Cross-sectional Evaluation of English Language Teachers' Technological Pedagogical Content Knowledge

Ismail Yuksel
Eskisehir Osmangazi University

Elif Yasin
TOBB University of Economics and Technology

The current study aims to identify the language teachers' technological pedagogical content knowledge and to examine their competency levels in terms of gender, length of service, and workplace. This cross-sectional evaluation study was conducted with 124 language teachers in Eskisehir, Turkey. Participants were administered Technological Pedagogical Content Knowledge (TPACK) survey. The Cronbach's Alpha coefficient for the scale was .90. The data of the study were analyzed via descriptive statistics, t-test and one-way analysis of variance test. Findings indicated that the participating language teachers had average competency levels in TPACK. Results also suggested that teachers' TPACK scores were not significantly different in terms of gender or work place. However, teachers who had five years or less of teaching experience had higher scores in TPACK than the other groups.

Globalization and technology have changed enormously in the last few decades, providing people with easy access to endless information and facilities. For technology to be integrated effectively in education, a number of variables should be taken into consideration, such as curriculum and pedagogy, institutional readiness, teacher competency, and funding (Tinio, 2003). Hence, the use of information and communication technology (ICT) in the classroom, especially in English classes, is essential for providing opportunities for students to learn effectively in this information age

(Bingimlas, 2009). However, integrating technology into the teaching process in classes is much more complicated when it is acknowledged that newer technologies challenge teachers in a negative way. For a teacher who is not familiar with using technological devices such as computers, overhead projectors (OHP), or the Internet, integrating technology and content in the class may be difficult. Technology can be applied both analogically and digitally; nevertheless most of the technological devices used today are digital, which makes their application a little more difficult due to some of their inherent properties, such as touchpad screens, new applications and new features of the Internet and technological devices (Koehler & Mishra, 2009). In the last few decades, as technology has increasingly developed in terms of its access to millions of people, variety and low-cost , it has become crucial for teachers to keep pace with this development via improving their knowledge regarding technology, pedagogy and their content areas. According to Sahin (2011), thanks to ICT, teachers and school managers have the chance to follow developments in their areas, apply the contemporary approaches and applications regarding their teaching methods and more importantly, keep themselves up-to-date. For all these reasons, technology has a crucial place in the teaching and learning process as well as for improving teachers' knowledge (Sahin, 2011).Today, however, many teachers feel inadequate about their knowledge since they learned how to deal with technology years ago when it was not as developed as it is today. It is therefore not surprising that they do not consider that technology plays an important role in each step of the teaching and learning process.

        With the quick rise of the Internet and worldwide web, there has been a significant increase in the number of teachers using projectors, computers and interactive whiteboards as teaching tools in Turkey, only a minority of schools have them. For better evaluation of the use of ICT in

education it is very crucial to make detailed examination of the investments made by the Ministry of National Education (DPT, 2011). According to Information Society Statistics,

The numbers of teachers per computer throughout the country in general are 24.6 and 17.8 in primary and secondary education.

The number of students per computer throughout the country is 30.9 in primary schools and 27.3 in secondary schools.

With Turkish Ministry of Education's Fatih (Action for Increasing Opportunities and Improving Technology) Project-schools and classrooms will be equipped with technology resources- this deficiency is aimed to be resolved. The Project was introduced by the Ministry in 2010 and funded by the support of Turkish Ministry of Transport. It is hoped to bring about a new understanding towards strengthening the infrastructure and use of technology in schools in 3 years (2010-2013) time (DPT, 2011). It is assumed that 40.000 schools and 620.000 classrooms in Turkey will have access to internet with the help of technological hardware and infrastructure (Bilici, Akdur, Yıldızbaşı, Günday & Çiçek, 2011). On the other hand % 92 of Turkey's population (approximately 67 million people) has never had training about ICT usage. And it is remarkable that more than half of the population has no idea about www (Bilici et al., 2011). In addition to these results, with respect to Strategic Plan 2010-2014 of MNE (2011), access to education and contemporary educational goals are the top of the list of the most problematic issues in Primary education. When looking from the scope of these realities it will be helpful to examine the technological pedagogical content knowledge of teachers.

