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Original Article

On the Efficacy of Technological Pedagogical Content Knowledge (TPACK) Workshops: Academic Behavior and Perceptions in Focus

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Abstract

This research examined EFL teachers' and their learners' perceptions regarding teachers' Technological Pedagogical Content Knowledge (TPACK) proficiency after implementing TPACK workshops in the Iranian context. TPACK workshops were administered by 15 EFL teachers and 45 EFL learners by applying the TPACK model (Koehler & Mishra, 2006) and learning by doing (Hegelheimer & Chapelle, 2004). The data analyses showed statistically significant differences between the participants' perceptions regarding TPACK intervention in pre and post-workshop stages and positive augmentations of TPACK workshops on academic behavior of EFL teachers. Therefore, the study provides a novel viewpoint regarding the importance of the participants' perceptions in blending technology into English teaching practice and suggests the actual beliefs and perceptions of Iranian EFL teachers and learners towards incorporating technology into English language teaching and Computer-Assisted Language Learning (CALL) and teachers' academic behavior changes after implementation of online TPACK workshops as a professional development program.

Keywords: Academic Behavior Changes, Learners' Perceptions, Teachers' Perceptions, TPACK, TPACK Workshop

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1. Introduction

With the advent of modern technology, the essence of teaching and learning processes is changed. Blending technology in language teaching was started in the 1980s (Hubbard, 2008). Many researchers suggest that technology has become an indispensable element of Education (Guichon & Hauck, 2011; Mishra & Koehler, 2009). However, technology use in instructional settings provides many profits. However, it necessitates a few factors in teachers' practice. Many researchers have investigated the EFL teachers' cognition of technology usage in the classroom (Aydin, 2013; Baser et al., 2015; Bostancıoğlu & Handley, 2018; Kessler, 2007). Previous research revealed that perceptions and knowledge of teachers regarding technology and its blending might settle technology implementation of teachers in the practice of teaching and the potency of technology blending (Atkins & Vasu, 2000; Lavelle et al., 2004).

Technology-oriented education courses assist teachers in achieving a positive viewpoint toward CALL by using specific technology, for instance, an online bulletin board, Information Communication Technologies (ICT), an online course management system, and a Language Learning Technology module (Van Olphen, 2007). Additionally, technology-oriented programs also provide the intention of assisting teachers in boosting confidence in blending technology into practice (Hegelheimer, 2006; Hoven, 2007). Hong (2010) mentioned that "the confidence of teachers in blending technology is a vital move toward augmenting their expertise about how to harness the pedagogical potential of CALL technology" (p. 56).

Professional development courses need an accurate design and effort based on teachers' available schedules. Although teachers' knowledge development must be enhanced, it is essential to ensure that the design, implementation, and sources are assigned to practical programs in light of the most appropriate approaches (Dede et al., 2009). In consideration of the Iranian technological setting, teachers are necessitated to participate in professional development programs. Some factors such as distance, time, and funding are determining elements in designing professional development (Boehm et al., 2012). Therefore, conducting these professional development programs through online platforms can provide great opportunities for teachers because of more availability and accessibility. Technology implementation for professional development courses has recently been accentuated in teacher education development (Bustamante, 2019).

In analyzing the teaching English language research area, many investigations have probed the proficiency and beliefs of EFL teachers regarding the technology used to elucidate the procedures teachers contemplate technology blending into their teaching (Zhao & Tella, 2002). Although EFL teachers discerned CALL as a practical approach, rehearsing EFL teachers' proficiency and competency for blending technology into their teaching needs further profound investigation. Effective technology blending cannot be considered only by the infrastructural facilities and the availability of technology devices. Moreover, it should be regarded as teachers' attitudes, perceptions, and competencies regarding selecting and implementing technology successfully in line with the subject matter and pedagogy (Bilici et al., 2016). The practical technology blending design to explain the perceptions and competencies is the Pedagogical Technological and Content Knowledge (TPACK) framework (Chai et al., 2011; Joo et al., 2018).

Mishra and Koehler (2006) provided the theoretical framework of TPACK. Since its foundation, TPACK has been a useful model for explaining and perceiving the technology blending of EFL teachers into teaching in different instructional contexts. Many pieces of research have been run in the field of investigating the TPACK role in teacher training and professional development courses, considering that an entrenched TPACK framework could have a prominent effect on perceptions of teachers regarding the ideal approaches to implementing technology-advanced Education that results in learning improvement of students (Graham, 2011; Shih & Chuang, 2013).

Two possibilities arise in implementing TPACK in the teaching and practicing process, whether the teacher is competent to blend these three domains or not. Several studies investigated how TPACK blending is implemented in teaching and learning. The studies focused on teachers' perceptions of blending TPACK in learning. Such as Mai and Hamzah's (2016) study investigated teachers' perceptions towards implementing TPACK in Malaysia. The results show that teachers rate themselves with a lower perception of how to blend technology and content. They seem less confident in blending and implementing technology successfully with the content knowledge in their teaching process. Contrary to the previous research, Ohlson et al. (2013) assessed in-service teachers' perceptions of their TPACK development. The results showed that teachers are eager to implement technology and blend it with content and pedagogy because they declared that using technology in their teaching process is advantageous.

Therefore, it is important to run this study to determine how the EFL teachers' perceptions of blending the TPACK framework in the teaching and learning process can affect EFL learners' perceptions of TPACK and their teachers' academic behavior changes after participation in TPACK workshops.

2. Literature Review

2.1. TPACK Framework Formation

The foundation of TPACK was created on the notion of Pedagogical Content Knowledge

(PCK), Shulman (1986) suggests a specified professional knowledge consisting of two sources of knowledge bases: (a) the general pedagogical rules and competencies and (b) the knowledge of the content to be taught. The original study of Shulman provided solutions for achieving two essential goals regarding the pedagogical mindset of teachers. First, elaborating on how to teach a specific subject matter and highlighting acquiring content knowledge and pedagogical approaches is not enough to acquire the knowledge needed by successful teachers.

According to Koehler et al. (2013), there are three essential elements of teachers' knowledge: pedagogy, content, and technology. Teachers should know how to combine these three elements in the teaching and learning process to have a fruitful learning process. It constructs pedagogical content knowledge by blending pedagogy and content knowledge with technology (TPACK). These three major knowledge domains will provide the combination of Pedagogy and Content (PC), Technology and Pedagogy (TP), and Technology and Content (TC). Later, blending these three knowledge bases will create Technological Pedagogical Content Knowledge (TPACK).

Therefore, TPACK embraces a blended knowledge domain of technological knowledge and competencies and subject matter knowledge, teachers' actions, and the pedagogy essential for teachers to be skillful in implementing technology in the classroom (Koehler & Mishra, 2009). This concept provides a model with seven distinctive knowledge bases (Figure 1) that teachers should acquire to blend digital technologies in their teaching practices advantageously. It is, then, expected for teachers' knowledge and competency for technology blending to be formed upon a profound perception of the interplay between content, pedagogy, and technology.

