

Technological Pedagogical Content Knowledge (TPACK) Proficiency of Preservice Teachers Who will Teach a Foreign Language

Yabancı Bir Dil Öğretecek Öğretmen Adaylarının Teknolojik Pedagojik İçerik Bilgisi (TPIB) Çerçevesinde Yeterlikleri

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Abstract

In this study, it was attempted to determine the technological pedagogical content knowledge proficiency (TPACK) perceptions of preservice teachers who will teach a foreign language. This study, which was designed as a general survey model, included preservice teachers who will carry out language education. The proficiency and efficiency levels of preservice teachers were determined concerning certain variables such as gender, department, receiving technology education, having access to internet, ability to use computer, searching for new technologies particular to the field, and ability to use these new technologies in the teaching activities. It was detected that they had the proficiency for TPACK. It was also determined that there was statistically no significant difference between the general TPACK proficiency levels of the students and the gender variable. It was determined that gender had no impact on the TPACK general proficiency levels of the students. It was determined that there were statistically significant differences among the TPACK general proficiency levels concerning department, receiving technology education, having access to internet, ability to use computer, searching for new technologies particular to the field, and ability to use these new technologies in the teaching activities. It was also found that these variables had impacts on the preservice teachers to have the TPACK proficiency concerning the selected languages, which were included in the study.

Keywords: Technological pedagogical content knowledge, language teaching, technology integration, proficiency, preservice teacher.

Öz

Bu çalışmada, dil eğitim-öğretimi gerçekleştirecek olan öğretmen adaylarının Teknolojik Pedagojik İçerik Bilgisi (TPIB) alanındaki yeterlik algıları tespit edilmeye çalışılmıştır. Genel tarama modeline göre tasarlanan bu çalışmaya, dil eğitim-öğretimi gerçekleştirecek olan öğretmen adayları dahil edilmiştir. Öğretmen adaylarının cinsiyet, bölüm, teknoloji eğitimi alma, internet erişimine sahip olma, bilgisayar kullanım düzeyi, alana yönelik yeni teknolojileri araştırma ve alana yönelik yeni teknolojileri eğitim-öğretim faaliyetlerinde kullanma durumuna göre yeterlikleri ve etkileri belirlenmiştir. Dil öğretimi konusunda TPIB yeterliklerinin olduğu saptanmıştır. Öğrencilerin TPIB çerçevesindeki genel yeterlikleri ile cinsiyet değişkeni arasında anlamlı bir farklılık tespit edilmemiştir. Cinsiyetin öğrencilerin TPIB genel yeterlikleri üzerinde bir etkisinin olmadığı saptanmıştır. Bölüm, teknoloji eğitimi alma, internet erişimine sahip olma, bilgisayar kullanım düzeyi, alana yönelik yeni teknolojileri araştırma, alana yönelik yeni teknolojileri eğitim-öğretim faaliyetlerinde kullanma durumuna göre TPIB genel yeterlikleri arasında anlamlı farklılık tespit edilmiştir. Araştırma kapsamına dahil edilen dillerin eğitim-öğretimi alan öğretmen adaylarının TPIB alanındaki yeterliğe sahip olmada bu değişkenlerin etkilerinin olduğu da bulunmuştur.

Anahtar Kelimeler: Teknolojik pedagojik içerik bilgisi, dil öğretimi, teknoloji entegrasyonu, yeterlik, öğretmen adayı.

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Introduction

Information and technological innovation is of vital importance in the 21st century educational institutions as in many institutions. Various models are being created to support mediums to build and apply 21st century skills. Since information and communication technologies have become a part of the daily studies of schools and institutions, a wide range of models have been created (Scardamalia, Bransford, Kozma, & Quellmalz, 2012).

Since the internet, social networks, and technologies have become indispensable for the daily life of students (Szeto, Cheng, & Hong, 2016) and because of the rapid integration of technology, a need emerged for a structure, which supports the use of appropriate technologies in the learning-teaching processes of teachers (Baser, Kopcha, & Ozden, 2016). To ensure this, Mishra and Koehler (2006) developed the technological pedagogical content knowledge (TPACK) framework. It focuses on the ability of teachers to combine educational technologies with their own pedagogical knowledge in education and to transfer them into the learning environment.

Emphasizing the connections, interactions, and limitations among the content (the subject learned and the subject taught), pedagogy (methods of learning and teaching) and technology, the TPACK framework consists of seven components (Mishra & Koehler, 2006): Pedagogical Knowledge (PK), Content Knowledge (CK), Technology Knowledge (TK), Pedagogical Content Knowledge (PCK), Technological Pedagogical Knowledge (TPK), Technological Content Knowledge (TCK), and Technological Pedagogical Content Knowledge (TPACK).

PK: The knowledge about processes and practices or methods of teaching and learning (Mishra & Koehler, 2006).

CK: The knowledge about the subject area that is learned or taught (Mishra & Koehler, 2006).

TK: The knowledge and ability to use the standard and advanced technologies (Mishra & Koehler, 2006).

PCK: The knowledge about teaching the content, which teaching approaches fit the content, and how to design the elements of the content for a better teaching (Mishra & Koehler, 2006). It is a mixture of content and pedagogy, which contains information about how to organize, represent, and adapt certain problems and subjects to the different interests and abilities of the students and how they are prepared for teaching (Shulman, 1987).

TPK: The knowledge about various technologies that can be used in teaching and learning environments and how education can change as a result of the use of these technologies. Includes teachers' knowledge of the benefits and limitations of technological tools in pedagogical terms (Mishra & Koehler, 2006)

TCK: The knowledge about the relationship between technology and content. It is the knowledge about the subject that the teachers teach, and how this subject can be changed by the implementation of technology (Koehler, Mishra & Yahya, 2007; Mishra & Koehler, 2006).

TPACK is understanding the representation of concepts by using technologies; the pedagogical techniques that use technologies in constructive methods in teaching content; the knowledge about the things that complicate or facilitate learning concepts and about how technology can help solve some problems faced by students; the knowledge about how to use technology in building students' existing knowledge upon their preliminary information, and how technologies can be used to develop new epistemologies or strengthen the old ones. It is emphasized that a good education can be implemented through technology (Mishra & Koehler, 2006).

