Assessing Language Teachers' Technological Pedagogical Content Knowledge (TPACK): EFL Students' Perspectives

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Abstract

Technological Pedagogical Content Knowledge (TPACK) is considered as a valuable frame for describing and understanding technology integration into different educational settings, including English as a Foreign Language (EFL) classroom. There is an accumulated body of literature on TPACK among teachers engaged in different areas of education. However, few studies have addressed the assessment of TPACK through students' perspectives in EFL settings. To address this gap, the purpose of this study was set to assess Iranian EFL students' perspectives regarding their teachers' TPACK. A total of 148 Iranian EFL students participated in this survey study. The data were collected through administering a previously validated TPACK questionnaire to the participants of the study. The findings obtained from the survey indicated that most EFL students perceived that their EFL teachers excelled in four components of TPACK such as technological knowledge (TK), pedagogical knowledge (PK), content knowledge (CK), and pedagogical content knowledge (PCK), but the teachers were perceived to be relatively less proficient in the other three components of the scale such as technological content knowledge (TCK), technological pedagogical knowledge (TPK), and TPACK. The results suggest that Iranian EFL teachers may require further training in these latter elements of the TPACK to gain the required proficiency to integrate technology more effectively into their language classrooms.
Keywords: CALL, EFL Students' Perspectives, Technological Pedagogical Content Knowledge, Technology Use

1. Introduction

With rapid advances in technology and technological innovations in education, teacher's capacity and skill in information and communication technology integration (ICT) into their teaching practice has been the center of much attention among many researchers (Chai, Koh, & Tsai, 2010). Meanwhile, research into computer-assisted language learning (CALL) has also gained prominence in language teacher education as an effort to enhance language learning (Zhao & Tella, 2002).

With regard to English as a second or foreign language, many studies have investigated teachers' knowledge and attitudes towards the use of technologies to shed more light on the ways teachers consider technology integration into their instructional practice (e.g., Zhao & Tella, 2002). Although CALL was positively perceived by teachers, practicing teachers' knowledge and expertise to integrate technology into their own teaching required more in-depth research. As a result, a theoretical framework known as TPACK was introduced by Mishra and Koehler (2006). Since its inception, TPACK has been recognized as a valuable framework for describing-g and understanding teacher's technology integration into their own teaching in a variety of educational settings, including EFL classrooms.

Within this line of enquiry, there is an increasing body of literature on the effect of TPACK on teacher education, indicating that a well-established TPACK could have a significant impact on teachers' understanding of the optimal ways of conducting technology-enhanced instruction which leads to the enhancement of students' learning (Graham, 2011; Koehler & Mishra, 2008; Niess, 2008; Shih & Chuang, 2013; among others). Additionally, the results of numerous previous studies adopting a TPACK instrument have verified the reliability and validity of those instruments for measuring teachers' ability to incorporate technology devices into their instructional practice (e.g., Koh, Chai, & Tsai, 2010).

As far as survey-based TPACK studies are concerned, a bulk of studies have been conducted to uncover teachers' perspectives involved in technology-supported learning environments (Schmidt et al. 2009; Yurdakul et al. 2012; Koh, Chai, & Tsai, 2010; among others). Nevertheless, few studies have ever investigated the perceptions of students with regard to their teachers' TPACK (e.g., Shih & Chuang, 2013; Tseng, 2014). It should be noted that teachers' perceptions or self-assessment may not be in line with their actual

level of knowledge or instructional practices (Lawless & Pellegrino, 2007). Since teachers' self-report of their competence or their practices in the classroom may be incompatible with what they actually do in the world of classroom (Tseng, 2014), further research into the students' perception of their teachers' TPACK may illuminate and increase the findings of previous TPACK studies in which teachers' self-assessment has been the only source of the data. Students' attitudes or perceptions towards the use of technology by their teachers are of high importance (Aryadoust et al., 2016) and researching student cognition on their technology-supported learning context can provide teachers with much feedback for more reflection on their teaching activities (Chuang, et al., 2018). Therefore, investigating teachers' TPACK through the perspectives of students in order to gain a deeper understanding of practitioners' competence to incorporate technology into their teaching is of high significance. As an attempt to fill this gap, this study employed a validated TPACK instrument in order to explore the perceptions of Iranian EFL students about their teachers TPACK at private language schools.

2. Literature Review

2.1. The TPACK Framework

The TPACK model (see Figure 1), as introduced by Mishra and Koehler (2006), includes seven types of knowledge related to the technology integration practices: technological knowledge (TK), pedagogical knowledge (PK), content knowledge (CK), pedagogical content knowledge (PCK), technological pedagogical knowledge (TPK), technological content knowledge (TCK), and technological pedagogical content knowledge (TPACK). TPACK is believed to be a blend of three main domains of knowledge of teachers, such as TK, PK, and CK (e.g., Graham, 2011). The TPACK framework proved to be useful for giving the right directions to teachers regarding the incorporation of the areas of content, pedagogy, and knowledge of technology (Niess, 2008).

According to Koehler and Mishra (2008), the main seven components of TPACK can be defined as follows:

- TK: the component associated with teachers' knowledge of utilizing technology tools.
- PK: the component associated with teachers' knowledge of teaching strategies.