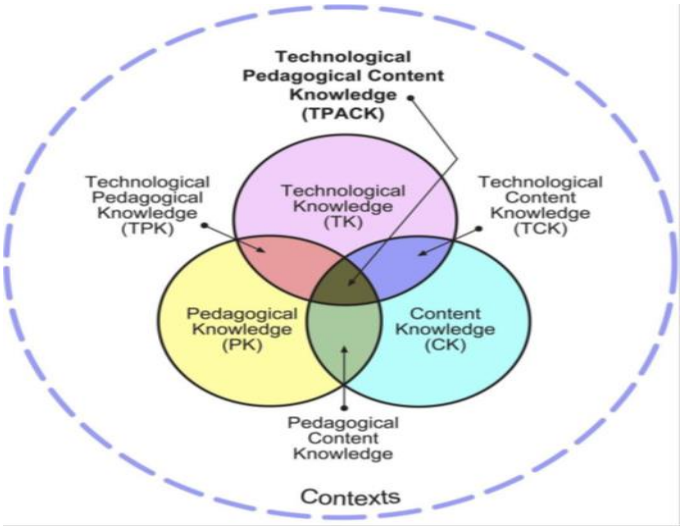

Figure 1. TPACK Framework (Mishra & Koehler, 2006)

2.2. Implementation of TPACK Framework in Teacher Education Program

By considering the increasing access to technology, availability of technological devices, and the flourishing attentiveness of teachers, many researchers have paid to the significance of preparing teachers to blend technology in teaching more efficiently. Teacher professional development programs are a vital factor in the readiness of teachers to blend technology into their teaching process. However, the intricate knowledge needed to blend technology successfully demonstrates a serious difficulty for teacher professional development courses. It means there is a need to focus on blending technology into content and instructional pedagogy programs (International Society for Technology in Education, 2008).

Researchers have started to examine the efficacy of various program structures on teachers' methods and skills to blend technology into their teaching. Although, because of the intricacy of the indispensable knowledge to integrate technology successfully into instruction and curriculum, as well as the interrelated essence of this knowledge, there is a requisite to perceive how teachers' knowledge of technology blending expands through course-based experiences with the aim of teacher training programs (Chai et al., 2011; Jang & Chen, 2010; Lawless & Pellegrino, 2007).

Teacher training programs should consider the transference from ability-oriented technology programs to technology blended syllabi. Training courses now supply teachers with adequate information in shifting pedagogical approaches cultivated with advanced educational technologies (Martin, 2015). To blend technologies into educational practices

efficiently, teachers should be trained throughout the pre-service professional development courses based on technology blending sources and approaches (Bradshaw, 2002; Kilickaya & Serefoglu, 2013; Todorova & Osburg, 2010; Williams et al., 2009).

Then, the formation of the TPACK framework appeared to turn into a useful instrument in exploring how blended technology can reinforce pedagogical approaches in addition to the content knowledge in the curriculum (Ansyari, 2013; Fyfe, 2010; Hew & Brush, 2007; Hsu, 2012; Hu et al., 2008; Schmidt, 2009).

2.3. The Importance of Teachers' Perspectives in Technology Blending

Besides some external impeding factors, such as lack of accessibility to technologies and inadequate infrastructure, there are internal hindering factors in technology blending, such as teachers' confidence in using technology and their beliefs regarding teaching and technology. Teachers who feel confident using technology are more likely to blend it into the classroom. The researchers have recognized that the most significant factors in teachers' technology use are confidence and beliefs (Hegelheimer, 2006; Inan & Lowther, 2010; Sarhandi et al., 2016).

On the other side, feeling confident in using technologies is insufficient to implement them into practice (Sulaimani et al., 2017); the other determining factors, such as teachers' beliefs and their resistance to change, can cause trouble. Moreover, teachers with anxiety about using technologies that are doubtful about their competency to teach with technology are less plausibly to implement it in their teaching process. Technological anxiety is mostly associated with their beliefs about the inability to solve technical matters during teaching (Howard, 2013).

Ertmer and Ottenbreit-Leftwich (2010) stated that technology blending is affected by the beliefs regarding technologies and teaching and the possibility of using technology in teaching practice would be enhanced when teachers believe that the educational technologies are compatible with the specific subject matter and technology implementation supports the goals of the teaching and learning. Moreover, their study certified the results of the Kessler and Plakans (2008) research that teachers willing to blend technology into their teaching process are more likely to use learner-centered methods.

2.4. The Importance of Learners' Perspectives in Technology Blending

In consideration of technology blending into the learning process, teachers should perceive how learners are eager to use technology in their learning. Keller (1987) provided that attention, relevance, confidence, and satisfaction (ARCS) are the four characteristics one needs to establish for people to be motivated to learn. Concerning blending technology within learning, teachers should pay attention to the population of learners to perceive how they will acquire efficiently and how they could boost learners' confidence in technology-use; and satisfy them to enhance their knowledge acquired (Spears, 2012).

Sansone et al. (2011) stated that learners who were previously willing to use computers might show more considerable knowledge and attentiveness because the practices they may do fit their attentiveness. They can build associations between new knowledge and existing one on their own. They stated, "Technology immersion positively affected students' technology proficiency and frequency of their technology-based class activities and small-group interactions" (p. 299). Therefore, technological training for enhancing ability and competency would be highlighted.

Therefore, many studies have been performed to reveal the teachers' perspectives on technology-oriented teaching and learning atmospheres (Schmidt et al., 2009; Yurdakul et al., 2012). However, until now, few studies have explored the perceptions of both teachers and learners about their teachers' TPACK literacy and academic behavior changes after TPACK intervention (Shih & Chuang, 2013; Tseng, 2014). It should be considered that the teachers' perceptions might not show their true level of knowledge and literacy (Lawless & Pellegrino, 2007). Therefore, teachers' competency self-assessment may not align with their actual practices in the classroom (Doering et al., 2014; Tseng, 2014).

Learners' attitudes and beliefs toward their teachers' technology use have great Significance (Aryadoust et al., 2016). Exploring learners' perceptions of the technology-enhanced learning context could give teachers constructive feedback for additional reflection on their practice (Chuang et al., 2018). It means that the learners' perceptions could provide a profound realization of educators' competence to implement technology into their teaching practice efficiently.

Therefore, the current research aimed to simultaneously investigate the EFL teachers' and learners' perceptions to achieve more precise and accurate results on EFL teachers' TPACK perceptions and their academic behavior changes after TPACK workshops.

Learners' perceptions regarding their teachers' TPACK could enhance and support the results of earlier TPACK inquiries. Thus, this study aimed to explore:

1. To what extent does the frequency of the indices of the EFL teachers' perceptions regarding TPACK proficiency change in light of TPACK intervention?
2. How do the EFL teachers perceive their academic behavior after attending TPACK intervention?
3. How do the EFL learners perceive their teachers' academic behavior after attending TPACK intervention?

3. Methodology

The design of the study, participants, instruments, and data collection and analysis procedures are explained in this section.

3.1. Design and Context of the Study

In this mixed-method study, the experimental model of the embedded design was used. The embedded design includes collecting both quantitative and qualitative data, but one of the data types plays a supplemental role within the overall design (Hanson et al., 2005). According to the essence of this study, the experimental model of embedded design is used to evaluate the participants' perceptions after implementing TPACK workshops as the intervention and follow up on their experiences. Related to the study context, the implementation stage of TPACK intervention was conducted virtually via the online platform.

3.2. Participants

The attendees were 15 Iranian EFL teachers composed of three Ph.D. holders in teaching the English language, six MA holders in teaching English, two MA holders in translation studies, and four BA holders in teaching English majors. The participant's knowledge, field of study, teaching experience, and technological proficiency were among the main criteria for selecting the participants. All attendees had more than two years of teaching experience at intermediate and advanced levels in language institutes and were selected from the LinkedIn platform. Moreover, 45 EFL learners were introduced by the EFL teachers to participate in the study. Therefore, to meet the research goals, participants who

were active in teaching English, had fundamental abilities to use the computer and online platform, and were eager to participate in virtual TPACK intervention were selected.

