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Full Length Research Paper

A comparison of pre-service, in-service and formation program for teachers' perceptions of technological pedagogical content knowledge (TPACK) in English language teaching (ELT)

Yıldız Turgut

Department of English Language Teaching, Faculty of Education, Adnan Menderes University, Turkey.

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In view of the rapid advancement of technology, technological pedagogical content knowledge (TPACK) has been extensively studied. However, research on technological pedagogical content knowledge (TPACK) in teaching English appear to be scarce and addressed either pre-service or in-service teachers, but not their comparison. Additionally, although teacher-certificate programs are employed in many countries, none of the existing studies have examined teacher-candidates' TPACK, especially in English language teaching (ELT). To fill the gap, this study aims to compare TPACK among teacher-candidates, pre-service and in-service English as a foreign language (EFL) teachers in Turkey. Quantitative and qualitative data analysis indicated significant differences among them. Based on these findings, suggestions for teacher education and future research were made.

Key words: Pre-service teachers, in-service teachers, teacher certificate program, English language teaching (ELT), technological pedagogical content knowledge (TPACK), self-perception.

INTRODUCTION

One of the milestones in teacher education that changed the standards of qualified teachers is Shulman (1986) perspective. According to these standards, qualified teachers should master not only content and pedagogical knowledge but also the intersection of both: pedagogical content knowledge.

In addition to Shulman (1986) ideas, changes in technology led Mishra and Koehler (2006) to propose that technology also cannot be separated from pedagogical content knowledge (PCK); therefore, they suggested technological pedagogical content knowledge (TPACK) framework, which consists of technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK). Moreover, the intersections of these knowledge domains are PCK, technological content knowledge (TCK), and technological pedagogical

E-mail: yildiztr@gmail.com.

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knowledge (TPK). PCK addresses the ways of teaching particular content-based material to students. TCK denotes selecting and then using technologies to teach particular content knowledge, while TPK refers to using a particular technology when teachers are teaching a certain subject matter. Finally, the intersection of the three circles forms a combination of the three knowledge domains, referred to as TPACK (Thompson and Mishra, 2007).

In line with these changes in standards, implementing technology into teacher education programs has changed. In early models, technology training and the rest of teacher preparation program were disconnected because computer literacy courses were separate from content methods classes and seldom engaged in real collaboration on how teachers could integrate technology into authentic learning experiences (Cetin-Berber and Erdem, 2015).

As a result, technology training failed focusing only on how to use computers, but not addressing how to teach students more effectively and using a variety of technological tools (Wentworth, 2007). That is, as the research indicated, pre-service teachers (PTs) believe that receiving the technology training in a single course isolated with the content hindered them to retain and transfer to their classroom teaching the information gained from this course (Sutton, 2011). Therefore, universities are revising courses to infuse the introduction and utilization of technological tools, to enhance instruction (Stobaugh and Tassell, 2011). Technology education is moving from a stand-alone technology course to technology-integrated curricula and context-specific approaches, modelling of technology use by college educators, faculty development, and providing opportunities for prospective teachers to use technology (Pamuk, 2012).

Increasingly, teachers are being prepared to teach in innovative ways; for instance, blended classrooms including virtual and face-to-face learning enable students not only to use digital devices as personal learning and productivity tools to comprehend digital content and Web 2.0 tools, but also to be guided and assessed their learning by using data (SETDA, 2010). This process is also similar with technology education for PTs in Turkey. Even though using computers in education began in 1984 (Akbaba-Altun, 2006), taking any technology-related course to fulfil the requirements for teaching became a requirement in PT curricula from 1998 (Yildirim, 2007). Hence, 'Computer' and 'Instructional Technology and Material Development (ITMD)' courses became mandatory in teacher education programs (Goktas et al., 2008).

A 'Computer' course provides basic concepts and computer applications, that is, word processors, presentation software, the Internet, and so forth, whereas an 'ITMD' course provides knowledge and skills on the function of instructional technology in learning process and selecting appropriate technologies to enhance teaching and learning (Goktas et al., 2008).

Examining the effectiveness of the technology-related courses reported that although PTs had positive attitude for the effectiveness of technology-related courses, they stated that technology training was limited to these two courses and these courses were relying more on theoretical technology education rather than giving PTs practice opportunities, and (Yuksel and Yasin, 2014); for that reason, the knowledge and skills gained from this process remain isolated and unused (Goktas et al., 2008; Cetin-Berber and Erdem, 2015). That is, although PTs might know the basic functions of technology use in the classroom, they might not be prepared to truly integrate these skills into their teaching (Ertmer, 2005; Sahin, 2011; Tondeur et al, 2012); consequently, teacher preparation programs may not prepare PTs to effectively use technology (West and Graham, 2007; Cetin-Berber and Erdem, 2015).

As technology is advancing fast and not all teachers from schools have received the education on integrating technology into the teaching process (Carbová and Betáková, 2013), it is necessary for in-service teachers to receive technology integration training. The trainings were provided through nation-wide projects in different countries, such as in Australia 'Teaching Teachers for the Future' (Parr et al., 2013), in the US Preparing Tomorrow's Teachers for Technology (Polly et al., 2010) and in Ethiopia UIN SUSKA (Ansari, 2015).

Similarly, in agreement with the significant educational reforms being made by the EU countries, Ministry of National Education (MoNE) in Turkey has emphasized the use of technology as an important instructional tool within schools across the country through Movement of Enhancing Opportunities and Improving Technology (FATIH) Project (MoNE, 2010). The five components of the project are:

1. Providing equipment and software substructure
2. Providing educational e-content and management of e-content
3. Effective usage of the information and communications technology (ICT) in teaching programs
4. In-service training of the teachers, and
5. Conscious, reliable, manageable and measurable ICT usage (MoNE, 2010).

Through these components the project aimed to improve technology in schools for the efficient usage of ICT tools in both teaching and learning processes through providing tablets and liquid-crystal display (LCD) Interactive Boards as well as in-service trainings for teachers working at preschool, primary and secondary schools. Through projects as schools are equipped with technology much better than ever before, researchers have investigated the way they are used in the classes.

In the literature, teachers' technology use is various. For instance, Fisher et al. (2012) state that teachers use

technology to support learning for distributed thinking and knowing, engagement and motivation, communication and knowledge building. Other studies revealed that teachers use technology to give students practice on content and skills; more specifically, they use the Internet to find activities or content for class, create learning materials for students on the computer or assess student learning on instructional objectives (Kopcha and Sullivan, 2007; Kurt, 2013).

Moreover, Bang and Luft (2013) indicated that teachers used PowerPoint for teacher-centred lecture-style classes, whole-class setting arrangements or reviewing facts for exams. Websites are often used for one-way communication by teachers through showing video clips and pictures found on relevant sites to help students understand the scientific facts they have learned. However, websites are rarely used for generating class discussions promoting collaborative learning or creating knowledge (Cetin-Berber and Erdem, 2015). Hence, it is revealed that a majority of teachers use technology to support low-level curricular task for assisting traditional teaching and learning, rather than for high-level tasks to engage learners as active contributors to the learning process (Ottenbreit-Leftwich and Brush, 2011; Bang and Luft, 2013).

