogical content knowledge.

RESEARCH QUESTIONS OF THE STUDY

Quantitative Research Question: RQ 1. What is the total level of Iranian EFL teachers' TPACK considering their educational degree and teaching experience?

Qualitative Research Question: RQ 2. What are the Iranian EFL teachers' perceptions regarding TPACK and its components?

METHOD

PARTICIPANTS

One hundred and four male (forty) and female (sixty-four) Iranian EFL teachers teaching at various branches of the Iran Language Institute (ILI) were chosen by convenience sampling to collect the necessary data. In order to include a wider range of teachers from different generations and teaching styles, participants were selected from a variety of teaching experiences and educational degrees. The participants' years of teaching experience varied from less than five to more than five years. Participants held BA, MA, and PhD degrees in diverse subfields of English language teaching, translation, and literature. Their ages ranged from 22 to 60, and Persian was their first language. The TPACK Self-Assessment Questionnaire (Baser et al., 2016) was used to assess participants' TPACK competencies. To collect demographic information (i.e. participants' educational degree and teaching experience), some questions were also added to the main questionnaire. All the participants respond completely to the questionnaire items and were chosen as the main participants. Six male (three) and female (three) participants voluntarily participated in a structured interview session about EFL teachers' perception towards TPACK as part of the qualitative portion of the study, which was conducted through convenience sampling. Before filling out the questionnaire, all respondents were informed about the aim of the study and that their responses to the questionnaire and interview questions will be analyzed by the researcher and kept confidential.

INSTRUMENTS

THE TPACK SELF-ASSESSMENT QUESTIONNAIRE (QUANTITATIVE RESEARCH INSTRUMENT)

The TPACK Self-Assessment Questionnaire (Baser et al., 2016) measures teachers' TPACK competency. This questionnaire includes 39 items divided into seven categories: technological knowledge (9 items), pedagogical knowledge (6 items), content knowledge (5 items), pedagogical content knowledge (5 items), technological content knowledge (3 items), technological pedagogical knowledge (7 items), and technological pedagogical content knowledge (4 items). Participants show their agreement level with each questionnaire item using a Likert Scale. For instance, one of the items of the questionnaire asked the participants the extent to which they can use basic technological terms appropriately and the participants were supposed to show their level of agreement with this item of the questionnaire on a Likert Scale (i.e. 1=nothing/none, 2=very little, 3=some influence, 4=quite a bit, and 5=a great lot). A higher TPACK score indicates a higher competency of TPACK competency. According to Baser et al. (2016), the questionnaire has high validity. Baser et al. (2016) used Cronbach's alpha to find the questionnaire's internal consistency, and the reliability coefficients for the questionnaire components ranged from .81 to .92 when the items for each component were analyzed separately. It should also be mentioned that, the questionnaire had a time limit of 60 minutes.

INTERVIEW (QUALITATIVE RESEARCH INSTRUMENT)

Based on Farhady (1995), interviews are the most reliable source of information about a phenomenon. They allow the researcher to obtain information that would be impossible to obtain using other research tools (Farhady, 1995). A structured interview consists of particular questions asked in a fixed order to all respondents (Ary et al., 2013). In a

structured interview, the questions are prepared in advance and consistently asked from the interviewees (Farhady, 1995). Structuring the interview improves its effectiveness in relation to the criteria of success (i.e. validity, reliability, compliance with the law and the organization's policies, as well as legal defensibility, and candidate's reaction). It also has other advantages for interviewers such as processing the information, comparing candidates, and time management (Pettersen & Durivage, 2008).

In order to arrange the interview criteria for this study, one of the demographic questions asked the volunteered participants' phone number to ensure the number of participants who are interested in taking part in the interview session and also to decide on the time of the interview sessions. To achieve the study's qualitative goal, online interview sessions were held using phone call. The interviews were structured with a standardized procedure, with questions probing the participants' perceptions regarding TPACK and its components. The interviewer posed 15 questions. The first three questions were about technological knowledge. The second three questions focused on pedagogy and pedagogical knowledge. The third three questions concerned content knowledge. The fourth three questions focused on TPACK and TPACK knowledge. The next two questions looked at the relationship among EFL teachers' educational degree, teaching experience, and TPACK competency. The last question asked respondents to provide additional information about EFL teachers' TPACK. Six participants, who wrote their phone number in the demographic part of the questionnaire and voluntarily took part in the interview session, were interviewed and asked to respond to 15 questions. The interview questions were designed by the researcher. The items were reviewed by a group of TEFL experts to assess their reliability. The questions' suitability and applicability were also examined by the experts. Each interview lasted one hour and was recorded and transcribed. Using MAXQDA software, a qualitative analysis tool for text, memos, images, and video segments (Ary et al., 2013), the interview transcriptions were subjected to content analysis in order to find patterns and categories and convert a verbal, non-quantitative document into quantitative data (Bailey, 1978).

PROCEDURE

This survey research (also called descriptive research) followed an explanatory sequential design and used both "non-experimental quantitative" and "basic qualitative research" methods to gather information regarding TPACK competency and perception among Iranian EFL teachers while taking their educational degree and teaching experience into account. To perform the study, one hundred and four Iranian male and female EFL teachers (novice and experienced) teaching at different branches of the ILI from different provinces of Iran (i.e., Ardabil, East Azerbaiijan, Fars, Gilan, Isfahan, Mazandaran, and Razavi Khorasan) were chosen using convenience sampling to contribute in the study. The participants were of different educational degrees, including BA, MA, and PhD in different subfields of English language teaching, translation, and literature.

In order to collect the necessary data, the current research took the subsequent steps. First, the researcher asked for the permission of the head of the ILI to perform the study there. Then, to serve the quantitative purpose of the research, a TPACK Self-Assessment Questionnaire (Baser et al., 2016) was used to assess the participants' TPACK competency considering their educational degree (i.e. BA, MA, and PhD in English) and teaching experience (novice vs. experienced). Some demographic questions were also used to collect demographic information from participants (such as their educational level and teaching experience). The quantitative data were collected over a four-month period. The questionnaire's online link was sent to participants via the WhatsApp application. After the quantitative data collection, the participants' scores on TPACK were analyzed through SPSS software. Then, for the sake of the qualitative part of the study, the participants' perceptions towards TPACK and its components were also investigated through structured interview sessions via phone call in which the volunteered participants took part and their answers to the interview questions were recorded, transcribed, and analyzed through MAXQDA software. Six participants were interviewed and asked to answer fifteen interview questions. It is worth mentioning that to decide on the number of participants who are interested in taking part in the interview session, one of the demographic questions asked the volunteered participants' phone number. It should also be noted that participants were given instructions on how to complete the TPACK questionnaire, and they were also assured that their information and answers to the questionnaire statements and interview questions will be kept confidential and analyzed by the researcher.