Teaching is a complex cognitive ability (Leinhardt & Greeno, 1986). Teacher education is important, which is relevant to the teaching that is the focal point of all education and educational renovations (Shulman, 1987). The first condition of effective and good language teaching is that teachers, instructors, and preservice teachers, who will achieve this, should have the necessary knowledge and skills. Foreign language learning is associated with applied teaching methods and approaches. Being aware of previous language experiences, qualifications, and skills of students, a creative learning environment should be created with more knowledge and providing more meaningful inputs (Ondrakova & Tauchmanova, 2019). The TPACK increases the creativity of students in teaching a second language (Paneru, 2018). Since language teaching ability of teachers is influenced from learning the language (Lin, 2010), they use technologies, which they used for their own language developments, to improve their students' language learning (Başer, 2015). The use of technology in classrooms where language teaching is performed contributes to the effectiveness of teachers (Sharp, 2017).

Integration of technology in learning and teaching language;

- makes the learning process more vivid and attracts students' attention,
- increases motivation, interest, and recalling,
- allows students to be eager to learn a language,
- increases participation in class activities,

- can appeal to students with different learning styles and intellect,
- saves time and energy,
- helps direct access to authentic and intercultural materials and real life experiences,
- provides faster feedback for students,
- develops individual study and autonomous learning skills,
- provides freedom to teachers and students,
- gives a chance to new ideas and suggestions (Kayacan Köse, 2016).

The integration of technology to the learning-teaching process is based on the tendency to work effectively with information and communication technologies and to develop the ability to use a second language (Zukerstein & Novotný, 2009, as cited in Maňonová & Žembová, 2012). This integration has caused changes in the roles of teachers. In addition, teachers' use of more effective and more appropriate technology has paved the way for them to be more successful (Sarı & Bostancıoğlu, 2018).

Various studies have been conducted about TPACK proficiency with stakeholders in various fields of education (Balcin & Ergun, 2017; Can, Erokten & Bahtiyar, 2017; Chai, Koh & Teo, 2019; Mouza, Nandakumar, Ozden & Karchmer-Klein, 2017; Njiku, Mutarutinya, & Francois Maniraho, 2020; Yanış & Yürük, 2021). It was attempted to create an awareness and consciousness required in this field. The studies were conducted particularly in science (Aktaş & Özmen, 2020, 2022; Canbazoğlu Bilici & Baran, 2015; Irmak & Yılmaz Tüzün, 2019; Karakaya & Yazici, 2017; Srisawasdi, 2014), mathematics (Akkoç, 2011; Morales-López, Chacón-Camacho, & Vargas-Delgado, 2021; Niess et al., 2009; Ozudogru & Ozudogru, 2019; Özgen, Narlı & Alkan, 2013), social sciences (Adalar, 2021; Apau, 2017; Gómez-Trigueros, 2020; Knapp, 2017), and English language teaching (Arslan, 2020; Furkan, 2020; Kayacan Köse, 2016; Na, Zhang, Wang, Wang, Yoneda & Li, 2017; Nazari, Nafissi, Estaji, Marandi, & Wang, 2019; Paneru, 2018; Ramanair, Rethinsamy & Misieng, 2017). However, no analysis was made on the proficiency perceptions of the preservice teachers, who teach foreign languages. With this research, it is considered to create an awareness and to help preservice teachers, who will perform language teaching to individuals from different walks of life, to evaluate their own potentials for integration with technology in language teaching and learning and to evaluate their knowledge and skills for the future.

1. Purpose

The potential for foreign students is increasing in many countries owing to the removal of borders. Countries, in parallel with their education policies, are in an attempt to teach both their own languages and other languages. In their own educational policies, they strive to teach both the native language of their country as well as other languages. Instructors, who will work for this purpose, from various fields are trained in universities. In this respect, the study attempted to determine the perceptions of preservice teachers, who will perform language teaching, about proficiency in TPACK. In this context, the proficiency and efficiency levels of preservice teachers were determined concerning gender, department, receiving technology education, having access to the internet, ability to use computer, searching for new technologies particular to the field, and ability to use these new technologies in the teaching activities.

2. Method

2.1. Research model

This study, which was designed as a general survey model, attempted to reach a judgment through a group taken from the population or through all the population (Karasar, 2003). Thus, proficiency levels of students were depicted through various variables.

2.2. Population and Sample

The population of this study was the final year students attending the departments of English Language and Literature, Turkish Language and Literature, and Oriental Language and Literature (Kurdish Language and Literature, and Zaza Language and Literature) at Bingöl University, Faculty of Arts and Sciences in 2017-2018 academic year. Since it was attempted to reach the entire population in this study, no sample was taken. In addition, the students studying in these departments were also receiving pedagogical formation training.

Table 1. Demographical Properties of the Participants

Gender	f	%
Female	139	61.5
Male	87	38.5
Department		
English Language and Literature	96	42.5
Turkish Language and Literature	77	34.1
Oriental Language and Literature (Kurdish Language and Literature)	32	14.2
Oriental Language and Literature (Zaza Language and Literature)	21	9.3
Having previous technology training		
Yes	107	47.3
No	119	52.7
Having internet access		
Yes	212	93.8
No	14	6.2
Having a smartphone		
Yes	222	98.2
No	4	1.8
Ability to use computer		
Sufficient	149	65.9
Insufficient	77	34.1
Research for new technologies particular to the field		
Yes	143	63.3
No	83	36.7
Ability to use new technologies of the field in teaching activities		
Yes	183	81.0
No	43	19.0
Total	226	100.0

226 students were reached for the study. In the research, 61.5% of the participant students were female, while 38.5% of them were male. 42.5 % of these students were from the department of English Language and Literature, 34.1% from the department of Turkish Language and Literature, 14.2% were from the department of Oriental Language and Literatures Kurdish Language and Literature, and 9.3% were from the department of Zaza Language and Literature. Among the students, 47.3% mentioned that they participated in technology training before, while 52.7% stated that they did not participate in any training about technology. The rate of the students with access to the internet is 93.8% while 6.2% did not have any access to the internet. Almost all (98.2%) of the students reported that they have smartphones. It is observed in the table that more than half (65.9%) of the students can sufficiently use computer. Of the students, 63.3% mentioned that they do research on the technology in their fields, while 81.0% reported that they used these new technologies for educational purposes.