3.3. Instrumentations

The following instruments were employed for the study: a Perception Survey, a Reflection Survey, and a Semi-structured interview.

3.3.1. Perception Survey

The perception survey aimed to attain data from the attendees, such as technology literacy and use in their practice and their perspectives regarding technology blending in Education and suppositions of the TPACK intervention.

Kessler (2007) provided a questionnaire with 40 items to measure the participants' perceptions of the TPACK workshops. The questionnaire was distributed in two stages, before and after the TPACK intervention, to probe the intervention's effect on the attendees' attitude changes. This questionnaire provides items considering expertise and comprehension related to the different teaching approaches and subject matter, making determinations in association with choosing and implementing technology, and providing tools and analytical skills regarding the CALL-oriented syllabus for efficient technology blending. The attendees were requested to specify their suppositions (pre-survey) and satisfaction (post-survey). The internal consistency of the questionnaire was probed using Cronbach's alpha for the whole scale, and the result was α=.848.

3.3.2. Reflection Survey

Reflections were the other data feeds. The aim of using this data source was to provide the attendees the chance to reflect on their learning regarding implementing technology in their practice. Two distinct series of reflections were conducted in the data gathering process: teachers' and learners' reflections. Reflection data were analyzed and interpreted both quantitatively and qualitatively. The participants' reflections were collected through Google Forms, asking the attendees to specify their reflections regarding the way the workshop assisted them in blending technology constructively into their teaching and learning. In total, 15 EFL teachers' and 45 learners' reflections were collected from Cronbach's alpha reliability of the whole scale, which was α=.725.

3.3.3. Interviews

This study used a semi-structured interview to interview the EFL teachers and their learners. At the end of the workshop program, an overall interview was held with each participant. The questions were addressed to the EFL teachers to gather data about their perceptions about TPACK, technology integration in teaching, and the TPACK workshops. The other interview was made with EFL learners and was based on EFL teachers' academic behavior changes after attending TPACK workshops. The qualitative data gathered through interviews were transcribed and coded for qualitative data analysis by MAXQDA 2020 program.

3.3.4. Data Collection Procedures

3.3.4.1. Pre-workshops Stage

Before conducting the TPACK workshops, attendees were asked to indicate their perceptions and beliefs about technology blending and TPACK by filling out the perception questionnaire.

3.3.4.2. The Implementation of TPACK Workshops

In this study, the TPACK-in- Action model provided by Tai (2013) is used to conduct TPACK intervention to assess and develop TPACK skills and perceptions of EFL teachers. Then, it is suggested that the TPACK workshop consists of the following steps: (a) modeling, (b) analyzing, (c) demonstrating, (d) application, and (e) reflection to conduct the technology mediation in current research to attain the aims that lead English teachers to strongly expand their TPACK skills required to blend technology and maintain TPACK capability practically into practice (Tai & Chuang, 2012).

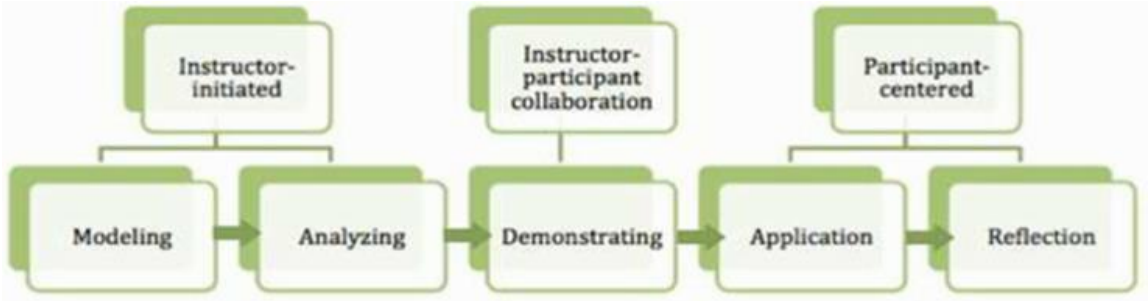

Figure 2. TPACK-in-Action Model (taken from Tai, 2013)

3.3.4.3. TPACK Workshops' Setting

TPACK workshops were conducted in six sessions by the researcher. Firstly, the attendees were asked to participate in virtual workshops, and after that, the attendees and the researcher began to share and cooperate via online platforms. Secondly, the essential tools and materials that suited the subject matter were provided to the teachers.

In the first stage, the pre-workshop Perception questionnaire was distributed to gather data related to the attendees' technological literacy and its implantation in teaching and their perspectives regarding technology blending for teaching. Then, in each session, the attendees obeyed the directives designed by considering each step of the TPACK framework entailing modeling, analyzing, demonstrating, applying, and reflecting. All the stages were planned to meet its aims, focusing on the objective to assist the attendees in observing TPACK in context and learning to blend and utilize the TPACK skills acquired.

3.3.4.4. Post Workshops Procedures

After conducting the TPACK workshop, the Perception and Reflection surveys were distributed. Moreover, two interviews were held separately with both EFL teachers and their learners. EFL teachers' overall perceptions of TPACK workshops and their achievements were asked. In contrast, the EFL teachers' learners were asked about their teachers' academic behavior changes after attending TPACK workshops. All the quantitative and qualitative data were recorded and saved for data analysis.

4. Results

4.1. Quantitative Phase

4.1.1. Addressing the First Research Question

This question addressed the frequency of the indices of the Iranian EFL teachers' perceptions regarding TPACK literacy after TPACK intervention (Perception Questionnaire/ pre and post-workshop administered). The research question aimed at exploring the effect of TPACK intervention on the EFL teachers' perceptions of TPACK literacy. This was achieved by comparing the EFL teachers' responses to the perception questionnaire administered as a pretest and posttest. Table 1 displays the frequencies, percentages, and Std. Residuals for the EFL teachers' reactions to the perception questionnaire on pretest and posttest.

Based on the results displayed in Table 1, it can be concluded that a significantly higher percentage of EFL teachers (33.2 %, Std. Residual = 9.6 > 1.96) believed that they "very frequently" enjoyed TPACK; while the same percentage before taking the workshop was significantly below what was expected.That is to say, only .8 percent (Std. Residual = -9.6 > -1.96) of the EFL teachers claimed that they very frequently enjoyed TPACK. The results also showed that a significantly higher percentage of EFL teachers (50.3 %, Std. Residual = 8.8 > 1.96) claimed that they frequently enjoyed TPACK, while the percentage before the workshop was significantly below what was expected. That is to say, only 10.7 percent (Std. Residual = -8.8 > -1.96) of the EFL teachers stated that they frequently used TPACK. On the other hand, prior to taking the workshop, higher percentages of EFL teachers never (6.2 %, Std. Residual = 4.3 > 1.96) and rarely (32.0%, Std. Residual = 9.1 > 1.96) used TPACK, while the same percentages decreased significantly after taking the workshop, i.e. never (0 %, Std. Residual = -4.3 > -1.96), and rarely (1.5 %, Std. Residual = -9.1 > -1.96). And finally, the percentages of neutral responses dropped from 50.3 percent (Std. Residual = 7.6 >1.96) on pretest to 15.0 percent (Std. Residual = -7.6 > -1.96) on posttest.

Table 1.