DATA ANALYSES

After the data collection procedure, quantitative-qualitative methods were used to analyze the collected data. To answer the quantitative research question, the participants' mean scores on the total scale of the TPACK questionnaire were compared with each other considering their educational level (BA, MA, and PhD) and teaching experience (experienced and novice). The Kolmogorov-Smirnov test of normality of data distribution for the overall TPACK scores of the TPACK Questionnaire was also utilized to select appropriate statistical tests. The descriptive statistics of the TPACK Questionnaire's total TPACK score of the participants were also used. To address the quantitative research question, the test of normality of data distribution, descriptive statistics, one-way ANOV, and Independent Samples T-test were used. To deal with the qualitative research question, participants' perceptions regarding TPACK and its components were collected through structured interview sessions, transcribed, and analyzed through MAXQDA software.

RESULTS AND DISCUSSION

RESULTS

1. ANSWERING THE FIRST RESEARCH QUESTION

RQ 1. What is the total level of Iranian EFL teachers' TPACK considering their educational degree and teaching experience?

In order to choose the appropriate statistical test, the normality test was used for the scores of the three educational levels.

The normality of the distribution of data was calculated using the Kolmogorov-Smirnov test, and its results revealed that the data for the three sets of scores were normally distributed (P>.05). As a result, the one-way ANOVA was the proper test for the mean comparison. Below are the three groups' descriptive statistics.

Descriptive statistics for the total TPACK scores of the three educational levels showed that the mean scores for the PhD, MA, and BA levels were 153.30, 154.89, and 147.23, respectively. It showed that the participants' scores in three groups were not significantly different from each other. The next table shows the results of the inferential test for the comparison of the three educational levels.

The results of the One-Way ANOVA (table 3) showed that there was no statistically significant difference among the three educational levels regarding their total TPACK score, F (2, 101) = 1.14, P> .05. The next table shows the test of normality for the TPACK scores based on the participants' teaching experience.

The Kolmogorov-Smirnov test was used to check the normality of the data distribution, and the findings revealed that the data were normally distributed for both sets of scores (more experienced and less experienced) (P>.05). As a result, the Independent Samples T-test was the most appropriate mean comparison test. The descriptive statistics for each groups are presented below.

The mean scores for the above-five and below-five categories were 154.72, 145.20, respectively. It showed that the participants' scores in two groups were different from

Table 1. The Test of Normality for the Total TPACK Scores of the Three Educational Levels

	Degree	Kolmogorov-Smirnov[a]		
		Statistic	DF	Sig.
Total TPACK	PhD	.161	10	.200*
	MA	.083	64	.200*
	BA	.071	30	.200*

Table 2. Descriptive Statistics for the Total TPACK Scores of the Three Educational Levels

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
PhD	10	153.3000	6.1833	1.9553	148.876	157.723	145.00	162.00
MA	64	154.8906	23.7193	2.9649	148.965	160.815	65.00	192.00
BA	30	147.2333	24.3391	4.4436	138.145	156.32	89.00	188.00
Total	104	152.528	22.9334	2.2488	148.068	156.98	65.00	192.00

Table 3. The Results of the One-Way ANOVA for the Comparison of the Three Educational Levels

	Sum of Squares	DF	Mean Square	F	Sig.
Between Groups	1204.212	2	602.106	1.148	.321
Within Groups	52967.701	101	524.433		
Total	54171.913	103			

Table 4. The Test of Normality for the Total TPACK Scores Based on Teaching Experience

	Experience	Kolmogorov-Smirnov[a]		
		Statistic	DF	Sig.
Total TPACK	More than 5	.070	80	.200*
	Less than 5	.138	24	.200*

Table 5. The Descriptive Statistics for the Total TPACK Scores Based on Teaching Experience

	Experience	N	Mean	Std. Deviation	Std. Error Mean
Total TPACK	More than 5	80	154.7250	24.33832	2.72111
	Less than 5	24	145.2083	15.74796	3.21454

Table 6. The Results of the Independent Samples T-test for the Comparison of the Two Teaching Experience Categories

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	T	DF	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Total TPACK	Equal variances assumed	5.52	.021	1.80	102	.074	9.51667	5.28014
	Equal variances not assumed			2.26	58.95	.028	9.51667	4.21161

each other. In order to compare the groups' mean scores, an independent samples t-test was also used (Table 6) for both of the groups. The next table shows the results of the inferential test.

As shown in the table above, the assumption of variance equality was not made (p =.02). The second row shows a significant difference (in favor of experienced teachers) in total TPACK score (t (58.95) = 2.26, P <.05.

2. ANSWERING THE SECOND RESEARCH QUESTION

RQ 2. What are the Iranian EFL teachers' perceptions regarding TPACK and its components?

This qualitative research question delved into the participants' perceptions of TPACK. Structured one-to-one interviews were conducted to answer this research question and investigate the responses of the participants. Six participants were interviewed and asked to respond to 15 interview questions. The transcripts were the primary source of data for the content analysis.

Interviewers can easily distinguish between objective facts and subjective definitions if they conduct a content analysis beforehand (Cohen et al., 2000). Content analysis entails going through text passages or images one by one to create aggregated data units, first in codes and then collapsing them into themes. Sometimes the themes are linked together to form a timeline of events (Brown et al., 2006). Fortunately, computers can now perform content analyses quickly and accurately (Creswell, 2021). To conduct a content analysis on a computer, the MAXQDA (2020) software, which is a qualitative analysis software for text, notes, photos, and video segments (Ary et al., 2013), was used to assist in the coding process of the interview transcriptions. MAXQDA software allows researchers to code data, get text segments, rename or merge specific codes without affecting the other codes, and build visualizations of emerging codes and their interactions with one another. The interview transcriptions were subjected to content analysis in order to find patterns and categories and convert a verbal, non-quantitative document into quantitative data (Bailey, 1978).

Thematic content analysis, a type of inductive approach, was applied to analyze the qualitative data in the present study. The codes and themes arose entirely from the data. The analysis began after the document was imported into the software. The coding process took place in stages over time. By rereading the data, the themes and sub-themes were extracted and their exact frequency reported. The initial coding process was open coding. Each interview transcript was read and annotated carefully. During this process, the texts were combined, and concepts were highlighted and labeled. The key points of each interview were extracted, and individual themes were coded as the unit of analysis. During this stage, 187 codes emerged from open coding as the participants' perceptions of TPACK. The codes that cover the same or similar meanings were then merged using axial coding. The selected codes were assigned to one main category during the selective coding stage.

