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Research Article

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High School Teachers' Technological Pedagogical Content Knowledge and Self-efficacy Perceptions*

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Abstract

The aim of this research is to determine the correlation between high school teachers' technological pedagogical content knowledge levels and teacher self-efficacy perceptions. In the 2018-2019 academic year, 386 teachers working in high schools in the city center of Karaman, Turkey, participated in the research conducted in the correlational survey model. The data of the study were collected with the personal information form, the technological pedagogical content knowledge scale and the teacher self-efficacy scale. In the analysis of the data, arithmetic mean, standard deviation, Pearson correlation technique were used. When the research findings are examined; it was concluded that teachers' technological pedagogical content knowledge and their self-efficacy perceptions are at high level. At the same time, there was a positive and medium-level correlation between teachers' technological pedagogical content knowledge and their perception of self-efficacy. The research findings were discussed in line with the related literature and some suggestions were made.

Key Words

Instructional technology • Self-efficacy • Technological pedagogical content knowledge • TPACK

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Introduction

The progress in the field of technology is accelerating day by day and this situation causes technology products to take more place in our lives. An important part of the place that technology occupies in our lives is the field of education. Curriculum and learning-teaching processes are reviewed in the context of developing technologies. The innovations that technological tools bring to the teaching environment also affect students and teachers, who are the components of this environment. With the integration of technology into education, students' expectations for the teaching and learning process, teachers' approach to materials and the form of learning and teaching activities are changing. This situation causes a change in the skills that teachers should have. In order to create effective technological environments in lessons, teachers are expected to have appropriate knowledge, beliefs and skills about using technology in teaching (Ruggiero & Mong, 2015). Because teachers, who design the teaching environment and teaching activities with the skills they have, have an important responsibility as the people who ensure that the teaching activities are carried out effectively. They are expected to use their theoretical knowledge and past experience effectively while fulfilling this responsibility. In the first studies on the knowledge that teachers should have, teachers were expected to have content knowledge and pedagogical knowledge, but then attention began to be focused on pedagogical content knowledge, which is the combination of these two kind of knowledge (Shulman, 1986; Veal & MaKinster, 1999). In recent years, a new one has been added to the knowledge areas that teachers should have: Technological pedagogical or briefly technopedagogical content knowledge (TPACK) (Sağlam-Kaya, 2019).

Integration of technology with teaching is a continuous and dynamic, but also quite difficult and complex process (Binghimlas, 2009). Studies indicate that successful results cannot be achieved if the technology integration process is not well conceptualized and not understood by teachers (Ertmer, 2005; Hew & Brush, 2007). In this context, a conceptual framework is needed for teachers for using technology effectively in their teaching and learning activities. In the related literature, it is seen that there are different models that will enable learning-teaching processes to be more effective and efficient together with information and communication technologies (Kurt, 2013). The TPACK model briefly mentioned above is one of them.

Technological Pedagogical Content Knowledge

The TPACK Model is built on the theoretical framework of Pedagogical Content Knowledge (PCK) defined by Shulman (1986). According to Shulman, the way of effective teaching passes through the combination of pedagogy and content. Technologies used in the educational environment have changed the climate of the classroom environment (Mishra & Koehler, 2006); technology has arised as a new part of teacher skills and the need to define what it means to use other types of knowledge effectively with technology has begun to come to the fore. Mishra and Koehler (2006) elucidate TPACK, which is the combination of these types of knowledge, as follows: TPACK is defined as the fundamentals of effective teaching through technology and includes pedagogical techniques that enable the constructive use of technology to teach subjects, and the knowledge of situations that make the subject easy or difficult to learn. TPACK also includes knowledge of how technology can help organize some problems faced by students, students' existent knowledge and epistemological theories, how technologies can be used to create

new knowledge on existent knowledge, and to create new theories or strengthen old theories (Er & Sağlam-Kaya, 2017) .