2.3. Data Collection Tool

“TPACK assessment for preservice teachers learning to teach English as a foreign language” scale which was developed by Baser, Kopcha and Ozden (2016) was used to determine the proficiency perceptions of preservice teachers. It is comprised of 39 items and 7 factors (Technological Knowledge (TK)-9 items, Content Knowledge (CK)-5 items, Pedagogical Knowledge (PK)-6 items, Pedagogical Content Knowledge (PCK)-5 items, Technological Pedagogical Knowledge (TPK)-7 items, Technological Content Knowledge (TCK)-3 items, and TPACK-4 items). The value of the reliability coefficient of this scale varied between 0.81 and 0.92 for the factors. The highest variance value reported was 70.42%. A nine-point rating scale was employed ranging from “nothing/none” (1) to “very little” (3) to “some” (5) to “quite a bit” (7) to “a great deal” (9). The authors of this scale, whose reliability and validity were proved, were contacted, permissions were gained, and it was implemented. Since the scale focuses on teaching English as a foreign language, necessary regulations for its adaptation to other languages were employed in line with the consent of the authors. This adaptation was limited to the change of the word “English” in the content. No other changes were made regarding the structure or the context. In this study, the Kaiser-Meyer-Olkin (KMO) value was determined as 0.926, and the Bartlett’s test was determined as 6459.896 and significant ($p=0.000$). As per the Cronbach Alpha values, they were determined as

TK-0.905, CK-0.909, PK-0.905, PCK-0.876, TCK-0.722, TPK-0.855, TPACK-0.908, and for the complete scale, it was 0.958. The explained total variance was 67.022 %. It was observed that these results were fit (Can, 2016).

2.4. Data Collection and Analysis

The data collected from the preservice teachers, who study language, were subjected to descriptive statistical analysis and normality tests. The parametric tests were employed since the assumption suggesting that there was a normal distribution and the variances were homogeneous was verified according to the mean, median, peak value, skewness, kurtosis, and Kolmogrov-Smirnov tests (Can, 2016; George & Mallery, 2010; Pallant, 2005; Tekin, 2009). Independent samples t-tests and one-way variance analysis were used. In order to determine the groups with significant differences in the one-way variance analysis, the Scheffe test was used among the multiple comparison tests. Cohen's d value was used to calculate the magnitude of the impact in the t-test, and eta-squared (η^2) was employed to calculate the magnitude of the impact in the one-way variance analysis. When interpreting the values of η^2 , 0.01 is interpreted as small, 0.06 as moderate, and 0.14 as large impact; as per the Cohen's d value, it is interpreted as 0-equal, 0.2-small, 0.5-moderate, 0.8-large impact regardless of the signs (Büyüköztürk, 2013; Can, 2016; Cohen, 1998; Foul, Erdfelder, Lang & Buchner, 2007). In addition, the Levene test was also employed to control the equality among the variances of the groups. The significance level is considered as 0.05.

3. Findings and Interpretation

The students were asked about the technology tools they use for educational purposes. A multiple-choice response was obtained. The results are as follows:

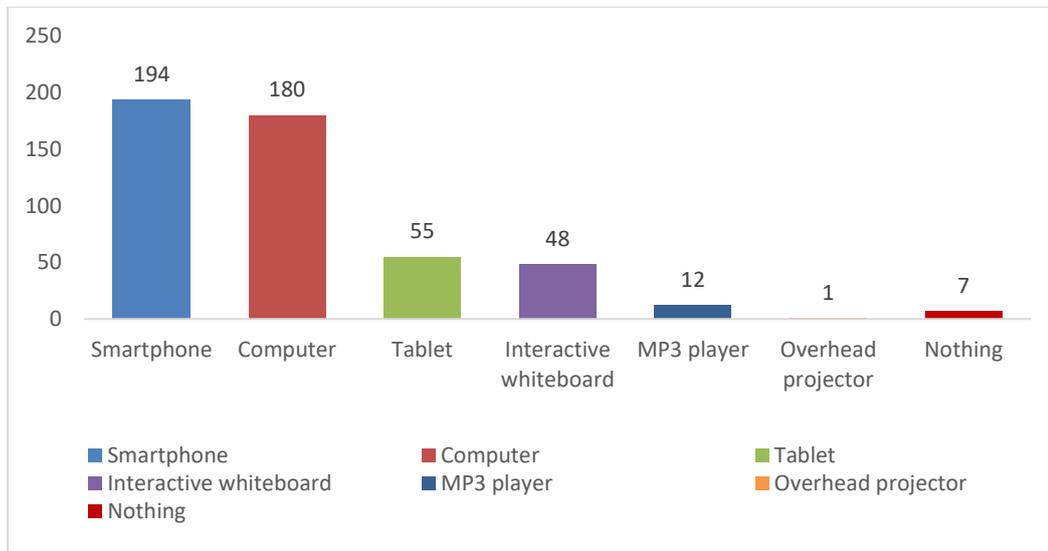


Figure 1. The Distribution of The Technological Tools That The Students Used for Education

The students stated that they mostly used smartphones ($n=194$). Second-most used device was the computer (laptop and desktop), tablet, interactive whiteboard, MP3 player, and overhead projector (Figure 1). Based on this finding, it can be mentioned that the students excessively benefit from technology in education activities. However, there were students, as well, who mentioned that they did not use technological devices for education activities.

It was also determined through which devices the students had access to the internet. These findings are given in Figure 2.

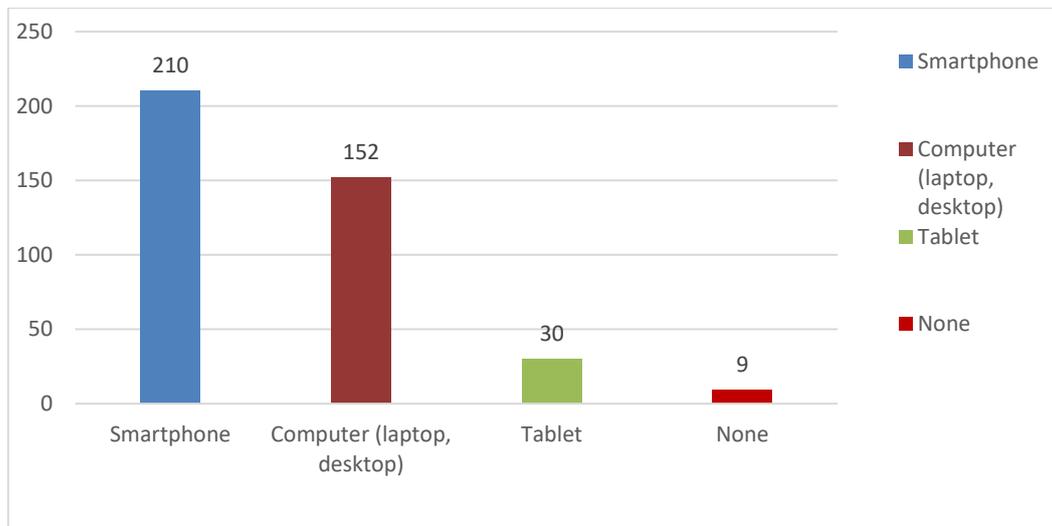


Figure 2. The Distribution of The Devices by Which The Students Have Access to The Internet

The majority of students are known to have internet access (Table 1). Figure 2 also shows that the most access was made over the smartphones (n = 210). Besides the smartphone, it is observed that they also use the computer and tablet for access to the internet. A very small number of students (n = 9) stated that they do not have access to the internet. Based on these results, it can be said that the majority of the students have access to the internet through their smartphones. It can be considered that the smartphone, which is an indispensable component of our modern day providing convenience, is preferred more because of its widespread use and since it provides convenience for access to anything desired anywhere and anytime.

