Teaching English as a Second Language Quarterly (TESLQ)
(Formerly Journal of Teaching Language Skills)
40(4), Fall 2021, pp. 161-193
DOI: 10.22099/JTLS.2021.39038.2914

Online ISSN: 2717-1604
Print ISSN: 2008-8191

Research Paper

Assessment and Development of Iranian EFL Teachers' Technological Pedagogical Content Knowledge (TPACK)

Rana Najjari [*]
Department of English Language Teaching, Central Tehran Branch, Islamic Azad University, Tehran, Iran

Gholam-Reza Abbasian [**]
English Language Department, Faculty of Basic Sciences, Imam Ali University, Tehran, Iran

Massood Yazdanimoghaddam [***]
Department of English Language Teaching, Islamic Azad University, Garmsar, Iran

Abstract

Theory and practice are two sides of one coin, and the way they are perceived adds to its practice. This holds true regarding teachers' Technological Pedagogical Content Knowledge (TPACK) literacy status and its implementation. To shed more light on these issues in the Iranian EFL setting, this study was designed to pursue a three-fold purpose: the status quo of the Iranian EFL teachers' TPACK literacy, the contribution of TPACK literacy, and perception developments in the light of TPACK intervention. For the intervention purpose, TPACK workshops were implemented with 15 teachers through employing the TPACK framework and the learning by doing method. The results of chi-square data analysis showed statistically significant differences between the participants' TPACK literacy before and after TPACK workshops and also positive contributions of the intervention. Moreover, it was observed that participants' perceptions towards TPACK literacy developed in the light of TPACK workshops. Thereby, the study develops a new perspective and provides empirical evidence to investigate incorporating technology and

Received: 30/12/2020 Accepted: 06/06/2021

[*] Ph.D., Email: ranajjari15@gmail.com
[**] Assistant Professor, Email: gabbasian@gmail.com, Corresponding Author
[***] Assoicate Professor, Email: mym1300@gmail.com

knowledge into teaching English and Computer-Assisted Language Learning (CALL) in Iran. Also, the theoretical and pedagogical recommendations for future research and practice are provided.

***Keywords**:* TPACK Perceptions, CALL Literacy, TPACK, TPACK Workshop

The succeeding outcome of technology-based language teaching is bound to the teacher education programs for EFL teachers because they play a very crucial role in the language learning process. As noted by Hubbard (2008, p. 176), "They select the tools to support their teaching and determine what CALL applications language learners are exposed to and how learners use them". Harris and Hofer (2010) asserted that today's technologies are in the vanguard of occupation as a result of digitalization, but what matters is not to use technology or not, instead the vital issue is the way that language teachers can put technology into practice correctly. If they refuse to acquire modern technologies, they may lag behind constructive and functional teaching (Mishra, Koehler & Kereluik, 2009). One of the commonest examples of technology is the Internet, which is an indispensable factor that prompts teachers to expand the competence necessary for technology use. Technology-blending in the educational environment increases the efficacy of learning and teaching processes (Chapelle, 2009).

Technology incorporation into education necessitates certain requirements by itself. For example, those language teachers eager to engage and blend technology into practice should have expertise not only in pedagogy and content but also in technology use as well. The successful result of blending new technologies in teaching and learning mostly relies on the teachers' competency to implement technologies purposefully because in

language teaching classrooms, technology reinforces the conveyance of content and the construction of learning skills (Reinders, 2009). Particularly, teachers' learning of technology use possesses a prominent position in the process of blending CALL in classrooms.

Studies have shown that teachers' perception and knowledge regarding CALL and its blending might settle technology integration of teachers in the process of teaching and the effectiveness of CALL blending (Lam, 2000; Lavelle, Liu & Theodore, 2004; Atkins & Vasu, 2000; Kinzie & Milbrath, 2000). Although there are still some enthralling matters regarding teacher education and CALL that need exploration, a few of them are about what CALL training should assume to assist teachers in successfully blending CALL and how CALL training programs affect teachers' competency development and adoption of CALL blending.

Studies run by Kessler (2006, 2007) and Robb (2006), focusing on teacher education and CALL, have revealed that traditional professional development courses and teacher preparation programs might not be able to meet the aims of supplying language teachers with CALL competencies and technology to pursue the digitalized educational system. Additionally, the number of studies that explored the efficacy of CALL in teacher education courses with the focus on the teachers' approval regarding their learning and use of CALL in teaching are very limited (Hegelheimer, 2006; Peters & Desjardins, 2007; Kessler, 2007; Kilickaya, 2009), which holds true with the Iranian EFL context. This is compatible with the insufficient experience of teachers regarding technology use in English language teaching at all stages (Jahanbanisfahlan, Hadidi Tamjid & Seifoori, 2017). Many Iranian EFL teachers use technologies for pedagogical purposes on a very narrow and limited scale. This might be the result of insufficient accessibility to

technologies such as computers and the Internet inside the education environment or insufficient training they receive in blending technology into classrooms (Abbasian & Najjari, 2016). In other words, another important barrier in Information and Communications Technology (ICT) use in ELT courses might be the result of EFL teachers' insufficient technology-blending training in their teachers' professional development courses (Albalawi & Galeb, 2011). The status quo of teachers' technological pedagogical content knowledge (TPACK) and the extent to which TPACK education can result in developing practical knowledge among language teachers in general and among the EFL teachers' are of prime significance. More practically, the effect of TPACK workshops on the development and adoption of TPACK competencies by the Iranian EFL teachers is amongst the intact issues which are to be addressed in this study.