The researcher asked 15 questions. The researcher also divided the interviews into seven major categories based on the interview questions and the frequency of the extracted codes, which were then sorted by descending order:

1) Content knowledge (43 codes)

2) TPACK (42 codes)

3) Pedagogical knowledge (40 codes)

4) Technological knowledge (39 codes)

5) TPACK competency and teaching experience (12 codes)

6) TPACK competency and educational degree (9 codes)

7) More about TPACK competency and TPACK knowledge (2 codes)

ANALYZING THE INTERVIEW QUESTIONS

How do you define technology? The answers to this question were analyzed, and 11 codes were extracted. Table 7 and Figure 1 show themes defining participants' answer to this question. As can be seen, there was no comprehensive definition of technology.

What is the importance of technological knowledge for an EFL teacher? A number of 12 codes emerged for this question. Table 8 and Figure 2 show the related themes to this interview question. As can be seen in this table, the answers were relevant to the question and the main points were expressed.

How can EFL teachers improve their technological knowledge? A number 14 codes emerged from the respondents' answers to this question. Table 9 and Figure 3 show the emerged themes. Different suggestions were provided, which were effective and useful to improve individuals' technological knowledge.

How do you define pedagogy? There are 15 codes emerged from this question. Table 10 and Figure 4 show the emerging themes. As it is illustrated in the table below, the term pedagogy was defined well by the interviewees.

What is the importance of pedagogical knowledge for an EFL teacher? The participants' responses to this question were analyzed and 15 codes emerged. Table 11 and Figure 5 presented the participants' explanation of the importance of pedagogical knowledge for EFL teachers.

How can EFL teachers improve their pedagogical knowledge? The answers to this question were analyzed and the major themes were coded. A number of 9 codes were emerged. Table 12 and Figure 6 illustrated the suggestions to improve the EFL teachers' pedagogical knowledge. The responses offered EFL teachers some effective ways to improve their pedagogical knowledge.

How do you define subject matter? The 12 coded themes of this question were shown in Table 13 and Figure 7. As can be inferred from the responses, subject matter was defined as whatever is taught.

What is the importance of subject matter knowledge for an EFL teacher? A number of 13 codes emerged from the responses to this question. Table 14 and Figure 8 depict the importance of subject matter knowledge. It can be assumed that EFL teachers' preparation was very important.

How can EFL teachers improve their subject matter knowledge? A number of 17 codes were found through analyzing the answers to this question. Table 15 and Figure 9 illustrate the elicited codes. Items 2 and 5 implicitly refer to the use of technology to improve EFL teachers' subject matter knowledge.

How do you define technological, pedagogical, and content knowledge (TPACK)? The answers to this question were shown using 11 codes. Table 16 and Figure 10 describe the elicited codes. As can be seen, code 1 was the exact and comprehensive definition of TPACK. It showed that the respondents had enough knowledge about this term.

What is the importance of TPACK for an EFL teacher? A number of 21 codes were extracted from the answers to this question. Table 17 and Figure 11 indicate the extracted codes. Considering the answers to this question, it can be concluded that the participants have understood the importance of this knowledge for EFL teachers.

How can EFL teachers improve their TPACK competency? Ten codes emerged from the analysis of the responses to this question. Table 18 and Figure 12 illustrate the emerged codes. Based on the responses, different factors can motivate teachers to improve their TPACK competency.

How is the TPACK competency of EFL teachers related to their educational degree? There were nine codes that emerged from the answers to this question. As can be seen, there were different ideas about the relationship between TPACK and EFL teachers' educational degree. Table 19 and Figure 13 show these extracted themes.

How is the TPACK competency of EFL teachers related to their teaching experience? To answer this question, the interviewees' responses were analyzed and a number of 12 codes were extracted. Table 20 and Figure 14 illustrate the answers. Some participants stated that there is no correlation between the TPACK competency of EFL teachers and their teaching experience because there are some experienced teachers who are not able to use technological tools. It showed that they considered TPACK knowledge as technological knowledge.

Now, if you have anything to add about TPACK competency of EFL teachers, please do not hesitate. A number of seven codes emerged from this question. Table 21 and Figure 15 indicate the codes. The answers to this question did not have more information about TPACK competency of EFL teachers. The interviewees just expressed their perceptions towards the interview and the topic presented. Accordingly, teachers need to know more about TPACK and its effectiveness in the teaching and learning process.

Table 7. *Themes Related to the Definition of Technology*

	Themes	No. Codes
1	It's the use of technology and the Internet	3
2	A tool to convey the materials	1
3	Defining technology is context specific	1
4	Essential part of daily life	1
5	It's a broad and general question	1
6	It's not just the use of Internet, mobile, and computer	1
7	It's the use of new things	1
8	The ability to use computers and operate a system	1
9	Technology facilitates the process of teaching	1

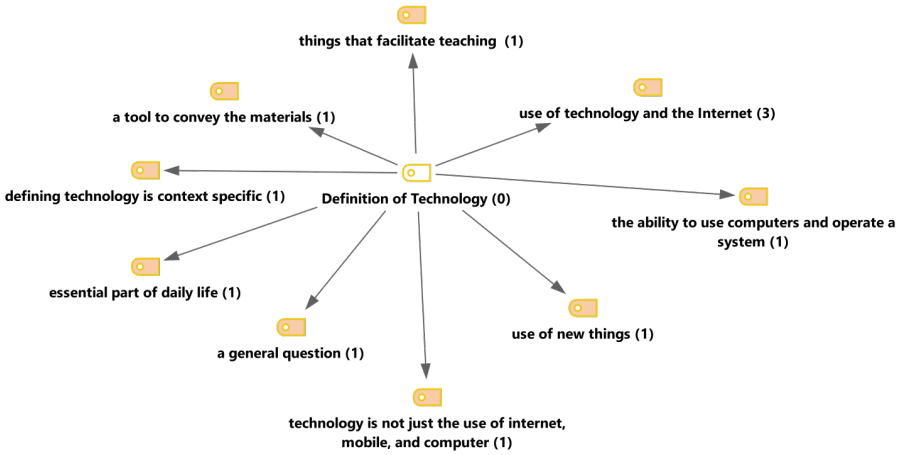

Figure 1. *Definition of technology*

Table 8. *Themes Related to the Importance of Technological Knowledge*

	Themes	No. Codes
1	It facilitates instruction and reduces the instructional problems	1
2	It is important for online teachers	3
3	Being creative needs the use of technology	2
4	It helps teachers to fill the gap between technology and teaching	1
5	Teaching learners who are living in technological era	1
6	It's a connection between the subject matter and pedagogical process	1
7	It's important to know how to use technology	1
8	The use of technology helps teachers and learners to save their time and efforts	1
9	Technology is an interdisciplinary knowledge for EFL teachers	1

