

Investigation of Teacher Candidates' Technology Competencies and Perceptions in Terms of Various Variables

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Abstract

The aim of this study is to examine the teacher candidates' technology competencies and perceptions in terms of various variables (gender, type of education, department, whether they have their own computers or not, the situation of connecting to the Internet). The study is a survey model, and the research group consists of five hundred eighteen teacher candidates studying in nine different departments in the spring term of 2018–2019 academic year at Atatürk University Kazım Karabekir Education Faculty. "Technology Perception Scale" and "Computer Competency Scale", which is developed by Tımmaz (2004), were used as data collection tools. The Cronbach alpha value of the Technology Perception Scale was calculated as ninety-four, and the Computer Competency Scale was eighty-eight. Independent Samples "T" test and Kruskal Wallis "H" test were used for data analysis. It has been concluded that there is no significant difference in terms of technology competencies of the teacher candidates in terms of education type, department, having own computer or not, and internet connection variabilities but there is a significant difference in terms of technology competencies in terms of gender (in favor of male) and there is a significant difference in terms of perceptions of gender (in favor of men), type of education (in favor of evening education), department, whether having a computer or not (in favor of having a computer) and the variables of connecting to the Internet.

Keywords: teacher candidates, perception of technology, competency

1. Introduction

In our age, advances in science and technology are the main factors that affect the structure of societies and education systems. The quality of life changes with the applied of technology and information technologies (Akkoyunlu, 1996). The necessity of raising students who are suitable for the age has emerged in the step of raising individuals for community needs. Thousands of scientific articles are published every day and information is multiplied, and individuals should be equipped with the skills of accessing, organizing, evaluating, presenting the information and communication. In this context, these skills need to be provided to educators who will guide the students (Çetin, Önal, & Gündüz, 2015). Today, technologies make it possible to organize the teaching and learning process in a way that takes into account the professional tendency of teaching, as well as the personality, interests and abilities of the student. Technology plays an important role in the development, activation and adaptation of innovations to the teaching process. Computer and other technological tools also play an important role in the accessing to information, creating rich learning environments, responding to different learning styles of students, transferring the learned, supporting high-level thinking skills, offering students the opportunity to compare with the real-life problems, by solving problems steering students to learn science based on inquiry, cooperation, communication and support lifelong learning. The rapid developments in information technologies make it essential for countries to follow technological developments closely in order to achieve success in their education system (Akkoyunlu, 1996; Beşoluk, Kurbanoğlu, & Önder, 2010; Uerz, Volman, & Kral, 2018).

Teachers have become an important element in the education of children in terms of the use of technology. If teachers will teach children technology, they should receive the necessary training about computers and follow technological innovations (Dawes, 1999).

The rapid development of information technology has made computers and computer-related technology an integral part of teaching and learning. Therefore, an important goal in teacher education is to enable teachers to acquire and understand technology skills so that they can provide meaningful technological-based learning

experiences for their future students (Bai & Ertmer, 2008). When used meaningfully to support innovative pedagogy, educational technology can provide enriching and highly encouraging educational opportunities. Therefore, administrators and educators need to provide all teachers the necessary knowledge and support they need to better use technology in their classroom and integrate it better into the school curriculum (Znamenskaia, 2000). The use of technology manifests itself in every aspect of society and education. This includes teacher training (Dieker et al., 2014).

When the literature is examined, it is seen that there are many studies on use of technology and technology competencies of teachers in learning and teaching process.

Uçar (1999) states that most of the teachers cannot be equipped with sufficient knowledge and skills about instructional technologies in their pre-service education and they have deficiencies in terms of using technology in teaching processes and also Aşan (2002) expresses that most of the teacher candidates graduated from faculties of education with limited knowledge about how to use technology in their courses.

In a study conducted by Kabadayı (2006), it is seen that teacher candidates and teachers stated that technology-supported teaching in education environment is indispensable for preschool education.