In Turkey, similar to the studies mentioned earlier, teachers use the Internet and word processing software mostly to prepare the documents for instruction, homework and assessments, and use PowerPoint presentations to deliver the contents of the subject matter (Gulbahar, 2007; Yildirim, 2007; Goktas et al, 2009; Cakir, 2012; Unal and Ozturk, 2012; Kurt, 2013). That is, teachers use technology mostly to support their traditional ways of teaching and administrative purposes (Kurt, 2010; Kurt and Ciftci, 2012; Kurt, 2013; Cetin-Berber and Erdem, 2015).

In many countries, in order to respond to the shortage of teachers, though in general teachers are educated in education faculties, alternative paths to teacher training have been adopted for example pedagogical formation/teaching certificate programs (TCP) and master's programs, such as Postgraduate Certificate in Education (PGCE) in UK, Professional Development Certification and master's degree in Education in the US, Australia, Israel, India, and so on.

TCP provide PK training, which is necessary to know how to teach what you know, to candidates for teacher licensure who have received a bachelor's degree in the content area. Similarly, since 2010, students who graduated from Science and Arts Departments and successfully completed two-semester-long pedagogical formation program offered by Faculties of Education in Turkey can become teachers (Ozoglu, 2010).

In TCP curriculum, only one technology course is mandatory, ITMD is also offered in PT education programs. Furthermore, unlike teacher education programs, the bachelor degree programs in Science and Arts Departments do not include the basic computer courses. Although the need for teachers has tried to be met through the certificate programs, it is still a continuing debate as to whether or not such programs are effective in training qualified teachers (Yüksel, 2004).

Particularly in recent years, regardless of the department and faculty of graduation, nearly every university graduate can take formation education, even via the distance education medium. This naturally has given rise to many questions about the quality of the teaching profession (Yildirim and Vural, 2014).

In line with the rapid advancement of technology, TPACK has been discussed and extensively studied, such as establishing a conceptual framework (for example, Mishra and Koehler 2006), conducting preliminary enquiries (Ferdig, 2006), creating assessment tools (Koh et al., 2010), and exploring TPACK in specific domains (Graham et al., 2009; Niess et al. 2009). However, studies on TPACK in teaching English as a second or other language (TESOL) or as a foreign language (EFL) appear to be scarce (Wu, 2013; Wu and Wang, 2015). Furthermore, TPACK studies have examined either pre-service or in-service teachers. Up to date, there is one study (Dong et al., 2015) comparing in-service and pre-service teachers' TPACK majoring in six different subjects: Chinese Language, English Language, History, Education, Math and Physics.

Therefore, this study may be the first in TPACK research to provide comparison of pre-service and in-service teachers in a single refined major: English language teaching (ELT). Additionally, despite it is widely used as an alternative path to teacher education, none of the existing studies examined Teacher Certificate Program candidates' TPACK in the field of ELT. In conducting effective technology-enhanced instruction, the importance of teachers' TPACK has been recognized; however, the understanding of teachers' TPACK when teaching EFL, in conjunction with the need for their further TPACK development has not been properly addressed.

To fill the gap in TPACK research in the EFL domain, this exploratory study aims to explore the TPACK among pre-service teachers from ELT program at education faculty, candidates of ELT certificate program and in-service EFL teachers at primary and secondary schools in Turkey. With this aim, the following research questions guided the study:

1. Is there any difference among PTs', teacher-candidates' at a certificate program and in-service EFL teachers' self-perceptions of their TPACK?
2. From participants' perspective, what does TPACK integrated ELT mean?

Answering these questions might shed light on the nature of TPACK in EFL settings. More specifically, as research indicates that there are gaps between the rhetoric of policies of the program and its practices of TPACK (Kedir, 2006; Jeylan, 2006; Abera, 2014). Examining

technology integration in three teacher education and training contexts, PTs', TCP candidates', in-service teachers' TPACK and associated beliefs can provide a holistic picture of policies and practices of technology integration in ELT. As Schmidt et al. (2009) stated, using TPACK as a framework for understanding what knowledge teachers must have to integrate technology into teaching, and how they might develop this knowledge. Various types of training and professional development experiences might be designed for teachers. Hence, a better understanding of teacher's beliefs and TPACK can lead to improve the efficiency of teacher education and training programs.

LITERATURE REVIEW

Studies on TPACK with pre-service English language teachers

As pre-service language teachers' TPACK have 1 recently begun to draw attention of researchers (Wu, 2013), few studies conducted either to report the results of training programs or to evaluate the status quo are summarized below.

Effectiveness of workshops and training sessions on TPACK were examined (Koçoğlu, 2009; Yan and Yuhang, 2012; Kurt et al., 2014; Ersanlı, 2016). Koçoğlu (2009) explored how 27 senior pre-service EFL teachers improved technology integration into L2 teaching during a semester-long 'Computer-Assisted Language-Learning' course in Turkey. The findings of the qualitative study revealed that through the course, PTs had practiced and developed their TPACK skills.

Similarly, Yan and Yuhong (2012) examined how ICTs can be effectively integrated into subject-teaching in Comprehensive English course and how the pre-service English teachers could benefit from the infusion of ICTs both as English language learners (ELLs) and would-be teachers in China. They highlighted that no matter how much the teacher knows about ICT, the knowledge he knows cannot be automatically transformed into the ability of utilizing it in teaching. Also, they reported that the integration of ICTs on pre-service English teacher education impacts shifting the focus from the teaching knowledge to teaching competence, from teacher-centred to student-centred learning facilitating learners to construct knowledge.

Kurt et al. (2014) investigated Turkish pre-service EFL teachers' TPACK development. The teachers participated in a 12-week explicit TPACK development program based on Learning Technology by Design approach (Mishra and Koehler, 2006). The findings of their study showed that even though the participants hadn't' received any prior training on technology integration into L2 teaching, after the treatment, there was a statistically significant increase in participants' TK, TCK, TPK and TPACK scores.

Also, it is reported that at the end of the program, PTs were more confident in choosing technologies that enhance both the teaching approaches and students' learning in a lesson. Ersanlı (2016) examined the effectiveness of a five-week training session of an ELT Methodology Course on TPACK of Junior 59 pre-service EFL teachers enrolled at a state university in Turkey.

In a mixed-method design, data were collected through TPACK Competency Survey (Archambault and Crippen, 2009) and participants' journals. The results indicated a statistically significant improvement in participants' TPACK scores. Moreover, the journal entries indicated an increase in many applications and websites that could be used with more effective and to the point objectives in the classroom. Furthermore, participants performed better in manufacturing and altering language learning/teaching materials with specific goals.

Besides effectiveness of short-term training sessions on TPACK, four-year teacher education programs were examined for status quo. For example, Solak and Çakır (2014) assessed 137 Turkish PTs' TPACK competencies at the end of four-year ELT teacher education program with respect to gender and academic achievement. Based on TPACK Competency Survey (Archambault and Crippen, 2009), the results suggested that while males' TK was higher than females, females were better than males in PK. Meanwhile, no significant difference was found between TPACK mean and academic achievement.