- CK: the component associated with teachers' knowledge of subject content.
- TPK: the component associated with teachers' knowledge of utilizing technology in instructional practices.
- TCK: the component associated with teachers' knowledge of presenting the subject content via the use of technology.
- PCK: the component associated with teachers' knowledge of employing optimal teaching strategies required for presenting the intended subject content.
- TPACK: the component associated with teachers' knowledge of fostering students learning of a specific content via the use of optimal technology and pedagogy.
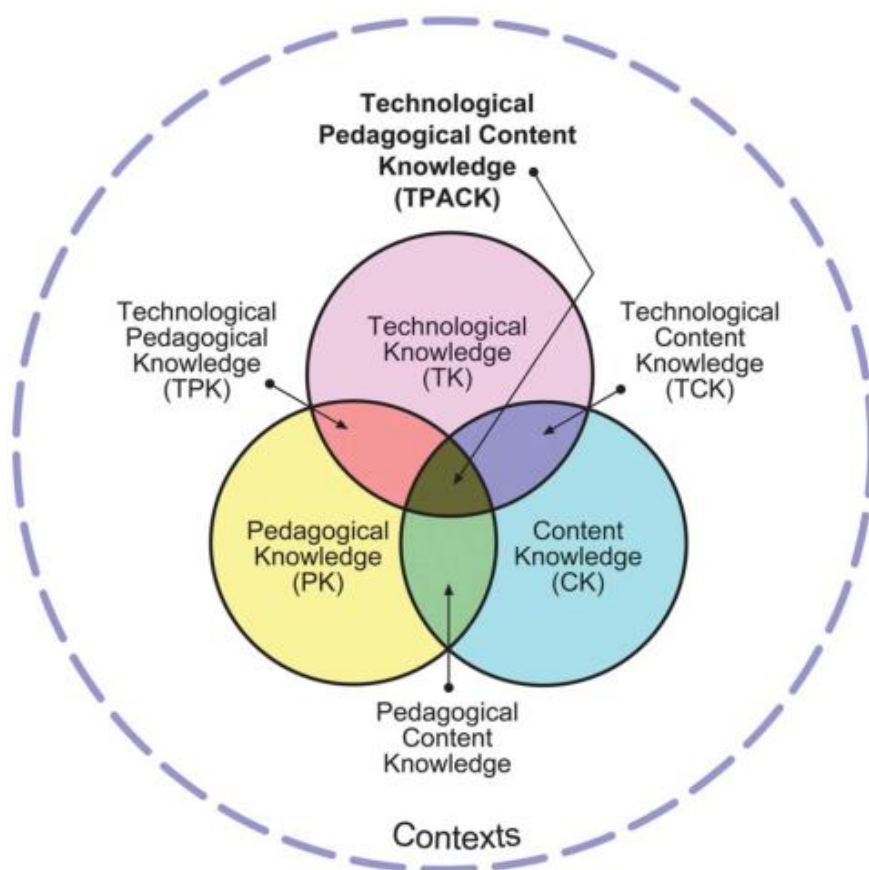

Figure 1. The TPACK framework.

Note: TPACK= Technological Pedagogical Content Knowledge; TK= Technological Knowledge; PK= Pedagogical Knowledge; CK= Content Knowledge; TPK= Technological Pedagogical Knowledge; PCK= Pedagogical Content Knowledge; TCK= Technological Content Knowledge.

2.2. Domain-general/Content-specific Teachers' TPACK

Considering the potential benefits of TPACK surveys, including their cost-effectiveness and their convenience in assessing a large number of people of the target population in a relatively quick fashion (Graham, 2011), they have been recognized as one of the most employed instruments in studies on teacher TPACK in a variety of subject-matter areas in education (Graham et al., 2009; Koehler, Shin, & Mishra, 2012). Despite their proposed effectiveness, these surveys have been criticized for their perceived drawbacks such as unspecified cut-off points in the components of TPACK (Cox, 2008; Graham, 2011), non-specificity of the items even in some instruments with appropriate reliability and validity (e.g. Chai, Koh, & Tsai, 2010; Schmidt et al., 2009; Yurdakul et al., 2012).

While there have been a number of studies investigating domain-general TPACK of teachers (e.g. Koh et al., 2013; Lee & Tsai, 2010), some studies attempted to investigate content-specific TPACK of teachers in areas of mathematics, and science (Jang & Chang, 2016). Many studies used reliable instruments to measure TPACK of teachers through the perspectives of teachers (e.g., Schmidt et al., 2009). With regard to English language teaching, numerous studies have investigated the TPACK of English language teachers through the perceptions of language teachers (e.g., Baser, Kopcha, & Ozden, 2016; Cheng, 2017).

Meanwhile, Koehler and Mishra (2008) underscored the significant role of the context of TPACK in affecting students' learning and knowledge of teachers and further emphasized the role of practitioners in understanding the interplay existing among content, instruction, and technology in addition to students' knowledge. Also, Niess (2008) highlighted the role of students and their understanding in shaping teachers' TPACK via interaction with students in technology-supported learning milieus. As a result, the investigation of the perceptions of students regarding teachers' TPACK enjoyed some research attention (Shih & Chuang, 2013; Tseng, 2014). Within this line of enquiry, Tuan, Chang, Wang, and Treagust (2000) developed a measuring instrument to assess students' perceptions of teachers' knowledge. Jang, Guan, and Hsieh (2009) validated another scale for measuring the perceptions of college students regarding teachers' pedagogical content knowledge. Also, Shih and Chuang (2013) constructed and validated a measuring scale to

assess the perceptions of students on faculty knowledge in technology-mediated learning environments.