Frequencies, Percentages, and Standardized Residuals; Pretest and Posttest of Perception towards TPACK

		Perception					Total
		Never	Rarely	Occasionally	Frequently	Very Frequently	
Pretest	Count	37	192	302	64	5	600
	%	6.2%	32.0%	50.3%	10.7%	0.8%	100.0%
	Std. Residual	4.3	9.1	7.6	-8.8	-9.6	
Posttest	Count	0	9	90	302	199	600
	%	0.0%	1.5%	15.0%	50.3%	33.2%	100.0%
	Std. Residual	-4.3	-9.1	-7.6	8.8	9.6	
Total	Count	37	201	392	366	204	1200
	%	3.1%	16.8%	32.7%	30.5%	17.0%	100.0%

Table 2 displays the results of the chi-square test. The results (χ^2 (4) = 657.52, p < .05, Cramer's V = .740 representing a large effect size) indicated that there were major differences between the teachers' perception of the TPACK workshop on pretest and posttest. Thus, the null hypothesis as "the frequency of the indices of the Iranian EFL teachers' perceptions towards TPACK literacy did not significantly change in the light of TPACK workshops" was rejected. As it was discussed above, EFL teachers, after taking part in the TPACKworkshop, held a significantly positive perception of TPACK literacy.

Table 2.

Chi-Square Tests Comparing Perception towards TPACK on Pretest and Posttest

	Value	df	Asymptotic significance (2-sided)
Pearson Chi-Square	657.520[a]	4	.000
Likelihood Ratio	781.391	4	.000
Linear-by-Linear Association	588.621	1	.000
N of Valid Cases	1200		
Cramer's V	.740		.000

a. 0 cells (0.0%) have an expected count of less than 5. The minimum expected count is 18.50.

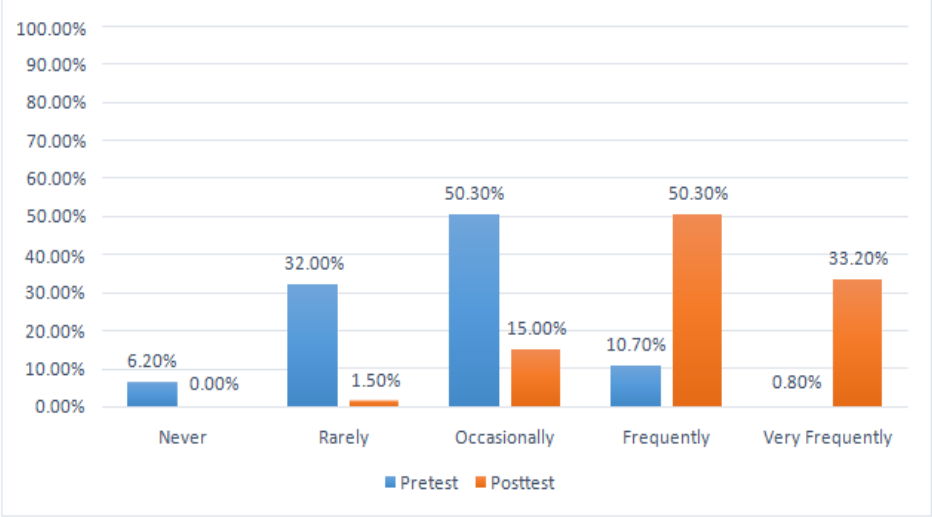

Figure 3. Percentages for Pretest and Posttest of Perception towards TPACK

4.2. Quantitative Investigation of the Second Research Question

This research question was posed to explore how the Iranian EFL teachers perceive their academic behavior after attending TPACK workshops (Reflection questionnaire/ post

workshop administered to teachers). Therefore, EFL teachers' reflection on their own academic behavior changes after attending the TPACK workshop was explored. Table 3 displays the frequencies, percentages, and expected and residual indices for the EFL teachers' reflection on their academic behavior changes following the TPACK workshop. The results showed that more than 81 percent of EFL teachers, i.e., 44.44 % agree and 36.83 %strongly agree, believed that their academic behavior changed after attending the TPACK workshop. In contrast, the percentage of teachers who disagreed with any behavior change was 1.90.

Table 3.

Frequencies, Percentages, and Residuals for EFL Teachers' Reflection Questionnaire

	Observed N	Percent	Expected N	Residual
Disagree	6	1.90	78.8	-72.7
Undecided	53	16.83	78.8	-25.7
Agree	140	44.44	78.8	61.3
Strongly Agree	116	36.83	78.8	37.3
Total	315			

Table 4 displays the results of the chi-square test. The results (χ^2 (3) = 140.88, p < .05, Cramer's V = .386 representing a moderate effect size[3]) indicated that the differences observed in Table 4 were statistically significant. As discussed above, most of the EFL teachers believed that their behavior changedafter attending the TPACK workshop.

Table 4.

Chi-Square Statistics for EFL Teachers' Reflection Questionnaire

	Teacher's Reflection
Chi-Square	140.886[b]
Df	3
Asymp. Sig.	.000

a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 78.8.

[1] Cramer's V for chi-square analysis = square root of chi-square / total frequency (df); i.e., square root of 503.983 / 585 = .464. Cramer's V "may be interpreted like a correlation" (George and Mallery 2020, p 372). That is to say; .10 = Weak, .30 = Moderate and .50 = Large.

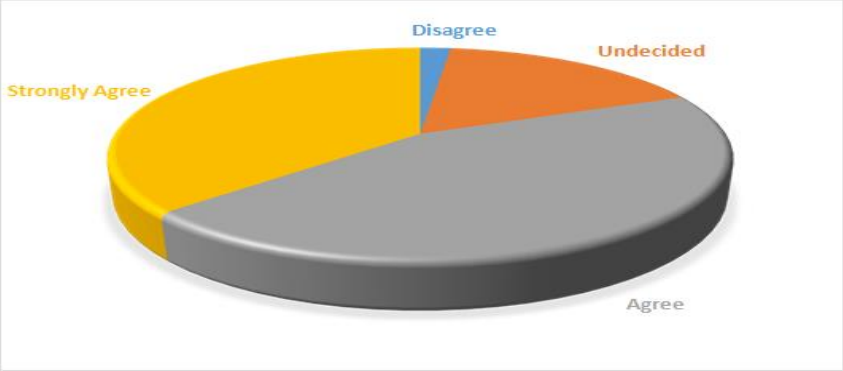

Figure 4. Perception of EFL Teachers' Reflection

4.3. Quantitative Investigation of the Third Research Question

Similarly, question three tried to explore how the Iranian EFL learners perceive their teachers' academic behavior after attending TPACK workshops (Reflection questionnaire/ post workshop administered to learners). The third research question explored EFL learners' reflections on their teacher's academic behavior changes after attending the TPACK workshop. Table 5 displays the frequencies, percentages, and expected and residual indices for the EFL learners' reflection on their teachers' behavior changes following the TPACK workshop. The results showed that about 80 percent of EFL learners believed teachers' behavior changed after attending the TPACK workshop.

Table 5.

Frequencies, Percentages, and Residuals for EFL Learners' Reflection Questionnaire

	Observed N	Percent	Expected N	Residual
Disagree	27	2.86	236.3	-209.2
Undecided	181	19.15	236.3	-55.2
Agree	418	44.23	236.3	181.8
Strongly Agree	319	33.76	236.3	82.8
Total	945			

Table 6 presents the chi-square test results. The results (χ^2 (3) = 367.06, $p < .05$, Cramer's V = .359 representing a moderate effect size) indicated that the differences observed in Table 6 were statistically significant. As it was discussed above, the majority of the EFL learners believed that their behavior changed after attending the TPACK workshop.