Similarly, Oz (2015) examined 76 pre-service EFL teachers' TPACK at the end of four-year teacher education program in Turkey. Based on TPACK Scale (Schmidt et al., 2009) with some open-ended questions, the findings revealed a highly developed knowledge of TPACK. Qualitative data analysis revealed that faculty members used more TPACK in the courses than cooperating teachers at practicum schools. Oz suggested that in learning and teaching quality could be improved through integrating TPACK into the existing teacher education curriculum and providing technologically rich environment for language learners.

Kwangsawad (2016) examined senior 33 EFL PTs' TPACK through TPACK Survey (Schmidt et al., 2009), lesson plan assessments and classroom observations of actual practice in Thailand. The results showed high scores for all domains. The highest mean score was for TPK, and the lowest for CK. Moreover, analysis of lesson plan documents indicated a well-presented theoretical development of the participants' technology integration skills.

The actual practice was closer to self-report survey data to assessing teachers' ability to apply their TPACK than the lesson plans. All the domains of TPACK, except TPK, reported higher scores in the EFL PTs' actual practices as compared to their self-report.

Kwangsawad (2016) concluded that the program was confirmed as being successful in training teachers with

highly developed TPACK knowledge that provides them with skills and knowledge of technology to be implemented in their practical teaching.

Studies on TPACK with pre-service English language teachers in teacher certificate program

Turkish Council of Higher Education has initiated a teacher certification program to provide an opportunity for graduates of certain faculties to qualify as teachers (Ozoglu, 2010). Thus, measuring the occupational readiness level of this group joining the teacher candidates is crucial. However, to the best of the researcher's knowledge, there is no study focusing on TPACK of English language teacher-candidates attending to teacher certificate program. In Turkey, there are two studies focusing on TPACK of teacher-candidates.

Delen et al. (2015) conducted a mixed-method study for teacher certificate program to measure whether 175 mathematics teacher candidates' beliefs regarding to their abilities to use educational technologies show differences according to their age, gender, and experience in Turkey. After TPACK survey (Bulut, 2012) was administered, candidates were asked to create sample activities and to describe what they knew about Turkey's technology initiative (named as FATIH Project).

Based on quantitative results, teacher candidates appeared to think they were ready to teach and use technology in their classrooms; however, the qualitative results indicated the situation was contrary in terms of the PCK they possess. More than half of the candidates (54%) could not create activity examples using technology in mathematics education and half of the participants could not describe FATIH project.

The other study evaluated teacher certificate program in Muğla Sıtkı Koçman University, Turkey based on the opinions of 36 teacher-candidates who graduated from the departments of Turkish Language and Literature, German Language, Philosophy, Mathematics, History, and Physics (Aykaç et al., 2015). According to focus group interviews, the most significant problems experienced by the teacher-candidates throughout the program were that a lot of information was tried to be given in a short time, and the classrooms are very crowded.

Moreover, as traditional lecturing was adopted as the primary means of instruction and there were only projectors used in the teaching at the education faculty, though there were smart boards at practicum schools, teacher-candidates stated that they experienced some difficulties in the use of technological tools such as smart boards in their classes. Also, they think that no matter how much technology the school has, if the teachers are indifferent to these technologies, they cannot be effective as means of instruction.

Studies on TPACK with in-service English language teachers

As in-service teachers and domain specific TPACK, precisely language, are the least searched domain in TPACK literature (Wu, 2013; Wu and Wang, 2015), limited research conducted either to evaluate the status quo or to report the results of training programs are summarized below.

Exploratory studies of in-service English language teachers' performances on the seven TPACK construct components were conducted (Wetzel and Marshall, 2011; Abera, 2014; Yuksel and Yasin, 2014; Wu and Wang, 2015). Wetzel and Marshall (2011) exploratory qualitative case study investigated ways a sixth grade middle school English language teacher show evidence of behaviours that fit the TPACK framework in the classroom. The data gathered through classroom observations and interviews showed that a foundation for the use of technology in content (language arts) and pedagogy (project-based learning) was provided by the teacher. That is, the teacher demonstrated TPK through both well-planned classroom management practices and the interplay between components of the framework.

Additionally, Abera (2014) examined the ELT program and EFL teachers' TPACK applications in Ethiopia. The results of the structured questionnaire (Schmidt et al., 2009), 10 interviews, 20 classroom observations, and documents indicated that the teacher education program failed to educate connections between technology, content, and pedagogy.

ELF teachers' TPACK was also found to be low. That is, teachers applied their PCK while teaching English language through televised instruction like the conventional instruction. Another study examined 124 EFL teachers' TPACK competency levels in terms of gender, length of service, and workplace in Turkey (Yuksel and Yasin, 2014).

The results of TPACK-Deep survey (Yurdakul et al., 2011) indicated that the teachers had average competency levels in TPACK and there wasn't any significance between the teachers' TPACK and their gender, experience, workplace, the time they have spent using a computer or the Internet. However, participants with five years or less of teaching experience and those working in private schools had higher scores in TPACK than the other groups. Lastly, Wu and Wang (2015) explored TPACK of 22 in-service EFL teachers' at elementary schools in Taiwan.

The results of a quantitative self-reported questionnaire, interviews and classroom observations indicated that the EFL teachers must be confident in their PK and they need more TK to further develop their TPACK. The participants' TPACK focused much on motivating students, providing language input or displaying information rather than using technology for creating opportunities for students to use English

language meaningfully and authentically. That is, components such as meaningfulness, creativity, autonomy, and higher order thinking skills (analysing, evaluating, and creating) were less frequently observed in the classrooms than lower order skills.

Effectiveness of TPACK training courses for in-service teachers was also examined. In a mixed-method study, Liu and Kleinsasser (2015) examined six EFL vocational high school teachers' TPACK and perceived computer self-efficacy from their use of technology while participating in online project-based EFL instruction. Data analysis revealed after receiving CALL training courses five of the teachers' TPK, TCK, TPACK ratings and computer self-efficacy items scores in the survey increased.

In the interviews and posted messages, all the participants reported the benefits and their professional growth for joining this in-service program. Also, they stated that they were confident about improving students' learning motivation through Internet technology. However, these teachers' perceived computer self-efficacy as mainly relevant to their TK development rather than TPACK as a whole. The other study investigated the impact of a training course on a secondary school English teacher's lessons (Carbová and Betáková, 2013). This qualitative study based on a TPACK questionnaire, interviews and 16 lesson observations, indicated that during the course the participant was becoming more and more aware of the differences in practicing skills and sub-skills by means of traditional technologies and the interactive whiteboard. Moreover, the study showed that although the teacher started using some new technologies and was capable of developing further on her own, these changes refer mostly to TK but her PCK took this into account and took steps to avoid it in the next training.

To the researchers' knowledge, there is one study comparing in-service and PTs' TPACK; however, the study included participants from different majors. Dong et al. (2015) examined 390 PTs and 394 in-service teachers' TPACK, their beliefs about constructivist oriented teaching (CB) and design disposition (DD) in China. Participants majored in Chinese Language, English Language, History, Education, Math, and Physics. Based on the TPACK constructs (Chai et al., 2013a) and constructivism belief (Chai et al., 2013b) surveys, CB and DD were found between PTs and in-service teachers significant differences in the TPACK factors.