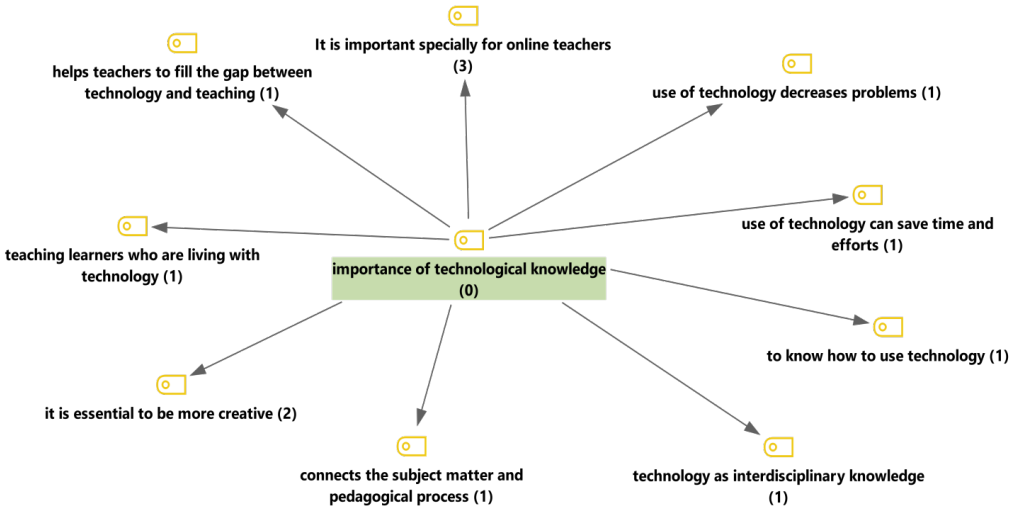

Figure 2. Importance of technological knowledge

Table 9. Themes Related to the Improvement of Technological Knowledge

	Themes	No. Codes
1	Self-study, searching the Internet, and carrying out research	4
2	Through continuous learning and application of technological tools	3
3	Participating in workshops and different courses about technology	2
4	Taking part in online meetings	2
5	Being perfect in technology before starting teaching	1
6	Watching films and videos particularly on You Tube	1
7	Improving technological knowledge is different from technology usage	1

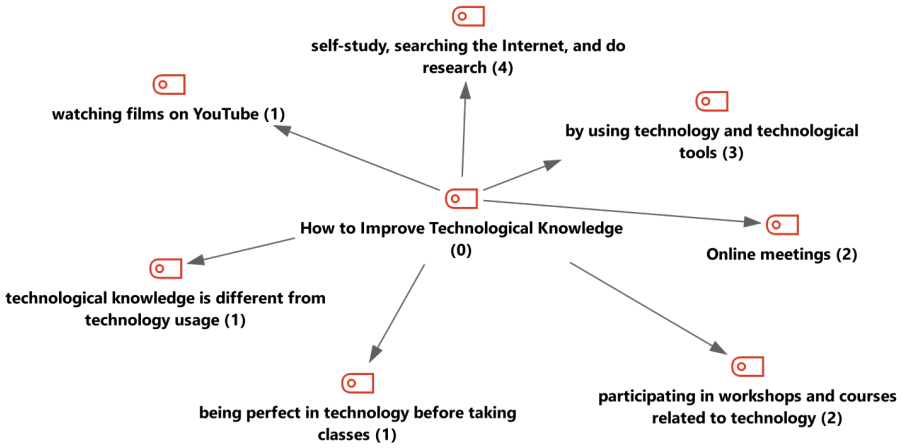

Figure 3. Improvement of technological knowledge

Table 10. *Themes Related to the Definition of Pedagogy*

	Themes	No. Codes
1	It is the knowledge of teaching and how to teach	6
2	It is about the teaching approaches and methods	4
3	It is a kind of prescriptive instruction	2
4	Pedagogy is the main step in the process of teaching	1
5	It's an umbrella term for teaching	1
6	Pedagogy and teaching are interrelated	1

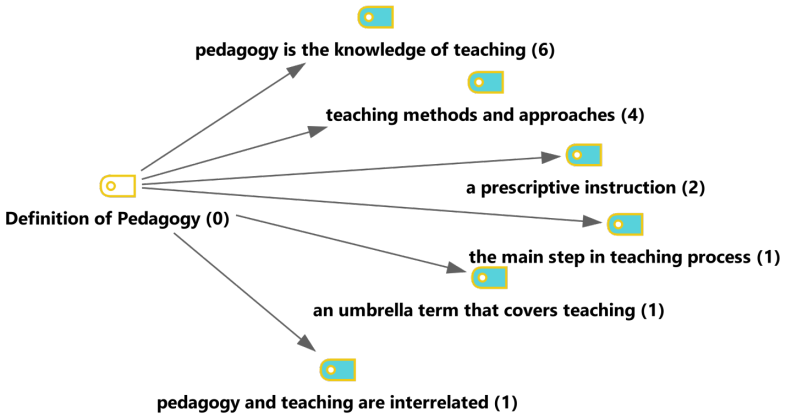

Figure 4. *Definition of pedagogy*

Table 11. *Themes Related to the Importance of Pedagogical Knowledge*

	Themes	No. Codes
1	Teachers need pedagogical knowledge to teach the content	4
2	Become familiar with the ups and downs of teaching process	2
3	This knowledge helps learners understand everything about language	2
4	Pedagogical knowledge helps teachers in classroom management	2
5	It is required to know how, when, and where to use the pedagogy	1
6	To have an effective class, we need pedagogical knowledge	1
7	It is important to observe and give feedback	1
8	Using pedagogical knowledge increases the learning and teaching speed	1
9	It gives guidelines and techniques in teaching process	1