As previously discussed, a significant number of studies have investigated teachers' perspectives regarding TPACK (e.g., Schmidt et al. 2009). However, few studies have examined students' perceptions on teachers' knowledge in handling technology-mediated learning environment. Although it is beyond the scope of the present study to review all of these studies, some more illustrative ones are reviewed to ground the purpose of the present study. For example, Tseng (2014) investigated the EFL learners' perceptions of the TPACK of their teachers by administering a valid learner-based scale. The participants of the study were 257 Taiwanese high school students. The findings of the study revealed that the students considered their teachers to be more capable in three areas of core knowledge than in the interfaces between them. More particularly, it was found that students' perceptions were that their teachers' content knowledge was better than their integrated TPACK. Also, the implication of this study was that students' perceptions could be taken into account in order to assist practitioners in improving their technology-related teaching activities.

In another study, Chuang et al. (2018) investigated high school learners' perceptions of English teachers' knowledge in handling technology-supported classes. Using structural equation modeling procedure, they administered a validated scale to a sample of 287 Taiwanese students. The validated scale constituted four components of knowledge of subject matter, knowledge of students' understanding, knowledge of technology, and technological pedagogical content knowledge (TPACK). The findings indicated that students' perceptions of technological knowledge and knowledge of students' understanding directly influenced TPACK. Knowledge of subject matter and knowledge of students' understanding are indirectly correlated with TPACK with significant mediation of technological knowledge. Likewise, Chang, Jang, and Chen (2015) traced the change in students' perceptions of their teachers' TPACK over a period one semester (18 weeks) in two contexts of Taiwan and China. To collect the data, TPACK scale, teacher interviews, and observations were carried out. Overall, the findings revealed that the perceptions of students on teaching performance of their teachers helped teachers to have more reflection on their teaching and improved some of their teaching strategies and behaviors.

Given the results of the above-reviewed studies and also due to the paucity of studies investigating students' perspectives regarding their teachers' TPACK especially in EFL contexts, further empirical studies are pressingly needed to shed more light on students' perceptions on their teachers' use of technology in their instruction. As teachers' self-report is very likely to be different from students' perceptions, carrying out further research into students' perceptions may provide a clearer picture of teachers' TPACK in their classrooms (Chang, Jang, & Chen, 2015). Therefore, the purpose of the present study was set to investigate the TPACK of Iranian EFL teachers at private language institutes from the perspectives of their students. More particularly, this study sought to explore the Iranian EFL students' perspectives on their language teachers' TPACK and its underlying components.

3. Methodology

3.1. Design and Context of the Study

This study was carried out in six Iranian language institutes in Tehran, Iran. The design of the study was a non-experimental, survey study whose purpose was to investigate Iranian EFL students' perspectives regarding their teachers' TPACK. In survey studies, researchers usually collect information about the features of samples drawn from the population and then utilize the findings obtained from the sample to make inferences about the target population (Ary et al., 2010).

3.2. Participants

The participants of the present study consisted of 148 Iranian EFL students, 90 men, and 58 women at the Intermediate level from about six private language institutes in Tehran, Iran. It should be noted that the EFL learners participated in this study voluntarily. A criterion sampling technique was adopted, and the students in this study had to meet two selection criteria. First, they had to be students at the intermediate level of study. Second, they had to be students learning English a foreign language at the private language institutes. Their teachers' ages ranged from 22 to 35. The demographic background of the participants has been presented in Table 1.

Table 1.

Demographic Background of the Participants

No. of students	148
Gender	90 Males & 58 Females
Proficiency level	Intermediate
Academic Year	2018

3.3. Instrument

The TPACK scale, which was developed and validated by Tseng (2014; see Appendix A), was employed to examine the TPACK of EFL language teachers through students' perspectives in EFL settings. The scale included all the seven components of TPACK framework including Technological Knowledge (TK), Pedagogical Knowledge (PK), Content knowledge (CK), Technological Pedagogical Knowledge (TPK), Technological Content Knowledge (TCK), Pedagogical Content Knowledge (PCK), Technological Pedagogical Content Knowledge (TPACK). The scale included 35 items, each indicating the degree to which the students agreed to the statements regarding the technological pedagogical content knowledge of their EFL teachers on a 5-point Likert-scale ranging from "strongly disagree" to "strongly agree" (strongly disagree, disagree, not sure, agree, and strongly agree). Internal consistency reliability (Cronbach's alpha) in the sample of the current study was reported to be 0.89.

3.4. Data Collection Procedure

The data collection was carried out in fall 2018 and the whole procedure lasted for two months. First, about 160 TPACK questionnaires were given to the participants in the form of hard copies or sent via e-mails and telegram attachments. Among the total number of distributed questionnaires, 148 students completed the TPACK questionnaires and returned them by the end of the fall semester. The respondents to the questionnaire were students learning English as a foreign language at the Intermediate level at the private language institutes in Tehran, Iran. Upon the distribution of the questionnaires, the respondents were provided with some explanations on how to respond to the items of the scale. Since the recruited participants were of intermediate proficiency level and were able

to comprehend the English version of the employed TPACK questionnaire, the researchers did not feel necessary to administer the translated version of the questionnaire. Moreover, the respondents were ensured that their information and answers to the questionnaire items would remain confidential.