Literature Review

Teachers' Professional Knowledge

There is a presupposition that teachers' actions depend on their 'professional knowledge' (Bork & Putman, 1995). This is rationalized on the ground that, as stated by Luvas and Handal (1987), "each teacher has a 'practical theory' that is inwardly the most powerful determinant in his teaching performance" (1987, p.9). According to Connell (1985), such a' practical theory' is complicated and innate and, therefore, rather very hard to explain and defend. In a bid to describe teachers' professional knowledge or their practical theory, Connelly and Clandinin (1995) call it the 'professional-knowledge landscape' metaphor which is composed of a wide variety of components and influenced by a wide variety of people, places, and things (Connelly & Clandinin, 1995, pp.4-5). The professional knowledge landscape

describes that teachers' professionalism is essentially multifaceted in integrating the knowledge, and the role of the teacher as a potential specialist and expert in an innovative kind of research and teaching knowledge is complicated (Connelly & Clandinin, 1995). As proof, Shulman (1986, 1087) claims that the domains of teachers' professional knowledge consist of seven interwoven knowledge areas, including 1) overall pedagogical knowledge, 2) knowledge of learners and the way of their acquirement, 3) subject matter knowledge, 4) pedagogical content knowledge, 5) other content knowledge, 6) curriculum knowledge, and 7) educational aims knowledge. In the same vein, some other scholars (e.g., Malderez & Wedell, 2007; Mishra & Koehler, 2006; Richards & Farrell, 2005) have tried to portray their models of teachers' professional knowledge.

But among them, Shulman criticizes traditional views regarding teachers' knowledge and argues that in the past, teacher trainers believed that teachers' professional knowledge consisted of general pedagogical skills and content knowledge. Likewise, Ersanli (2016) declared that in the past, knowledge was defined as "an intersection of two main domains; pedagogical and content knowledge (PCK)" (p. 18). Traditionally teachers' professional knowledge was highlighted on two forms of knowledge: "content" and "pedagogical" knowledge and they were known as mutually exclusive. Shulman (1987) found fault with the courses of teacher education in considering "content knowledge" and "pedagogical knowledge" as discrete teacher knowledge dominions. Arguing that either pure "content knowledge" or pure "pedagogical knowledge" was not enough for teaching, Shulman introduced a new type of knowledge base called "pedagogical content knowledge" (PCK) (Gess-Newsome, 1999). By PCK, Shulman (1987) refers to the interconnectedness of pedagogy and content and suggests that teachers should

have an in-depth understanding of how to integrate these multiple domains of knowledge.

Advent and Formation of TPACK Framework

With the advent of digital educational technologies and their appearance in educational settings, educators have started to think that technical knowledge cannot be considered as an isolated construct, and effective teaching necessitates the knowledge of the way that technology is associated with "pedagogy" and "content" (Koehler & Mishra, 2006), who suggested that "technological knowledge" (TK) must be included as a third component. Following this development, Koehler and Mishra suggested a new model called "Technological Pedagogical Content Knowledge" (TPACK) in an attempt to describe the dynamic and strong relationships among the knowledge of technology, content, and pedagogy. For Koehler and Mishra, "new technologies have changed the nature of the classroom or have the potential to do so" (p. 1023), and "technology is able to provide access to explanations, representations, analogies, and demonstrations that make the subject matter more accessible to the learner" (p.1023), but simultaneously, they mentioned that "technology differed from the content and its representation" (p. 1025).

TPACK framework based on the integration of the knowledge of technology, content, and pedagogy doesn't consider these knowledge domains separately but provides the new type of knowledge which assembles the convergence between these domains, Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK) (Koehler, Mishra, Akcaoglu & Rosenberg, 2013).

English Language Teaching and TPACK

As the TPACK framework is fairly new, a few studies have documented its implications in teaching language contrary to the researchers' willingness to explore teachers' knowledge of TPACK and its feasibility and likelihood of use. Kulavuz (2011) revealed the intelligible implementation of TPACK in South Florida University with a group of ESP students. The participants were asked to capture and choose a picture of one place and write a complete script. At this stage, feedbacks were given to them about the scripts and pictures. Kulavuz found out that this research offered "an opportunity to apply grammar structures in an authentic way by developing all four skills [...] and also can be implemented with learners at varying proficiency levels" (p.22).

In the other study, Muniandy and Veloo (2011) attempted to assess the TPACK knowledge of 33 TESOL preservice Malaysian teachers and their attitude the engagement level of YouTube videos among learners who were requested to evaluate 50 English videos extracted from various resources. They analyzed the videos in terms of technical qualities, viewpoint and preparedness, contents, pedagogy, and learner involvement. The researchers explored participants' views who believed that videos successfully met the curriculum's requirements and that they were presented effectively, engaged learners richly in content, and improved the pedagogical parameters in the classroom.

Koçoğlu (2009) explored the preservice EFL teachers' viewpoint regarding technological pedagogical content knowledge. He provided an undergraduate teacher education program that lasted about four years. The findings indicated that the CALL course was helpful in developing the teachers' TPACK and supported them in practicing TPACK.

Archambault and Crippen (2009) studied 596 teachers' TPACK competencies in an online platform. The findings showed that participants'

"pedagogical content knowledge" is at a high level, although their confidence decreases when the technological component is blended. Also, Sing and Koh (2011)–investigated preservice teachers' perceptions in congruence with demographic factors such as age, gender, and TPACK components. The results showed that, contrary to the demographic factors, components of TPACK had a significant impact on teachers' perceptions.

In another study, Ansyari (2012) offered a course of technology blending on the basis of professional development to 12 EFL teachers. As a result, the participants reported having positive experiences with TPACK professional development programs and weaknesses related to time, technology exploration, and student engagement. Similarly, Kurt et al. (2013) offered a course based on expanding TPACK skills to 22 Turkish preservice EFL teachers. Thereby, they briefed them in terms of the TPACK model. Then, they built technological materials, investigated numerous technologies together, arranged a technology-blended curriculum, and taught in a real learning environment. The findings revealed significant enhancements in TK, TCK, TPK, and TPACK scores.

TPACK Framework and EFL Teachers' Professional Knowledge

The TPACK framework considers planning and assessing the teacher's knowledge, focusing on successful learning in different subject matters (AACTE, 2008). The use of the TPACK framework for assessing teachers' knowledge could possibly have an effect on the kind of professional development and training that are structured for trainers. Therefore, the TPACK framework is practical in the stage of assessing and developing the knowledge that teachers should possess to blend technology in teaching. So, there is an existing need to think about preparation training in the teacher

education area and suggest new approaches to prepare teachers to blend technology into teaching effectively (Schmidt, Baran & Thompson, 2009).