PTs' TPACK profile shows that they perceived themselves strongest in terms of their TPK and weakest in terms of their CK. All other factors of TPACK fall within these range, indicating that the PTs didn't possess high efficacy about TPACK knowledge. In-service teachers profile indicated that they were at least with some confidence in their TPACK but there was a need to develop the teachers' TPACK, especially through professional development activities, directly engaging them in designing ICT integrated lessons. With regards to the beliefs measured, both PTs and the in-service teachers are inclined toward constructivist beliefs, with the in-service teachers expressing stronger inclinations toward CB.

METHODOLOGY

Theoretical framework

The theoretical background of this study was TPACK framework (Mishra and Koehler, 2006) since it has been widely used as a theoretical basis for structuring ICT curriculum in teacher education programs (Angeli and Valanides, 2009; Chai et al., 2011; Cetin-Berber and Erdem, 2015).

Context of the study and participants

The study was conducted in the ELT department of a state university located at the southern part of Turkey, in addition to the primary and secondary schools located in the same city. In selecting the participants, convenience sampling technique was employed, which is a common non-probability sampling technique in L2 research where an important criterion of sample selection is the convenience to and resources of the researcher (Dörnyei, 2007).

PTs attending to senior level in a four-year ELT program at Education Faculty (N= 53), English language teacher-candidates enrolled in the Teacher Certificate Program (N= 39), and in-service English language teachers working at primary and secondary schools (N=103) participated voluntarily in the study. ELT program and Certification program were offered by the same department.

The four-year ELT program consists of professional courses including methodological and pedagogical approaches to EFL teaching as well as courses raising students' awareness on the English language system, and first and second language acquisition. Additionally, the program organizes practicum in selected schools. In the program via other content and subject-specific methods courses PTs are supposed to develop TPACK skills. These courses and the order they will be offered are decided by Higher Education Council.

Hence, the standard curriculum is employed around the country. However, to what extend the technology will be integrated into courses varies among universities, depending on instructors' TPACK. Related to technology, PTs receive three courses: Computer (I and II) and Instructional technologies and material design course (ITMD). The Computer course, which is a standalone technology course received in the freshman year, focuses on the development of basic computer skills such as learning how to use office programs and selected software and how to use the Internet effectively. ITMD course, offered by Department of Educational Sciences, enables PTs to design handmade teaching materials, websites and e-portfolios. As the requirement of School Experience I/II courses, in the senior year PTs are placed to the schools organized by the department to do their practicum. While School Experience I course requires PTs to do structured observation tasks followed by discussions related to theoretical and experiential considerations in EFL, School Experience II course, offered in the second semester, includes observation and supervision of carefully prepared student teaching followed by critical appraisal. PTs are expected to do both micro and macro-teachings during their practicum. During practicum courses PTs are expected to observe and experience technology use in collaborating schools.

Table 1. Number of items and possible scores for each TPACK domains of the scale.

Subscale	Number of items	Possible minimum-maximum scores
TK	7	7-35
CK-Literacy	3	3-15
PK	7	7-35
PCK	4	4-20
TCK	4	4-20
TPK	5	5-25
TPACK	8	8-40
Model of faculty	8	8-40
Model of TPACK	3	3-12

The Pedagogical Formation program since 2010, as a teacher certification program, has been offered to meet the need of teachers in Turkey. The path for teacher-candidates is to obtain a Bachelor's degree and then complete a pedagogical formation program. The program lasts two semesters -14 weeks each- and includes 10 courses with 21 credits in theory and 10 credits in practical education courses (MoNE, 2011).

The courses are: Introduction to educational sciences, Principles and methods of teaching, Instructional technologies and material design, Educational psychology, Teaching methods, Classroom management, Measurement and evaluation, and Teaching practice. Teaching practice is limited to one semester and it covers School Experience II. In this study, participants majored in Linguistics, English Language and Literature, Translation and Interpreting, and American Culture and Literature. These Bachelor programs do not include any technology courses in their curriculum. Therefore, teacher-candidates received only one technology course, ITMD, during the teacher certificate program.

In-service English language teachers were teaching at primary and secondary public schools in the same city that the university was located. Participants were graduated from either Education Faculties or Teacher Certificate program. Through FATIH project, as a requirement, the teachers have received technology training organized by MoNE in Turkey. According to the in-service teachers, these training sessions were usually in a seminar format rather than practice-based one.

Data collection and analysis

Attempting to accurately portray the TPACK of the EFL teachers, this mixed-method study investigated their self-perceived performance on the seven TPACK components with a quantitative instrument (Schmidt et al., 2009), and explored their synthesized TPACK by means of open-ended questions at the end of the survey and class observations conducted both in the ELT department and practicum schools.

TPACK survey, a 5-point Likert confidence scale, included multiple items related to each of the seven types of knowledge represented in the TPACK construct (Table 1). The survey was administered to participants at the end of the spring semester of 2014. The statistical data was analysed through Games -Howell post hoc. As the participants were in ELT, only Literacy subcategory of Content Knowledge (CK) domain in the survey was included in the analysis.

The qualitative data from the open-ended items that investigated the respondents' perceptions of how the TPACK was modelled by schoolteachers, faculty and participants themselves was analysed through Phenomenological Data Analysis (Moustakas, 1994). The first step is Horizonalization in which every quote relevant to the experience was listed. Then, for the Reduction and Elimination step, repeated, overlapping and irrelevant statements to the topic were deleted.

The related invariant constituents of experience were clustered into a thematic label. These clustered and labeled constituents composed the cores themes of the experience. For final Identification of the Invariant Constituents and Themes by Application, the researcher checked the invariant constituents and themes against the complete record of participants (Table 3). Using the relevant, validated invariant constituents and themes, the researcher constructed an Individual Textural Description for each participant of the experience including verbatim examples from the qualitative data. Based on the Individual Textural Description and Imaginative Variation an Individual Structural Description for each participant was constructed. Then, a Textural-Structural Description for each participant of the meanings and essences of the experience, incorporating the invariant constituents and themes, was constructed. From here, the researcher developed a Composite Description of the meanings and essences of the experience that represent the group as a whole.

At the beginning of this study, the researcher's role was an insider (Punch, 1998), who was a full participant in activity, program, or phenomenon because the researcher was an instructor at the department. Then, starting from the data collection and forward, the researcher's role became an outsider (Punch, 1998), more of an objective viewer to reflect only the participants' perspectives on the phenomenon through phenomenological analysis.

To increase credibility, codes and themes emerged from the data were checked by a colleague. Inter-rater reliability was assessed using Miles and Huberman (1994) formula and found to be 0.90. Moreover, the researcher observed 30 lessons the participants taught, 40 min each, and took field notes during the observations and then organized them accordingly. The field notes of classroom observations were also used to triangulate the data gathered through an open-ended question and the TPACK self-confidence scale.