3.5. Data Analysis Procedure

The results obtained from the questionnaire were analyzed employing descriptive statistics (mean and median) and inferential statistics including one-sample Wilcoxon Signed Ranks test as a non-parametric test using SPSS version 20. One-sample Wilcoxon Signed-Rank test is the non-parametric version of the one-sample *t*-test which was used to examine the direction (i.e., positive vs. negative) of the Iranian EFL learners' perceptions on their teachers' TPACK. In fact, one-sample Wilcoxon Signed-Rank test analysis was employed to compare the EFL learners' perceptions with an answer of ''3'', the ''neutral'' point on the five-point Likert scale, regarding their teachers' TPACK.

4. Results
4.1. Reliability and Validity

As previously discussed, to collect data on the students' perspectives on their EFL teachers' TPACK, Tseng's (2014) questionnaire was administered to 148 students during breaks between classes. This questionnaire consists of 7 subscales, each measuring one dimension of TPACK. Each subscale includes 5 items measuring different sub-dimensions of each TPACK subscale. It should be noted that Tseng (2014) examined the internal consistency of this questionnaire through Cronbach's alpha formula. The reliability index for the 35 items was reported to be 0.969. Internal consistency of items within the subscales was also high, with coefficient alphas above 0.7, hence indicating acceptable internal consistency.

Moreover, corrected item-total correlations were greater than .400, meaning that a strong correlation existed between the items of the components. Finally, no Cronbach's alpha values were found to increase very much if any item were to be removed from the questionnaire.

With regard to construct validity, Tseng (2014) ran a principal component analysis (PCA) to come up with 35 items to be included in the final questionnaire. Then, another PCA was run on the 35 items using a Varimax rotation with Kaiser normalization, resulting in the confirmation of the current factor structure of the questionnaire.

Given this structure of the TPACK questionnaire, the total score of the TPACK questionnaire and its subscales were computed by summing up the item scores relevant to the total scale and subscales. In order to examine to what extent the students' responses show either average or significantly beyond/below average responses in terms of their perspectives on their EFL teachers' TPACK, the theoretical means/medians of the total scale, subscales, and items were computed. Specifically, for the items, 3 as the midpoint response on the Likert scale was considered as the theoretical mean/median of each item, showing neutral average response. For the total scale and subscales, 3 was multiplied by the number of items in the total scale and subscales to compute the theoretical mean/median of the total scale (i.e. 105) and subscales (i.e. 15 for each subscale). Then, depending on the normality of the data, either the observed mean or median of the items/subscales/total scale based on the gathered data was compared with the relevant theoretical mean/median to see to what extent the students' responses show either average or significantly beyond/below average responses in terms of their perspectives of their EFL teachers' TPACK at item/subscale/total scale levels.

As the first step of data analysis, the descriptive statistics of the total scale and subscales of TPACK questionnaire were computed (see Table 2). As Table 2 shows, TK, PK, CK, and PCK subscales had the highest observed means and medians.

Then, the normality of the data was checked by computing the skewness and kurtosis ratios (i.e. skewness/kurtosis value divided by its standard error). Since all these ratios are beyond -+1.96, all the data violated normality assumption. Therefore, instead of one-sample t-test, one-sample Wilcoxon Signed Ranks test as a non-parametric test was run, which compares theoretical median rather than mean with the observed median of the sample.

Table 2.

Descriptive Statistics (total scale & subscales)

	N	Mean	Median	Std. Deviation	Skewness		Kurtosis	
						Std. Error		Std. Error
Technological Knowledge (TK)	148	22.7973	23	.91070	-1.065	.199	3.522	.396
Pedagogical Knowledge (PK)	148	22.7770	23	.56929	-1.326	.199	2.387	.396
Content Knowledge (CK)	148	22.6284	23	1.11441	-2.002	.199	5.830	.396
Technological Pedagogical Knowledge (TPK)	148	9.5946	8	3.77935	2.423	.199	4.526	.396
Technological Content Knowledge (TCK)	148	10.5811	9.5	4.52959	2.305	.199	3.833	.396
Pedagogical Content Knowledge (PCK)	148	18.8919	21	5.42247	-1.265	.199	.034	.396
Technological Pedagogical Content Knowledge (TPACK)	148	8.5068	9	1.19236	-1.041	.199	1.026	.396
Total TPACK	148	115.7770	116	7.02650	-.402	.199	1.658	.396
Valid N (listwise)	148							

Appendix B presents the results of one-sample Wilcoxon Signed Ranks test for total scale and subscales of TPACK questionnaire. As seen in Appendix B, all the results turned out to be significant (p < .01) showing that total scale and subscales' observed medians were significantly below or above the relevant theoretical medians. Moreover, one-sample Wilcoxon Signed-ranks test indicated that students' total perspectives of their EFL teachers' total TPACK (*Mdn* = 116) was significantly higher than the theoretical median (*Mdn* = 105), $Z = 4.61$, $p < .001$, revealing that the students believed that their teachers possessed above average level of total TPACK. With regard to TK component, the results of one-sample Wilcoxon Signed-ranks test revealed that students' perception (*Mdn* = 23)

was significantly higher than the theoretical median (*Mdn* = 15), *Z* = 2.25, *p* < .001. Similarly, one-sample Wilcoxon Signed-ranks test demonstrated that students' perception of their teachers' PK (*Mdn* = 23) was significantly higher than the theoretical median (*Mdn* = 15), *Z* = 2.48, *p* < .001. Also, one-sample Wilcoxon Signed-ranks test conducted for CK component indicated that students' perception (*Mdn* = 23) was significantly higher than the theoretical median (*Mdn* = 15), *Z* = 2.12, *p* < .001. By the same token, the results of one-sample Wilcoxon Signed-ranks test demonstrated that students' perspectives of their teachers' PCK (*Mdn* = 21) was significantly higher than the theoretical median (*Mdn* = 15), *Z* = 1.98, *p* < .001. These results indicate that Iranian EFL learners' perspectives towards their teachers' total TPACK as well as its components of TK, PK, CK, and PCK were positive and significant.