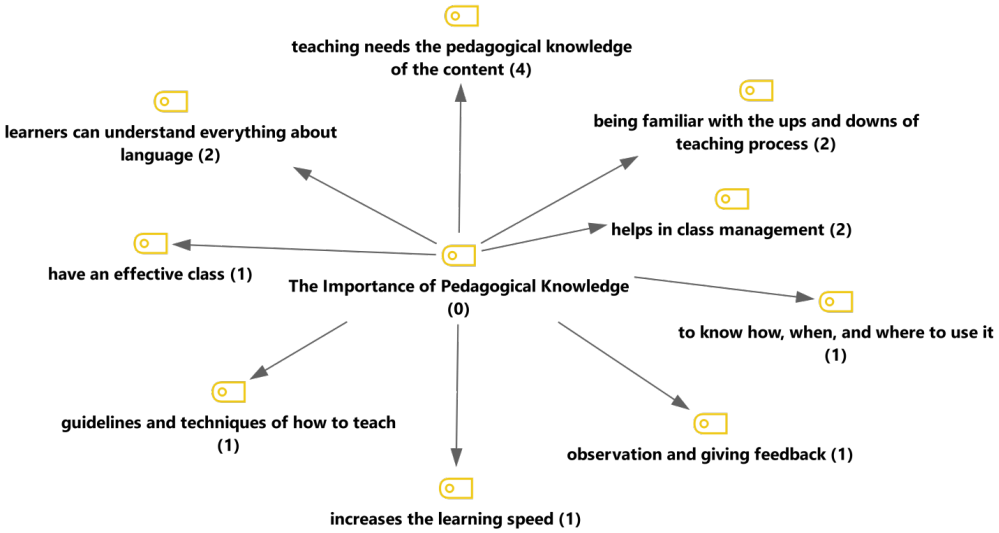

Figure 5. *Importance of pedagogical knowledge*

Table 12. *Themes Related to Improvement of Pedagogical Knowledge*

	Themes	No. Codes
1	Via reading books, articles, and recent publications	4
2	Taking part in workshops and academic courses	2
3	Being in touch with the professionals and other teachers' experiences	1
4	Taking TTC courses and learn about how to teach	1
5	Having updated knowledge	1

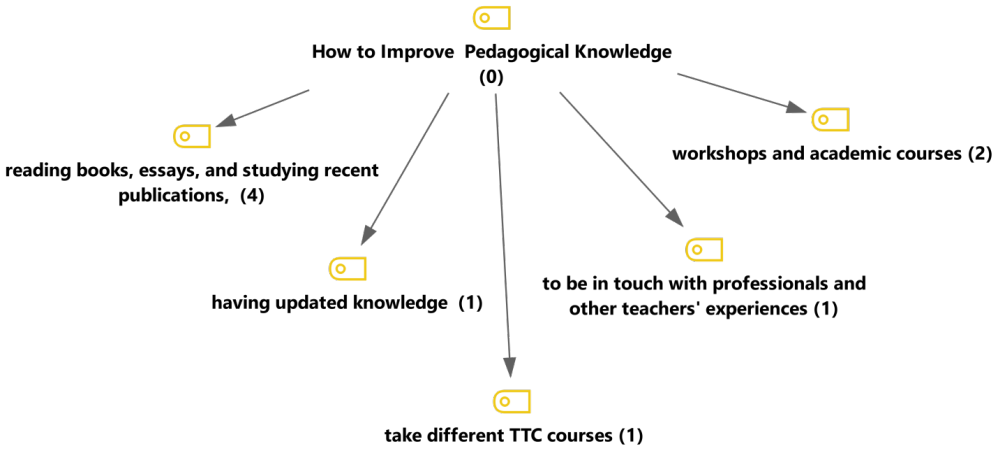

Figure 6. Improvement of pedagogical knowledge

Table 13. *Themes Related to the Definition of Subject Matter*

	Themes	No. Codes
1	The teaching content is the subject matter	4
2	Teachers' experience in addition to their educational knowledge is subject matter	3
3	Teachers' knowledge about every subject	2
4	Each field is a subject matter, e.g. English is subject matter for EFL teachers	2
5	Teachers' preparation before teaching process is subject matter	1

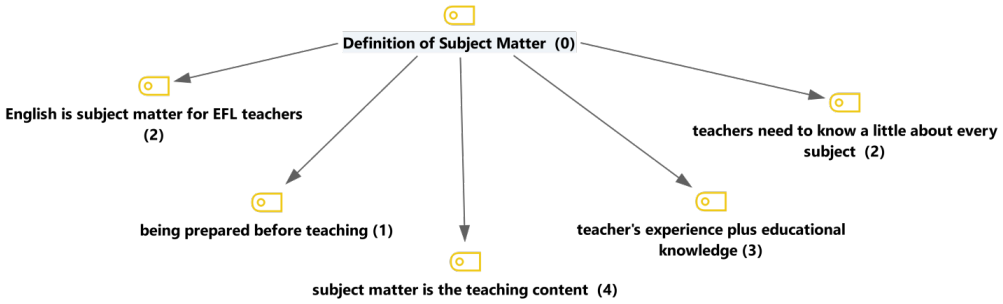

Figure 7. *Definition of subject matter*

Table 14. *Themes Related to the Importance of Subject Matter Knowledge*

	Themes	No. Codes
1	Being aware of how to teach is really important	6
2	Being a well-prepared teacher is important	2
3	Teachers' subject matter knowledge is useful for learners	2
4	Teaching without subject matter is not possible	2
5	The more teachers read the more they know	1