Communicative language teaching (CLT) is known as a useful method for teaching interactional purposes (Byate, 2001), but its goals can be easily achievable with a powerful supply of technology. Moreover, technology assists teachers in solving the problems such as large classes and adapting each individual learner's learning due to their progress based on their e-portfolio (Liu, 2011). Therefore, a strong TPACK would be significant for EFL teaching. However, TPACK necessitates professional knowledge development for teachers at various phases of education, such as curriculum planning, practice and implementation, and assessment and evaluation processes (Coppola, 2004). Furthermore, EFL teachers could make use of TPACK to recognize learners' problems and increase interaction among themselves and learners (Liu, 2011).

TPACK framework is almost new, and the field suffers from scarce research findings in general and in the Iranian EFL setting in particular. In a bid to shed some empirical light on this issue, this study seeks, first and foremost, to explore the status quo of the Iranian EFL teachers' TPACK knowledge, and second to investigate the way TPACK framework can guide to expand their effective technology blending skills in EFL classes. More particularly, the study follows a twofold objective: (1) to develop and assess the Iranian EFL teachers' TPACK knowledge in light of TPACK oriented workshops, and (2) to investigate how they perceive TPACK as an educationally significant, which are abstracted in the form of the three research questions:

1. What is the status quo of the Iranian EFL teachers' TPACK literacy like?

2. To what extent does the EFL teachers' TPACK literacy develop in light of TPACK workshops?
3. To what extent do the EFL teachers' perceptions towards TPACK literacy develop in light of TPACK workshops?

Method

Participants

The participants of this research were 15 male and female Iranian EFL teachers teaching at intermediate and advanced levels and with more than two years of teaching experience with B.A, Master, and Ph.D. degrees. As TPACK workshops were held online, the participants were chosen as a professional social network from the LinkedIn website. A letter was sent through the network addressing the EFL teachers deemed competent enough to engage in online workshops. Thereby they were, of course, briefed on the advantages of the workshops and the expected responsibilities. Therefore, to achieve the research goals, LinkedIn members who were actively teaching English and claimed to have basic computer and Internet knowledge and declared their readiness to participate in online TPACK workshops were chosen as participants.

Instruments

To meet the objectives of the study, two different questionnaires, including TPACK survey questionnaire and Perception, were employed:

TPACK Survey

TPACK questionnaire adapted from Baran, Schmidt, Koehler, Mishra, Thompson, and Shin (2009), considerably used for different subject areas to evaluate teachers' TPACK development and associated knowledge domains, was employed. The questionnaire consists of seven components:, Content Knowledge (CK), Pedagogical Knowledge (PK), Technological Knowledge (TK), Technological Content Knowledge(TCK), Pedagogical Content Knowledge (PCK), Technological Pedagogical Knowledge(TPK), and Technological Pedagogical Content Knowledge (TPACK). The questionnaire with 39 questions extracted from the seven domains of the TPACK framework consisted of a five-point Likert scale ranging from "strongly agree" (5 points) to "strongly disagree" (1 point). But its adapted version focused on the content area of English language teaching. The Cronbach's alpha was used to examine the internal consistency of the TPACK questionnaire for each component and also the whole scale. Cronbach's alpha coefficients of the scale with each factor (i.e., TK, CK, PK, PCK, TCK, TPK, and TPACK) ranged from 0.72 to 0.88, and the whole scale's reliability estimate was α=.93. It was perceived that the convergent validity of the measurement model is established by the indicators that were strongly related to their purported latent factors (ranging from β= .52, t= 5.46 to β= .85, t= 6.87, significant at p .50).

Perceptions Survey

TPACK Perceptions survey questionnaire adapted from Kessler's (2007) study consists of 20 items aimed to assess participants' expectations of TPACK workshops. The questionnaire items are based on knowledge and skills related to a variety of teaching techniques, content, selection and technology use, educational material creation, and evaluating abilities in computer-based instruction for effective CALL blending. At the pre-survey

stage, the attendants of the study were asked to declare their expectations and, at the post-survey stage, to express their satisfaction on a five-point Likert scale, with 1 "Strongly Disagree" being the lowest satisfaction or expectation and 5 "Strongly Agree" being the highest. The internal consistency of the Perceptions questionnaire was examined using Cronbach's alpha for the whole scale, and the result was α=.758.

Procedures

Pre-workshops Procedures

Before implementing the TPACK workshops, participants were asked to declare their experience and knowledge regarding technology use in their teaching process and their perceptions of TPACK literacy.

Implementation of TPACK Workshops

Before implementing the TPACK workshops, the participants were asked to declare their experience and knowledge regarding technology use in their teaching process and their perceptions of TPACK literacy. Practically, 6 sessions of workshops were designed to help participants to develop their TPACK. First, those who were chosen from the LinkedIn website were invited to attend online workshops. Second, all necessary teaching materials such as Apps and software that were suitable for teaching "content" and "context" were expanded, supplied, and shared among them.

The purpose of the TPACK workshops in this study was to assist English teachers to (1) acquire successful technology integration into their teaching, (2) expand TPACK literacy and competency, and (3) implement what they have learned from TPACK workshops to their teaching effectively. During each session, the directions and instructions were provided to the participants, and they were asked to follow the designed steps: (1) step of modeling, (2)

step of analyzing (3) step of demonstrating (4) step of application, and (5) step of reflection. All of the steps were designed to meet its purpose regarding focusing on the goal to help the participants understand TPACK according to the context and learn to blend and use TPACK skills they have acquired. For each workshop, specific technologies and tools were chosen according to their potentiality to attain the content objectives. The chosen technologies for this study were software, Web tools, and Apps. Each workshop session was planned to last one and half hours, in which the participants were focused on the above-mentioned five steps to learn TPACK blending in context and content. During the last session, post-workshop survey questionnaires, including both the Perceptions and the TPACK, were administered.

Results

Addressing the First Research Question

The first research question addressed 'the status quo of the Iranian EFL teachers' TPACK literacy like' and was answered in light of the frequency analysis and percentage estimation of data collected through the questionnaire (Table 1).

Table 1.