TPACK has three sources, as pedagogical knowledge, technological knowledge and content knowledge, and focuses on the coactions between that resources (Abbitt, 2011; Mishra & Koehler, 2006; Schmidt et al., 2009). In this direction, TPAB presents three areas, namely theoretical framework technology knowledge, pedagogical knowledge and content knowledge, and their intersections: technological pedagogical knowledge, technological content knowledge, pedagogical content knowledge and technological pedagogical content knowledge (Koehler & Mishra, 2009; Mishra & Koehler, 2006). However, TPACK does not just focus on what teachers need to know, but is also a useful frame that teachers can use when considering how to evolve this knowledge (Schmidt et al., 2009).

According to the TPACK model, which is seen as one of the main types of knowledge that teachers should have in the technology integration period, it is expected that educational technologies will be used appropriately in the teaching and learning process (Harris et al., 2009; Voogt & McKenney, 2017). However, another important issue that needs to be mentioned at this point is teachers' self-efficacy beliefs. According to Pajares (1992), it is possible to predict what knowledge and skills teachers have and what they can do in the classroom by determining their self-efficacy. A teacher with high self-efficacy trusts her knowledge and skills and tends to reflect these in classroom practices.

Teacher Self-efficacy

Self-efficacy belief first emerged on the basis of Bandura's (1977) Social Cognitive Learning Theory. Bandura, emphasized that self-efficacy belief forms the basis of social cognitive theory and that this belief is individuals' individual perceptions of how well they can do the activities essential to cope with any possible case; he defined the concept of self-efficacy as the personal evaluation of what an individual can do when faced with certain tasks. In other words, self-efficacy is a person's belief in organizing and applying the skills necessary to achieve desired results (Skaalvik & Skaalvik, 2010). According to Bandura (1977), self-efficacy is necessary in order to organize and exhibit a behavior on which belief about abilities is based and which is necessary to achieve goals.

Consistent with belief in self-efficacy, Tschannen-Moran and Woolfolk-Hoy (2001) identify teacher self-efficacy as teachers' judgments of their own abilities to achieve expected outcomes for all students' engagement and learning, including those with difficult or low motivation. Considering the knowledge, attitudes and skills required by the teaching profession, it is observed that the concept of self-efficacy is an important variable that should be emphasized especially for the profession of teaching. Reflections of self-efficacy beliefs can be experienced during teachers' classroom practices. Because teachers' beliefs also have the feature of being the determinant of their practices in their lessons (Pajares, 1992; Wilkins, 2008). Teachers with a strong sense of efficacy tend to have a high level of planning and organization, be open to new opinions, be ungrudging in trying new ways to resolve student demands, and be determined in teaching, while teachers with lower self-efficacy tend to avoid them (Woolfolk-Hoy, 2004). In addition, teachers with strong self-efficacy beliefs may prefer to use several teaching strategies and techniques by adopting a learner-centered approach; It has been stated that teachers with low self-efficacy beliefs tend to conduct more teacher-centered lessons (Milner & Woolfolk-Hoy, 2003). In this case, it is expected that every

teacher should have a high perception of teacher self-efficacy in order to reveal their competencies in educational processes.

Rationale and Purpose of the Study

In the 21st century we live in, to be successful in both education and working life of individuals; there are some skills that they should have in order to carry out their daily and social lives easily. These skills, gathered under the headings of life and career skills, learning and renewal skills, information, media and technology skills, are called 21st century skills in the literature (Trilling & Fadel, 2009). It is seen that among the mentioned skills are information literacy, media literacy, information and communication technologies literacy. Similarly; "digital competence" is included in the key competences of the Turkish Qualifications Framework (TYÇ) prepared by the Vocational Qualifications Authority (MYK) (TYÇ, 2023). In this direction, the concept of digital competence is also included in our curriculum (Ministry of Education [MOE], 2018). For today's students, who will be the adults and employees of the future, to be equipped with these skills and at the same time; In terms of the effectiveness of education and training in schools, it is of great importance to train teachers who have the knowledge and skills to use the possibilities of technology. Successful use of technology in educational processes by pre-service teachers depends on knowing to what extent they have the competencies for this use and determining the variables that affect this situation.