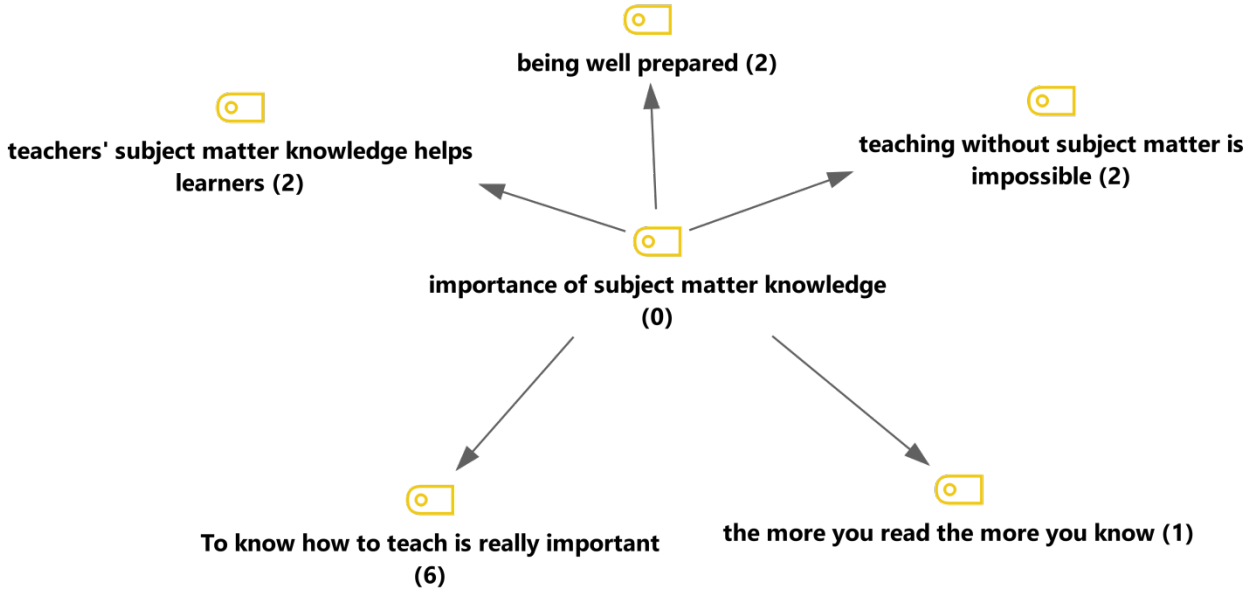

Figure 8. *Importance of subject matter knowledge*

Table 15. *Themes Related to Improvement of Subject Matter Knowledge*

	Themes	No. Codes
1	Studying about things that are going to be taught	8
2	The only way to improve subject matter is teaching, searching, and taking different courses	2
3	Subject matter knowledge improves during the time	1
4	Taking note is a way to improve subject matter knowledge	1
5	Reading, watching videos, and studying different English materials	1
6	Taking part in workshops	1
7	Taking special course about subject matter	1
8	Taking advantage of helpful resources	1
9	Know the psychology of teaching	1

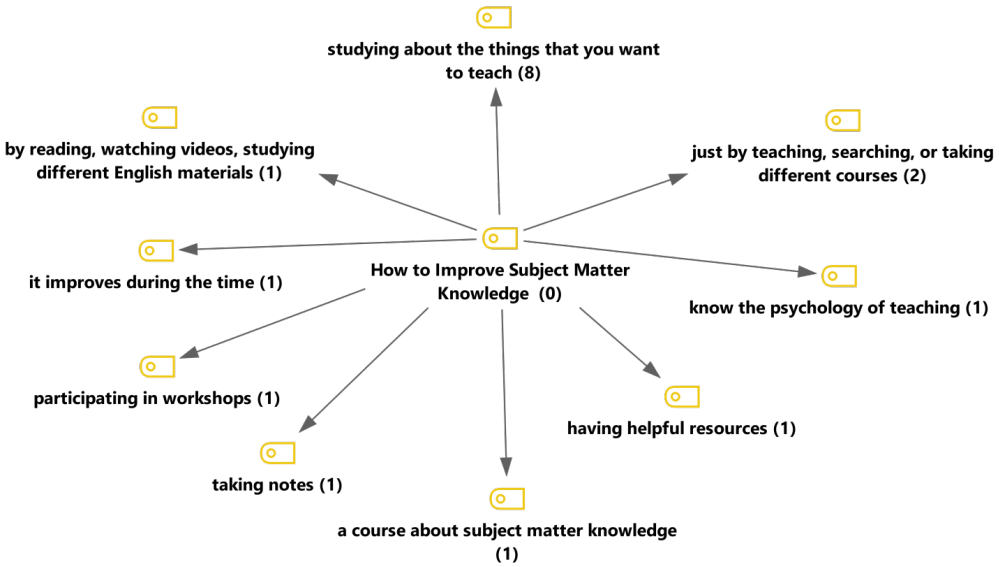

Figure 9. *Improvement of subject matter knowledge*

Table 16. *Themes Related to the Definition of TPACK*

	Themes	No. Codes
1	Interactions among TPACK	4
2	Knowledge of technology, pedagogy, and subject matter, which are all important	3
3	Teaching using these three bodies of knowledge is a better way	2
4	Being a well-prepared teacher in all these three bodies of knowledge	1
5	Having no idea about it	1

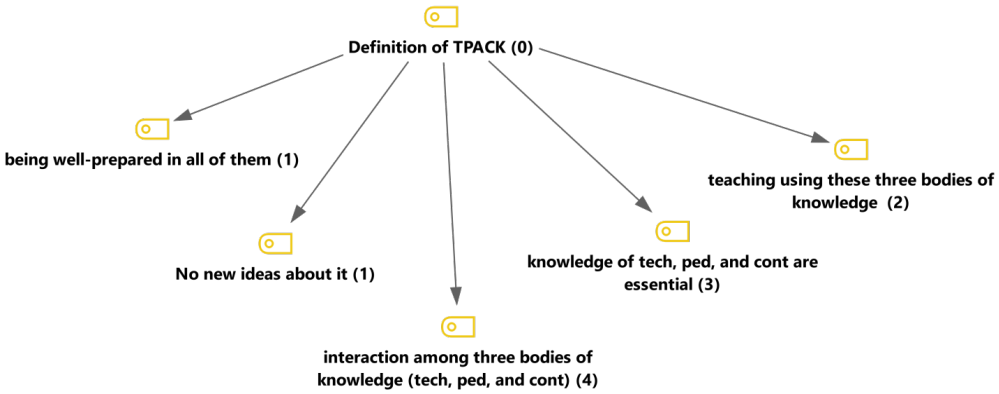

Figure 10. *Definition of TPACK*

Table 17. *Themes Related to the Importance of TPACK*

	Themes	No. Codes
1	Use of more creative and innovative instructional methods	6
2	By having the TPACK we have no problems in educational parts and use of technology and technological tools	4
3	TPACK helps teachers and facilitates the instruction	3
4	Using this knowledge helps teachers in classroom management	2
5	Having this knowledge is very important	2
6	Without content knowledge, effective teaching is not possible	2
7	It is important to have information about content knowledge	1
8	This knowledge needs more attention and serious observation	1

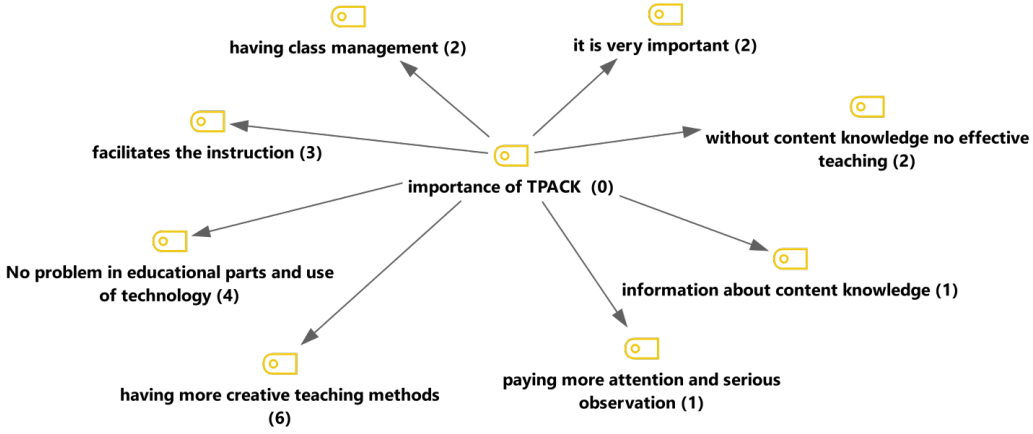

Figure 11. *Importance of TPACK*

Table 18. *Themes Related to the Improvement of TPACK competency*

	Themes	No. Codes
1	Teachers can share their experiences with their colleagues	3
2	Reading books and articles can improve TPACK competency	3
3	Teachers' experiences can help them to improve their TPACK competency	1
4	Use of psychological knowledge improves TPACK competency	1
5	Taking some course related to the components of this knowledge	1
6	By encouraging EFL teachers to use TPACK	1