Frequency and Percentage for Teachers' TPACK Literacy before Attending TPACK Workshops

***TPACK* parts**		**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Technological knowledge (TK)	f	0	6	7	2
	%	0.0%	40.0%	46.7%	13.3%
Content knowledge (CK)	f	0	2	8	5
	%	0.0%	13.3%	53.3%	33.3%
Pedagogical knowledge (PK)	f	0	4	8	3

***TPACK* parts**		**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
	%	0.0%	26.7%	53.3%	20.0%
Pedagogical and content knowledge (PCK)	f	2	4	8	1
	%	13.3%	26.7%	53.3%	6.7%
Technical and content knowledge (TCK)	f	4	7	3	1
	%	26.7%	46.7%	20.0%	6.7%
Technical and pedagogical knowledge (TPK)	f	4	7	4	0
	%	26.7%	46.7%	26.7%	0.0%
Technical and pedagogical and content knowledge (TPACK)	f	3	7	5	0
	%	20.0%	46.7%	33.3%	0.0%
TOTAL	f	0	6	9	0
	%	0.0%	40.0%	60.0%	0.0%

Table 1 shows that the teachers are more competent and skillful in the first four parts of the questionnaire, i.e., Content knowledge (CK) (Agree or strongly agree: 86.6%), Pedagogical Knowledge (PK) (Agree or strongly agree: 73.3%), Pedagogical and content knowledge (PCK) (Agree or strongly agree: 60.0%), and Technological knowledge (TK) (Agree or strongly agree: 60.0%) in descending hierarchical order. But, they showed less competent and expert in the other three parts of the TPACK questionnaire i.e., Technical and pedagogical and content knowledge (TPACK) (Agree or strongly agree: 33.3%), Technical and pedagogical knowledge (TPK) (Agree or strongly agree: 26.7%), Technical and content knowledge (TCK) (Agree or strongly agree: 26.7%) in a descending hierarchical order.

Evidently, almost half (40 percent, 6 / 15) of the participants reported that they do not have high knowledge of technology to be used in the classroom; 60% (9 / 15) claimed that they have good knowledge of employing

technology, while none of them (0.0%, 0 / 15) rated him/herself as highly competent and skillful in utilizing technology in their ELT classrooms.

Addressing the Second Research Question

The second research question addressed 'the extent to which TPACK literacy of EFL teachers develop in light of TPACK workshops' was answered by the analysis of crosstabs (chi-square test for independence). Before discussing the chi-square results, the frequency and percentage, and standard residuals for teachers' TPACK literacy before and after attending TPACK workshops were computed (Table 2).

Table 2.

Frequency and Percentage and Standard Residuals for Teachers' Total TPACK Literacy before and after Attending TPACK Workshops

Test time	Parameter	Response			Total
		Neutral	Agree	Strongly Agree	
Pretest	Count	6	9	0	15
	% within Time	40.0%	60.0%	0.0%	100.0%
	Adjusted Residual	2.7	-.8	-2.1	
Posttest	Count	0	11	4	15
	% within Time	0.0%	73.3%	26.7%	100.0%
	Adjusted Residual	-2.7	.8	2.1	
Total	Count	6	20	4	30
	% within Time	20.0%	66.7%	13.3%	100.0%

Investigating Std. Residuals revealed that two of the above-mentioned statistics are selected significantly beyond expectation, i.e. Std. Residuals are beyond +/- 1.96. In other words, Table 5.2 shows that the teachers have

responded noticeably different from the pretest to the posttest. In fact, teachers have selected 'Neutral' choice (40.0%, Std.. Residual = 2.7 > 1.96) significantly above expectation on the pretest, whereas, on the posttest, they have selected this choice (0.0%, Std.. Residual = -2.7 < -1.96) considerably below expectation. Additionally, Table 2 shows that teachers have selected 'Strongly Agree' choice (0.0%, Std.. Residual = -2.1 < -1.96) significantly below expectation on the pretest whereas, on the posttest, they have selected this choice (26.7%, Std.. Residual = 2.1 > 1.96) considerably above expectation.

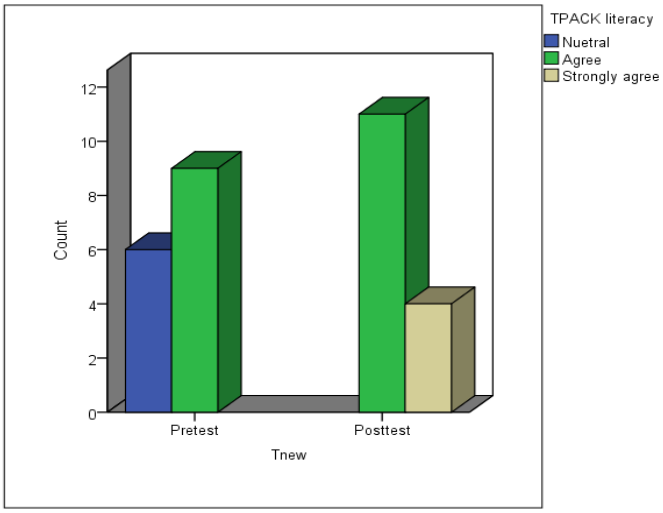

Figure 1.
Bar Graph for Teachers' Total TPACK Literacy before and after Attending TPACK Workshops

Moreover, Table 3 summarizes the results of chi-square tests used to compare teachers' TPACK literacy before and after attending TPACK workshops. One of the main assumptions of the chi-square test for

independence is that the lowest expected frequency in any cell should be 5 or more. Since this assumption was violated, the researcher had to report the results of Fisher's Exact Probability Test instead of Pearson chi-square (Pallant, 2013). As seen in Table 3, Fisher's Exact Test (value = 9.98, $p = .004$, $p < .05$) revealed that there was a significant increase in teachers' TPACK literacy before and after attending TPACK workshops.

Table 3

Chi-Square Tests for Teachers' Total TPACK Literacy before and after Attending TPACK Workshops

	Value	df	Asymptotic Significance(2-sided)	Exact Sig.(2-sided)
Pearson Chi-Square	10.200[a]	2	.006	.004
Likelihood Ratio	14.063	2	.001	.002
Fisher's Exact Test	9.981			.004
Linear by Linear Association	9.797[b]	1	.002	.002
N of Valid Cases	30			

a. 4 cells (66.7%) have an expected count of less than 5. The minimum expected count is2.00.
b. The standardized statistic is3.130.