Taş, Özel and Demirci (2007) states that although teachers see technology as an important tool for teaching, they do not know how to use computer-oriented technologies such as computer simulations, databases, photograph and graphic editing programs, and various information system software. Within the scope of the thesis study conducted on in-service and pre-service teachers' computer usage levels and attitudes about this subject, Mete (2008) determined that teachers were insufficient to use technology effectively in the classroom. One of the reasons for this situation, he states that the computer courses given during the undergraduate education of teachers candidates were not offered within the scope of appropriate educational activities.

Sönmez, Çavuş and Meray (2009) state that the effective use of instructional technology will make the teaching process efficient and will ensure permanent learning. It will also provide entirety to the education process. In their study, Beşoluk, Kurbanoglu and Önder (2010) determined that teachers and teachers' candidates did not consider themselves sufficient in terms of knowledge and usage levels about educational technologies, in general and concluded that they wanted to reach higher level of knowledge and usage level. As a result of this, they state that both teacher candidates and teachers need to get more education about educational technologies.

Kabakçı Yurdakul (2011) tried to determine teacher candidates' proficiency levels for technological pedagogical education and the differentiation situation of these levels in terms of usage levels of information and communication technologies. According to the results of the research on three thousand one hundred five teachers from seven different state universities in Turkey, it is established that teacher candidates consider themselves advanced in terms of technological pedagogical competencies, and also in the dimension of specialization, they considered themselves as moderate enough, while in the sub-dimensions of technological pedagogical education, they consider themselves advanced sufficient in the dimension of design, implementation and ethics, respectively.

Çetin, Çalışkan and Menzi (2012), in their study in which they research teacher candidates' technology competency in terms of various variables with six hundred forty two teacher candidates, it was found that there are significant differences among the teacher candidates in terms of gender, grade level, department, purpose of using computer and internet, frequency of internet usage and having personal computer and internet connection. It was found that teacher candidates consider themselves sufficient on basic computer and word processing skills; close enough on network, telecommunications, spreadsheet, installation, maintenance, troubleshooting and media communications; less than enough on databases and social, legal and ethical issues.

Nowadays, teacher candidates need to both be able to use technology very well and to use these technologies efficiently in their learning-teaching processes. Teacher candidates' perspectives on technology are very important to benefit from the opportunities offered by technology more effectively and efficiently (Çelik & Kahyaoglu, 2007). In this context, in the faculties of education in which the knowledge and skills of the teaching profession are gained, there is a need for studies examining the level of perceptions of teacher candidates about technology, how much they have technological competencies, and how their attitudes towards technology have changed.

Up to the advancement of new technologies in education, teacher was the only one who knew everything and passed it on to the students. We are definitely beginning an era where students have the same access to an incredible amount of information the same as their teachers. Under the light of this necessity, computer technology has been perceived as an important issue and the argument about whether or not teachers are adequately trained to use computer technology into their classroom has turned out to be a major concern and research issue of most scholars (Andrews, 1996; Boshuizen & Wopereis, 2003; Crawford, 2000).

In a study by Looney, Valacich and Akbulut (2004) it is pointed out that general self-efficacy reflects considerable positive influence regarding computer self-efficacy, which, in turn, seems to predict, to a considerable degree, self-efficacy in the use and development of online research. Thus, researchers with a greater sense of computer self-efficacy tend to prefer technologies based on the worldwide web as a vehicle for research, whereas researchers with lower computer self-efficacy prefer more traditional methods such as library research, or traditional lectures.

Teo (2008) stated that in a study conducted with 139 pre-service teachers' to use of computer technology depends on many reasons such as affect (liking), perceived usefulness, perceived control, and behavioural intention and their attitudes towards computers are the leading ones. The results of this study showed no gender or age differences for computer attitudes by the subject areas that pre-service teachers had been trained during their university education; Humanities, Sciences, Languages and General (Primary). Correlation analyses revealed significant associations between years of computer use and level confidence and computer attitudes.

Paraskeva, Bouta and Papagianni (2008), found a positive correlation between general efficacy and computer self-efficacy. Our perceptions play an important role in guiding and predicting our future actions. Our past experiences are summarized into perceptions which serve in many ways to predict or influence future actions. The attitudes, values or perceptions pre-service teachers have about technology, whether received through parents, peers (Ellis, 2003),

Therefore, the necessity of conducting current research emerges.