Regarding the TPACK survey, two limitations were reported in related literature. Firstly, this instrument might be a context-dependent as it was specifically designed for PTs majoring in elementary or early childhood education with a focus on four content areas of social studies, mathematics, science, and literacy. However, this context limitation doesn't apply in this present study because a standard curriculum, which doesn't allow any specialization to teach at different levels, is administered in a four-year ELT program. That is, pre-service English language teachers can teach English at all levels after graduation. Secondly, the scale was designed as a self-assessment tool; for that reason, it may be

prone to student under- or over-reporting (Hofer and Grandgenett, 2012).

According to any self-reporting measure, the ability of the instrument to accurately represent knowledge in the TPACK domains is limited by the ability of the respondents to assess their knowledge and respond appropriately to the survey items. However, when it is used along with additional data, the survey has been demonstrated to be valid and reliable and provides an efficient tool for research and evaluation relating to TPACK (Abbitt, 2011). This limitation also doesn't apply in this present study because the survey scale was used with other data collection methods such as the qualitative part that includes open-ended questions and classroom observations for data triangulation.

Ethical issues

Great care was taken to obtain all data in accordance with the guidelines of ethical conduct. As the researcher was also the lecturer of the course, in order to maintain confidentiality participants used pseudonyms while filling out the instruments. Besides, the data were analysed after the participants graduated from the program. The same principle was applied to the school teachers who participated in the study. Moreover, all participants contributed to the study voluntarily.

FINDINGS

Is there any difference among PTs', teacher-candidates' at a certificate program and in-service EFL teachers' self-perceptions of their TPACK?

Games-Howell test results showed that in all other TPACK construct components as well as Modelling Faculty and Modelling TPACK, except TPACK component, there was a significant difference among the perceptions of PTs', teacher-candidates and in-service EFL teachers (Table 2).

In TK ($F(2, 192) = 7.002$, $p = 0.001$), TPK ($F(2, 192) = 12.58$, $p = 0.000$) and PK ($F(2, 192) = 3.67$, $p = 0.027$) it is found that self-efficacy of in service teachers ($M = 19.40$, $SD = 4.07$; $M = 19.40$, $SD = 4.07$; $M = 28.37$, $SD = 3.54$) was significantly lower than teacher-candidates ($M = 22.28$, $SD = 2.08$; $M = 22.28$, $SD = 2.08$; $M = 29.74$, $SD = 2.97$) and PTs ($M = 21.47$, $SD = 2.83$; $M = 21.47$, $SD = 2.83$; $M = 29.57$, $SD = 2.96$). However, PTs did not significantly differ from teacher-candidates in the certificate program.

In addition, in terms of CK- Literacy ($F(2, 192) = 12.07$, $p = 0.000$), teacher-candidates ($M = 13.46$, $SD = 1.53$) had significantly higher self-efficacy than PTs ($M = 11.92$, $SD = 2.59$) and in-service teachers ($M = 11.53$, $SD = 1.97$). However, PTs did not significantly differ from in-service teachers (Figure 1).

With respect to PCK [$F(2, 192) = 9.862$, $p = 0.000$] and TCK [$F(2, 192) = 23.071$, $p = 0.000$] in-service teachers ($M = 16.07$, $SD = 2.34$; $M = 16.04$, $SD = 2.30$) had significantly higher self-efficacy than PTs ($M = 14.16$, $SD = 3.38$; $M = 13.35$, $SD = 3.15$) and teacher-candidates ($M = 14.56$, $SD = 2.85$; $M = 13.39$, $SD = 2.24$). However, PTs did not significantly differ from teacher candidates in the certificate program. Additionally, considering TPACK component, there was no significant difference [$F(2, 192) = 2.71$, $p = 0.069$] among PTs', teacher-candidates and in-service ELF teachers' self-efficacy of TPACK.

In Model of Faculty and Model of TPACK there was a significant difference [$F(2, 192) = 12.47$, $p = 0.000$; $F(2, 192) = 3.89$, $p = 0.022$] among PTs', teacher-candidates and in-service ELF teachers' self-efficacy modelling. In Model Faculty, in-service teachers ($M = 30.10$, $SD = 4.75$) had significantly higher self-efficacy than PTs ($M = 26.16$, $SD = 5.76$) and teacher-candidates ($M = 27.23$, $SD = 4.35$). However, PTs did not significantly differ from teacher-candidates. On the other hand, in Model TPACK, teacher-candidates ($M = 8.20$, $SD = 2.12$) and PTs ($M = 7.43$, $SD = 2.17$) had significantly higher self-efficacy than in-service teachers ($M = 7.07$, $SD = 2.14$).

From participants' perspective, what does TPACK integrated ELT mean?

Three open-ended questions were placed at the end of the survey (Schmidt et al., 2009). Through these questions, participants were asked to describe a specific episode where their instructors at their department/training sessions, practicum teachers and the participants themselves effectively demonstrated or modelled combining content, technologies and teaching approaches in a classroom lesson.

Also, in these episodes participants were expected to provide details, such as what content was being taught, what technology was used, and what teaching approach(es) was implemented. Additionally, field notes of classroom observations were gathered and organized for additional data. Through Phenomenological data analysis, reflecting essences of the experience from PTs enrolled in a four-year ELT program, teacher-candidates attending ELT certificate programs and in-service ELT teachers' perspectives, findings regarding this research question are presented through the subheadings of Technology as an efficiency aid in conventional instruction, Technology as TK and Technology as transforming teaching/learning process (Table 3).

In-service teachers: 'Technology as an efficiency aid in conventional instruction'

Firstly, not only several in-service teachers but also many pre-service and certificate program participants stated that using technology in lessons at primary and secondary schools were very limited. Besides reporting that, some PTs explained the reasons for it as:

"Although it is necessary to use technology in public schools, many teachers lack of knowledge about how to

Table 2. TPACK perceptions of PTs, teacher-candidates and in-service teachers of EFL.

Variable		SS	df	MS	F	*p*
	Between groups	344.061	2	172.030	7.002	0.001
TK	Within groups	4717.352	192	24.570	-	-
	Total	5061.413	194	-	-	-
	Between groups	105.370	2	52.685	12.076	0.000
CK-Literacy	Within groups	837.629	192	4.363	-	-
	Total	942.999	194	-	-	-
	Between groups	79.511	2	39.755	3.672	0.027
PK	Within groups	2078.915	192	10.828	-	-
	Total	2158.426	194	-	-	-
	Between groups	150.838	2	75.419	9.862	0.000
PCK	Within groups	1468.261	192	7.647	-	-
	Total	1619.099	194	-	-	-
	Between groups	300.564	2	150.282	23.071	0.000
TCK	Within groups	1250.689	192	6.514	-	-
	Total	1551.254	194	-	-	-
	Between groups	298.175	2	149.088	12.589	0.000
TPK	Within groups	2273.867	192	11.843	-	-
	Total	2572.042	194	-	-	-
	Between groups	103.742	2	51.871	2.715	0.069
TPACK	Within groups	3668.584	192	19.107	-	-
	Total	3772.327	194	-	-	-
	Between groups	617.312	2	308.656	12.476	0.000
Model faculty	Within groups	4750.073	192	24.740	-	-
	Total	5367.384	194	-	-	-
	Between groups	36.069	2	18.035	3.896	0.022
Model TPACK	Within groups	888.709	192	4.629	-	-
	Total	924.778	194	-	-	-