According to Ertmer (2005), for foreign language learners, acquiring new knowledge and skills can sometimes be challenging, especially when teachers have busy schedules.

Moreover, most teachers are not eager to gain new knowledge, even if they realize that their technology is not in line with new technology (Ertmer, 2005). In fact, even if the teachers know how to use technology, they are not provided with sufficient materials and knowledge in schools in order to integrate these skills into the teaching and learning process. In Turkey, a developing country, not every school has adequate facilities for teachers to integrate their content knowledge into technology; it is sometimes difficult to even find a computer laboratory, or access to the Internet, or a projector in classrooms. As mentioned above, if teachers are not provided with technological facilities, their TPACK level and its integration in classes may not be efficient.

On the other hand, one of the barriers that influences the integration of technology into education systems has also become a process that affects the development of technology integration models. As such, teachers do not apply this integration in the same way within schools. People may have different views as to how to conduct TPACK while teaching. However, despite these kinds of drawbacks in the teaching and learning process, the need for an effective approach has become a current topic. Yet nobody can argue that there is 'a best' way to integrate technology into lessons. Shulman (1989) indicates that effective integration of technology into teaching depends largely on teacher skills and capabilities.

Koehler & Mishra (2006& 2008) suggest that good teaching with technological items has three main components: content, pedagogy, and technology, also the relationships among and between them. By means of the interactions between and among these three components, a lot of variations can be seen in terms of its extent and quality in educational technology integration. These three knowledge bases (content, pedagogy, and technology) make up the main parts of the technology, pedagogy, and content knowledge framework, the acronym for which was originally TPCK, but

then changed into TPACK to ease pronunciation (Koehler & 2008; Mishra & Koehler, 2006). TPACK provides teachers with more sensible and creative choices in the use of technology in their classrooms. Seven components are included in the TPACK framework (see Figure 1).

Figure 1. **The components of the TPACK** (Adapted from Mishra & Koehler, 2006)
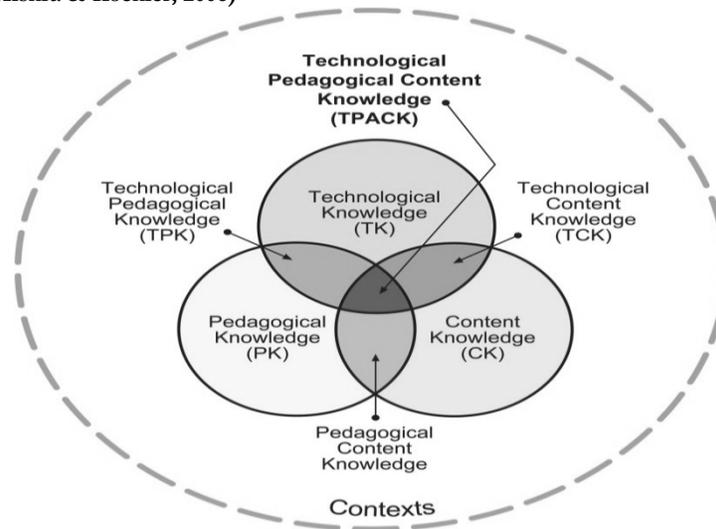
According to Mishra and Koehler (2006), teacher knowledge of the complex and integrated components of TPACK (CK, PK, TK) has indeed an important role in a teaching period, which is the basis of effective teaching with technology. In this area of technopedagogical knowledge, there have been some studies to define and measure the knowledge of TPACK with a variety of educational activities such as observations, scales and interviews.