1.1 Problem of Research

The aim of this study is to examine the teacher candidates' technology competencies and perceptions in terms of various variables (gender, type of education, department, whether they have their own computers or not, the situation of connecting to the Internet).

2. Method

2.1 General Background

In this study, which aims to examine the teacher candidates' perceptions of technology in terms of various variables, survey design which is one of quantitative research methods, is used. According to Karasar (2005, p. 79), the survey model is the screening arrangements made on a whole, or a group to be taken from the universe, sample or sampling in a universe consisting of many elements in order to reach a general judgment about universe. This pattern is a type of quantitative research conducted to determine the tendencies, attitudes or opinions of individuals in a sampling selected from a universe (Creswell, 2012).

2.2 Study Group

Convenience sampling method was used to determine the research group. Convenience sampling is defined as the making sampling on individuals who are in the immediate vicinity, easy to reach and willing to participate in the study (Erkuş, 2009, p. 98). Therefore, it is considered more appropriate to use the concept of research group instead of the sample concept. The research group which was determined according to the convenience sampling method consists of five hundred eighteen teacher candidates studying in nine different fields in the spring term of 2018–2019 academic year at Atatürk University Kazım Karabekir Education Faculty. Information about sampling is given in Table 1.

Table 1. Information about sampling

		f	%
Gender	Female	352	68.0
	Male	166	32.0
	Total	518	100
Department	German Language Education	57	11.0
	Physical Education	58	11.2
	Science Education	53	10.2
	Music Education	58	11.2
	Preschool Education	77	14.9
	Psychological Counseling and Guidance	55	10.6
	Primary School Education	57	11.0
	Social Science Education	48	9.3
	Turkish Language Education	55	10.6
	Total	518	100
Type of Education	Daytime Education	490	94.6
	Evening Education	28	5.4
	Total	518	100
Do you have your own Computer?	Yes	341	65.8
	No	177	34.2
	Total	518	100.0
The Internet Connection	There is	320	61.8
	There is not	21	4.1
	Not having computer	177	34.2
	Total	518	100

When the Table 1 is examined, the sample group includes 77 preschoolers, 58 music, 58 physical education, 57 primary, 57 German, 55 Turkish, 55 Psychological Counseling and Guidance, 53 science and 48 social science teachers, in other words, in total 518 teacher candidates. In addition, 352 of the teacher candidates in the sample group were female and 166 were male. 341 have a personal computer, while 177 do not have a personal computer. While 320 of the teacher candidates who have personal computers can connect to the internet, 21 cannot connect to the internet.

2.3 Instruments

The data of the study “Technology Perception Scale” and “Computer Competency Scale” developed by Tinmaz (2004) was used. In this study, confirmatory factor analysis was made in order to ensure the validity of the scale and the existing structure of the scale was confirmed for the sampling of this study. They were asked to mark the scale with this way; Which of the following programs do you feel sufficient to use in your future professional life? Weak (1), Medium (2) and Good (3) and in the Perception Scale, they were asked to write on of these words; Strongly Disagree (1), Disagree (2), Undecided (3), Agree (4), Strongly Agree (5). Technology Perception Scale consists of 28 items. The Cronbach alpha value of the scale was calculated as .94. Perceived Computer Competency Scale consists of 10 items. The Cronbach alpha value of the scale was calculated as .88. According to these results, it can be said that the scale is reliable.

3. Results

SPSS package program was used for data analysis. Independent group t test and Kruskal Wallis H test (since the section variable did not meet the homogeneity assumption) was used as statistical technique.

Based on the analysis of computer competency scale, Independent samples t test results showing whether candidates’ technology competencies differ according to their gender are provided Table 2.

Table 2. Independent samples t test results showing whether teacher candidates’ technology competencies differ according to their gender

Gender	N	\bar{X}	SS	Sd	t	P
Male	166	2.12	.40	516	5.0	.00*
Female	352	1.94	.36			

Note. *p<.05.