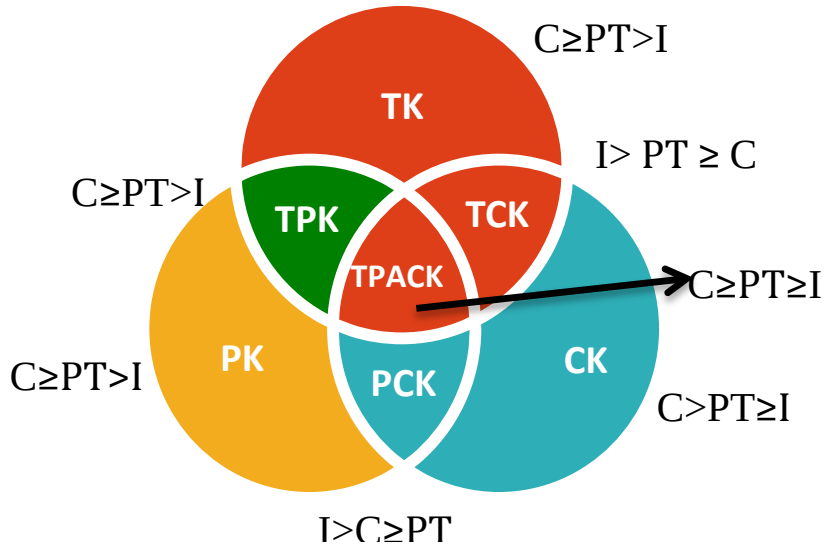

Figure 1. The pattern showing TPACK perceptions of PT, certificate and in-service teachers.

Table 3. Themes emerged from open-ended questions of the survey.

Levels	Themes
In-service	**Technology as efficiency aids in conventional instruction**
	• No use
	○ Lack of TK
	▪ In-service training in a seminar format
	○ Devises not working
	○ MoNE's official *mandate* of Course book use
	○ DynEd not properly used
	• Technology as efficiency aids
	○ Show picture
	○ Listen from PC instead of tape recorder
	• Look up a new word and practice pronunciation
Certificate	**Technology as Technological Knowledge (TK)**
	• TK and name of devices
	○ Major specific software
	▪ Content via PP, word
	▪ N-gram, Linguistic and simultaneous translation software
	○ Vague description of ITMD
	• Teach how they've been taught
Pre-service	**Technology as transforming teaching/learning process**
	• Integrated / infusion
	○ Skill based examples
	▪ L, videos, songs, e-stories
	▪ S= movie
	▪ R=online newspapers, stories
	▪ W= story completion
	○ Technology based
	▪ Body parts: video PP, song
	▪ Global warming: Pictures, Smartboard,
	○ Attract students' attention

use it. They generally think that crowded classes hinder using technology in class. Also, they don't have a tendency to use technology. They only use course books. Course books are very important."

Also, in-service teachers admitted,

"Indeed, I didn't have a chance to prepare such a combined lesson in teaching experiences. First of all I can say that I haven't got enough knowledge to use technology. Secondly, the devices in the schools are not enough or they don't work well."

One of the in-service teachers clarified the situation:

"Our main problem is the resource books for learning English. The books chosen for the students are prepared by Turks, I mean the using of grammar or the chosen listening or reading or writing activities don't have an order like the books prepared by publishers in UK and US. As you know it is forbidden for teachers to suggest or make the students buy resource books except the ones, which are given by MoNE. 4 h a week also isn't enough for young learners to learn English. In Turkey, we (the teachers) only can teach English grammar, not more than this!"

Few participants also reported that in-service training sessions on technology conducted by MoNE in line with the FATIH project were mainly based on seminar format rather than hands-on activities and practices. Regarding technology integration modelling in practicum schools, few participants mentioned DynED, an English learning program that MoNE has mandated all schools to practice English for at least two-hours per week in labs. About this practice, a PT noted:

"My teacher in the practicum school don't use any kind of instructional technology. They only let the students play (not use) with DynEd for an hour. It is not useful!"

Additionally, during the classroom observations conducted some of in-service teachers complained about the inconvenience of technological devices especially for

speaking in DynEd. These quotations indicate that even the mandatory use of technology in ELT classes is not effective.

After reporting the limited use of technology due to several reasons, for the cases of technology integration into lessons, it is observed by the researcher and stated by participants that at schools technology were often used to assist school teachers to do their job easier rather than to transform learning and teaching practice. When in-service teachers were asked to describe a specific episode where they effectively demonstrated combining content, technologies, and teaching approaches in a classroom lesson, they reported,

"In previous week I taught the simple past tense. In the lesson I used a projector in order to demonstrate historical events. By historical pictures, the lesson was more easily understood."

Another teacher reported similar use:

"In my lessons about 'jobs' or 'animals' I mostly use computers in these lessons to show pictures or animations"

Other example is that:

"I used a song to show the use of present perfect. I projected a popular song's video clip. First, the students listened to the song & watched the clip. Then I gave them the lyrics of the song but with blanks. I had left blanks for the verbs that used in that song. SS tried to fill in the blanks. I let the students to watch & listen to the song for three times."

Furthermore, PTs and teacher-candidates stated that practicum teachers use PowerPoint to teach grammar points and do exercises, a laptop to do listening and fill-in the blanks activities, and a projector to watch a movie. A teacher-candidate gave an example:

"The teacher used laptop projector and audio speakers in order to show some animals' pictures and let students hear their sounds. In this way he could teach their names to the students easily".

Only one in-service teacher gave a different example:

"I use the computers at my school for educational activities. The students can look up new words and I showed them how to use Internet to learn English, especially how to pronounce new words."

During the classroom observations, it was observed that instead of using flashcards, teachers were using PowerPoint slide with pictures, they replaced OHP with PowerPoint to reflect the content knowledge or multiple choice test questions in a written format on the wall and instead of carrying a type, they use a laptop for listening activities without providing any contextual clue about the listening material such as a pictures. That is using technology as efficiency aids in replacement of type, flashcards, OHP, etc, with laptop and PowerPoint software. However, they could have used PowerPoint features such as inserting a video, a listening material, using animation features, giving hyperlinks to other documents or websites etc. and making it even more interactive way that each student in class can contribute to it through connecting the smartboard via their computers. That can be considered as using technology to transform teaching and learning processes, rather than efficiency aid.

Teacher-candidates in the certificate program: 'Technology as TK'

As previous experiences, participants in the certificate program stated that their faculty members in the Bachelor program they graduated from used PowerPoint and word documents. Also, they stated that in Simultaneous interpreting, Computer Assisted Translation Studies and Corpus linguistics courses were useful to them for the use of technology. The instructors provided them technological tools for simultaneous interpretation in booth and linguistics related software programs, such as N-grams. Participants, in relation to teacher certificate program courses, stated

"For teaching approaches, an instructor effectively demonstrated the topic with the help of PowerPoint slide shows by combining content, technology, and teaching approaches" and specifically for ITMD course the participants stated vaguely "during the course, my use of internet and pc has increased".