The analysis results concerning the proficiency perceptions of the students about the general scale and its sub-dimensions are given in the following table.

Table 2. Arithmetic Mean and Standard Deviation Values of the Students Concerning the TPACK General Scale and Sub-dimensions

TPACK-General and Sub-Dimensions	n	\bar{X}	sd
TK	226	5.10	1.83
CK		7.02	1.68
PK		6.53	1.57
PCK		6.67	1.50
TCK		5.68	1.73
TPK		6.25	1.66
TPACK		6.08	1.82
General of Scale		6.12	1.31

The proficiency levels of the students according to Table 2 were determined to be between “some” and “quite a bit” (\bar{X} =6.12). The lowest proficiency was at the “some” level in TK dimension (\bar{X} =5.10), subsequently, in the TCK (\bar{X} =5.68) dimension, while the highest proficiency level was as the “quite a bit” (\bar{X} =7.02) level in the CK dimension. According to these results, it can be mentioned that the students consider that they have sufficient level of proficiency in the general TPACK scale, while they consider to have the least proficiency level in the TK and TCK, and the highest level in the CK proficiency level. However, although it is known that the students are prone to technology for learning and improving a

second language, this kind of low knowledge level demonstrate that the students have limited experience and they cannot use advanced technologies.

It was examined whether there were differences among the TPACK general proficiency levels of the students based on the gender variable. In this purpose, the independent samples t-test was employed, which is among the parametric tests. The obtained results are given in Table 3.

Table 3. The t-test Results of the Students Concerning their TPACK General Proficiency Levels in terms of Gender Variable

Gender	n	\bar{X}	sd	Levene's Test		t	p
				F	p		
Female	139	6.00	1.26	1.412	0.236	-1.707	0.089
Male	87	6.31	1.37				

As the conclusion of the independent samples t-test, which was employed to determine whether there were significant differences among the TPACK general proficiency levels based on the gender variable, no significant difference was detected between the arithmetic mean of the female ($\bar{X} = 6.00$) and male ($\bar{X} = 6.31$) students ($t(224)=1.707, p>0.05$). Thus, it can be mentioned that the gender differences of the preservice teachers, who are studying language education, have no impact on their TPACK general proficiency levels. It can be stated that both male and female students considered their TPACK proficiency levels as sufficient.

It was examined through the one-way variance analysis whether there were differences among the TPACK general proficiency levels of the students based on the department variable, and the results are given in Table 4.

Table 4. The Variance Analysis Results of the Students Concerning their TPACK General Proficiency Levels in terms of Department Variable

Department	n	\bar{X}	sd	Source of variance	Sum of squares	sd	Mean square	F	p	Scheffe
1. English Language and Literature	96	6.41	1.32	Between groups	33.390	2	16.695			
2. Turkish Language and Literature	77	5.58	1.22	Within groups	350.328	223	1.571	10.627*	0.000	2-1,3
3. Oriental Language and Literature	53	6.37	1.17	Total	383.718	225				
Levene: 0.289		p= 0.749								

*p<0.05

The TPACK general proficiency levels of the students studying different languages were compared based on their departments and significant differences were observed ($F(2-223)=10.627, p<0.05$). The magnitude of the impact calculated after the test ($\eta^2=0.09$) demonstrates that this difference is moderate. As a result of the Scheffe multiple comparisons test, it was observed that the significant difference was between the students of Turkish Language and Literature, those of the English Language and Literature, and the Oriental Language and Literature departments. It is observed that the TPACK general proficiency test results of the students attending the Turkish Language and Literature department were lower compared to the other departments; it can be mentioned that they consider their proficiency as the "some" level. It can be mentioned that the department variable has a moderate impact on the TPACK general proficiency levels.

It was attempted to determine the general TPACK proficiency levels based on whether the participants previously had a technology training. For this purpose, the independent samples t-test was applied and the results are given in the following table.

Table 5. TPACK General Proficiency t-test Results of The Students Based on Having Previous Technology Training Variable

Having previous technology training	n	\bar{X}	sd	Levene's Test		t	p
				F	p		
Yes	107	6.37	1.32	0.362	0.548	2.740*	0.007
No	119	5.90	1.26				

*p<0.05

As is seen in Table 5, there are significant differences among the TPACK general proficiency levels of the students about having a previous technology training ($t(224)=2.740$, $p<0.05$). It was determined that this difference was in favor of the ones with previous technology training. Considering the magnitude of the impact, it was determined to be at a low-impact level (Cohen's $d=0.37$). In line with these results, it can be mentioned that having a previous technology training experience is influential in the TPACK general proficiency levels.

According to having internet access variable, the t-test results of the students concerning their TPACK general proficiency levels are given in Table 6.

Table 6. The t-test Results of The Students Concerning Their TPACK General Proficiency Levels Based on Having Internet Access Variable

Having internet access	n	\bar{X}	sd	Levene's Test		t	p
				F	p		
Yes	212	6.17	1.30	0.064	0.800	2.223*	0.027
No	14	5.37	1.27				

*p<0.05

TPACK general proficiency levels of the students were determined to be statistically significant concerning having internet access ($t(224)=2.223$, $p<0.05$, Cohen's $d=0.62$). This difference is in favor of the students with internet access. Another result is that this variable has a moderate impact on the general proficiency levels. It can be concluded that TPACK proficiency levels of the students with internet access are higher, and this variable is efficient in having these high proficiency levels.

TPACK general proficiency levels of the participants were examined concerning their abilities to use computers. The obtained findings are in the following table.