However, one-sample Wilcoxon Signed-ranks test indicated that students' perspectives of their EFL teachers' TPK (*Mdn* = 8) was significantly lower than the theoretical median (*Mdn* = 15), *Z* = -3.96, *p* < .001. Likewise, the results of one-sample Wilcoxon Signed-ranks test revealed that students' perspectives of their teachers' TCK (*Mdn* = 9.5) was significantly lower than the theoretical median (*Mdn* = 15), *Z* = -4.12, *p* < .001. Also, regarding TPACK component, the results of one-sample Wilcoxon Signed-ranks test revealed that students' perception (*Mdn* = 9) was significantly lower than the theoretical neutral median (*Mdn* = 15), *Z* = -2.87, *p* < .001. These results suggest that the students did not perceive that their teachers were competent in terms of TPK, TCK, and TPACK.

After comparing the observed medians of the subscales/total scale with the relevant theoretical medians, the same comparison was made in terms of individual items of TPACK scale. In this analysis, the descriptive statistics of all TPACK scale items were computed (see Table 4).

Table 4 reveals that all the items of TPK, TCK, and TPCK had observed means and medians below 3 as the theoretical mean/median, but the rest of the subscales' items had observed means and medians above 3. Again, the data presented in Table 4 indicates that the normality assumption was violated for all the items (as calculated by the skewness and kurtosis ratios). Therefore, one-sample Wilcoxon Signed Ranks test as a non-parametric test was performed.

Table 4.

Descriptive Statistics

	N	Mean	Median	Std. Deviation	Skewness	Std. Error	Kurtosis	Std. Error
a1	148	4.6486	5	.47901	-.629	.199	-1.626	.396
a2	148	4.4324	4	.49710	.276	.199	-1.951	.396
a3	148	4.6824	5	.46711	-.792	.199	-1.392	.396
a4	148	4.5811	5	.52182	-.622	.199	-.977	.396
a5	148	4.4527	4	.49945	.192	.199	-1.990	.396
b1	148	4.5878	5	.49390	-.361	.199	-1.896	.396
b2	148	4.4122	4	.49390	.361	.199	-1.896	.396
b3	148	4.7703	5	.42209	-1.298	.199	-.319	.396
b4	148	4.4662	4	.50055	.137	.199	-2.009	.396
b5	148	4.5405	5	.50005	-.164	.199	-2.000	.396
c1	148	4.6892	5	.46440	-.826	.199	-1.336	.396
c2	148	4.4257	4	.49612	.304	.199	-1.934	.396
c3	148	4.6149	5	.48828	-.477	.199	-1.797	.396
c4	148	4.4257	4	.57251	-.806	.199	2.157	.396
c5	148	4.4730	5	.61108	-1.618	.199	6.706	.396
d1	148	1.7838	2	.97269	1.481	.199	1.701	.396
d2	148	1.8986	2	.83901	1.245	.199	1.540	.396
d3	148	2.0270	2	.86462	1.420	.199	2.252	.396
d4	148	1.8581	2	.90358	1.463	.199	2.224	.396
d5	148	2.0270	2	.91060	.768	.199	-.049	.396
e1	148	2.0000	2	1.10040	1.708	.199	2.496	.396
e2	148	2.1419	2	1.09427	1.735	.199	2.486	.396
e3	148	2.0405	2	.85618	1.570	.199	2.948	.396
e4	148	2.2027	2	1.04952	1.911	.199	2.966	.396
e5	148	2.1959	2	.83836	1.652	.199	2.939	.396
f1	148	3.8716	4	1.09594	-1.093	.199	.329	.396
f2	148	3.8446	4	.98086	-.910	.199	-.130	.396
f3	148	3.4865	4	1.46843	-.809	.199	-.879	.396
f4	148	3.8311	4	1.18027	-1.151	.199	.357	.396
f5	148	3.8581	4	1.26173	-1.191	.199	.292	.396
g1	148	1.4324	1	.49710	.276	.199	-1.951	.396
g2	148	1.6892	2	.46440	-.826	.199	-1.336	.396
g3	148	1.7297	2	.44561	-1.045	.199	-.920	.396
g4	148	1.8514	2	.35695	-1.996	.199	2.009	.396
g5	148	1.8041	2	.39827	-1.548	.199	.401	.396
Valid N (listwise)	148							

Appendix C presents the results of one-sample Wilcoxon Signed Ranks test for all the items. As seen in Appendix C, all the results for all items turned out to be significant ($p < .01$) revealing that the items' observed medians were significantly below or above the relevant theoretical medians. Concerning the observed medians (Table 4), the results indicated that the students' perspectives of their EFL teachers' TPACK in terms of all the items for TK, PK, CK, and PCK were higher than the average level, suggesting that the students perceived their teachers to be proficient in terms of TPACK components of the items of TK, PK, CK, and PCK. Nevertheless, the results indicated that students' perspectives of their EFL teachers' TPACK for the components of TPK, TCK, and TPCK were lower than the average level, revealing that the EFL students did not believe that their teachers were competent in these components of TPACK. Taken together, the results of one-sample Wilcoxon Signed Ranks test for total scale and subscales of TPACK questionnaire were consistent with results of one-sample Wilcoxon Signed Ranks test for all the items of the TPACK scale.