When the literature is examined, it is seen that there are many independent studies on self-efficacy (Kasalak & Dağyar, 2020; Liu et al., 2020; Sokhom et al., Sorakrich & Ravinder, 2023; Wray et al., 2022) and technopedagogical content knowledge (Koyuncuoğlu, 2021; Mutiani et al., 2021; Schmid et al., 2021; Tseng et al., 2022; Yeh et al., 2021). However, a limited number of studies have been found that reveal the relationship between TPACK and teacher self-efficacy. In line with these determinations, the determination of teachers' TPACK levels and teacher self-efficacy levels in terms of different variables; It is also aimed to reveal the relationship between these two variables. The following questions were sought to be answered in the research:

1. What are the teachers' levels of technological pedagogical content knowledge?
2. What are the teachers' self-efficacy perception levels?
3. Is there a significant correlation between teachers' technological pedagogical content knowledge levels and self-efficacy perception levels?

Method

Research Design

The design of the research is the correlational survey model, one of the quantitative research designs. Correlational survey models are research models that intend to determine the presence and severity of co-change between two or more variables (Karasar, 2009). Since the main purpose of this study is to determine the correlation between teachers' self-efficacy perception levels and their technological pedagogical content knowledge levels, the research design was determined as a correlational survey model.

Research Sample

The population of the research consists of high school teachers working in the city center of Karaman. The sample of the study was determined by proportional stratified sampling method. In the proportional stratified sample selection, a sample proportional to the place of that stratum in the population is selected from each stratum. For the sample to be representative, the sampling rate of the various groups in the sample must be the same as in the population. Proportional stratified sampling helps to achieve this (De Vaus, 2013). In this research, Anatolian High School, Science High School, Social Sciences High School, Vocational High School, Fine Arts High School, Imam Hatip High School, which are different types of high schools, were determined as strata. Considering the number of teachers working in each school type, the number of participants to be selected from the strata was determined. As a result of these determinations, the distribution of 386 teachers in the study group according to various demographic characteristics is given in Table 1.

Table 1

Distribution of the Participants by Demographic Characteristics

Variable	**Category**					
Gender	Female			Male		
	175			211		
Age	25 and below	26-30	31-35	36-40	41-45	46 and above
	18	68	63	89	73	75
Type of school	Anatolian High School	Science High School	Social Sciences High School	Vocational High School	Fine Arts High School	Imam Hatip High School
	128	26	24	143	19	46
Professional seniority	0-5 year	6-10 year	11-15 year	16-20 year	21-25 year	26 years and above
	60	93	49	77	60	47
Education level	Undergraduate			Postgraduate		
	303			83		

As can be seen in table 1, 175 female and 211 male teachers participated in the research. 18 of these teachers are 25 years old and below, 68 are 26-30 years old, 63 are 31-35 years old, 89 are 36-40 years old, 73 are 41-45 years old, 75 are 46 age and over. 128 of the teachers participating in the research work in Anatolian High School, 26 in Science High School, 24 in Social Sciences High School, 143 in Vocational High School, 19 in Fine Arts High School, 46 in Imam Hatip High School. 60 of the participants have 0-5 years, 93 of the participants have 6-10 years, 49 of the participants have 11-15 years, 77 of the participants have 16-20 years, 60 of the participants have 21-25 years, 47 of the participants have 26 years or more professional seniority. Among the participants of the research, 303 teachers received undergraduate education and 83 teachers received graduate education.