Table 7. The t-test Results of The Students Concerning Their TPACK General Proficiency Levels Based on Ability to Use Computer Variable

Ability to use computer	n	\bar{X}	sd	Levene's Test		t	p
				F	p		
Sufficient	149	6.48	1.22	0.358	0.550	6.257*	0.000
Insufficient	77	5.42	1.19				

*p<0.05

A significant difference was determined between students' ability to use computer and their TPACK general proficiency levels ($t(224)=6.257$, $p<0.05$). This difference is in favor of the ones with sufficient ability to use computer. Besides its statistical significance, the magnitude of impact was determined as "high impact" (Cohen's $d=0.88$). It can be thought that the students considering their ability to use computer as sufficient have high proficiency. Moreover, it can be mentioned that the ability to use computer is an efficient factor in having the TPACK general proficiency.

The results of the analysis examining the TPACK general proficiency levels of the students and their research for new technologies particular to the field variable are as follows.

Table 8. The t-test Results of The Students Concerning Their TPACK General Proficiency Levels Based on Research for New Technologies Particular to The Field Variable

Research for new technologies particular to the field	n	\bar{X}	sd	Levene's Test		t	p
				F	p		
Yes	143	6.39	1.28	0.830	0.363	4.171*	0.000
No	83	5.66	1.23				

*p<0.05

As is seen in Table 8, there was significant difference concerning the research for new technologies particular to the field variable among the TPACK general proficiency levels ($t(224)=4.171$, $p<0.05$). The magnitude of the impact, which reveals the magnitude of the difference as well, was found as moderate (Cohen's $d=0.58$). It is observed that the students ($\bar{X}=6.39$), who make research for the new technologies particular to the field, have higher proficiency levels compared to other students ($\bar{X}=5.66$). It can be mentioned that making research for the new technologies particular to the field variable has an influence on the TPACK general proficiency level.

The results of the analysis examining the TPACK general proficiency levels of the students and their ability to use the new technologies in teaching activities variable are as follows.

Table 9. The t-test Results of The Students Concerning Their TPACK General Proficiency Levels Based on Ability to Use New Technologies of The Field in Teaching Activities Variable

Ability to use new technologies of the field in teaching activities	n	\bar{X}	sd	Levene's Test		t	p
				F	p		
Yes	183	6.27	1.23	0.219	0.640	3.737*	0.000
No	43	5.47	1.43				

*p<0.05

A significant difference was determined as a result of the analysis, and this difference is in favor of the students who use these new technologies of the field in teaching activities ($t(224)=3.737$, $p<0.05$). This variable has a medium level impact (Cohen's $d=0.60$). It is emphasized that using new technologies of the field in teaching activities is influential in the TPACK general proficiency levels.

Conclusion and Discussion

In teacher education, it was initially concentrated on the content knowledge of teachers, and subsequently, their pedagogical knowledge and their relationships. Afterwards, with the emergence of digitalization and the advance of technology into all domains of our lives, the integration of technology in teacher education and its reflections started to be discussed (Mishra & Koehler, 2006). Therefore, in this study, the proficiency levels of the preservice teachers, who will teach a second language, was examined through the TPACK framework, which was developed as the reflection of the changes digital technologies made in the teaching-learning processes (Mishra & Koehler, 2006). The integration of technologies as a collaborative tool for in-class training for the teachers, who are in a quest for alternative learning interactions, leads to positive transformations in terms of the TPACK (Paneru, 2018).

Technology is subtly used in teaching and learning through TPACK (Koehler, Mishra, & Yahya, 2007). In this study it was determined that almost all of the preservice teachers have smartphones and they have internet access through these devices. It was also detected in the study that since the students have internet access in such an easy and simple way, they prefer these devices before computers for education. It was determined that they used additionally tablet, interactive whiteboard, MP3 player, and overhead projector for educational purposes. As is in all fields, having a smartphone has advantages in language learning, particularly in education field (Başoğlu, 2010; Çavuş & İbrahim, 2009; Göçer and Karadağ, 2020; Saran, 2009; Tuncay, 2016; Yang, Li & Lu, 2015; Yıldırım, Yaşar & Duru, 2016). In language teaching, basic technological devices are also used: Such as computer, tablet, cell phones, projector, recorder, and textbook

software (Geçgel and Peker, 2020; Kayacan Köse, 2016). Additionally, the use of interactive whiteboard is also efficient in language teaching and learning (Al-Saleem, 2012; Geçgel and Peker, 2020; Mathews-Aydinli and Elaziz, 2010; Schmid, 2008).

Almost all individuals living in this digital age are searching for new technological devices and learning their usages. They also have the knowledge and proficiency in using these technological devices in all fields. They are the members of the generation which has grown up with these technologies and they always carry their smartphones (Dumanlı Kürkçü, 2015; Yelkikalan, Akatay and Altın, 2010). It can also be mentioned that the students implemented the integration of technology successfully, and they have the proficiency in terms of TPACK general framework. In line with their own evaluations, it can be stated that they have the highest level of proficiency in TK and TCK dimensions, and the lowest in CK dimension. The most important factor for the students to have low levels of knowledge can be explained by limited experience and being unable to use advanced technologies for educational purposes, resulting in low level of motivation or negative attitudes (Başer, 2015). In a study conducted on English instructors, the dimension with the highest proficiency was the CK dimension, the TPACK dimension had the lowest proficiency level (Kayacan Köse, 2016). In another study conducted on preservice English teachers, a high level of TPACK proficiency was determined (İşler & Yıldırım, 2018). In another study, it was determined that the teachers teaching language had the TPACK knowledge; however, it was reported that their confidence levels were low in terms of using relevant technology (Ramanair, Rethinsamy & Misieng, 2017). In a study conducted on English teachers the TK average score was low, and the TCK, TPK, and TPACK average scores were determined to be high (Debbagh & Jones, 2018).

It was determined that there was no significant difference between the TPACK general proficiency levels of the students and the gender variable. Knowing how to use technological tools, pedagogical strategies and the subject area to teach a certain subject is actually equal to having the TPACK proficiency (Jang & Chen, 2010).