When the teacher-candidates were asked to describe a specific episode where they effectively demonstrated combining content, technologies, and teaching approaches in a classroom lesson, they answered that question through writing a list of technological devices: computer, audio systems, projectors and software (PowerPoint, online dictionaries). Some of them explained the reason for it as

"I had opportunity to teach a lesson but I didn't make use of technology because I didn't have time for planning such a lesson" and "I didn't use technology for lessons. I didn't know how to use technology as a teaching approach. I taught the topics as my teachers did".

Technology as transforming teaching/learning process'

Compared to in-service teachers and teacher-candidates

in the certificate program, while describing their professors' modelling content, technologies and teaching approaches, pre-service ELT program participants reported technological devices the least and gave more details on the application of technology in their courses and specifically on language skills:

"The technological devices are usually used in the lessons, especially for teaching skills. The videos, songs or e-stories are used for listening skills. For speaking skills, a film is watched and talked about. For writing skills, a story is shown on the computer and the students write the end of the story. Newspapers or stories can be read online for reading skills."

Unlike in-service teachers and teacher-candidates in the certificate program, PTs at ELT program provided more elaborate descriptions of episodes that they used technology to teach English. For instance, one of the participants explained the use of technology in his/her teaching practice as:

"In teaching the topic 'Global Warming' I used projector in order to show some pictures on it and did some activities. I used smart-board to do some activities about Simple Present Tense to attract students' attention." Another one gave this example: "While I was teaching "body parts", I used communicative language teaching. I used videos, PowerPoint, and music; while teaching the body parts."

Those examples show that PTs use technology to transform the teaching and learning process for learners.

DISCUSSION

Findings of quantitative data analysis revealed that except for TPACK subdomain, in other components, there was a significant difference among PTs' attending to senior level in ELT program, teacher-candidates enrolled in ELT teacher-certificate program, and in-service ELT teachers' self-perceptions of TPACK. More specifically, in TK, TPK, PK, and CK components teacher-candidates and PTs had significantly higher self-efficacy than in-service teachers.

In TK, TPK, and PK teacher-candidates was not significantly different from PTs. In CK- Literacy, also teacher-candidates had significantly higher self-efficacy than PTs and in-service teachers; however, PTs did not significantly differ from in-service teachers. With respect to PCK and TCK, in-service teachers had significantly higher self-efficacy than PTs and teacher-candidates. However, PTs did not significantly differ from teacher-candidates. Similar to previous studies, in-service teachers' self-perception of TK (Wu and Wang, 2015) and TPK (Dong et al 2015) was lower than PTs and teacher-candidates.

Additionally, there was a significant difference in Model Faculty and Model TPACK. In Model Faculty, in-service teachers had significantly higher self-efficacy than PTs and teacher-candidates. However, PTs did not significantly differ from teacher-candidates. On the other hand, in Model TPACK, teacher-candidates and PTs had significantly higher self-efficacy than in-service teachers. Even though in-service teachers' participated in training sessions of nation-wide technology integration project, FATIH, their self-perceptions of TPACK modelling of instructors was lower than PT and teacher-candidates who haven't received such training. It might be due to the structure of the training program, lecturing, as reported by the participants. Therefore, in-service teachers need to further develop their TPACK, especially through directly engaging them in designing technology-integrated lessons (Kurt et al., 2014; Dong et al., 2015).

As Yan and Yuhang (2012) clarified that no matter how much the teacher knows about ICT, the knowledge he knows cannot be automatically transformed into ability in utilizing it in teaching. This might be true for PTs because teacher-candidates and in-service teachers, who received none or limited ICT training, outperformed PTs in all TPACK subdomains.

Contrary to quantitative results, the qualitative data analysis showed that the opposite case is true. Each individual TPACK assessment has its limitations. For example, self-report surveys may be prone to participants under- or over-reporting (Hofer and Grandgenett, 2012); and therefore, may not provide enough detail to examine TPACK. As a result, it is advised that TPACK should be examined in various ways to be truly useful for program refinement (Koehler and Mishra, 2008; Harris et al, 2010; Abbitt, 2011; Kwangsawad, 2016).

Parallel to this, in this present study, the open-ended questions of the survey and classroom observations showed that PTs' TPACK knowledge and applications were more advanced than teacher-candidates and in-service teachers contrary to the quantitative findings. However, similar to Abera (2014) findings, even for PTs', all participants' TPACK was also found to be low. That is, participants applied their PCK while teaching English language through technology like the conventional instruction with teacher-centred focus (Yan and Yuhang, 2012).

Although teacher-candidates' self-perceived TPACK mean scores were the highest, their statements showed that they considered technology as only TK rather than TPACK as a whole, similar to previous studies (Carbová and Betáková, 2013; Aykaç et al, 2015; Liu and Kleinsasser, 2015). That is, based on quantitative results, teacher candidates appeared to think they were ready to teach and use technology in their classrooms; however, qualitative results indicated the situation was contrary in terms of TPACK they possess, similar to Delen et al. (2015). Instead of writing technology integration episodes, teacher-candidates wrote names of technological

devices and applications they were introduced to and used, especially related to their majors rather than teaching English. In that, knowing how to use technology and using it for individual purposes all the time does not mean that teachers can integrate technology efficiently into their instruction to improve teaching and learning (Kessler and Plakans, 2008; O'Bannon, 2011). Also, in line with existing literature, teachers who improve their technology literacy do not necessarily enhance TPK or TCK unless simultaneously revisiting their PK or CK (Doering et al., 2009; Jang, 2010; Benson and Ward, 2013; Liu and Kleinsasser, 2015).

Hence for the participants, the link between TK, CK and PK (TPACK) hasn't been established and though TK is important, it is not an indicator of making use of technology in instruction to enhance teaching and learning.

Similar to previous studies, all participants declared that practicum-schools and teachers were very limited to provide an example of technology infusion in English lessons (Aykac et al., 2015; Oz, 2015).

Moreover similar to previous studies (Ertmer, 2005; West and Graham, 2007; Goktas et al., 2008; Sahin, 2011; Tondeur et al., 2012; Abera, 2014; Cetin-Berber and Erdem, 2015; Oz, 2015), in-service teachers' TPACK was found to be low despite technology training, as mentioned. That is, teachers applied PCK while teaching English language through technology like the conventional instruction (Kurt and Ciftci, 2012; Abera, 2014); for instance, projector and PowerPoint were used for only showing some pictures and delivering content similar to previous studies (Gulbahar, 2007; Yildirim, 2007; Goktas et al., 2009; Cakir, 2012; Unal and Ozturk, 2012; Kurt, 2013). This is to make their job easier and to motivate the students (Fisher et al., 2012). Few teachers used DynEd software as it was mandatory in English lessons at schools and the majority of the teachers used technology as efficiency aids rather than as a way of transforming learning and teaching practice. Different from other studies, in-service teachers expressed that they weren't allowed to use any material except the course books and their pdf versions on smart-board, which might restrict the technology use in lessons.