Research Instruments and Processes

"Personal Information Form" which was prepared by the researchers, "Technological Pedagogical Content Knowledge Scale" and "Teacher Self-efficacy Scale" were used to get data in the study, which was carried out in correlational survey model. The personal information form created by the researchers includes information on gender, age, school type, professional seniority, and education level. The "Technological Pedagogical Content Knowledge Scale" created by Horzum et al. (2014) was used to determine the technological pedagogical content knowledge levels of teachers and teacher candidates. The scale is of a five-point Likert type and has a rating of "(5) completely agree, (4) agree, (3) undecided, (2) disagree, and (1) strongly disagree". The reliability coefficient of the scale is 0.98. In scale; there are 51 items consisting of 7 sub-dimensions, 8 items of content knowledge, 7 items of pedagogical knowledge, 6 items of technological knowledge, 6 items of technological content knowledge, 8 items of pedagogical content knowledge, 8 items of technological pedagogical knowledge and 8 items of technological pedagogical content knowledge. The reliability coefficient of the scale was recalculated based on the data obtained from the research. The Cronbach α coefficient was found to be 0.912 for technological knowledge, 0.922 for pedagogical knowledge, 0.963 for content knowledge, 0.925 for technological content knowledge, 0.948 for pedagogical content knowledge, 0.945 for technological pedagogical knowledge, 0.937 for technological pedagogical content knowledge, and 0.984 for the whole scale.

The "Teacher Self-efficacy Scale" created by Senemoğlu (2006) was used to get data on the teachers' self-efficacy perception levels in the study. The scale, which consists of 32 positive items, is a five-point Likert type. Rating of the scale is; inadequate (1), poor (2), moderate (3), good (4) and very good (5). The scores that can be obtained from the scale are between 32 and 160, and the reliability coefficient of the scale is 0.96. The reliability coefficient of the scale was recalculated over the data obtained in the study and was found Cronbach α= 0.970. A Cronbach α coefficient above 0.80 is interpreted as having high reliability of the scale (Alpar, 2013). Based on this, it can be said that the scales used in the research are appropriate in terms of reliability.

Data Analysis

The analysis of the data collected from the scales was made through the statistical package program. Descriptive statistical techniques such as arithmetic mean and standard deviation were used to determine the technological pedagogical content knowledge and teaching self-efficacy perception levels of the participants. The Pearson product-moment correlation coefficient was examined to determine the correlation and direction between the technological pedagogical content knowledge and teacher self-efficacy perceptions of the participants. The level of significance in the interpretation of the findings of the study was taken as p=0.05.

Results

Teachers' Technological Pedagogical Content Knowledge Levels

The first sub-problem of the research is "What is the teachers' level of technological pedagogical content knowledge?" expressed as. The analysis results for this problem are given in Table 2.

Table 2

Descriptive Statistics Results of Teachers' Technological Pedagogical Content Knowledge Levels

	n	$\bar{x}$	SD	Min	Max
Technological knowledge	386	23.09	4.683	7	30
Pedagogical knowledge	386	27.95	5.404	8	35
Content knowledge	386	33.25	6.700	8	40
Technological content knowledge	386	23.71	4.830	7	30
Pedagogical content knowledge	386	32.67	6.521	8	40
Technological pedagogical knowledge	386	31.62	6.247	8	40
Technological pedagogical content knowledge	386	31.13	6.231	9	40
Technological pedagogical content knowledge (Total)	386	203.42	35.873	64	255

As can be seen in Table 2, the mean score of teachers' technological pedagogical content knowledge levels was found to be $\bar{x}$=203.42. Accordingly, it can be said that teachers' technological pedagogical content knowledge scores are at a high level. When the mean scores of the teachers from the technological pedagogical content knowledge scale are examined in point of the dimensions of the scale; it was seen that teachers got high scores in all dimensions of the scale.

Teachers' Self-efficacy Perception Levels

The second sub-problem of the study is "What are the teachers' self-efficacy perception levels?" expressed as. The analysis results for this problem are given in Table 3.

Table 3

Descriptive Statistics Results of Teachers' Self-Efficacy Perception Levels

	n	$\bar{x}$	SD	Min	Max
Self-Confidence	386	127.32	20.954	32	160

As can be seen in Table 3, the mean score of teachers' self-efficacy perception level was found as $\bar{x}$=127.32. Accordingly, it can be stated that teachers' self-efficacy perceptions are at a high level.