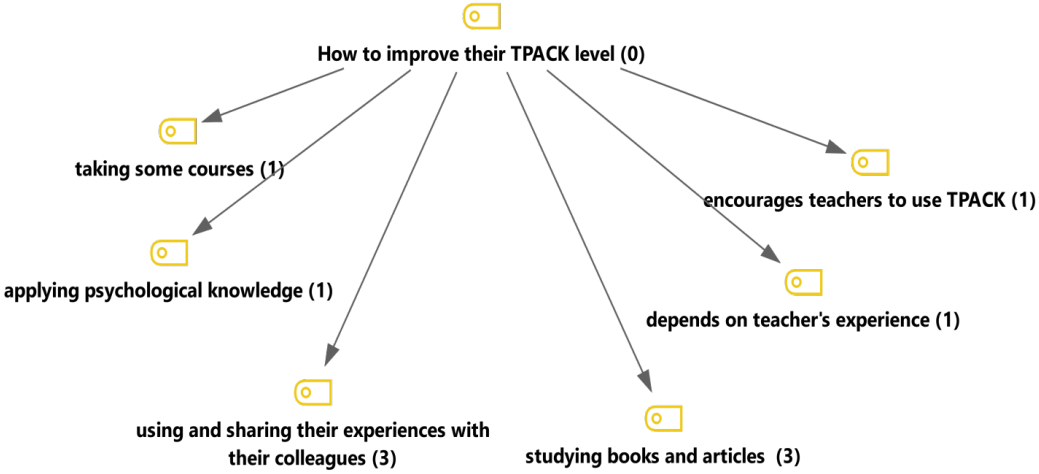

Figure 12. *Improvement of TPACK competency*

Table 19. *Themes Related to the EFL Teachers' TPACK competency and Their Educational Degree*

	Themes	No. Codes
1	There is no relationship between TPACK competency and teachers' educational degree	3
2	There is a positive link between TPACK competencies and teachers' educational degrees.	3
3	There is a link between technology knowledge, content knowledge, and teachers' educational degree	1
4	There is a link between pedagogical expertise, content knowledge, and teachers' educational degree	1
5	Any relationship depends on teachers' interest	1

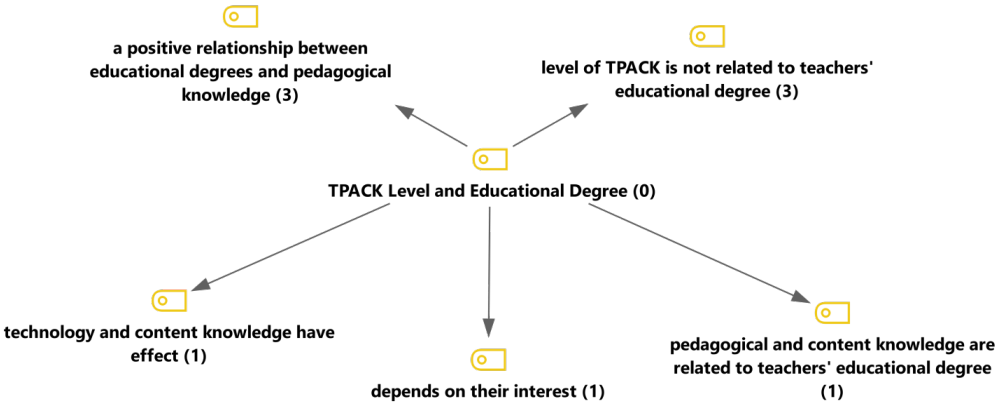

Figure 13. *EFL teachers' TPACK competency and their educational degree*

Table 20. *Themes Related to the EFL Teachers' TPACK competency and Their Teaching Experience*

	Themes	No. Codes
1	TPACK competency and teaching experience have a positive relationship	3
2	There is no relationship between TPACK competency and teaching experience	5
3	Teaching experience has a little effect on TPACK competency	2
4	Content Knowledge is related to teaching experience	1
5	Teaching experience is more important than TPACK competency	1

Figure 14. *EFL teachers' TPACK competency and their teaching experience*

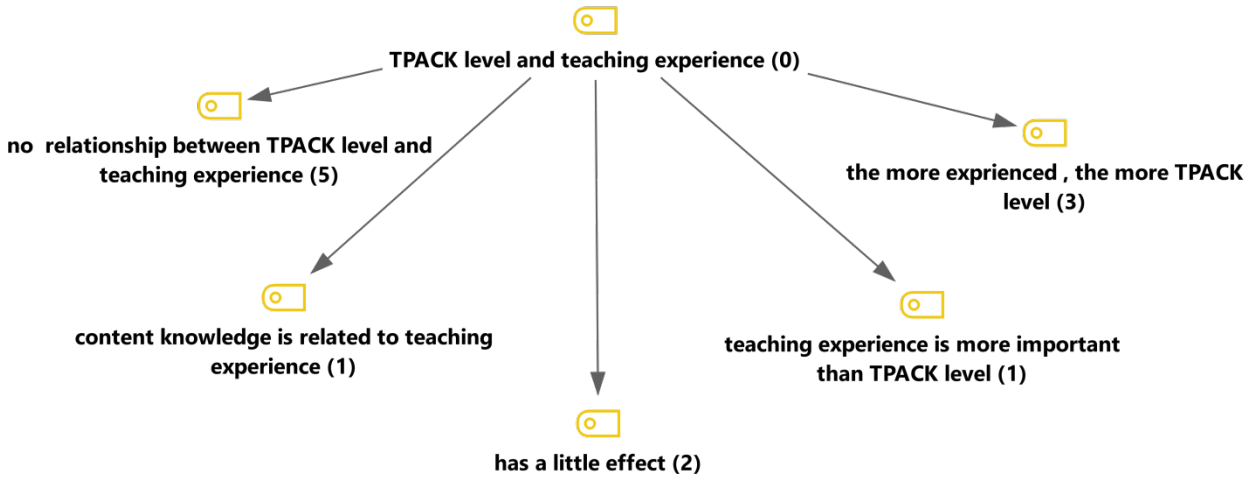

Table 21. *Themes Related to More Ideas about EFL Teachers' TPACK competency*

	Themes	No. Codes
1	Being happy to know about TPACK	2
2	TPACK is essential for academic life of EFL teachers	1
3	The interview gave a new perception towards TPACK	1
4	It is essential to think more about TPACK	1
5	No more ideas and suggestions about TPACK	1
6	Having inadequate knowledge about TPACK	1