It was determined that there were statistically significant differences among the TPACK general proficiency levels concerning department, receiving technology education, having access to internet, ability to use computer, searching for new technologies particular to the field, and ability to use these new technologies in the teaching activities. It was also determined that these variables are influential in the TPACK proficiency levels of preservice teachers, who are attending language teaching education concerning the languages included in this research. The pedagogical decisions of teachers concerning the TPACK technology integration are influenced from the individual technological preferences and subject area properties. The TPACK development, which is a pedagogical guide for the professional preparation and development of technology integration, contributes to these decisions of teachers in education (Szeto & Cheng, 2017). It was observed that the computer, internet, and technology knowledge levels of individuals increased, who have taken the responsibility and control of learning process and the activities within this process, and who have all the opportunities of communication technologies (Tercan, Horzum & Uysal, 2014); additionally, it was beneficial for both their writing skills and education processes (Akdağ, Şahan Yılmaz, Özhan & Şan, 2014). In line with the findings of this study and the data of Turkish Statistical Institute (2019), it is normal for these students, who are known to have a good command of computer and easy access to internet, to have high TPACK proficiency levels. Some language instructors stated that they used technologies such as Learning Management Tools, Social Networking and Bookmarking Sites, Blogs and Wikis, Presentation preparing tools, Resource Sharing tools and Web Exercise/ Activity Creation tools (Kayacan Köse, 2016). The TPACK proficiency in language teaching is highly related to the integration of technology (Bostancıoğlu & Handley, 2018; İşler & Yıldırım, 2018; Paneru, 2018). The use of technology in teaching learning process is a factor which is expected to have an impact on the quality of the learning experience (Aldunate & Nussbaum, 2013). The support of technologies in the development of language skills is undeniable (Golonka, Bowles, Frank, Richardson, & Freynik, 2012).

Suggestions

It is observed that, in the individuals studying language, the command of content is at high levels, however, there is an insufficiency and deficiency in integration with technology. Time should be allocated and efforts should be made for the technology integration that will provide the needed professional development. Various programs should be prepared that will inform the teachers about new technologies in language teaching during the higher education and in the initial years of the professional life; these programs should also demonstrate how to integrate these tools with the educational purposes. Technological infrastructure should be renewed within the schools to encourage teachers and preservice teachers to use their knowledge and skills in a way that can provide a good and effective learning environment. Both the academic and physical infrastructures should be revised so as to support the institutions raising teachers to ensure the TPACK proficiency. It should also be ensured that there is an applied education that will focus on the use of technology in the teaching of the courses. Memberships should be provided to various platforms where technology and educational developments can be followed.

References

- Adalar, H. (2021). Social studies teacher candidates' self-efficacy beliefs for technological pedagogical content knowledge (TPACK). *International Journal of Education and Literacy Studies*, 9(3), 169-183. Doi: 10.7575/aiac.ijels.v.9n.3p.169
- Akdağ, M., Şahan Yılmaz, B., Özhan, U., & Şan, İ. (2014). Üniversite öğrencilerinin internet bağımlılıklarının çeşitli değişkenler açısından incelenmesi (İnönü Üniversitesi örneği) [Investigation of university students' internet addiction in terms of several variables (Inonu University sample)]. *İnönü Üniversitesi Eğitim Fakültesi Dergisi [Inonu University Journal of Faculty of Education]*, 15(1), 73-96. Doi: 10.17679/ieufd.98972.
- Akkoç, H. (2011). Investigating the development of prospective mathematics teachers' technological pedagogical content knowledge. *Research in Mathematics Education*, 13(1), 75-76. doi:10.1080/14794802.2011.550729.
- Aktaş, İ. & Özmen, H. (2020). Investigating the impact of TPACK development course on pre-service science teachers' performances. *Asia Pacific Education Review*, 21(4), 667-682.
- Aktaş, İ. & Özmen, H. (2022) Assessing the performance of Turkish science pre-service teachers in a TPACK-practical course. *Education and Information Technologies*, 27(3), 3495-3528.
- Aldunate, R., & Nussbaum, M. (2013). Teacher adoption of technology. *Computers in Human Behavior*, 29, 519-524.
- Al-Saleem, B. I. A. (2012). The interactive whiteboard in English as a foreign language (EFL) classroom. *European Scientific Journal*, 8(3), 126-134.
- Apau, S. K. (2017). Technological pedagogical content knowledge preparedness of student-teachers of the department of arts and social sciences education of University of Cape Coast. *Journal of Education and Practice*, 8(10), 167-181.
- Arslan, A. (2020). Reliability and validity of TPACK instruments in EFL. *International Journal of Assessment Tools in Education*, 7(3), 343-360.
- Balcin, M. D., & Ergun, A. (2017). Science teacher candidates' views about technological pedagogical content knowledge (TPACK). *Journal of Theory and Practice in Education*, 13(4), 570-600.
- Başer, D. (2015). *Development and evaluation of a technological pedagogical content knowledge (TPACK) assessment tool for preservice teachers learning to teach English as a foreign language*. Unpublished doctoral dissertation, Computer Education and Instructional Technology Department, Middle East Technical University, Ankara.
- Baser, D., Kopcha, T. J., & Ozden, M. Y. (2016). Developing a technological pedagogical content knowledge (TPACK) assessment for preservice teachers learning to teach English as a foreign language. *Computer Assisted Language Learning*, 29(4), 749-764. DOI: 10.1080/09588221.2015.1047456.
- Başıoğlu, E. B. (2010). *Cep telefonu ve sözcük kartı kullanan öğrencilerin İngilizce sözcük öğrenme düzeylerinin karşılaştırılması [A comparison of undergraduate students' English vocabulary learning: Using mobiles phones and flashcards]*. Unpublished master thesis, Zonguldak Karaelmas University Social Sciences Institute, Zonguldak.
- Bostancıoğlu, A., & Handley, Z. (2018). Developing and validating a questionnaire for evaluating the EFL 'Total PACKage': Technological pedagogical content knowledge (TPACK) for English as a Foreign Language (EFL). *Computer Assisted Language Learning*, 31(5-6), 572-598. doi:10.1080/09588221.2017.1422524.
- Büyüköztürk, Ş. (2013). *Sosyal bilimler için veri analizi el kitabı istatistik, araştırma deseni SPSS uygulamaları ve yorum [Data analysis handbook for social sciences statistics, research design SPSS applications and comments]*. (Extended 18th ed.). Ankara: Pegem Akademi Publishing.
- Can, A. (2016). *SPSS ile bilimsel araştırma sürecinde nicel veri analizi [Quantitative data analysis in the scientific research process with SPSS]* (4th ed.). Ankara: Pegem Akademi Publishing.
- Can, B., Erokten, S., & Bahtiyar, A. (2017). An investigation of pre-service science teachers' technological pedagogical content knowledge. *European Journal of Educational Research*, 6(1), 51-57. Doi:10.12973/eu-jer.6.1.51.
- Canbazoğlu Bilici, S., & Baran, E. (2015). The investigation of science teachers' self-efficacy toward technological pedagogical content knowledge: A longitudinal study. *Gazi University Journal of Gazi Educational Faculty*, 35(2), 285-306.