5. Discussion

The purpose of this study was set to investigate the Iranian EFL teachers' TPACK through their students' perspectives. The reliability and validity of the TPACK scale administered in the current study was already verified by Tseng (2014). This study was conducted following the assertion made by Shih and Chuang (2013), emphasizing the investigation of the quality of teachers TPACK through exploring the perspectives of students about their teachers' integration of technology in higher education contexts. In line with Shih and Chuang's (2013) study was carried out in the context of higher education, and Tseng (2014) attempted to expand our understanding of TPACK through the perspectives of students in the context of secondary education, specifically related to English teaching and learning, the current research focused on assessing the level of Iranian EFL teachers through the students' perspectives at private language institutes.

The results of both descriptive and inferential statistics indicated that the Iranian EFL students maintained that their teachers were proficient in terms of global TPACK as measured by the used scale of the study. In other words, the students perceived their teachers as generally competent enough to improve the students' language ability through effective use of technology in their own pedagogy. Moreover, regarding the components of

TPACK, it was revealed that the EFL students considered their teachers to be more competent in the four components of the used scale including TK, PK, CK, and PCK. However, they considered their teachers to be relatively less proficient in the three other components such as TCK, TPK, and TPACK. More particularly, the results obtained from the questionnaire revealed that TK of teachers was perceived to be the strongest component while their TPACK was perceived as the weakest component of TPACK possessed by Iranian EFL teachers, suggesting that Iranian EFL teachers were competent in terms of familiarity with the basics of computer software and hardware, but lacked the essential knowledge and strategies to present the instructional materials via the use of various technologies. In other words, the Iranian EFL students believed that although Iranian teachers were equipped with adequate knowledge of English language, language teaching strategies, and using technology, they were not proficient enough to utilize technology devices in their instructional practices or to improve students' learning by effective integration of technology in their language teaching instruction. These findings may suggest that Iranian EFL teachers need further training to present instructional materials via the use of technology.

The findings of the present study are in line with those of Tseng (2014) who found that the EFL students regarded their teachers to be more proficient in three domains of core knowledge than in the interacting sub-categories of TPACK. Also, the findings of this study partially verify those of Chuang et al. (2018) who indicated that students' perceptions of TK directly affects their perceptions of their teachers' TPACK. Furthermore, it can be argued that the findings of this study lend further empirical support via students' perspective to corroborate the significant associations among different components of TPACK.

The findings of this study can shed more light on the existing body of research exploring teachers' TPACK in EFL settings. Previous studies have highlighted the significance of students' perspectives on the ways teachers presented instructional materials via the use of technology (Hsu, Wang, & Comac, 2008). Unlike some previous studies in which the instrument's focus was on teachers' TPACK through the perspectives of teachers (e.g., Schmidt et al., 2009), this study adopted a self-reported TPACK questionnaire investigating the students' perspectives. The lack of adequate technological pedagogical knowledge of EFL teachers poses a challenge to many practicing EFL

teachers when it comes to dealing with presenting instructional materials via the employment of technology in EFL classrooms. The results of the present research may call for the conduction of further empirical research into Iranian EFL teachers' TPACK, and also highlight the fact that pre-service EFL teacher training programs in Iran may require further revision in terms of teachers' technology integration.

More particularly, the low levels of teachers' TPK, TCK, and TPACK as perceived by the EFL students might suggest that CALL teacher education programs should encourage their student teachers to incorporate technology into their teaching practice more effectively. In so doing, teacher educators and CALL stake-holders might need to advocate the development of TPACK components within EFL teachers. To achieve such a goal, CALL teacher education programs should foster incorporating technology use in their teacher training courses and should provide their student teachers with adequate engagement in technology use so that the prospective teachers can transfer their experience of technology use to their actual teaching practice in the world of classroom.

6. Conclusion

Assessing the extent of technology-related knowledge of EFL teachers and their expertise in presenting the language learning materials through the employment of different technologies is critical. The current study, which was a survey-based study, uncovered the perspectives of Iranian EFL students on the level of their teachers' TPACK. Results of the survey revealed that the majority of students maintained that their teachers were competent with regard to total TPACK. In addition, most EFL students believed that their EFL teachers excelled in four components of the TPACK such as TK, PK, CK, and PCK, but they were perceived to be relatively less proficient in three components of TPACK including TCK, TPK, and TPCK. Overall, the findings of this study indicated that although Iranian L2 practitioners were viewed to be familiar with the usual technology devices, they were perceived to be less competent in effectively teaching L2 through different technology devices. These results revealed that Iranian EFL students did not consider their teachers as the practitioners to be able to enhance their students' learning via effective integration of technology in their EFL instruction. Such findings might reveal that Iranian EFL teachers might require further training in these components of TPACK to gain