In order to compute the effect size of chi-square, Phi and Cramer's V values were prepared. As Pallant (2013) believes, for tables larger than 2 by 2 (such as the current study), the value to report is Cramer's V, which takes into account the degrees of freedom. Table 4 indicates that the effect size (Cramer's V) is .58 that is considered a large effect using Cohen's (1988) criteria of .10 for a small effect, .30 for medium effect, and .50 for large effect.

Table 4.

Phi and Cramer's V *for the Effect of Attending TPACK Workshops on Teachers' Total TPACK Literacy*

		Value	Approximate Significance	Exact Significance
Nominal by Nominal	Phi	.583	.006	.004
	Cramer's V	.583	.006	.004
N of Valid Cases		30	30	

For further deeper analysis, chi-square tests were used to compare teachers' TPACK literacy before and after attending TPACK workshops considering the 7 parts of the TPACK literacy per se. As seen in Table 5, Fisher's Exact Test was significant for four parts of teachers' TPACK literacy i.e., '*Technical and content knowledge'* (p = .02, p < .05), *'Technical and Pedagogical knowledge'* (p = .01, p < .05), *'Technical and Pedagogical and content knowledge'* (p = .02, p < .05), and Technological knowledge (p = .04, p < .05). That means there was a significant increase in TPACK literacy of teachers after attending TPACK workshops regarding these four parts. However, Fisher's Exact Test was not significant for the other three parts (p > .05).

Table 5.
Chi-Square Test for 7 Parts of Teachers' TPACK Literacy before and after Attending TPACK Workshops

Parts of teachers' TPACK literacy	**Fisher's Exact Test Value**	**Exact Sig. (2-sided)**
Technological knowledge (TK)	6.095	.038
Content knowledge (CK)	.840	.770
Pedagogical knowledge (PK)	.922	.781
Pedagogical and content knowledge (PCK)	2.383	.619

Parts of teachers' TPACK literacy	Fisher's Exact Test Value	Exact Sig. (2-sided)
Technological and content knowledge (TCK)	9.205	.023
Technological and Pedagogical knowledge (TPK)	10.222	.011
Technological and Pedagogical and content knowledge (TPACK)	11.482	.005

Addressing the Third Research Question

The third research question explored 'the extent to which EFL teachers' perceptions towards TPACK literacy develop in light of TPACK workshops', was similarly addressed through the analysis of crosstabs (chi-square test for independence).

Before discussing the results of chi-square, the frequency and percentage, and standard residuals for teachers' perceptions towards TPACK literacy before and after attending TPACK workshops were computed (Table 6).

Table 6.

Frequency and Percentage and Standard Residuals for Teachers' Perceptions s towards TPACK Literacy before and after Attending TPACK Workshops

Test time	Parameter	Response				Total
		Rarely	Occasionally	Frequently	Very Frequently	
Pretest	Count	3	11	1	0	15
	% within Time	20.0%	73.3%	6.7%	0.0%	100.0%
	Adjusted Residual	1.8	1.5	-2.2	-1.5	
	Count	0	7	6	2	15

Test time	Parameter	Response				Total
		Rarely	Occasionally	Frequently	Very Frequently	
Posttest	% within Time	0.0%	46.7%	40.0%	13.3%	100.0%
	Adjusted Residual	-1.8	-1.5	2.2	1.5	
Total	Count	3	18	7	2	30
	% within Time	10.0%	60.0%	23.3%	6.7%	100.0%

Investigating Std. Residuals (see Table 6 above and Figure 2 below) revealed that one of the above-mentioned statistics is selected significantly beyond expectation, i.e., Std. Residuals are beyond +/- 1.96. In other words, Table 6 shows that the teachers have responded noticeably different from the pretest to the posttest. In fact, teachers have selected 'Frequently' choice (6.7%, Std.Residual = -2.2 <-1.96) significantly below expectation on the pretest whereas, on the posttest, they have selected this choice (40.0%, Std.Residual = 2.2 >1.96) considerably above expectation.

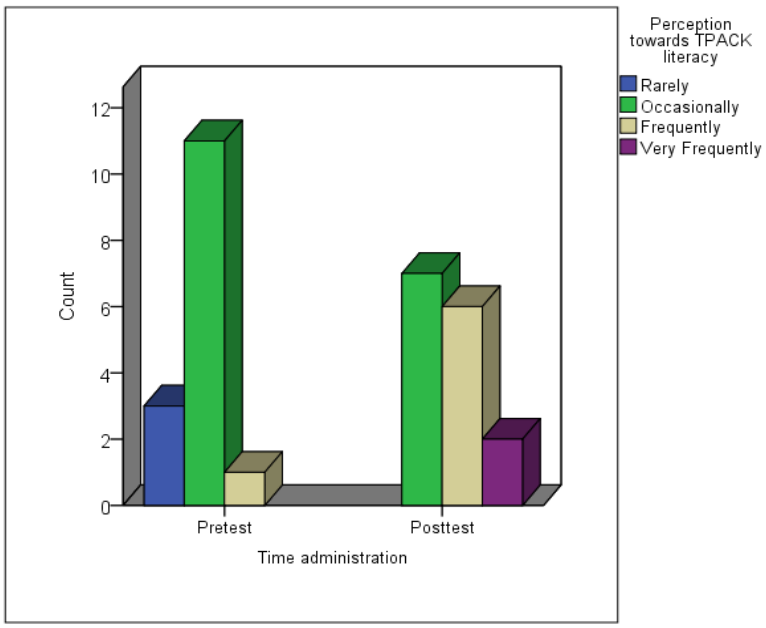

Figure 2.
Bar Graph for teachers' perceptions s towards TPACK literacy before and after attending TPACK workshops

Table 7 summarizes the results of chi-square tests that were chosen to compare teachers' perceptions' of TPACK literacy before and after attending TPACK workshops. One of the main assumptions of the chi-square test for independence is that the lowest expected frequency in any cell should be 5 or more. Since this assumption was violated, the researcher had to report the results of Fisher's Exact Probability Test instead of Pearson chi-square (Pallant, 2013).

As seen in Table 7, Fisher's Exact Test (value = 9.46, $p = .02$, $p < .05$) revealed a significant increase in teachers' perceptions of TPACK literacy after attending TPACK workshops.