According to the results of independent samples t test that shows whether the technology competencies of

teacher candidates differ or not according to gender, there is a significant difference between teacher candidates' competencies scores according to gender ($p < .05$). This difference is in favor of male teacher candidates. In other words, male teacher candidates' competencies scores are higher than female teacher candidates.

Based on the analysis of technology perception scale, Independent samples t test results showing whether the teacher candidates' technology perceptions differ according to gender are provided Table 3.

Table 3. Independent samples t test results showing whether the teacher candidates' technology perceptions differ according to gender

Gender	N	\bar{X}	SS	Sd	t	P
Male	166	3.44	.47	516	1.95	.05*
Female	352	3.35	.45			

Note. * $p < .05$.

According to the results of independent samples t test showing whether the technology perceptions of the teacher candidates in Table 3 differ or not according to their gender, it is seen that according to the gender (in favor of men) there is a significant difference between the perception scores of teacher candidates.

Based on the analysis of computer competency scale, Independent samples t test results showing whether teacher candidates' technology competencies differ according to the type of education are provided Table 4.

Table 4. Independent samples t test results showing whether teacher candidates' technology competencies differ according to the type of education

Type of education	N	\bar{X}	SS	Sd	T	P
Daytime Education	490	2.00	.38	516	-.85	.45*
Evening Education	28	2.06	.43			

Note. * $p < .05$.

When Table 4 is examined, it is seen that there is no significant difference according to the results of the t-test regarding whether the teacher candidates' technology competencies differ according to the type of education.

Based on the analysis of technology perception scale, Independent samples t test results showing whether the teacher candidates' technology perceptions differ according to the type of education are provided Table 5.

Table 5. Independent samples t test results showing whether the teacher candidates' technology perceptions differ according to the type of education

Type of education	N	\bar{X}	SS	Sd	T	P
Daytime Education	490	3.37	.46	516	-2.31	.02*
Evening Education	28	3.58	.37			

Note. * $p < .05$.

According to the Independent samples t test results showing whether the technology perceptions of the teacher candidates differ according to the type of education, there is a significant difference between teacher candidates' proficiency scores considering the type of education ($p < .05$). This difference is in favor of evening education students. In other words, technology perception scores of evening education students are higher than Daytime education students.

Based on the analysis of computer competency scale, Kruskal Wallis H results showing whether teacher candidates' technology competencies differ according to the department are provided Table 6.

Table 6. Kruskal Wallis H results showing whether teacher candidates' technology competencies differ according to the department they study

Departments	N	Mean Rank	Sd	Chi-square	P
German Language Teaching	57	274.36		6.97	.53*
Physical Education	58	273.08			
Science Education	53	258.94			
Music Education	58	250.61	8		
Pre-school Education	77	285.55			
Psychological Counseling and Guidance	55	252.45			
Primary School Education	57	254.06			
Social Sciences Education	48	223.24			
Turkish Language Education	55	247.55			
Total	518				

Note. *p<.05.

When Table 6 is examined, it is seen that there is no significant difference in the technology competencies of the teacher candidates according to the department variable. In the table, it can be seen that the teacher candidates with the highest average are the students studying in Preschool Education Department. When the average score of the competency exam is examined, it is seen that the teacher candidates studying in the Social Studies Education Department have the lowest average (223.24).

Based on the analysis of technology perception scale, Kruskal Wallis H test results showing whether the teacher candidates' technology perceptions differ according to the department are provided Table 7.

Table 7. Kruskal Wallis H test results showing whether the teacher candidates' technology perceptions differ according to the department they study

Departments	N	Mean Rank	Sd	Chi-square	P	Significant difference
German Language Education	57	287.39	8	29	.00*	
Physical Education	58	237.29				
Science Education	53	252.58				
Music Education	58	246.19				
Pre-School Education	77	280.68				
Psychological Counseling and Guidance	55	191.92				7>1, 2, 3, 4, 5, 6, 8, 9
Primary School Education	57	325.67				
Social Sciences Education	48	235.82				
Turkish Language Education	55	264.73				
Toplam	518					

Note. *p<.05.

When Table 7 is examined, it can be seen that the highest rank average belongs to teacher candidates who are studying in the Department of Primary School Education (325.67). Then, it is seen that the teacher candidates who study in the Departments of German Language Education (287.39), Preschool Education (280.68) and Turkish Language Education (264.73) have high averages. The lowest average is seen in Psychological Counseling and Guidance (191.92) and the second lowest is in Social Sciences Education (235.82). It is understood that the technology perceptions of the teacher candidates showed a significant difference (p<.05) according to the department variable they studied.

Table 8. Independent Samples t test results showing whether teacher candidates' competency and perceptions differ according to their own computers.

	Do You Have Your Own Computer?	N	\bar{X}	SS	Sd	T	P
Competency	Yes	341	2.00	.39	516	.079	.93*
	No	177	2.00	.37			
Perception	Yes	341	3.42	.46	516	2.58	.01*
	No	177	3.31	.46			

Note. *p<.05.

There was no significant difference in the teacher candidates' competency scores according to the variable of having personal computer. A significant difference was found in the perception scores of teacher candidates according to the variable of having personal computer. When the arithmetic average of perception scores are examined, it is seen that teacher candidates who have their own computer have higher average and there is a significant difference in perception scores in favor of teacher candidates who have their own computer.

Table 9. The results of the t-test showing whether the technology competencies and perceptions of the teacher candidates differ according to their internet connection status

		Can you connect to the Internet?	N	\bar{X}	SS	Sd	T	P
Competency	Yes		320	2.00	.38	339	1.14	.25*
	No		21	1.90	.39			
Perception	Yes		320	3.43	.44	339	2.14	.03*
	No		21	3.21	.53			

Note. *p<.05.

There was no significant difference between the teacher candidates' competency scores according to the variable of internet connection status (p<.05). A significant difference was found in the perception scores of the teacher candidates according to the variable of internet connection status. When the arithmetic averages of perception scores are examined, it is seen that the teacher candidates who can connect to the Internet have higher average and there is a significant difference in perception scores (p<.05) in favor of teacher candidates who can connect to the internet.

4. Discussions

In terms of technology competencies of teacher candidates, there is no significant difference in terms of type of education, department, having own computers, internet connection variables, but there is a significant difference in terms of technology competencies of gender (in favor of male), in terms of perceptions of teacher candidates, there is a significant difference in perceptions of gender (in favor of men), type of education (in favor of evening education), department, having own computers and internet connection variables.

In the study conducted by Şimşek (2016) with 3932 teacher candidates in 18 different universities, a significant difference was realized in the small effect level in favor of male teacher candidates in the Technology Knowledge dimension. It was seen that technology knowledge self-efficacy perceptions of male teacher candidates were better than female teacher candidates. This finding supports the findings of the study.

In their study, Erdemir, Bakırcı and Eyduran (2009) concluded that female teacher candidates' concept, mind and knowledge maps were better than male teacher candidates in selecting and preparing material for the purpose of teaching instructional material.

According to the results of the study, it is seen that the perceptions of the teacher candidates studying in the Department of Primary School Education are high. Then, it is seen that the teacher candidates who study in the departments of German Language Education, Preschool Education and Turkish Language Education have high averages. It is seen that Psychological Counseling and Guidance has the lowest average and Social Sciences Education has the second low average. It is understood that the technology perceptions of the teacher candidates showed a significant difference (p<.05) according to the department variable they studied.

In a study conducted by Usta and Korkmaz (2010) with 106 teacher candidates, it was observed that teacher candidates' perceptions about the use of technology in education were positive and this positive perception level had a positive effect on the attitude towards teaching profession, as the technology literacy levels of teacher candidates increased, these positive attitudes towards the use of technology increased. In addition, most of the teacher candidates think that they have sufficient computer skills. Another finding is that although primary school students consider themselves as more adequate than social studies teacher students, this difference is not significant.

It is seen that there is no significant difference in teacher candidates' technology proficiency according to department variable. It is seen that the highest average teacher candidates are the students studying in Preschool Education Department. When the adequacy score averages are examined, it is seen that the teacher candidates studying in the Social Sciences Education Department have the lowest average.