PTs used more integrated approach of TPACK domains compared to teacher-candidates and in-service teachers. Statements of PTs highlighted a more balanced TPACK in the episodes of not only Faculty members', but also their own integration of technology into lessons. PTs' descriptions included more to the point objectives of technology integrated teaching (Ersanli, 2016) and observations of lessons showed a well-presented theoretical development of the participants' technology integration skills similar to Kwangsawad (2016) study.

Hence, participants were more enabled to combine CK, PK, and TK. On the other hand, the difference between 'knowing' and 'doing' was also demonstrated in PTs.

Although PTs were confident about different knowledge domains, their implementations were limited. Similarly to the results of the previous study (So and Kim, 2009), knowing about technology or the content did not produce effective technology use in the given context. Although PTs may have TPACK, TPACK development from interactions among these components was problematic to a certain degree (Marino et al., 2009; Sahin, 2011; Tondeur et al., 2012; Cetin-Berber and Erdem, 2015).

Conclusion

This exploratory study illustrates the TPACK of pre-service English language teachers, teacher candidates attending to ELT certificate program and in-service English Language teachers who have been working in primary and secondary public schools. The current paper contributes to the field of teacher education and training of TPACK in three major aspects.

Firstly, this study compares PTs of ELT, teacher-candidates attending to teacher certificate program with ELT focus and in-service teachers of ELT through self-perceived TPACK survey and classroom observations. None of the existing studies have attempted to do such comparison in ELT field before. Therefore, current study provides a holistic picture of TPACK integration of ELT by different type of teachers.

Secondly, based on the picture, this study suggests changes in teacher education and teacher-training programs. Despite increases in computer access and technology training, technology was under used by prospective and in-service teachers to support the various kinds of instruction. Teacher-candidates' high TK confidence does not necessarily equal innovative and integrated technology and subject matter use.

Additionally, in-service teachers' use of technology was mostly for enhancing rather than transforming teaching and learning process. Integrating technology into classroom instruction means more than teaching basic computer skills and software programs in a separate computer class. Effective technology integration should happen across the curriculum in ways that research shows deepen and enhance the learning process.

Besides, teachers' reflections on how technology is used in a language class should be highlighted in TPACK courses. Other ways to develop TPACK for teachers are also presented, such as portfolios, peer-assessment, holding meetings, etc. Mishra et al. (2009) explained that one reason new technologies have failed to transform education is because "most innovations have focused inordinately on the technology rather than more fundamental issues of how to approach teaching subject matter with these technologies".

Lastly, the findings provide discerning evidence that teacher-candidates have perceived self-efficacy as mainly relevant to their TK rather than TPACK as a whole. Additionally, they are the ones who had highest

self-perceived TPACK in many sub-domains, without taking any technology related courses. Therefore, special attention should be given to this program, and practicum duration should be extended.

IMPLICATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

As there is something special and different about teaching with technology than without technology, it is necessary to educate the prospective and in-service teachers the connections between technology, content and pedagogy (Abera, 2014), and how to use technology to create real interactions, increase cooperation, and promote creativity among students (Wu and Wang, 2015).

Therefore, educators of teacher's technology-enhanced learning environments should be provided to prospective teachers to engage in as students, and help them experience TPACK on their own (Oz, 2015). Meanwhile, such modelling should both demonstrate good classroom examples, and it should also be expanded to include 'cognitive modelling' revealing the logic behind the teacher educator's actions (Wu and Wang, 2015).

The findings of this study strongly suggest that developing PCK and TCK is an important factor in overall technology integration; teachers must prioritize this before integrating technology. Besides, the development must be supported with actual teaching experience and prospective teachers should be directed to reflect on their TPACK concerning the use of technology and the incorporation of higher-order thinking skills (Ottenbreit-Leftwich and Brush, 2011; Bang and Luft, 2013; Wu and Wang, 2015), with ELT focus.

Furthermore, similar to previous studies (Niess, 2006; Pamuk, 2012), this study indicate that, lack of or limited direct teaching experience limit prospective teachers in effectively using or integrating technology into teaching (So and Kim, 2009; Koh et al., 2010). Therefore, as supported by previous study (Aykaç et al., 2015) for teacher-candidates in the certificate program, the period of practicum should be extended to cover one or two semesters.

Despite FATIH project, as the participants reported, technology integration in schools wasn't at expected level. There might be several reasons for this result, such as trainings are conducted often as seminars, short term and off-site, which is beyond the scope of this study. However, what emerged from the data was that continuous in-service training should be designed among faculty members, school-teachers, technology specialists and PTs.

Studies (Margerum-Leys and Marx, 2002) investigating the exchange of knowledge of technology between student/mentor pairs prove that mentor teachers often learned about technology from student teachers, and then the mentor teacher would incorporate this knowledge with pedagogical knowledge to inform classroom practices. Faculty members might contribute to TPACK integration process for both the pre-service and in-service teachers. Moreover, it is apparent that much attention has been devoted to motivating learners when integrating technology in English instruction, but less has been directed to how technology can help in using English in a meaningful context with an authentic audience.

Therefore, in-service teachers' perception of technology should be changed from using technology as a facilitating tool and an innovative attention-getter to using it to transform teaching and learning process providing more opportunities for students to use the language meaningfully, creatively, and autonomously. For that purpose, "individual TPACK profiles" promoting reflective processes (Benson and Ward, 2013) might be used as professional training tools. Teachers might keep track of the degree and manner "in which their individual knowledge areas overlap and integrate" via individual profiles when coming across different processes of developing TPK or TCK among peers in an in-service program.

Also, they might devote professional development time to improving their instruction and their assessments with technology (Boche, 2014). During that time, organized in a collaborative learning environment, they might observe one another (teachers, faculty members and PTs) and then discuss their observations (Ansari, 2015). Meanwhile, teacher educators could emphesize the positive experiences teachers have in the process of transition to new modes of teaching with technology (Wong and Benson, 2006), which might help teachers to re-conceptualize their instructional beliefs and fine-tune their design of future technology-enhanced learning practices (Rienties et al., 2013; Liu and Kleinsasser, 2015). If the teachers were explicitly taught the different ways to understand their TPACK and reflect on it, they would notice what was missing from their TPACK (Wu and Wang, 2015).

In line with the FATIH project, there should have been a revision in the PT education and teacher certificate programs. The curriculum of teacher education programs hasn't been revised since 2007. In both curriculums there is one course, ITMD, offered by Educational Science Department, but there isn't any course on domain-specific TPACK such as technology integrated ELT. Additionally, though the curriculum is same in the ELT programs in Turkey, how and what kind of technology will be integrated into content/method courses depends on the faculty members. Therefore, courses and curriculum should be restructured requiring further TPACK incorporation.

The limitations of this study recommend the following directions for future research. Future researchers may recruit a larger sample of participants with counterparts in

different educational contexts and countries to offer additional perspectives. In addition to self-assessment, EFL participants might conduct peer assessment on each other's TPACK development.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

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