Table 7.
Chi-Square Tests for Teachers' Perceptions s towards TPACK Literacy before and after Attending TPACK Workshops

	Value	Df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)
Pearson Chi Square	9.460a	3	.024	.016
Likelihood Ratio	11.790	3	.008	.015
Fishers Exact Test	8.510			.017
Linear by Linear Association	8.773b	1	.003	.003
No f Valid Cases	30			

a. 6 cells (75.0%) have expected count less than 5. The minimum expected count is1.00.
b. The standardized statistic is2.962.

In order to compute the effect size of chi-square, Phi and Cramer's V values were prepared. As Pallant (2013) believes, for tables larger than 2 by 2 (such as the current study), the value to report is Cramer's V, which takes into account the degrees of freedom. Table 8 indicates that the effect size (Cramer's V) is .56, which is considered a large effect using Cohen's (1988) criteria of .10 for a small effect, .30 for a medium effect, and .50 for large effect.

Table 8.

Phi and Cramer'sV *for the Effect of Attending TPACK Workshops on Teachers' Perceptions s towards TPACK Literacy*

		Value	Approximate Significance	Exact Significance
Nominal by Nominal	Phi	.562	.024	.016
	Cramer'sV	.562	.024	.016
N of Valid Cases		30		

Discussion

The results show that the TPACK workshop as a "professional development" program was effective and caused development in EFL teachers' TPACK competency. This research approved the previous studies' findings such as Blocher et al. (2011), Allan et al. (2010), Jimoyiannis et al. (2011), Doering et al. (2009), and Lee and Tee (2011). Moreover, the results of the present research are in accordance with the results achieved by Doering et al. (2009), indicating that the metacognitive awareness of social studies teachers in "technological, pedagogical, and content knowledge (TPACK)" improved after involvement in the course. The teachers were reported to experience prominent achievement within the diagrammatic knowledge domains of TPACK and showed positive feedbacks about the knowledge domains defined within the TPACK framework.

As mentioned above, EFL teachers had a positive experience with participating in TPACK workshops. It is in line with Blocher et al.'s (2011) study, who declared that 50 percent of the teachers participating in the research showed growth in confidence and comfort in technology use after the TPACK program. Another study supposed to be in line with the present study showed the increased willingness and confidence in the teachers who

participated in the program, especially in the ability to blend technology in the teaching process (Jimoyianis, 2010; Jimoyianis et al., 2011). Besides, Doering et al. (2009) argued that teachers who passed the TPACK-oriented course showed positive comments regarding the knowledge domains defined within the TPACK framework. Teachers were also reported being contented with the TPACK program and discerned it had effective implications on their TPACK development (Jimoyianis et al., 2011). Lastly, Trautmann and MaKinster's (2010) study found that teachers showed significant growth in interest and a high level of satisfaction after participating in the workshop.

Additionally, the results revealed that Iranian EFL teachers showed development in TPACK and CALL following their participation in TPACK workshops. It can be concluded that participants realize that all the stages of TPACK workshops, mainly the "modeling and demonstrating" stages were effective in assisting teachers in expanding TPACK skills and adopting technology in education. The teachers also declared that the "learning by doing" approach and in-detail instructions were the two most powerful factors of TPACK workshops. The approach of "learning-by-doing" assisted teachers in understanding that successful technology blending is possible, which resulted in teachers' implementation of technology integration; this is in compliance with the previous research that maintained that teachers should acquire to blend CALL through implementing it (Slaouti & Motteram, 2006; and Kereluik et al., 2012).

The analyses of the data on the perceptions towards TPACK workshops indicated that the Iranian EFL teachers' perceptions changed positively towards TPACK in the light of TPACK workshops, indicating that the TPACK workshop as a professional development program made a significant improvement in EFL teachers' TPACK literacy. These findings are in line

with Lawless and Pellegrino (2007) and Todorova and Osburg (2010) studies in that both of them reported that authentic learning experiences, active engagement in professional development, curriculum-based working, getting feedback and reaction of their practice, profound training, collaboration that can help them reduce loads and support can make EFL teachers more proficient in ICT integration in teaching process. Similarly and in line with Lawless and Pellegrino's (2007) findings, these findings state that professional development programs are usually arranged to supply new technologies for education, to expand meaningful and relevant activities regarding contexts, to foster collaboration, to promote teachers' competency in technology-use and to hold a clear vision of students' achievement.

The result of promoting EFL teachers' perceptions of TPACK literacy came true by implementing TPACK workshops; this is in compliance with the research of Asyari (2013) who reported that TPACK training program assisted teachers in expanding the perception of practical skills they need for technology integration. Also, the findings of by Bradshaw (2002) study showed a positive effect by implementing the training course for EFL teachers who engaged in professional development practices such as "theory, demonstration, practice, and follow-up" and as a result, EFL teachers were more willing to convey their technological skills in the teaching process. Moreover, the studies conducted by Atkins and Vasu (2000) and Milbraith and Kinzie (2000) showed that the well designed and implemented CALL workshops could have a positive effect on the realization of technology blending and CALL of the participants which might lead to the teachers' practice of blending CALL and affect the extent of successful outcome.

Conclusion

The study participants stated that the TPACK workshops assisted them to expand TPACK skills to use certain tools, Apps and softwares in the teaching process. In addition, they showed development in their TPACK literacy by using "how" to blend technology in the classroom and transform the knowledge learned in workshops into actions. It is, therefore, inferred that there is a significant development in TPACK competency and skills and prominent achievement in the objectives of the TPACK workshops about technology integration with content and pedagogy. So, it can be assumed that TPACK workshops met the purpose of developing EFL teachers' TPACK and CALL competency in teaching English area and signified the TPACK framework's role in teachers' adoption and use of CALL competency into their teaching.

Moreover, this research certifies the results of previous studies regarding the effectiveness of preparation courses of CALL on EFL teachers' perceptions changes regarding technology integration in instruction and their announcement of using what they acquired in the CALL preparation courses for teaching. The most significant side of this study is that the results provide a profound comprehension of the effects of TPACK workshops as a successful training mainly for EFL teachers to expand TPACK skills, use these skills in teaching, and be conscious of the strong TPACK blending components.