The Correlation between Teachers' Technological Pedagogical Content Knowledge Levels and Self-efficacy Perception Levels

The third sub-problem of the research is “Is there a significant correlation between teachers' technological pedagogical content knowledge levels and their self-efficacy perception levels?” expressed as. The analysis results related to this sub-problem are given in Table 4.

Table 4

The Correlation Between Teachers' Technological Pedagogical Content Knowledge and Self-Efficacy Perception Levels

		Self- efficacy	**Technological knowledge**
Self- efficacy	r	1	0.290**
	p		0.000
	N	386	386
Technological knowledge	r	.290**	1
	p	0.000	
	N	386	386
		Self- efficacy	**Pedagogical knowledge**
Self- efficacy	r	1	0.397**
	p		0.000
	N	386	386
Pedagogical knowledge	r	.397**	1
	p	0.000	
	N	386	386
		Self- efficacy	**Content knowledge**
Self- efficacy	r	1	0,319**
	p		0.000
	N	386	386
Content knowledge	r	0.319**	1
	p	0.000	
	N	386	386
		Self- efficacy	**Technological content knowledge**
Self- efficacy	r	1	0.332**
	p		0.000
	N	386	386
Technological content knowledge	r	0.332**	1
	p	0.000	
	N	386	386
		Self- efficacy	**Pedagogical content knowledge**
Self- efficacy	r	1	0.337**
	p		0.000
	N	386	386
Pedagogical content knowledge	r	0.337**	1
	p	0.000	
	N	386	386

		Self- efficacy	Technological pedagogical knowledge
Self- efficacy	r	1	0.294**
	p		0.000
	N	386	386
Technological pedagogical knowledge	r	0.294**	1
	p	0.000	
	N	386	386

		Self- efficacy	Technological pedagogical content knowledge
Self- efficacy	r	1	0.317**
	p		0.000
	N	386	386
Technological pedagogical content knowledge	r	0.317**	1
	p	0.000	
	N	386	386

		Self- efficacy	Technological pedagogical content knowledge (total)
Self- efficacy	r	1	0.369**
	p		0.000
	N	386	386
Technological pedagogical content knowledge (total)	r	0.369**	1
	p	0.000	
	N	386	386

** *p < .001*

When the Pearson Correlation results in Table 4 are examined, it is observed that there is a positive and medium-level significant correlation between the teachers' self-efficacy perception levels and their technological pedagogical content knowledge levels (r=0.365, p≤0.05). In addition, the correlation between teachers' self-efficacy levels and the dimensions of technological pedagogical content knowledge was also examined in the study. According to the findings, there is a positive and low correlation between teachers' self-efficacy levels and technology knowledge (r=0.291, p≤0.05), there is a positive and medium-level correlation between teachers' self-efficacy levels and pedagogical knowledge (r=0.391, p≤0.05), there is a positive and medium-level correlation between teachers' self-efficacy levels and content knowledge (r=0.315, p≤0.05), there is a positive and medium-level correlation between teachers' self-efficacy levels and technological content knowledge (r=0.327, p≤0.05), there is a positive and medium-level correlation between teachers' self-efficacy levels and pedagogical content knowledge (r=0.332, p≤0.05), there is a positive and low correlation between teachers' self-efficacy levels and technological pedagogical knowledge (r=0.288, p≤0.05), there is a positive and medium-level correlation between teachers' self-efficacy levels and technological pedagogical content knowledge (r=0.314, p≤0.05).