- Chai, C. S., Koh, J. H. L., & Teo, Y. H. (2019). Enhancing and modeling teachers' design beliefs and efficacy of technological pedagogical content knowledge for 21st century quality learning. *Journal of Educational Computing Research*, 57(2), 360-384. doi:10.1177/0735633117752453.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Earlbaum Associates.
- Çavuş, N., & İbrahim, D. (2009). M-learning: An experiment in using sms to support learning new English language words. *British Journal of Educational Technology*, 40(1), 78-91.
- Debbagh, M., & Jones, W. M. (2018). Examining English language teachers' TPACK in oral communication skills teaching. *Journal of Educational Multimedia and Hypermedia*, 27(1), 43-62.
- Dumanlı Kürkcü, D. (2015, December). İnternette Gazete Takibinde Dijital Yerliler ve Dijital Göçmenler [Digital natives and digital immigrants' newspaper tracking on the internet]. *İnet-Tr'15, XX. Türkiye'de İnternet Konferansı [Internet Conference in Turkey] 1-3 December 2015* (pp. 1-6). Istanbul University, Istanbul. Retrieved October 18, 2018 from <http://inet-tr.org.tr/inetconf20/kitap/inet15-DDKurkcü.pdf>
- Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39(2), 175-191.
- Furkan, C. (2020) EFL teachers' views about technology integration in English language teaching: A case study. *i-manager's Journal on English Language Teaching*, 10(2), 54.
- Geçgel, H. & Peker, B. (2020). Multimedya araçlarının yabancı dil öğretimine etkisi üzerine öğretmen görüşleri [Teachers opinions about the effects of multimedia services on language learning]. *RumeliDE Journal of Language and Literature Studies*, 20, 12-22. Doi: 10.29000/rumelide.791070.
- George, D., & Mallery, M. (2010). *SPSS for Windows step by step: A simple guide and reference, 17.0 update* (10th ed.) Boston: Allyn & Bacon.
- Golonka, E. M., Bowles, A. R., Frank, V. M., Richardson, D. L., & Freynik, S. (2012). Technologies for foreign language learning: A review of technology types and their effectiveness. *Computer Assisted Language Learning*, 27(1), 70-105. Doi: <https://doi.org/10.1080/09588221.2012.700315>.
- Gómez-Trigueros, I. M. (2020). Digital Teaching Competence and Space Competence with TPACK in Social Sciences. *International Journal of Emerging Technologies in Learning (IJET)*, 15(19), 37-52.
- Göçer, A. & Karadağ, B. F. (2020). Türkçenin yabancı dil olarak öğretimde whatsapp uygulamasının kullanımının sözcük öğretimi bakımından işlevselliği [The functionality of using whatsapp application in teaching Turkish as a foreign language]. *Mustafa Kemal University Journal of Social Sciences Institute*, 17(46), 322-340.
- Irmak, M. & Yılmaz Tüzün, Ö. (2019). Investigating pre-service science teachers' perceived technological pedagogical content knowledge (TPACK) regarding genetics. *Research in Science & Technological Education*, 37(2), 127-146.
- İşler, C., & Yıldırım, Ö. (2018). Perceptions of Turkish pre-service EFL teachers on their technological pedagogical content knowledge. *Journal of Education and Future*, 13, 145-160.
- Jang, S. J., & Chen, K. C. (2010). From PCK to TPACK: Developing a transformative model for pre-service science teachers. *Journal of Science Education and Technology*, 19(6), 553-564. Doi: <https://doi.org/10.1007/s10956-010-9222-y>.
- Karakaya, F., & Yazici, M. (2017). Examination of technological pedagogical content knowledge (TPACK) self-efficacy for pre-service science teachers on material development. *European Journal of Education Studies*, 3(3), 252-270. Doi: 10.5281/zenodo.290617.
- Karasar, N. (2003). *Bilimsel Araştırma Yöntemi [Scientific research method]* (12th Ed.). Ankara: Nobel Publishing.
- Kayacan Köse, N. (2016). Technological pedagogical content knowledge (TPACK) of English language instructors. *Journal of Educational and Instructional Studies in The World*, 6(2), 12-19.
- Knapp, W. M. (2017). *The impact of TPACK and teacher technology efficacy on social studies teachers' use of technology in the classroom*. Doctoral dissertation, The Faculty of The University of Minnesota, USA.
- Koehler, M. J., Mishra, P., & Yahya, K. (2007). Tracing the development of teacher knowledge in a design seminar: Integrating content, pedagogy, and technology. *Computer & Education*, 49(3), 740-762.

- Leinhardt, G., & Greeno, J. G. (1986). The cognitive skill of teaching. *Journal of Educational Psychology*, 78(2), 75-95. Doi: 10.1037/0022-0663.78.2.75.
- Lin, F.-A. (2010). *Those who entered through the back door: Characterizing adult ESL teachers and their knowledge*. Unpublished doctoral dissertation. The University of Texas, Austin.
- Maněnová, M. & Žembová, N. (2012). Analysis of lessons using interactive whiteboard focused on pedagogical interaction and communication. *Procedia-Social and Behavioral Sciences*, 69, 1719-1728. Doi: 10.1016/j.sbspro.2012.12.120.
- Mathews-Aydinli, J. & Elaziz, F. (2010). Turkish students' and teachers' attitudes toward the use of interactive whiteboards in EFL classrooms. *Computer Assisted Language Learning*, 23(3), 235–252.
- Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, 108(6), 1017-1054.
- Morales-López Y., Chacón-Camacho, Y., & Vargas-Delgado, W. (2021). TPACK of prospective mathematics teachers at an early stage of training. *Mathematics*, 9(15), 1741.
- Mouza, C., Nandakumar, R., Ozden, S. Y., & Karchmer-Klein, R. (2017). A longitudinal examination of preservice teachers' technological pedagogical content knowledge in the context of undergraduate teacher education. *Action in Teacher Education*, 39(2), 153-171. doi:10.1080/01626620.2016.1248301.
- Na, R., Zhang, H., Wang, Y., Wang, Y., Yoneda, T., & Li, Z. (2017, December). A study of TPACK structure of outstanding English teacher. *The Sixth International Conference of Educational Innovation through Technology (EITT)*, 7-9 December 2017 (pp. 299-302). Osaka, Japan. Doi: 10.1109/EITT.2017.78.
- Nazari, N., Nafissi, Z., Estaji, M., Marandi, S. S., & Wang, S. (2019). Evaluating novice and experienced EFL teachers' perceived TPACK for their professional development. *Cogent Education* 6(1).
- Niess, M. L., Ronau, R. N., Shafer, K. G., Driskell, S. O., Harper S. R., Johnston, C., Browning, C., Özgün-Koca, S. A., & Kersaint, G. (2009). Mathematics teacher TPACK standards and development model. *Contemporary Issues in Technology and Teacher Education*, 9(1), 4-24.
- Njiku, J., Mutarutinya, V., & Francois Maniraho, J. (2020). Developing technological pedagogical content knowledge survey items: A review of literature. *Journal of Digital Learning in Teacher Education*, 36(3), 150-165.
- Ondrakova, J., & Tauchmanova, V. (2019). Learning and teaching more foreign languages. *The European Proceedings of Social & Behavioural Sciences*. (pp. 356-366). Doi: 10.15405/epsbs.2019.01.34.
- Ozudogru, M., & Ozudogru, F. (2019). Technological pedagogical content knowledge of mathematics teachers and the effect of demographic variables. *Contemporary Educational Technology*, 10(1), 1-24. Doi: <https://doi.org/10.30935/cet.512515>.
- Özgen, K., Narlı, S., & Alkan, H. (2013). An investigation of mathematics teacher trainees' technological pedagogical content knowledge and their perception of the frequency of technology use. *Electronic Journal of Social Sciences*, 12(44), 31-51.
- Pallant, J. (2005). *SPSS Survival Manual: A Step by Step Guide to Data Analysis Using SPSS for Windows*. (Version 12). Australia: Allen & Unwin.
- Paneru, D. R. (2018). Information communication technologies in teaching English as a foreign language: Analysing EFL teachers' TPACK in Czech elementary schools. *CEPS Journal*, 8(3), 141-163. Doi: 10.26529/cepsj.499.
- Ramanair, J., Rethinsamy, S., & Misieng, J. (2017, December). The technological, pedagogical and content knowledge (TPACK) of tertiary level English language instructors in integrating technology in language classrooms. In *E-Proceeding of the 6th Global Summit on Education 2017 (GSE 2017)*, 4th December 2017 (pp. 15-19). Melia, Kuala Lumpur, Malaysia.
- Saran, M. (2009). *Exploring the uses of mobile phones for supporting english language learners' vocabulary acquisition*. Unpublished doctoral dissertation, METU Graduate School of Natural and Applied Sciences, Ankara.
- Sarı, M. H., & Bostancıoğlu, A. (2018). Application of Technological Pedagogical Content Knowledge framework to elementary mathematics teaching: A scale adaptation study. *Kuramsal Eğitim Bilim Dergisi [Journal of Theoretical Educational Science]*, 11(2), 296-317.

- Scardamalia, M., Bransford, J., Kozma, B., & Quellmalz, E. (2012). New assessments and environments for knowledge building. In P. Griffin, B. McGaw, & E. Care (Eds.), *Assessment and teaching of 21st century skills* (pp. 231-300). Springer, Dordrecht. Doi: https://doi.org/10.1007/978-94-007-2324-5_5.
- Schmid, E. C. (2008). Potential pedagogical benefits and drawbacks of multimedia use in the English language classroom equipped with interactive whiteboard technology. *Computers & Education*, 51(4), 1553-1568.
- Sharp, S. K. (2017). *iPads in the second language classroom: An examination of iPad use by teachers through TPACK and teacher perception lenses*, Doctoral dissertation. University of Maryland, College Park. Retrieved April 22, 2019 from https://drum.lib.umd.edu/bitstream/handle/1903/20334/Sharp_umd_0117E_18545.pdf?sequence=1&isAllowed=y.
- Shulman, L. S. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review*, 57(1), 1-22.
- Srisawasdi, N. (2014). Developing technological pedagogical content knowledge in using computerized science laboratory environment: An arrangement for science teacher education program. *Research and Practice in Technology Enhanced Learning*, 9(1), 123-143.
- Szeto, E., & Cheng, A. Y. N. (2017). Pedagogies across subjects: What are preservice teachers' TPACK patterns of integrating technology in practice? *Journal of Educational Computing Research*, 55(3), 346-373. Doi: <https://doi.org/10.1177/0735633116667370>.
- Szeto, E., Cheng, A. Y. N., & Hong, J.-C. (2016). Learning with social media: How do preservice teachers integrate YouTube and social media in teaching? *The Asia-Pacific Education Researcher*, 25(1), 35-44.
- Tekin, V. N. (2009). *SPSS Uygulamalı İstatistik Teknikleri [SPSS Applied statistic techniques]*. (Updated 2nd Edition). Ankara: Seçkin Publishing.
- Tercan, S. S., Horzum, M. B., & Uysal, M. (2014). Teknoloji ile öz-yönelimli öğrenme ölçeğinin Türkçe'ye uyarlanması [Adapting self-directed learning using technology scale into Turkish]. *Eğitim Teknolojileri Araştırma Dergisi [The Journal of The Educational Technologies Research]*, 3, 1-19.
- Tuncay, N. (2016). Smartphones as tools for distance education. *Journal of Educational and Instructional Studies in The World*, 6(2), 20-30.
- Turkish Statistical Institute. (2019). *Main Statistics*. Retrieved March 24, 2019 from <http://www.turkstat.gov.tr>.
- Yang, X., Li, X., & Lu, T. (2015). Using mobile phones in college classroom settings: Effects of presentation mode and interest on concentration and achievement. *Computers & Education*, 88, 292-302.
- Yanış, H. & Yürük, N. (2021). Development, validity, and reliability of an educational robotics based technological pedagogical content knowledge self-efficacy scale. *Journal of Research on Technology in Education* 53(4), 375-403.
- Yelkikalan, N., Akatay, A., & Altın, E. (2010). Yeni Girişimcilik Modeli ve Yeni Nesil Girişimci Profili: İnternet Girişimciliği ve Y, M, Z Kuşağı Girişimci [A new entrepreneurship model and a new generation entrepreneurship profile: An internet entrepreneurship and Y, M, Z generations entrepreneurs]. *Sosyal Ekonomik Araştırmalar Dergisi [The Journal of Social Economic Research]*, 10(20), 489-506.
- Yıldırım, K., Yaşar, Ö., & Duru, M. (2016). Öğretmen ve öğrenci görüşleri temelinde akıllı telefonların eğitim öğretim ortamlarında kullanılmasının ve etkilerinin incelenmesi [Based on the views of teachers and students analysig the usage of smartphones in teaching and learning environments and effects]. *International Journal of Education, Science and Technology*, 2(2), 72-84.