In one study conducted by Archambault & Crippen (2009), the TPACK competency of 596 teachers who taught online was investigated. It was found that although their

content and pedagogic knowledge was high, their technological knowledge was lacking and it was also concluded that this deficiency decreased their self-confidence. Besides, several studies in which the purpose was to specify developments in the area of TPACK proved that the pre-service or in-service activities prepared for teachers or teacher candidates have an important impact on their general TPACK and particularly on their technological knowledge (Harris & Hofer, 2011).

Although there have been several studies in which TPACK is questioned in terms of its components in the educational field, studies that directly question TPACK as a whole are quite limited. Moreover, (Archambault & Crippen, 2009; Cox & Graham, 2009) suggest that more studies should be carried out in order to clarify TPACK and understand it in terms of measurement. TPACK is essentially based on technological pedagogical education, and for an effective integration of technopedagogical education, one of the variables is the teacher competency associated with this area. Correspondingly, examining both pre-service and in-service teachers' TPACK has contributed enormously to the development of the future integration of TPACK in classes. In this framework, this study aims to determine the TPACK of English language teachers who have been working in Eskisehir at different schools. With this aim, the following questions were examined in the study:

1.   What is the TPACK level of English Language Teachers?
2.   Do teachers' TPACK levels differ in terms of their gender, teaching experience and the schools where they work?

Methodology
In this descriptive study, a cross sectional survey design was used to examine participants' TPACK and to compare their competency levels in terms of gender, teaching experience and the school they work at.

Participants
The participants in the study were 124 English language teachers working at various schools in Eskisehir in 2012 Fall Semester. The reason for choosing language teachers is that language teaching is one of the area that uses technology mostly. Thus it is important to determine language teachers" technological pedagogical content knowledge. In Eskisehir there are 615 public and private primary and secondary schools, and 2715 primary school teachers, and 2590 secondary school teachers (MNE,2013). There are about 500 language teachers working in both schools. Because of time, cost, factors and limited accessibility to population 150 teachers were chosen from primary and secondary schools. These teachers were chosen according to their schools. Eskisehir has three school districts as low income, moderate income and high income districts. For this study, teachers from 45 schools in these districts were chosen. Some schools have only one language teachers. 150 teachers were administered the scale, and 132 were replied it. Eight scales were left out of evaluation because misfillings. Finally, 124 participants were delivered the instruments. Of 124 participants, 64 of them were male and 60 were female teachers. Participants from three different school types were included in the study group. While the great majority of the participants were primary school language teachers (57), the number of teachers from Secondary Schools (34) and Private Schools (33) were almost equal. Participants had a diverse range of professional experience ranging from one year to more than 11 years. Of the124 participants, 14 of them were

recent graduates, 55 of them had experience up to 5 years, 47 of them were experienced up to 10 years, and finally 8 of them had teaching experience of more than 11 years. 76 English language teachers had completed a Bachelor's degree, 47 of them had a M.A. degree, and 1 of them had a Ph.D. degree.

Instruments

Data for the investigation were collected through the TPACK-Deep survey scale. The scale was developed by Yurdakul, Odabasi, Kilicer, Coklar, Birinci & Kurt (2011). The validity and reliability studies of the scale were carried out with 995 Turkish pre-service teachers by the developers. This Likert style scale consisted of 33 items. For each item, 'Strongly Disagree', 'Disagree', 'Neither Agree or Disagree', 'Agree', and 'Strongly Agree' were the available responses. The maximum total score for the scale was 165 and minimum score was 33. The scale had four subscales; design (10 items), exertion (12 items), ethics (6 items), and proficiency (5 items). The Cronbach Alpha coefficiency of the scale was .95. In this study it was calculated as .90. Also The Cronbach Alpha coefficiencies of the subscales for this study were also calculated as .83 for design, .78 for exertion, .80 for ethics, and .74 for proficiency. Therefore, the findings revealed that the TPACK-Deep scale was a valid and reliable instrument for measuring participants' TPACK. Using this scale, the study aimed to investigate English language teachers' efficacy level regarding their TPACK and its relation with gender, workplace and experience.