Discussion, Conclusion & Suggestions

Discussion and Conclusion

When the research findings were examined, it was observed that the technological pedagogical content knowledge of the teachers participating in the study was at high level. When the mean scores of the teachers from the technological pedagogical content knowledge scale are examined in terms of the dimensions of the scale; teachers got scores at high level in all dimensions of the scale. Today, technology, which we encounter in all areas of life, that we sometimes have to use it willingly, sometimes we have to; it has become a phenomenon that is easy to reach, learn and get support when necessary. This convenience also covers the field of education. Today, using technology in the learning and teaching process has become much more accessible thanks to the variety of software and the internet. In this case, it is expected that teachers' TPACK levels are high.When the results of the research conducted by Sağlam-Kaya (2019) were examined, it was observed that the TPACK scores of the majority of the pre-service teachers were moderate and high. In the research made by Demirezen and Keleş (2020), it was found that teachers' proficiency in the dimensions of technology knowledge, pedagogical knowledge, content knowledge, pedagogical content knowledge, technological content knowledge, technological pedagogical knowledge and technological pedagogical content knowledge is at a high level; technology domain knowledge was found to be weaker. Due to its rapidly developing and changing nature, technology is integrated effectively into educational processes. Many countries make high-budget investments to integrate technology into education (Belland, 2009). There are many studies focusing on technology integration in schools and examining the use of different technologies in teaching. These studies show that technology accompanying appropriate pedagogy positively affects learning and increases achievement (Albaaly & Higgins, 2012; Erbaş etal., 2015; Malik & Shanwal, 2015).

According to another finding of the study, it was observed that the self-efficacy perceptions of the teachers participating in the study were at high level. In the era we live in, the opportunities available to teachers are quite high. It is now possible for teachers to develop themselves, to learn and use different learning and teaching strategies, methods and techniques, to reach a wide variety of materials, even to develop their own materials, and to benefit from different measurement and evaluation techniques, especially through technology. It is thought that all these opportunities may affect teachers' self-efficacy perceptions positively. Similar to the results of this study; the results of the research made by Birişçi and Kul (2019) showed that pre-service teachers had high level of technology integration self-efficacy beliefs and also when the results of the research conducted by Sağlam-Kaya (2019) were examined, it was seen that the teacher candidates' perceptions of teacher self-efficacy were high.

When the research findings were examined, it was seen that there was a positive and medium-level significant correlation between the teachers' technological pedagogical content knowledge levels and their self-efficacy perception levels. It can be said that teachers with high TPACK level have a good command of the theoretical structure of the field they teach, know how to teach it, and can benefit from technology while teaching. Therefore, it is expected that these teachers have high self-efficacy perceptions. At the end of the study made by Abbit (2011), it was seen that TPACK affected teacher candidates' self-efficacy in the context of technology integration. In their study, Ekici et al. (2012) revealed that individuals are more willing and successful in implementing and designing

computer-related activities in parallel with the increase in their self-efficacy perceptions. Akgün (2013) revealed that there is a positive and moderate correlation between pre-service teachers' web pedagogical content knowledge and teacher self-efficacy perceptions. In the study made by Spazak (2013), it was seen that there were significant correlations between the self-efficacy perception levels of teacher candidates and their AB, PC, TB, PCK, TPB, TAB, TPACK levels. Lee and Lee (2014) revealed that teachers' self-efficacy belief is one of the major factors in technology integration and their use of technology in the classroom. The results of the studies of Keser et al. (2015) showed that there is a high positive correlation between teacher candidates' technopedagogical education competency and self-efficacy scores. Liang et al. (2017) found in their study that there is a positive correlation between teachers' TPACK and their teaching self-efficacy. Similarly, the results of the research conducted by Birişçi and Kul (2019) found out that there was a high level of positive correlation between the technology integration self-efficacy beliefs of teacher candidates and their technopedagogical education competencies. When the results of the research conducted by Sağlam-Kaya (2019) were examined, it was seen that TPACK competencies of teacher candidates were a significant forecaster of teacher self-efficacy. Unlike these results, in the research made by Açıkgül and Aslaner (2019), it was determined that there was no significant correlation between TPACK efficacy and self-efficacy. Research results are similar with the results of this study in the sense that teacher self-efficacy has the potential to affect technology integration and TPACK has the potential to affect teacher self-efficacy perception. According to the epistemological connection between belief and knowledge, knowledge requires or leads to both situational and general beliefs (Lemos, 2007; Rose & Schaffer, 2013).