Table 6.

Chi-Square Statistics for EFL Learners' Reflection Questionnaire

	Pretest of TPACK
Chi-Square	367.063[b]
Df	3
Asymp. Sig.	.000

a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 236.3.

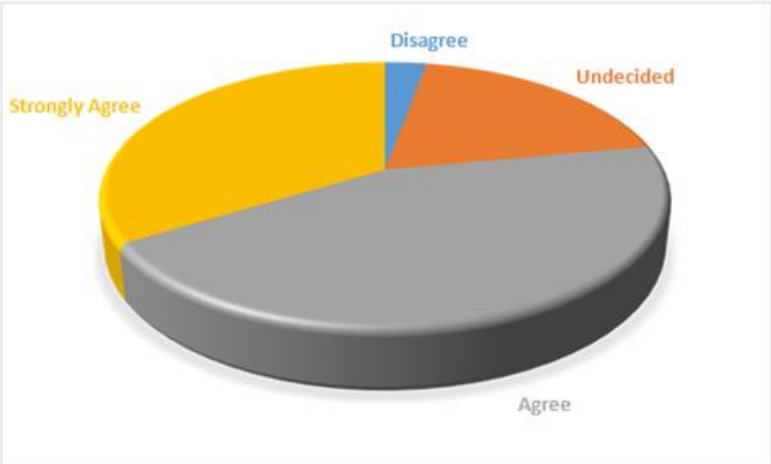

Figure 5. Perception for Learners' Reflection

4.4. Qualitative Phase

It was advantageous to make a more in-depth investigation on the matters promoting the study by implementing interviews with a few attendees; the semi-structured interviews would give the attendees worthwhile chances to share their feedback on the purposes the research was planned to explore.

4.4.1. Interview Data Analysis

The interviews were conducted with eight teachers and eight learners to explore their perceptions of EFL teachers' academic behavior changes after the TPACK workshops. The interviewees were chosen randomly from the attendees who declared their eagerness to take part in the interview. The qualitative data were analyzed, coded, and transcribed via MAXQDA Analytics 2020.

To gather qualitative data, three basic questions were asked from both EFL teachers and their learners:

1. What are some of the challenges you (your teacher) faced in implementing educational technologies after participating in TPACK workshops?
2. Have you changed your (your teacher's) teaching behavior after participating in TPACK workshops?
3. What benefits have you experienced from using technology in the English classroom?

The main findings extracted from the analysis of the interview data of both EFL teachers and learners related to the challenges of technology blending in teaching are presented by the following categories:(a) competency, (b) confidence, (c) exploration, (d) time, (e) ability, (f) infrastructure, (h) access, (i) curriculum, (j) professional development, (k) support, (m) funding, (n) experience, (p) resistance, (q) motivation, (r) method,(s) beliefs, and (t) training.

The main findings extracted from the analysis of the interview data about Academic Behavior Changes after technology blending in teaching is presented by the following categories: (a) role, (b) feedback, (c) lesson plan, (d) responsibility, (e) collaboration, (f) engagement, (g) motivation, (h) confidence, (i) communication, (j) teaching process, (k) learning process, (l) method, and (m) development.

The main findings extracted from the analysis of the interview data about the benefits of blending technology in teaching are presented in the following categories: (a) achievement, (b) learning process, (c) access, (d) method, (e) communication, (f) cooperation, (g) interaction, (h) engagement,(i) investigation,(j) time, (k) autonomy and (l) interesting.

4.5. Triangulation of the Quantitative and Qualitative Data Analyses Results

4.5.1. Triangulation of the Data on Second Research question

This multi-method research was insightful in exploring the academic behavior changes of EFL teachers after TPACK intervention from different data sources. The quantitative phase of analyzing the second research question focused on exploring EFL teachers' educational behavior changes after participating in TPACK workshops. The required data was gathered through a reflection questionnaire. The EFL teachers

administered the questionnaire at the end of the TPACK intervention to gather their reflections on their academic changes. Analyzing the frequencies, percentages, expected, and residual indices for the EFL teachers' reflection on their behavior change showed that more than 81 percent of EFL teachers believed that their academic behavior changed after attending the TPACK workshop.

The qualitative phase involved interviews with EFL teachers after conducting TPACK workshops. Three semi-structured interview questions were asked to the interviewees to make clear the challenges they had faced in using technology in their teaching process, the tangible academic behavior changes of teachers, the changes in their teaching practice, and exploring and analyzing the advantages and benefits of using technology in their classroom and the facilitative side of technology implementation into instruction. Data gathered through interviews were coded and thematically analyzed, and the most frequently used themes in the interviews have been organized into categories. The quantitative and qualitative analyses showed that EFL teachers have experienced positive and constructive changes and reflected these changes in their teaching practice.

4.5.2. Triangulation of the Data on Third Research Question

The quantitative phase of analyzing the third research question focused on exploring the academic behavior changes of Iranian EFL teachers after participating in TPACK workshops from the EFL learners' perspective, and the required data was gathered through a reflection questionnaire. The questionnaire was administered to the EFL learners at the end of the TPACK intervention to gather their reflections on their teachers' academic changes. Analyzing the frequencies, percentages, expected, and residual indices for the EFL learners' reflections on their teachers' academic behavior changes showed that about 80 percent believed teachers' academic behavior changed after attending TPACK workshops.

The qualitative phase involved interviews with EFL learners after the conduct of TPACK workshops. The same three semi-structured interview questions were asked to the learners to relate to the challenges their teachers had faced in using technology in the teaching process, academic behavior changes of teachers, and exploring and benefits of using technology in the classroom.

Data gathered through interviews were coded and thematically analyzed, and the most frequently used themes in the interviews have been organized into categories. The

interviews supplemented the quantitative data. The quantitative and qualitative analyses showed that EFL learners had experienced positive and constructive changes in teachers' academic behavior and their teaching practice in the parts mentioned above of the teaching process.

5. Discussion

The quantitative data analysis revealed that EFL teachers, after participating in the TPACK workshop, held significantly positive perceptions of TPACK literacy.

Furthermore, the EFL teachers' reflections on their behavior changes showed that more than 81 percent of EFL teachers believed their academic behavior changed after attending TPACK workshops. Besides, the EFL learners' reflections on their teachers' academic behavior changes showed that about 80 percent believed teachers' academic behavior changed after attending TPACK workshops. It means that the attendees' perspectives regarding teachers' academic behavior positively changed after the TPACK intervention; moreover, the analysis of interviews showed that although there were impeding factors for technology implementation in the classrooms, the attendees benefited from the advantages of technology blending into teaching. The findings also showed that TPACK intervention as an ongoing training course could enhance the TPACK skills of teachers and their perceptions of technology-oriented instruction. The results were associated with Lawless and Pellegrino's (2007) and Todorova and Osburg's (2010) research. Both studies represented that original acquiring experiences, dynamic participation in training, syllabus-oriented practice, getting criticism and response, in-depth Education, and support can make EFL teachers more accomplished in technology blending in teaching practice. Moreover, Bandura (1994) provides that attitudes toward self-efficacy are expanded via four fundamental sources of ascendancy: proficiency, derivative experiences, social inducement, and minimizing stress feedback. The purposeful and heedful plan of the TPACK workshop supplied chances for the attendees to bolster their self-efficacy in technology blending into their practice.

Likewise, in association with Lawless and Pellegrino's (2007) results, these findings indicated that ongoing training courses are mostly organized to provide modern educational technologies for pedagogy, bolster purposeful and pertinent rehearsals related

to the subject matter, promote cooperation, cultivate teachers' proficiency in technology blending and to provide a good judgment of learners' acquirement.

The results related to the improvement of EFL teachers' perspectives after TPACK intervention were in association with the study of Ansyari (2013), who declared that TPACK as a professional development course aided teachers in bolstering the attitudes of empirical expertise they demand technology blending. Additionally, the results of Bradshaw's (2002) research revealed a positive outcome by conducting the professional development program for EFL teachers who participated in training rehearsals like theory, demonstration, practice, and follow-up. Consequently, EFL teachers were more eager to transfer their technological expertise to teaching. In addition, Atkins and Vasu (2000) study revealed that well-planned and utilized technology-oriented workshops could create a positive impression on the comprehension of the attendees that might result in technology blending of teachers' CALL and impact the proportions of efficient consequence.

The last two research questions about EFL teachers' and learners' beliefs about teachers' academic behavior after participation in TPACK workshops were explored quantitatively through questionnaires and interviews with both EFL teachers and learners. The result of quantitative data showed no difference between teachers' and learners' beliefs; both believed there was a positive change in teachers' academic behavior. The interviews revealed that EFL teachers and learners had positive perspectives toward blending technology into teaching and learning. Moreover, both teachers and learners declared that by implementing the technological tools and software, they could perceive more positive academic and educational performance in the teaching process.

The literature provides that professional training as a procedure for aiding teachers with technology blending can be meaningful if determined standards are encountered. The TPACK intervention model associated with the basis of technology concentrated professional training suggested by Hew and Brush (2007) elaborates a purposeful experience should include a focal point on the subject matter, chances for the practice of teachers, and orientation of teachers' requirements.

The findings align with the results of previous studies, such as the one stated by Kessler and Plakans (2008), revealing that teachers' positive perception of proficiency can result in the implementation of technology in the class more than teachers with lesser

proficiency. Moreover, Kilickaya and Serefoglu (2013) found that the CALL training aimed the language teachers to imbue a range of technology-based devices and programs into their practices. By supplying the essential devices and availability of technology, incorporated with persistent reinforcement and coaching, teachers would be more eager to blend technology into teaching. It means that if teachers were supplied with the chance of imbuing technology into instruction and reinforcement by their institutions, they could handle the awkwardness they might face.

Moreover, the interview's results regarding the impeding factors in technology integration were in line with Hegelheimer's (2006) study, which also described the same difficulty that teachers do not imbue technology in practice as it is time-wasting. They have restricted time because of the fixed syllabus they should cover. Therefore, research conducted by Doering et al. (2014) declared that "implementation of thoughtfully designed, content-specific professional development programs and supported guidance in exploring technology integration models may help schools and teachers overcome these realities and barriers" (p. 223). The results of their investigation produced verification that reinforces their study.

Finally, some studies paid to similar research in the area of CALL blending into English language teaching but achieved irrelevant results in comparison to findings of this study such as Hegelheimer's (2006) study, the researcher found out that teachers do not blend technology in instruction as it is time-wasting. Besides this subject, a few attendees proposed that they could not combine these competencies in practice because they did not encounter the requisites of the practice. Even if, in the post-workshop stage, most teachers suggested that the intervention would assist them in the teaching process, the interviews' results showed low satisfaction levels. Despite their reactions after workshops, interviewees pointed out these interventions are not eventually relevant to the ELT area.

Moreover, Sarhandi et al. (2016) reached the same results as Hegelheimer (2006). The results of the two researchers manifest the same difficulty of not blending technology practically even after attaining sufficient continuous training on CALL. Impertinent education, unenlightened technology blending strategy, and compressed predetermined guidelines were accentuated as some obstacles in blending technology competency taught in the designated programs and courses. Additionally, Sulaimani et al. (2017) suggested that by considering the general satisfaction level of teachers with interventions, in the

interviews, some of the teachers claimed that these workshops were encouraging and attractive, and they also suggested new beliefs to blend the existing curricula with technology to have more practical teaching. Nevertheless, most attendees were unsatisfied because of the time factor and partially due to irrelevant Education suggested on the technology blending. This transfers a critical note on the intervention constituents, gained immediately after the workshop by sharing feedback.

The attendees' responses state that professional development courses should concentrate not only on the implemental features of technology but also on educational phases aiming at the background of teaching and learning, reviewing curricula, and evaluating acquirement achieved through technological instruments. It is important to know that before workshop implementation, most teachers declared to possess an acceptable level of Education and technological expansion knowledge in their instruction; obviously, it was a superficial and very common self-evaluation. When school-term is finished, most teachers perceive that blending technology knowledge does not plain knowledge regarding how technology operates comparatively. It encounters the knowledge of successfully modifying and scrutinizing the existing tool to meet the learners' requirements. Notwithstanding, the professional development interventions adopted the "TPACK-in-Action" frame, they were not productive in equipping the specified subject matter elements due to which the attendees were instantly astonished by the thrill of investigating something new and beneficial for their learners. Still, they were disappointed when they attempted to implement the proficiencies in their practice.

As mentioned before, one of the main issues considered in this study was teachers' maintained attitudes and perceptions towards technology use in the classroom. The results regarding EFL teachers' and learners' beliefs about teachers' academic behavior changes after participation in TPACK workshops were obtained through questionnaires and interviews. The results of quantitative data showed no difference between teachers' and learners' beliefs; both believed there was a positive change in teachers' academic behavior. Qualitative results also showed that both EFL teachers and learners had positive attitudes toward blending technology in teaching and learning. Both EFL teachers and learners declared that by implementing the technological tools and soft wares, they could perceive more positive academic and educational performance in the teaching process. The attendees declared that external barriers such as accessibility, infrastructure, curriculum,

and time limitations could hinder teachers' use of educational technologies, but also internal factors that decrease teachers' technology use, such as competency, ability, confidence, and beliefs. In future studies, the researchers can focus on the internal impeding factors in technology blending and investigate how these factors' effects on teachers' technology use can be controlled and minimized. Then, this study implies that research could be designed to understand the importance of teachers' perceptions and attitudes on their technology usage and experiences.

6. Conclusion

The findings of this investigation certify the results of the preceding research in association with the influence of CALL professional development programs on EFL teachers' perceptions changes regarding CALL and self-evaluation of implementing the subjects they acquired in preparation programs (Hoven, 2006, 2007; Hughes, 2005). As Serrano-Puche (2015) explored, technology provides a way to state people's emotions and contribution to modeling these emotions. It means that the frequent use of digital technology discloses the assertive role of emotions in recent decades and how implementing technologies could affect the configuration and expression of the identity of the users. In other words, teachers' attitude regarding technology is a vital elements in technology use (Zhao & Frank, 2003). Kessler and Plakans (2008) suggested that teachers' positive awareness of technological competency could implement technology in the educational environment, contrary to those teachers who feel less competent and attain a negative perspective towards using technology.

Moreover, this investigation verifies the findings of the preceding research related to the potency of CALL professional development training on EFL teachers' perception changes about technology blending in their performance and their declaration of utilizing the subjects they learned from the training programs into practice. The most notable part of this investigation is that the findings supply an extreme cognition of the outcomes of TPACK intervention as an efficacious preparation for EFL teachers to bolster TPACK proficiency, implement these proficiencies in practice, and be conscious of the fortified TPACK blending constituents. As Hampel and Stickler (2005) stated, the important side of the findings of this investigation commit a more detailed perception of the influence of TPACK intervention as a successful training, particularly in assisting EFL teachers in

expanding TPACK proficiencies, using such capabilities and skills in teaching, and be knowledgeable about the practical use of TPACK blending. Finally, the interviews show that both EFL teachers and learners believed they had observed positive changes in teachers' academic behavior. They explained the most important changes in the teaching process after implementing TPACK workshops.

Therefore, it is concluded and interpreted that TPACK as a version of a technologically-oriented mechanism affects learners' both cognition and affection. The former is involved in and concerned with academic achievements and signs of progress, as seen in the results of the workshops. The latter, however, is related to the developments regarding attitude, emotion, and some other personality traits as seen and reported in the exemplary studies in general and in this very study in particular.

References

Ansyari, M. (2012). *The development and evaluation of a professional development arrangement for technology integration to enhance the communicative approach in English language teaching* [Masters thesis]. Faculty of Behavioural Science, University of Twente.

Aryadoust, V., Mehran, P., & Alizadeh, M. (2016). Validating a computer-assisted language learning attitude instrument used in Iranian EFL context: An evidence-based approach. *Computer Assisted Language Learning, 29*(3), 561–595. https://doi. org/10.1080/09588221.2014.1000931.

Atkins, N. E., & Vasu, E. S. (2000). Measuring knowledge of technology usage and stages of concern about computing: A study of middle school teachers. *Journal of Technology and Teacher Education*, *8*, 279-302.

Aydin, S. (2013). Teachers' perceptions about using computers in EFL teaching and learning: The case of Turkey. *Computer Assisted Language Learning*, *26*, 214-233.

Bandura, A. (1994). *Self-efficacy*. In V. S. Ramachaudran (Ed.), *Encyclopedia of human behavior* (Vol.2, pp. 71-81). Academic Press.

Baser, D. & Kopcha, T, & Ozden, M. (2015). Developing a technological pedagogical content knowledge (TPACK) assessment for pre-service teachers learning to teach English as a foreign language. *Computer Assisted Language Learning*, *29*, 1-16. 10.1080/09588221.2015.1047456. Lam, 2000;

Bilici, S. C., Guzey, S. S., & Yamak, H. (2016). Assessing pre-service science teachers' technological pedagogical content knowledge (TPACK) through observations and lesson plans. *Research in Science & Technological Education, 34*(2).

Boehm, R. G., Brysch, C. P., Mohan, A., & Backler, A. (2012). A new pathway: Video-based professional development in geography. *Journal of Geography, 111*(2), 41-53.

Bostancıoğlu, A. & Handley, Z. (2018). Developing and validating a questionnaire for evaluating the EFL' Total PACKage': Technological Pedagogical Content Knowledge (TPACK) for English as a Foreign

Language (EFL), *Computer Assisted Language Learning*, *31*:5-6, 572-598, DOI: 10.1080/09588221.2017.1422524

Bradshaw, L. (2002). Technology for teaching and learning: strategies for staff development and follow-up support. *Journal of Technology and Teacher Education*,*10.*

Carspecken, P. F. (1996). *Critical ethnography in educational research: a theoretical and practical guide.* Routledge.

Chai, C., Koh, J., & Tsai, C. (2013). A review of technological pedagogical content knowledge. *Educational Technology & Society, 16*, 31-51.

Chai, C. S., Koh, J. H. L., Tsai, C.C. & Tan, L.L.W. (2011). Modeling primary school pre-service teachers' Technological Pedagogical Content Knowledge (TPACK) for meaningful learning with information and communication technology (ICT). *Computers & Education, 57*(1), 1184-1193.

Chuang, H. H., Ho, C. J., Weng, C. Y., & Liu, H. C. (2018). High school students' perceptions of English teachers' knowledge in technology-supported class environments. *The Asia-Pacific Education Researcher*, *27*(3), 197-206.

Dede, C., Jass Ketelhut, D., Whitehouse, P., Breit, L., & McCloskey, E. M. (2009). A research agenda for online teacher professional development. *Journal of Teacher Education*, *60*(1), 8-19.

Doering, A., Koseoglu, S., Scharber, C., Henrickson, J. & Lanegran, D. (2014). Technology integration in K-12 geography education using TPACK as a conceptual model. *Journal of Geography*, *113*(6), 223-237.

Ertmer, P., & Ottenbreit-Leftwich, A. T. (2010). Teacher technology change: how knowledge, confidence, beliefs and culture intersect. *Journal of Research on Technology in Education*, *42*, 255-284.

Graham, C.R. (2011). Theoretical considerations for understanding technological pedagogical content knowledge (TPACK). *Computers & Education, 57*(3), 1953–1960.

Guichon, N. & Hauck, M. (2011). Teacher education research in CALL and CMC: More in demand than ever. *ReCALL, 23*, 187 - 199. 10.1017/S0958344011000139

Hampel, R., & Stickler, U. (2005). New skills for new classrooms: Training tutors to teach languages online. *Computer Assisted Language Learning, 18*(4): 311–26.

Hanson, W. E., Creswell, J. W., Plano Clark, V. L., Petska, K. S., & Creswell, J. D. (2005). Mixed methods research design in counseling psychology. *Journal of Counseling Psychology*, *52*(2), 224–235. doi:10.1037/0022-0167.52.2.224

Hegelheimer, V. (2006). When the technology course is required. In P. Hubbard & M.Levy (Ed.), *Teacher education in CALL* (pp. 117-133). John Benjamins Publishing Company.

Hew, K. F., & Brush, T. (2007). Integrating technology into K-12 teaching and learning: current knowledge gaps and recommendations for future research. *Education Technology Research and Development*, *55*, 223-252. http://dx.doi.org/10.1007/s11423-006-9022-5

Hong, K. (2010). CALL teacher education as an impetus for L2 teachers to integrate technology. *ReCALL, 22*, 53 - 69.

Hoven, D. (2006). Designing for disruption: Remodelling a blended course in technology in (language) teacher education.

Hoven, D. (2007). The affordances of technology for student teachers to shape their teacher education experience. In M. A. Kassen, R. Z. Lavine, K. Murphy-Judy & M. Peters (Eds.), *Preparing and developing technology-proficient L2 teachers* (pp. 133-163). CALICO.

Howard, S. K. (2013). Risk-aversion: Understanding teachers' resistance to technology integration. *Technology, Pedagogy, and Education, 22*(3), 357-372.

Hu, C., & Fyfe, V. (2010). Impact of a new curriculum on pre-service teachers' Technical, Pedagogical and Content Knowledge (TPACK). *Curriculum, Technology & Transformation for an Unknown Future*. Proceedings ascilite Sydney 2010.

Hubbard, P. (2008). CALL and the future of language teacher education. *Calico Journal, 25*(2), 175-188.

Hughes, J. (2005). The role of teacher knowledge and learning experiences in forming technology-integrated pedagogy. *Journal of Technology and Teacher Education, 13*(2), 277-302.

Hsu, P. (2012). Examining the impact of educational technology courses on pre-service teachers' technological pedagogical content knowledge development. *Teaching Education, 23*(2), 195-213.

Inan, F., & Lowther, D. (2010). Factors affecting technology integration in K-12 classrooms: A path model. *Educational Technology Research and Development, 58*(2), 137-154.