In addition, the study suggests that the TPACK framework can be used for designing CALL teacher education programs. The literature of the study shows that there is a demand for models of training that expedite the effective and successful CALL integration in the classroom (Kilickaya, 2009; Healey et al., 2011; Kessler, 2006; Hubbard, 2008), and this research aims to bridge the gap by supplying documentation on "how" TPACK workshops assisted

EFL teachers to integrate technology in teaching effectively. Additionally, findings of the study provide that TPACK-based workshops have a positive and strong effect on EFL teachers' perceptions changes regarding TPACK and CALL blending, their TPACK skills development, and efforts on blending CALL and teaching.

Although the present study shed light on the effectiveness of the TPACK framework in teacher training as part of a professional development program, certain limitations should be considered while interpreting the findings. First, the researcher observed the participants prior to the workshops, and if observations or interviews were conducted before the TPACK workshops, it would be beneficial. Second, the participants were chosen from LinkedIn social media due to the feasibility restrictions: however, it would have been more beneficial to implement TPACK workshops in English language teaching institutes to get a greater picture of EFL teachers' current technological knowledge and the more accurate need analysis in the area of CALL integration through observation.

Declaration of Conflicting Interests

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

References

Albalawi, A., & Ghaleb, R. (2011). Professional development needs of mathematics teachers in Saudi Arabia.

Proceedings from *EDULEARN11*: *International Conference on Education and New Learning Technologies. Barcelona, Spain: EDULEARN11,* 569-582.

Allan, W. C., Erickson, J. L., Brookhouse, P., & Johnson, J. L. (2010). EcoScienceWorks: teacher professional development through a collaborative curriculum project. An example of TPACK in Maine. *TechTrends, 54*(6), 36-43.

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

Archambault, L. & Crippen, K. (2009). Examining TPACK among K-12 online distance educators in the United States. *Contemporary Issues in Technology and Teacher Education. 9*(1), 71-88.

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.

Blocher, J. M., Armfield, S. W., Sujo–Montes, L., Tucker, G., & Willis, E. (2011). Contextually based professional development. *Computers in the Schools, 28*(2), 158-169. doi: 10.1080/07380569.2011.577398

Borko, H. & Putman, R.T. (1995). Expanding a Teacher's Knowledge Base: A Cognitive Psychological Perspective on Professional Development. In T.R. Guskey & M. Huberman (Eds.). *Professional Development in Education: New Paradigm and Practices*. New York, N.Y.: Teachers College Press.

Bradshaw, L. (2002). Technology for Teaching and Learning: Strategies for Staff Development and Follow-Up Support. *Journal of Technology and Teacher Education. 10.*

Brook, C. & Oliver, R. (2005). Exploring system factors that influence community development in online settings. In P. Kommers & G. Richards (Eds.), Proceedings of ED-MEDIA 2005--*World Conference on Educational Multimedia, Hypermedia & Telecommunications,* 1969-1976. Montreal, Canada: Association for the Advancement of Computing in Education (AACE).

Bygate, M. (2001). Effects of task repetition on the structure and control of language. In Researching Pedagogic Tasks: *Second Language Learning, Teaching and Testing Longman.*

Chapelle, C. (2003). English Language Learning and Technology: *Lectures on Applied Linguistics in the Age of Information and Communication Technology (7).* Amsterdam: John Benjamins Publishing.

Chapelle, C. (2009). The Relationship Between Second Language Acquisition Theory and Computer-Assisted Language Learning. *The modern language journal, (93).*

Connell, R.W. (1985). Teachers' Work. Sydney: *George Allen & Unwin.*

Connelly, M. & Clandinin, D.(1995). Teachers' Professional Knowledge Landscapes. *New York: Teachers College Press.*

Coppola, E. M. (2004). Powering up: Learning to teach well with technology. *New York: Teachers College Press.*

Doering, A., Veletsianos, G., Scharber, C., & Miller, C. (2009). Using the technological, pedagogical, and content knowledge framework to design online learning environments and professional development. *Journal of Educational Computing Research, 41(3),* 319-346.

Egbert, J., Paulus, T., & Nakamichi, Y. (2002). The impact of CALL instruction on classroom computer use: A foundation for rethinking technology in teacher education. *Language Learning & Technology, 6(3),* 108–126.

Gess-Newsome, J. (1999). PCK: An introduction and orientation. In J. Gess-Newsome and N. Lederman (Eds.) Examining PCK: *The construct and its implications for science education*, 3-20. Boston: Kluwer.

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

Handal, G. & Lauvas, P. (1987). Promoting Reflective Teaching: Supervision in Action. *Milton Keynes: Open University.*

Harris, J., & Hofer, M. (2009). Instructional planning activity types as vehicles for curriculum-based TPACK development. In Maddux, C. D. (Ed.). *Research highlights in technology and teacher education*, 99-108. Chesapeake, VA: Society for Information Technology & Teacher Education (SITE).

Healey, D.,& Kessler, G., & Hubbard, P., & Hanson-Smith, E., & Ware, P., & Iannou-Georgiou, S. (2011). *TESOL Technology Standards: Description, Implementation, Integration.*

Hegelheimer, V. & Chapelle, C. A. (2004). The language teacher in the 21st century. In S. Fotos & C. M. Browne (Eds.), *New perspectives on CALL for second language classrooms*, 299 - 316. Mahwah, NJ: Lawrence Erlbaum.

Hooven, D. (2007). Networking to learn: blogging for social and collaborative purposes. In C. Montgomerie & J. Seale (Eds.), Proceedings of ED-MEDIA 2007--*World Conference on Educational Multimedia, Hypermedia & Telecommunications*, 1819-1828. Vancouver, Canada: Association for the Advancement of Computing in Education (AACE).

Hughes, J. (2009). Learning, Teaching, and Scholarship in a Digital Age: Web 2.0 and Classroom Research--What Path Should We Take "Now"?. *Educational Researcher*. 38. 10.3102/0013189X09336671.

Hubbard, P. 2008. "CALL and the Future of Language Teacher Education." *CALICO Journal 25(2):* 175-188.