When the relationship between teachers' self-efficacy levels and technological pedagogical content knowledge dimensions was examined in the study, a positive and medium-level significant correlation was seen between teachers' self-efficacy levels and technology knowledge, and between self-efficacy levels and technological pedagogical knowledge. This is explainable by the fact that the teacher self-efficacy scale used in the study was created in 2006 and did not include items related to the use of technology in instruction. This can be seen as a limitation of the research. While there were different scale alternatives at the time of the study, the current scale was preferred because it contains few items. As seen in the scale information, the TPACK scale is a multidimensional scale consisting of many items. In order not to cause boredom in the participants of the study, a one-dimensional scale containing relatively few items was preferred.

Suggestions

Ability of using technology in teaching is an important feature that today's teachers should have. Considering today's rapidly changing conditions and the fact that new technologies are emerging day by day; The risk that teacher training undergraduate programs may be insufficient in educating pre-service teachers equipped with these skills and preparing them for this dimension of the profession should be taken into consideration. For this, it is considered important to give more weight to courses such as information and communication technologies, instructional technologies and material design in teacher training programs, that is, in pre-service education, to carry out these courses in practice, and to update the course outcome and content according to changing conditions.

Thanks to technology integration, teaching performance and student success, which is seen as the most concrete output of teacher performance, can be improved. However, in most teacher training programs, it is observed that pedagogical knowledge, content knowledge and technology knowledge are taught independently of each other. Accordingly, teachers who are employed in the profession may also have difficulties in integrating these knowledge areas. Therefore, it is thought that developing technopedagogical skills together with content knowledge will provide an advantage to practitioners, namely teachers, in using these knowledge and skills. In this direction, considering TPACK as a whole and developing it theoretically and practically; in teacher training programs, it may be suggested to include guidelines based on the TPACK model in the contents of various courses.

Technology is not a fixed phenomenon, it continues to develop, change, affect and be affected by different systems. In line with "lifelong learning", which is one of the important concepts of the 21st century, teachers are expected to develop, adapt to change, and even create development and change after they are employed. An important way of doing this is to support their professional development with in-service training and to ensure that they keep up with the requirements of the age they live in. However, a number of factors in the form of prejudices, attitudes or experiences towards the use of technology in teaching can have a negative or positive effect on the use of technology by teachers and teacher candidates. It is valuable to enable them to approach the use of technology in education positively, to offer the necessary opportunities to increase their motivation in this field and to gain experience.

The increase in studies on TPACK is important in point of both discovering the current case of teachers in this field and raising awareness about TPACK. It is necessary to enlarge the TPACK literature to determine the extent to which the teachers find themselves competent in TPACK and to plan and conduct studies on the areas of need. Many studies, including this one, provide strong evidence that teachers' self-efficacy beliefs are one of the major factors in their use of technology in the class. Therefore, investigating the correlation between these two factors in different environments and situations, on different groups, can provide important data for teacher education.

In addition to these, as mentioned before, a scale developed in 2006 was used to determine teachers' self-efficacy perceptions in the study. In addition to being a very suitable measurement tool in point of reliability and validity, the mentioned scale does not contain items related to the dimension of technology use in teaching. Self-efficacy scales including the technology factor can be used or new ones can be developed for future studies.

Ethic

We declare that the research was conducted in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual sparticipants included in the study.

Author Contributions

This study was produced from the study titled "Examination of the Relationship Between Secondary Education Teachers' Technological Pedagogical Content Knowledge Levels and Teachers' Self-Efficacy Perceptions" which was accepted as a master's thesis at Karamanoğlu Mehmetbey University, Institute of Science.

Conflict of Interest

The authors declare that they have no conflict of interest.

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