Data Analysis

To indicate participants' TPACK, descriptive statistics (frequencies, means, and standard deviations) were examined and to compare their scores on TPACK, an independent t

test and a one-way analysis of variance test were conducted. In this study, the significance level was .05.

Findings

The participants' response to the TPACK-Deep scale indicated that participants' competency levels were at a medium level (see Table 1). This shows that teachers have moderate competency in TPACK. The mean scores for subscales also showed that participants think that they are capable of integrating technology into content knowledge.

According to the findings, female participants' scores on TPACK were higher than male participants' scores. An independent-sample t-test was conducted to compare the TPACK scores between male and female participants (see Table 2). The results indicated that there was no significant difference in scores for females (M = 122.06, SD = 14.28) and males (M = 125.89, SD = 15.54; $t_{(122)}$ = 1.42, p = .15, two-tailed). Thus, it can be concluded that one of the variables, gender, had no effect on the TPACK scores.

One of the concerns of this study was to compare participants' TPACK scores in terms of their teaching experience. A one-way between-group analysis of variance was conducted to explore the impact of length of service on levels of TAPCK, as measured by the TPACK-Deep scale (see Table 3). Participants were divided into three groups according to their experience of teaching (Group 1: 1-5 yrs; Group 2: 6-10 yrs; Group 3: 11 yrs and above). There was a statistically significant difference at the $p < .05$ level in TPACK scores for the three groups: $F_{(2, 121)}$ = 4.06, p = .02.

Further analyses used through the Tukey HSD test indicated that the mean score for Group 1 (M = 130.87, SD = 10.35) was significantly different from Group 3 (M = 121.49, SD= 16.60). Group 2 (M = 123.71, SD= 14.61) did not differ significantly from either Group 1 or 3.

Table 1.
Descriptive Statistics of Total Scoring

	N	M	SD	Min	Max
Overall	124	124.66	14.87	84.00	164.00
Design	124	39.47	4.69	25.00	50.00
Exertion	124	45.53	3.73	27.00	69.00
Ethics	124	21.59	3.01	10.00	30.00
Proficiency	124	18.06	6.69	8.00	24.00

Table 2.
Comparison of TPACK Scores In terms of Participants' Gender

Gender	N	M	SD	DF	t	p
Overall						
female	60	122.06	14.28	122	1.424	.157
male	64	125.89	15.54			
Design						
female	60	38.71	4.94	122	1.167	.245
male	64	39.73	4.76			
Exertion						
female	60	44.63	6.23	122	1.603	.111
male	64	46.53	6.90			
Ethics						
female	60	21.06	3.48	122	.809	.420
male	64	21.62	4.14			
Proficiency						
female	60	17.76	2.60	122	.529	.598
male	64	18.04	3.23			

Table 3.
Comparison of TPACK Scores In terms of Participants'
Length of Service

	Ss	df	Ms	F	p
Overall					
BetweenGroups	1709.220	2	854.610	4.057	.020*
WithinGroups	25490.555	121	210.666		
Total	27199.774	123			
Design					
BetweenGroups	193.013	2	96.506	4.649	.011*
WithinGroups	2511.915	121	20.760		
Total	2704.927	123			
Ethics					
BetweenGroups	76.239	2	38.119	2.823	.063
WithinGroups	1633.785	121	13.502		
Total	1710.024	123			
Proficiency					
BetweenGroups	91.839	2	45.919	5.449	.005*
WithinGroups	1019.645	121	8.427		
Total	1111.484	123			
Exertion					
BetweenGroups	173.769	2	86.884	1.972	.144
WithinGroups	5331.102	121	44.059		
Total	5504.871	123			

In order to explore the effect of a participant's workplace on their TPACK level, a one-way analysis of variance was conducted (see Table 4). Participants were divided into three groups according to their workplace (Group 1: primary schools; Group 2: secondary schools; Group 3: private schools). The average scores were found to be same across groups, $F_{(2, 121)}= 1.48$, p = 0.232. The findings revealed that working in different schools did not increase participants' TPACK scores substantially. On the other hand, participants working at private schools (M =47.30, SD = 5.86) reported significantly higher TPACK-exertion scores than teachers working in secondary schools (M = 43.38, SD =7.95), $F_{(2, 121)} = 3.05$, p <.049.