the required proficiency to integrate technology into their language classrooms. The results of the current study expanded our understanding of the ways Iranian EFL teachers integrate technology into English as a foreign language classrooms and the quality of this technology integration into Foreign Language Education. Given the findings of the present study as well as the significance of technology integration in L2 instruction, Iranian EFL teacher education programs should pay further attention to CALL teacher education initiatives. Such initiatives   not only include encouraging pre-service teachers to have actual experience of employing the technological devices during their practicums, but they also include providing EFL prospective L2 practitioners with a kind of internship to enhance their competence in using technology more effectively, the type of practical competence that is currently known as TPACK. As a result, to foster the use of CALL in EFL contexts, teacher educators, EFL policy makers, and CALL stake-holders should employ more workable plans in order to develop TPACK among Iranian EFL teachers. Due to the insufficient CALL training in pre-service EFL teacher education, further serious attempts should be made to design professional teacher development programs in order to encourage effective integration of technology with significant emphasis on TPACK.

Due to the employment of a questionnaire as the major instrument for assessing the TPACK of EFL teachers, this study has some limitations. Although questionnaires are regarded as highly structured data collection instruments, they also have some limitations which led certain researchers to question their reliability or validity. The plausible shortcoming of using self-report scales is the fact that the statements should be to be adequately simple and understandable by the respondents. Therefore, using questionnaires may not be a very credible data elicitation technique for deep investigation of people's opinion (Dörnyei, 2007). To compensate for the probable drawbacks of using TPACK questionnaire as the only data collection technique, and achieve more in-depth knowledge of EFL teachers' TPACK, it is advisable to conduct a mixed-methods study involving some follow-up semi-structured interviews or stimulated recall interviews requiring the respondents to evaluate their own responses and justify their given answers. Future studies could go on further and include other student variables including age, gender, educational level in their investigation of EFL teachers' TPACK.

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Appendix A

Technological Pedagogical Content Knowledge (TPACK) Questionnaire

This survey aims to assess the Iranian EFL student's perspectives on the TPACK of their teachers. Please indicate the degree you agree with the following statements. The results collected will be used only for research analysis. The survey remains anonymous, so please kindly do the survey at ease. Your assistance in this survey is highly appreciated.

Technological Knowledge

a1. My teacher knows about basic computer hardware (e.g. RAM, network cable, and projector).

Strongly Disagree ☐   Disagree ☐   Not Sure ☐   Agree ☐   Strongly Agree ☐

a2. My teacher knows about basic computer software (e.g. media players, word processing programs, and web page browsers).

Strongly Disagree ☐   Disagree ☐   Not Sure ☐   Agree ☐   Strongly Agree ☐

a3. My teacher knows how to solve technical problems associated with hardware (e.g. setting up printers, using webcams, and changing hard drives).

Strongly Disagree ☐   Disagree ☐   Not Sure ☐   Agree ☐   Strongly Agree ☐

a4. My teacher knows how to deal with technical problems related to software (e.g. installing drivers, setting up Internet connection, and sharing files in the cloud).

Strongly Disagree ☐   Disagree ☐   Not Sure ☐   Agree ☐   Strongly Agree ☐

a5. My teacher keeps up with important new technologies (e.g. e-books, Facebook, and white board).

Strongly Disagree ☐   Disagree ☐   Not Sure ☐   Agree ☐   Strongly Agree ☐

Pedagogical Knowledge

b1. My teacher uses a variety of teaching strategies in class (e.g. explanation, raising questions, and group work).

Strongly Disagree ☐   Disagree ☐   Not Sure ☐   Agree ☐   Strongly Agree ☐

b2. My teacher uses different evaluation methods and techniques (e.g. quiz, report, and role-playing).

Strongly Disagree ☐   Disagree ☐   Not Sure ☐   Agree ☐   Strongly Agree ☐

b3. My teacher understands students' learning difficulties.

Strongly Disagree ☐   Disagree ☐   Not Sure ☐   Agree ☐   Strongly Agree ☐

b4. My teacher adjusts the ways he/she teaches according to student performance and feedback.

Strongly Disagree ☐   Disagree ☐   Not Sure ☐   Agree ☐   Strongly Agree ☐

b5. My teacher knows how to manage his/her class (e.g. drawing up clear class rules, creating friendly atmosphere in class, and developing a good relationship between students and the teacher).

Strongly Disagree ☐   Disagree ☐   Not Sure ☐   Agree ☐   Strongly Agree ☐

Content knowledge

c1. My teacher has sufficient knowledge of English grammar.

Strongly Disagree ☐   Disagree ☐   Not Sure ☐   Agree ☐   Strongly Agree ☐

c2. My teacher has good pronunciation.

Strongly Disagree ☐   Disagree ☐   Not Sure ☐   Agree ☐   Strongly Agree ☐

c3. My teacher teaches class naturally in English.

Strongly Disagree ☐   Disagree ☐   Not Sure ☐   Agree ☐   Strongly Agree ☐

c4. My teacher creates materials that can enhance my learning.

Strongly Disagree ☐   Disagree ☐   Not Sure ☐   Agree ☐   Strongly Agree ☐

c5. My teacher answers students' questions about English.

Strongly Disagree □   Disagree □   Not Sure □   Agree □   Strongly Agree □

Technological Pedagogical Knowledge

d1. My teacher uses technologies to motivate me to learn.

Strongly Disagree □   Disagree □   Not Sure □   Agree □   Strongly Agree □

d2. My teacher uses technologies to explain clearly.