In the study of Ozan and Taşgım (2017), result obtained regarding the departments is that self-efficacy

perceptions of teacher candidates who are studying on Preschool Education are significantly higher than those students of science-mathematics and social studies. This situation can be thought to be due to the differentiation of the profiles of the teaching staff and teacher candidates working in the related programs.

According to the results of the research, no significant difference was found in the competencies scores of the teacher candidates according to the variable of having personal computer. A significant difference was found in the perception scores of teacher candidates according to the variable of having personal computer. When the arithmetic averages of perception scores are examined, it is seen that teacher candidates who have their own computer have higher average and there is a significant difference in perception scores in favor of teacher candidates who have their own computer.

In the study of Ata and Baran (2011), it was realized that university students' perceptions of information literacy self-efficacy did not change according to gender, but differed according to the level of foreign language, having computer and frequency of using internet.

In the study that is made by Inel, Evrekli and Balm (2011) it was aimed to determine the opinions of 53 teacher candidates studying in Science Teaching department about the use of educational technologies in science and technology courses teacher candidates state that the use of technology will be beneficial in science and technology teaching and may have effects on students such as providing visual and auditory learning, increasing interest and attention, facilitating learning, embodying abstract concepts and increasing permanence. It is concluded that the majority of teacher candidates considered themselves partly sufficient regarding to use educational technologies in the teaching environment and they thought that they do not have enough equipment regarding use of educational technology in the school environment in Turkey.

According to the results of the study conducted by Yenilmez, Turgut, Anapa and Ersoy (2012), it was seen that educational internet use self-efficacy beliefs of primary school mathematics teachers differed in gender (in favor of men). This finding supports the research findings. In the study conducted by Eyüp (2012), no significant difference was found between Turkish teacher candidates in terms of gender variable. It can be said that the self-confidence levels of female and male teacher candidates about using technology are close to each other. In terms of the ability to provide distance education only over the internet (m22), the results were in favor of male students.

In the study conducted by Dargut and Çelik (2014), it is seen that there is a significant difference in favor of women when the relationship between gender and attitudes of technology participants of 179 female and 103 male teacher candidates is examined.

In their study, Çetin and Güngör (2014) found that computer self-efficacy perceptions of teachers with personal computers were significantly higher than those without.

In the study conducted by Ozan and Taşgın (2017), data were collected from 568 teacher candidates who were studying in different programs in the faculty of education in order to determine the self-efficacy perceptions of teacher candidates oriented to educational technology standards. It was determined that teacher candidates perceptions of self-efficacy oriented to educational technology standards were generally high. While there was no significant difference in self-efficacy of teacher candidates according to gender variable, significant difference was found according to variable of education program and having personal computer. From these findings, being a significant differentiation according to the variable of the education program and having a personal computer, supports the research.

Uzunöz, Aktepe and Gündüz (2017) in their research; it is seen that teacher candidates have opinions on Instructional Technology and Material Design course that it is contributing to students' individual and social development in a many different dimensions such as communication, point of view, experience, self-confidence, dominance, skill, intelligibility, efficiency, socialization, success, multi-dimensional thinking, changing their perspectives in educational environments and developing their critical and creative thinking skills.

As a result of these studies, it can be seen that the use of technology enriches the educational environments and increases the skill level and also improves their perceptions about the use of technology. In addition, these similar studies about the subject of the research support the results of the research.

5. Suggestions

According to the results of the research, the following recommendations can be made. Particularly in computer courses, in instructional technologies and material design courses, issues related to increasing the competencies and perceptions of teacher candidates can be further reinforced.

All teacher candidates can be supported by instructors to use educational technologies both inside and outside the classroom. Qualitative research can be conducted to investigate the causes of the research in depth and to investigate the reasons. The relationship between teacher candidates' educational technology competencies and perceptions in terms of different variables can be investigated in depth.

The relationship between teacher candidates' educational technology competencies and perceptions in terms of different variables can be investigated in depth. Effective use of technology by faculty members who are model for teacher candidates in education faculties. It is important that they have high level skills. Therefore, primarily in education faculties the shortcomings of the lecturers should be provided as soon as possible.

Studies can be carried out with different research methods.

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