Table 4.
Comparison of TPACK Scores In terms of Participants'
Workplace

	Ss	df	Ms	F	p
Overall					
BetweenGroups	648.196	2	324.098	1.477	.232
WithinGroups	26551.578	121	219.435		
Total	27199.774	123			
Design					
BetweenGroups	4.214	2	2.107	.094	.910
WithinGroups	2700.714	121	22.320		
Total	2704.927	123			
Ethics					
BetweenGroups	28.736	2	14.368	1.034	.359
WithinGroups	1681.289	121	13.895		
Total	1710.024	123			
Proficiency					
BetweenGroups	23.317	2	11.659	1.296	.277
WithinGroups	1088.167	121	8.993		
Total	1111.484	123			
Exertion					
BetweenGroups	264.398	2	132.199	3.052	.049*
WithinGroups	5240.473	121	43.310		
Total	5504.871	123			

Discussion

The TPACK in teacher education has become one of the most debated issues in recent days. Although there are not many studies in Turkey in the TPACK field, there are many studies abroad relating to teachers, teacher candidates or students' knowledge of TPACK in their academic career, teaching, or learning process. Graham et al. (2009) stated that teachers who have sufficient TPACK and use it in teaching are better able to manage learning in a classroom, and teachers who know the principles for developing digital presentations are more aware of learning difficulties and facilities available to their students. It is clear that technology has an enormous impact on students' learning with the

contribution of an integrated learning and teaching process by means of TPACK. Thus, it is crucial that technology and pedagogy converge at a certain extent (Mumcu, Haşlaman, & Usluel, 2008)). In order to help teachers develop successful and sufficient TPACK, it is suggested that there must be an integration of curriculum-based technology with teacher knowledge and instructional planning and it is also important to combine technologically supported learning activity types within and across different type taxonomies (Ward, Lampner, & Savery, 2009).

According to Kohler et al. (2007) integration of the knowledge of technology, pedagogy and content is necessary for students to comprehend their studies effectively. Sahin (2011) clarifies that if the teachers understand the value of inserting appropriate technologies and pedagogies into their content knowledge, they will be much closer to becoming more effective teachers in the future, which will also help them with their teaching, class managing skills. Sweeney & Drummond (2013) state that technological knowledge provides efficient learning, thus it is important for teacher candidates and teachers to learn and conduct technology in their classrooms for an effective learning. According to Forssell (2010), TPACK has a great deal in common with supporting teachers in the classroom, especially with social network, which is one of the main factors that affects teaching and learning. Understanding the value of technology will definitely help teachers and students not only in class, but also for their outside activities, which will also facilitate comprehensible learning. To Strudler, Schrader, & Asay (2011), TPACK helps participants advance their knowledge, skills, management and it also provides teachers with great self-confidence with regards to classroom technology integration and its positive effect on learning outcomes. It can be concluded from these views based on their studies that there is a parallelism between the level of teachers' TPACK

and their teaching methods in managing a classroom and handling technological barriers. Nonetheless, in this study, meaningful significance has not been found between the teachers' experience, workplace, the time they have spent using a computer or the Internet and their TPACK. However, the findings are consistent with previous studies. That is to say, the average scores of recently graduated teachers are higher than the more experienced teachers. It can therefore be acknowledged that technology is more widely used by young people. Hence, it is possible for them to carry TPACK into their classes while teaching English, which also definitely requires ICT in order to be successful in the teaching and learning process.