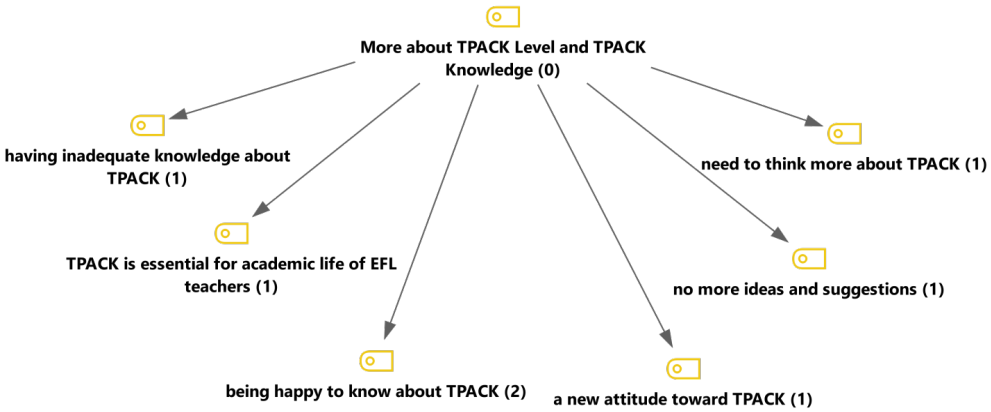

Figure 15. *More about EFL teachers' TPACK competency*

DISCUSSION

The quantitative discoveries of the present study revealed that there was no significant difference among participants with different educational levels in terms of their total TPACK score. The findings also revealed that more experienced participants outperformed less experienced ones in terms of total TPACK score. Thematic content analysis of the interview transcriptions revealed the participants' perceptions about the definition, importance, and ways to improve TPACK, as well as their perceptions regarding the correlation between EFL teachers' TPACK competency and their educational degree and teaching experience.

The goal of the qualitative part of this research was similar to that of an earlier research (i.e. Zhao & Tella, 2002), which focused on the knowledge and attitudes of EFL/ESL teachers toward technology use in order to discover how teachers perceive integration of technology into their instruction. The majority of previous studies were only interested in determining whether teachers' attitudes towards technology were positive or negative (Jahanban-Isfahlan et al., 2017; Saglam & Sert, 2012). Previous research has also focused on teachers' beliefs and attitudes towards technology integration, as well as the problems they face in the classroom (Albirini, 2006; Dehqan et al., 2017; Gilakjani et al. 2015). However, the aim of this study was to discover the competency and perception of TPACK among Iranian EFL teachers in relation to their educational background and teaching experience. The findings of this research which emphasized the necessity of holding TPACK workshops for language teachers who need more training in this area, are in line with the notion that an elegant TPACK can influence teachers' understanding of the best methods to conduct instruction enhanced by technology, ultimately leading to improved student learning (Graham, 2011; Niess, 2008; Shih & Chuang, 2013). Teaching is thought to be a complex profession that needs the integration of several sorts of specialized knowledge. It necessitates that teachers use complex knowledge structures in a variety of scenarios and contexts (Mishra et al., 1996; Spiro & Jehng, 1990). As a result, flexible access to enough, efficient, and combined knowledge from various areas is required for effective teaching (Putnam & Borko, 2000; Shulman, 1986, 1987). The current study not only confirmed such assumptions, but also agreed that the TPACK framework is useful in assisting teachers in the assimilation of content, pedagogy, and technical expertise (Niess, 2008). In line with the current study's goal of demonstrating the value of TPACK workshops for language instructors who require additional training in this area, Nazari et al. (2020) examined the effects of an online professional development course with a TPACK focus on EFL teachers' TPACK. With the exception of pedagogical content knowledge in the novice group and content knowledge in both the novice and experienced groups, the results demonstrated that the online course significantly impacted the TPACK of EFL teachers. In terms of TPACK and pedagogical content knowledge, their research suggests that experienced teachers might gain more from the online course. In an attempt to evaluate and enhance the TPACK of Iranian EFL teachers, Najjari et al. (2021) found statistically significant differences in participants' TPACK literacy before and after TPACK workshops. These findings are consistent with the current study's findings, which implicate the necessity of holding TPACK workshops for language teachers who require additional training in such an area. Mahmoudi et al. (2021) examined the function of in-service education and training courses in the development of teachers' TPACK in order to demonstrate the significance of TPACK workshops for EFL teachers. Their findings showed that the participants' knowledge base components before and after the courses differed statistically significantly. The current study's findings also supported the necessity of TPACK courses for language instructors who require additional instruction in this field.

In general, this study's findings supported the importance of holding TPACK workshops for less experienced language teachers who require additional training in this area and that EFL teachers need to broaden their understanding of new technological tools, contemporary language pedagogy trends, and subject matter expertise.

CONCLUSION AND IMPLICATIONS

Regarding the results of the study, it can be stated that there was no significant difference among EFL teachers with different educational levels in terms of their total

TPACK score. The findings also revealed that more experienced EFL teachers outperformed less experienced ones in terms of total TPACK score. Thematic content analysis of the qualitative data showed the participants' perceptions regarding the definition, importance, and ways to improve TPACK and its components, as well as their perceptions about the association between EFL teachers' TPACK competency and their educational degree and teaching experience. The findings of the current study alert language institutes, universities, and schools to hold some workshops in the field of TPACK for teachers who need more instructions in such an area.

The study has a number of theoretical and pedagogical implications for researchers, administrators, educators, and EFL teachers:

1. Examining EFL teachers' TPACK competency using TPACK questionnaires, interviews, and other data collection tools, as well as designing various courses, seminars, programs, and workshops for teachers with varying qualifications and teaching experiences, will increase EFL teachers' competency in this area.
2. It is critical for administrators to hold TPACK training courses for EFL teachers in order to improve their competency in TPACK.
3. EFL teacher educators can inform their trainees of the importance of incorporating technological knowledge into EFL classes and show them how to use various technological tools in their classes.
4. EFL teachers need to expand their knowledge of new technological tools, current trends in language pedagogy, and subject matter knowledge.

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