Hwee, J., & Koh, J., & Chai, C. (2011). Modeling preservice teachers' technological pedagogical content knowledge (TPACK) perceptions: The influence of demographic factors and TPACK constructs. *ASCILITE 2011 - The Australasian Society for Computers in Learning in Tertiary Education.*

Jahanban-Isfahlan, H. & Hadidi T., & Seifoori, Z. (2017). Educational Technology in Iranian High Schools: EFL Teachers' Attitudes, Perceived Competence, and Actual Use. *Education Research International.* 1-9. 10.1155/2017/9738264.

Jimoyianis, A. (2010). Designing and implementing an integrated technological pedagogical science knowledge framework for science teachers' professional development. *Computers and Education, 55(3),* 1259-1269.

Jimoyianis, A., Tsiotakis, P., & Roussinos, D. (2011). Pedagogical and instructional design issues towards the integration of Web 2.0 tools in instruction-Implications of teachers' training pilot courses in Greece. *The 7th International Conference on Next Generation Web Services Practices.*

Kereluik, K. & Mishra, P. (2012). Getting the digital generation to integrate technology in their learning: A framework for disciplinary learning with technology for adolescents. In P. Resta (Ed.), Proceedings of *SITE 2012--Society for Information Technology & Teacher Education International*

Conference, 2883-2892. Austin, Texas, USA: Association for the Advancement of Computing in Education (AACE).

Kessler, G. (2006). Assessing CALL Teacher Training: What are we doing and what could we do better? In P. Hubbard and M. Levy, Teacher Education in CALL, pp. 22-42. Amesterdam: John Benjamins Publishing Company.

Kessler, G. (2009). Student-initiated attention to form in wiki-based collaborative writing. *Language, Learning & Technology*, *13(1),* 79-95.

Kilickaya, F. (2009). World Englishes, English as an International Language and Applied Linguistics. *English Language Teaching, 2(3).*

Kinzie, M. & Milbrath, Y. (2000). Computer Technology Training for Prospective Teachers: Computer Attitudes and Perceived Self-Efficacy. *Journal of Technology and Teacher Education. 8*.

Kocoglu Z. (2009). Exploring the technological pedagogical content knowledge of preservice teachers in language education. *Procedia - Social and Behavioural Sciences, 1(1),* 2734-2737.

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

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.

Koehler, M. J., Mishra, P., Akcaoglu, M., & Rosenberg, J. (2013). The technological pedagogical content knowledge framework for teachers and teacher educators. In R. Thyagarajan (Ed.). *ICT integrated teacher education: A resource book*, 2–7. http://cemca.org.in/resources/books

Kulavuz, D.(2011). "English Language Teachers' Learning to Teach with Technology through Participation in an Online Community of Practice: A Netnography of Webheads in Action".*Graduate Theses and Dissertations.* http://scholarcommons.usf.edu/etd/4713

Kurt, G., Mishra, P., & Kocoglu, Z. (2013) Technological pedagogical content knowledge development of Turkish preservice teachers of English. *The Society for Information Technology and Teacher Education*, http://academicexperts.org/conf/site/2013/papers/38476/.

Lam, A. (2000) Tacit Knowledge, Organizational Learning and Societal Institutions: An Integrated Framework. *Organization Studies, 21*, 487-451.

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,* 575-614.

Liu, S. (2011). Computerized English language teaching in China. *CIES West Conference*, Stanford University.

Malderez, M., & Wedell, A. (2007). *Teachers' teaching: Processes and practices*. London: Bloomsbury.

Maor, D. & Roberts, P. (2011). Does the TPACK framework help to design a more engaging learning environment?. In T. Bastiaens & M. Ebner (Eds.), *World Conference on Educational Multimedia, Hypermedia and Telecommunications 2011*, pp. 3498-3504. Chesapeake, VA: AAC

Miller, M. & Hegelheimer, V. (2006). The SIMs meet ESL Incorporating authentic computer simulation games into the language classroom. *Interact. Techn. Smart Edu.. 3*. 311-328.

Muniandy, B. & Veloo, S. (2011). Managing and Utilizing Online Video Clips for Teaching the English Language: Views of TESOL Pre Service Teachers, 2nd International Conference on *Education and Management Technology*, *IPEDR, 13*, 173-178.

Najjari, R., Abbasian, G. (2016). Perceptions and Attitudes towards Integrating Internet in EFL Instruction in Iran. *Journal of Modern Research in English Language Studies, 2(4),* 90-77.

Pallant, J. (2013). SPSS survival manual: A step by step guide to data analysis using IBM SPSS (4th ed.). Crows Nest, NSW: *Allen & Unwin*.

Peters, M. & Desjardins, F. (2007). Single-course approach versus program approach to developing technological competencies in preservice language teachers. In M. A. Kassen, R.Z. Lavine, K. Murphy-Judy & M. Peters (Eds.), Preparing and developing technology-proficient L2 teachers. *San Marcos: CALICO,* 3-21.

Reinders, H. (2009). Teaching (with) technology: The scope and practice of teacher education for technology. *Prospect. 24.* 15-23.

Richards, J. C., & Farrell, T. S. (2005). *Professional development for language teachers: Strategies for teaching learning.* New York, NY: Cambridge University Press.

Robb, T. (2006). *Helping teachers to help themselves*. Benjamins, 335–347.

Rosaen, C.L&. Bird, T. (2005). Providing Authentic Contexts for Learning Information Technology in Teacher Preparation. *Journal of Technology and Teacher Education, 13(2),* 211-231. Norfolk, VA: Society for Information Technology & Teacher Education.

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 preservice Teachers. *Journal of Research on Technology in Education*. *4,* 123-149. 10.1080/15391523.2009.10782544.

Shulman, L. S. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review*, *57,* 1–22.

Slaouti, D. and Moteram, G. (2006) "Reconstructing practice: language teacher education and ICT", Teacher education in CALL, *John Benjamins Publishing Company,* 81–97.

Tee, M. Y., & Lee, S. S. (2011). From socialization to internalization: cultivating technological pedagogical content knowledge through problem-based learning. *Australasian Journal of Educational Technology*, *27(1),* 89-104.

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

Trautmann, N. M., & MaKinster, J. G. (2010). Flexibly adaptive professional development in support of teaching science with geospatial technology. *Journal of Science Teacher Education, 21(3),* 351-370.