This study has revealed that English language teachers have a moderate level of TPACK. This finding may be acceptable for language teachers. In Turkey there is no direct course for integrating ICT into teaching in language teaching programs. Instructional Technologies and Material Development courses indirectly aim to develop teachers' TPACK. The study indicated that male teachers had higher scores than female teachers. As discussed earlier, TPACK is interrelated with ICT usage. In Turkey, males are more interested in using new technological instruments than females. However, the differences in these two groups' scores are not significant. Thus, this study showed that gender did not make any difference to teachers' TPACK scores. This concurs well with the findings of Koh, Chai & Tsai, (2010) as they also found that gender did not make any difference to participants' scores.

The second concern of this study was to examine the effect of teachers' teaching experience on their TPACK. It was found that teachers who had 1-5 years' experience had the highest scores in the whole scale and subscales of the TPACK-Deep. Recently graduated teachers in Turkey are supposed to attend in-service trainings, especially based on

current trends in education. This finding, thus, may be considered as normal. This finding appears to be well supported by Chuang & Ju (2012) and Koh, Chai & Tsai, (2010). They revealed that younger groups of early childhood teachers had a better technological knowledge (TK) in comparison with more experienced groups.

Finally, the findings revealed that the teachers working at private schools had the highest scores in the TPACK-Deep. While not all of the results were significant, the overall direction of results showed that teachers working at private schools were more likely to have high TPACK than the other groups. As is known, private schools have the power to afford sufficient technology, materials and equipment for teachers to use them in classes while teaching and learning. Moreover, teachers in these schools are expected to regularly attend training on current developments in ICT.

In conclusion, in order to be successful in TPACK, teachers should first of all be aware of its importance in daily life and especially in the teaching process. Today, traditional methods are getting older and older, and new technology is improving day by day. Therefore, as it is in every part of our life, including teaching, it is an indispensable tool for teachers, particularly for foreign language teachers. Learning with technology, updating, finding suitable material, using it online for the students' to share, guidance and a lot more should be sustainable and available for teachers in technology, which can eventually turn into successful teaching and learning. With regards to using technology, first of all having access to technological items may not be convenient on account of several reasons, one of which is the 'expense'. Therefore, in order to encourage teachers to understand the importance of TPACK and value and use it in their classes for both themselves and their students in the teaching and learning process, some steps should be taken by the government

and/or school administrations. As (Sweeney & Drummond, 2013) mentioned in their research, a 'bring-your-own-device' project could be started, which means that teachers and students achieve TPACK, even if technology is not available at their schools. Through this project, teachers can bring their own technological devices such as tablets, computers, portable projectors and/or cameras into their classes to provide students with more integrated education in terms of the language use or other subjects. Moreover, thanks to this method, one of the drawbacks of TPACK (i.e., funding) can be overcome with the little help of enthusiastic teachers.

Teachers with a low-tech level should be supported and encouraged with special care by the government. Even if there is technology available at schools, studies reveal that not every teacher is interested in using it in their classes. Hence, it is important to make them eager and aware of the value of TPACK by means of providing them with funding, giving them enough time and even organizing some special courses under the control of school administrations. Every school library must have books about technology, pedagogy and content and their integration for teachers to obtain sufficient and effective knowledge of TPACK, and these books should be lent to teachers who are eager to improve themselves in academic and personal way. Additionally it may be useful to conduct more qualitative and quantitative research to define the level of technopedagogic efficiency, and moreover, its application among teachers and pre-service teachers would contribute to the literature related to integration of technological education and its integration.

The present study has only investigated English language teachers' TPACK in Eskisehir. Therefore, further studies should be conducted with the teachers working in other cities in Turkey or in other countries. Additionally, this study has highlighted language teachers' TPACK. Thus, further studies are needed to examine the TPACK of teachers

from other fields as well. The data of the study were collected through a scale that had four subscales. Future studies may employ qualitative data collection techniques such as observation, interview and/or video recordings, which may enrich the findings of TPACK and its development. Finally, this study was limited to the independed *t*-test and analysis of variance tests. Thus few findings reported as statistically significant may be due to chance, since the used analyze tecniques most probably inflated the Type 1 error.

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