International Society for Technology in Education. (2008). *ISTE national educational technology standards for teachers*. http://www.iste.org/standards/nets-for-teachers/nets-for-teachers-2008.asp

Jang, S. J. & Chen, K. C. (2010). From PCK to TPACK: Developing a transformative model for pre-service science teachers. *Journal of Science Education and Technology*, *19*(6), 553-564.

Joo, Y. J., Park, S., & Lim, E. (2018). Factors influencing pre-service teachers' intention to use technology: TPACK, teacher self-efficacy, and technology acceptance model. *Journal of Educational Technology & Society*, *21*(3), 48–59. http://www.jstor.org/stable/26458506

Keller, J. (1987). Strategies for stimulating the motivation to learn. *Performance & Instruction, 26*(8), 1-7.

Kessler, Greg. (2007). Formal and informal CALL preparation and teacher attitude toward technology. *Computer Assisted Language Learning, 20*, 173-188. 10.1080/09588220701331394

Kessler, G. & Plakans, L. (2008). Does teachers' confidence with CALL equal innovative and integrated use? *Computer Assisted Language Learning*, *21*, 269-282. 10.1080/09588220802090303

Kilickaya, F. & Serefoglu, G. (2013). The impact of CALL instruction on English language teachers' use of technology in language teaching. *Journal of Second and Multiple Language Acquisition – JSMULA, 1*,20-38.

Koehler, M.J., & Mishra, P. (2008). Introducing T*PCK*. In AACTE Committee on Innovation and Technology (Ed.), *Handbook of technological pedagogical content knowledge (TPCK) for educators* (pp. 3–29). Routledge.

Koehler, M. J., Mishra, P., & Cain, W. (2013). What is technological pedagogical content knowledge (TPACK)?. *Journal of Education, 193*(3), 13-19.

Koehler, M. J., Mishra, P., & Kereluik, K. (2009). The song remains the same: Looking back to the future of educational technology. *TechTrends*, *53*, 48–53.

Knapp, W.M. (2017). *The impact of TPACK and teacher technology efficacy on social studies teachers' use of technology in the classroom* [Doctoral dissertation].

Lavelle, E. & Liu, Y., Theodore, P.,(2004). A preliminary study of the impact of online instruction on teachers' technology concerns. *British Journal of Educational Technology, 35*(3), 1-3.

Lawless, K. A., & Pellegrino, J. W. (2007). Professional development in integrating technology into teaching and learning: Knowns, unknowns, and ways to pursue better questions and answers. *Review of educational research, 77*(4), 575-614.

Mai, M. Y. & Hamzah, M. (2016). Primary science teachers' perceptions of technological pedagogical and content knowledge (TPACK) in Malaysia. *European Journal of Social Sciences Education and Research*, *6*(2), 167-179.

Martin, B. (2015). Successful implementation of TPACK in teacher preparation programs. *International Journal on Integrating Technology in Education*, *4*(1), 17-26.

Milbrath, Y. & Kinzie, M. (2000). Computer technology training for prospective teachers: Computer attitudes and perceived self-efficacy. *Journal of Technology and Teacher Education, 8*.

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, *108*(6), 1017-1054.

Ohlson, T., Wehry, S., Monroe-Ossi, H., McLemore, B., Maki, K. & Fountain, C. (2014). Assessing inservice teachers' perceptions of their TPACK development. In M. Searson & M. Ochoa (Eds.), *Proceedings of SITE 2014--Society for information technology & teacher education international conference* (pp. 2598-2603). Association for the Advancement of Computing in Education (AACE).

Sansone, C., Fraughton, T., Zachary, J. L., Butner, J., & Heiner, C. (2011). Self-regulation of motivation when learning online: The importance of who, why, and how. *Educational Technology Research & Development, 59*(2), 199-212

Sarhandi, P. S., Khan, I. F., Buledi, M. H., & Asghar, J. (2016). Integration of technology with pedagogical perspectives: An evaluative study of in-house CALL professional development. *Arab World English Journal (AWEJ), Special Issue on CALL*, *3*, 23–35.

Schmidt, D. S. (2009). Technological pedagogical content knowledge (TPACK): The development and validation of an assessment instrument for pre-service teachers. *Journal of Research on Technology in Education (International Society for Technology in Education, 42*(2), 123.

Schmidt-Crawford, D., & Baran, E., & Thompson, A. & Mishra, P. & Koehler, M. & Seob, S. (2009). Technological Pedagogical Content Knowledge (TPACK): the development and validation of an assessment instrument for pre-service Teachers. *Journal of Research on Technology in Education*, *4*, 123-149. 10.1080/15391523.2009.10782544.

Serrano-Puche, J. (2015). Emotions and digital technologies: Mapping the field of research in media studies.

Shapley, K., Sheehan, D., Maloney, C., & Caranikas-Walker, F. (2011). Effects of technology immersion on middle school students' learning opportunities and achievement. *Journal of Educational Research*, *104*(5), 299-315.

Shih, C. & Chuang, C. (2012). Individual differences, psychological contract breach, and organizational citizenship behavior: A moderated mediation study. *Asia Pacific Journal of Management*, *30*. https://doi. 10.1007/s10490-012-9294-8

Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, *15*(2), 4-14.

Spears, S. A. (2012). *Technology-enhanced learning: The effects of 1: 1 technology on student performance and motivation*. The University of West Florida.

Sulaimani, A., Sarhandi, P., & Buledi, M. (2017). Impact of CALL in-house professional development training on teachers' pedagogy: An evaluative study. *Cogent Education, 4*(1), 135646. http:// doi. 10.1080/2331186X.2017.1355646

Tai, J. (2013). *From TPACK-in-Action workshops to English classrooms: CALL competencies developed and adopted into classroom teaching* [Doctoral dissertation, University of Iowa State].

Tanak, A. (2018). Designing TPACK-based course for preparing student teachers to teach science with technological pedagogical content knowledge. *Kasetsart Journal of Social Sciences*, *30*, 1-7. https://doi.org/10.1016/j. kjss.2018.07.012

Todorova, A., & Osburg, T. (2010). Professional Development Program for Technology Integration: Facilitators and Barriers to Sustainable Implementation. *Literacy Information and Computer Education Journal*, *1*. http://doi. 10.20533/licej.2040.2589.2010.0009.

Tseng, J. J. (2014). Developing an instrument for assessing technological pedagogical content knowledge as EFL students perceive. *Computer Assisted Language Learning*, *29*(2), 302–315.

Van-Olphen, M. (2007). Perspectives of foreign language pre-service teachers on the use of a web-based instructional environment in a methods course. *CALICO Journal, 25*(1), 91-109.

Williams, M. K., Foulger, T. S. & Wetzel, K. (2009). Preparing pre-service teachers for 21st-century classrooms: Transforming attitudes and behaviors about innovative technology. *Journal of Technology & Teacher Education, 17*(3), 393-418.

Yurdakul, I. K., Odabasi, H. F., Kilicer, K., Coklar, A. N., Birinci, G., & Kurt, A. A. (2012). Technological Pedagogical Content Knowledge Scale--Deep (TPACK Scale, TPCK). *Computers & Education*, *58* (3), p. 964-977.

Zhao, Y. & Frank, K.A. (2003). Factors affecting technology uses in schools: An ecological perspective. *American Educational Research Journal*, *40*(4), 807-840.

Zhao, Y., & Tella, S. (2002). Technology and teacher education (special issue). *Language Learning & Technology*, *6*(3), 2–5.