Strongly Disagree □   Disagree □   Not Sure □   Agree □   Strongly Agree □

d3. My teacher uses technologies to interact more with us.

Strongly Disagree □   Disagree □   Not Sure □   Agree □   Strongly Agree □

d4. My teacher uses technologies to facilitate teaching activities.

Strongly Disagree □   Disagree □   Not Sure □   Agree □   Strongly Agree □

d5. My teacher uses technologies appropriate for his/her teaching.

Strongly Disagree □   Disagree □   Not Sure □   Agree □   Strongly Agree □

Technological Content Knowledge

e1. My teacher uses digitalized teaching materials with which I can learn vocabulary better.

Strongly Disagree □   Disagree □   Not Sure □   Agree □   Strongly Agree □

e2. My teacher uses digitalized teaching materials with which I can learn grammar better.

Strongly Disagree □   Disagree □   Not Sure □   Agree □   Strongly Agree □

e3. My teacher uses digitalized teaching materials with which I can read better.

Strongly Disagree □   Disagree □   Not Sure □   Agree □   Strongly Agree □

e4. My teacher uses digitalized teaching materials with which I can speak better.

Strongly Disagree ☐   Disagree ☐   Not Sure ☐   Agree ☐   Strongly Agree ☐

e5. My teacher uses digitalized teaching materials with which I can understand the target culture better.

Strongly Disagree ☐   Disagree ☐   Not Sure ☐   Agree ☐   Strongly Agree ☐

Pedagogical Content Knowledge

f1. My teacher conducts lectures in which I can understand English better.

Strongly Disagree ☐   Disagree ☐   Not Sure ☐   Agree ☐   Strongly Agree ☐

f2. My teacher conducts quizzes in which I can practice English more.

Strongly Disagree   Disagree   Not Sure   Agree
Strongly Agree

f3. My teacher conducts games in which I can practice English more.

Strongly Disagree   Disagree   Not Sure   Agree
Strongly Agree

f4. My teacher conducts group activities in which I can use English more.

Strongly Disagree ☐   Disagree ☐   Not Sure ☐   Agree ☐   Strongly Agree ☐

f5. My teacher conducts discussion activities in which I can use English more.

Strongly Disagree ☐   Disagree ☐   Not Sure ☐   Agree ☐   Strongly Agree ☐

Technological Pedagogical Content Knowledge

g1. My teacher represents content with appropriate strategies via the use of various technologies.

Strongly Disagree ☐   Disagree ☐   Not Sure ☐   Agree ☐   Strongly Agree ☐

g2. My teacher provides us with the opportunity to practice English with appropriate strategies via the use of various technologies.

Strongly Disagree ☐   Disagree ☐   Not Sure ☐   Agree ☐   Strongly Agree ☐

g3. My teacher provides us with the opportunity to use English with appropriate strategies via the use of various technologies.

Strongly Disagree ☐   Disagree ☐   Not Sure ☐   Agree ☐   Strongly Agree ☐

g4. The way my teacher teaches English with the computer is engaging.

Strongly Disagree ☐   Disagree ☐   Not Sure ☐   Agree ☐   Strongly Agree ☐

g5. The way my teacher teaches English with the computer is of help to my learning of English.

Strongly Disagree ☐   Disagree ☐   Not Sure ☐   Agree ☐   Strongly Agree ☐

Appendix B

One sample Wilcoxon Signed Ranks test for total scale and subscales

Table 3.

One sample Wilcoxon Signed Ranks test for total scale and subscales

	Null Hypothesis	Test	Sig.	Decision
1	The median of Total.TPACK equals 105.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis.

	Null Hypothesis	Test	Sig.	Decision
1	The median of Technological. Knowledge equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis.
2	The median of Pedagogical. Knowledge equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis.
3	The median of Content.knowledge equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis.
4	The median of Technological. Pedagogical.Knowledge equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis.
5	The median of Technological. Content.Knowledge equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis.
6	The median of Pedagogical. Content.Knowledge equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis.
7	The median of Technological. Pedagogical.Content.Knowledge equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Appendix C

One sample Wilcoxon Signed Ranks test for TPACK items

Table 5.

One sample Wilcoxon Signed Ranks test for TPACK items

	Null Hypothesis	Test	Sig.	Decision		Null Hypothesis	Test	Sig.	Decision
1	The median of a1 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis	15	The median of c5 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis
2	The median of a2 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis	16	The median of d1 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis
3	The median of a3 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis	17	The median of d2 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis
4	The median of a4 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis	18	The median of d3 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis
5	The median of a5 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis	19	The median of d4 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis
6	The median of b1 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis	20	The median of d5 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis
7	The median of b2 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis	21	The median of e1 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis
8	The median of b3 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis	22	The median of e2 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis
9	The median of b4 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis	23	The median of e3 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis
10	The median of b5 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis	24	The median of e4 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis
11	The median of c1 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis	25	The median of e5 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis
12	The median of c2 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis	26	The median of f1 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis
13	The median of c3 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis	27	The median of f2 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis
14	The median of c4 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis	28	The median of f3 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis

29	The median of f4 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis.
30	The median of f5 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis.
31	The median of g1 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis.
32	The median of g2 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis.
33	The median of g3 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis.
34	The median of g4 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis.
35	The median of g5 equals 15.00.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis.