Investigation of the Relationship between Pre-service Teachers' Perceptions of Education and Support for ICT and ICT Competencies

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ABSTRACT

The aim of this study is to determine pre-service teachers' perceptions of education and support for ICT and ICT competencies, and to find out the relationship between these two variables. The research was conducted on 420 pre-service teachers studying in the faculty of education at a state university in Turkey in 2019. Within the scope of the research, a questionnaire was applied to obtain the perception of pre-service teachers about education and support for ICT, ICT competencies and a variety of demographic information. According to the data obtained from the study, it was observed that the perception of pre-service teachers about education and support for ICT was lower than the medium level. Although male pre-service teacher' perceptions of education and support for ICT were higher than female pre-service teachers, there was no significant difference between male and female pre-service teacher' ICT competencies. Even though the ICT competencies of pre-service teachers in the 3rd grade were higher than those in the 4th grade, it is seen that the perceptions of pre-service teachers about education and support for ICT do not differ in terms of grade level variable. It can be said that ICT competencies of pre-service teachers studying in Mathematics and Science Education programmes are higher than those studying in Pre-school Education programme. As a result of the correlation analysis carried out, it was found that there was a positive and moderate relationship between pre-service teacher's perception of education and support for ICT and ICT competencies. It was concluded that the perceptions of education and support for ICT was a significant predictor of ICT competency and that the themes of education and support perceptions for ICT explained 30% of ICT competency.

Keywords: *ICT, perceptions of education and support for ICT, ICT competencies, pre-service teachers*

INTRODUCTION

It is important for individuals and societies to go through qualified teaching processes in order to gain a place in today's world which is identified with information, technology and communication. Koehler and Mishra (2009) describe teaching as a complex practice involving a wide range of customized knowledge. The integration of information and communication technologies (ICT) seems to be an important contribution to addressing some of the problems encountered in this complex application. ICT integration in education has a complex structure that requires not only the acquisition of up-to-date technologies, but also taking various variables in administrative, educational and institutional terms into consideration (Koehler & Mishra, 2009; Kabakçı Yurdakul, 2011; Şahin İzmirli & Kabakçı Yurdakul, 2014). ICT integration improves the quality of education by both helping teachers in their jobs and helping students learn more effectively (Göktaş, Yıldırım

& Yıldırım, 2009; Korkmaz & Demir, 2012;). Teachers are expected to transfer their knowledge using ICT in learning process (Ersoy, Yurdakul Kabakçı, & Ceylan, 2016; Gündüz & Odabaşı, 2004). In addition, Teo (2015) states that with the rapid developments in technology, there are huge pressures on teachers to use various tools to conceptualize, prepare, and process their lessons. Although many governments around the world make large investments to integrate ICT into their teaching programmes and improve teachers' qualifications (Teo, 2015), it can be said that the level of its effective use is quite low (Demirli, 2013). When users perceive technology as complex, they tend to find it less useful (Teo, 2011). Teachers play a key role in ICT integration in educational settings (Uşun, 2009; Teo, 2015) and their way of ICT integration is influenced by their belief in teaching and learning (Teo, Chai, Hung & Lee, 2008). According to Koehler and Mishra (2009), teachers often have insufficient or inappropriate experience in using ICT in the teaching and learning process, and they do not consider themselves sufficient in the use of technology in the classroom and do not appreciate the value of ICT integration. Although teachers generally have a positive opinion about ICT integration, the reason for not being able to realise this is based on the lack of ICT in their classrooms, lack of knowledge (Gülbahar, 2008; Hew & Brush, 2007) and inadequate in-service trainings (Koçak Usluel, Kuşkaya Mumcu & Demiraslan, 2007).

The quality of teachers is a critical element in the success of students and learning outcomes (Jamieson-Proctor, Finger & Albion, 2010). It is known that pre-service training processes are very important for teachers to have sufficient knowledge, skills and attitudes about ICT usage and to realize ICT integration in teaching processes. Although teachers of the future need to consider many technologies that can increase their students' learning, it is seen that they are not sufficiently prepared for ICT and they need continuous education (Doering, Hughes & Huffman, 2003). Tezci (2011) states that due to the pre-service teachers' lack of knowledge about ICT, they have difficulties in integrating technology in their teaching and learning processes. Pre-service teachers believe that the use of ICT will be beneficial for their teaching (Birch & Irvine, 2009; Hammond, Reynolds & Ingram, 2011) and make learning more effective and useful (Hammond et al, 2011). Teo (2011) states that pre-service teachers will be more likely to use technology when they have positive attitudes and belief that technology will improve their job performance and make them more efficient. Sang, Valcke, van Braak and Tondeur (2010) states that successful ICT integration is associated with belief, self-efficacy and attitude towards ICT.

The elements that affect ICT integration into the teaching process of pre-service teachers were investigated in the literature. Hammond et al (2011) stated that the factors affecting the use of ICT are the complexity of access, trust in ICT use and beliefs that ICT affects learning. Although ICT integration of male pre-service teachers was higher than female pre-service teachers in some studies (Jamieson-Proctor et al, 2010; Tezci, 2011; Demirli, 2013), it can be seen that ICT integration did not change according to gender (Teo et al, 2008; Hammond et al, 2011; Siddiq, Scherer & Tondeur, 2016) in some studies. ICT integration into teaching processes can also vary according to culture (Tezci, 2011), department (Tezci, 2011; Siddiq et al, 2016) and age (Siddiq et al, 2016). Russell, Bebell, O'Dwyer and O'Connor (2003) stated that although new generation teachers feel comfortable in the use of ICT, they need more training on the value and use as an instructional tool. In order for teachers to integrate technology effectively into their classrooms, they need to receive a sufficient education before starting the profession (Doering et al, 2003; Brun & Hinostroza, 2014; Tondeur, Van Braak, Siddiq & Scherer, 2016).

One of the reasons that pre-service teachers show inadequacy about ICT integration is their pre-service training processes (Uşun, 2009; Gündüz & Odabaşı, 2004). At this point, the first thing to be emphasized is that pre-service teachers' use ICT for high motivation and productive activities in teaching environments, believing that it is helpful and useful. It is emphasized in the literature that for pre-service teachers to feel good about the use of technology-related courses must be productive, practical (Gündüz & Odabaşı, 2004); more authentic and student-centered activities should be provided in the classroom to support students' pedagogies (Doering et al, 2003). One of the main problems here is the course contents. Kabakçı Yurdakul (2011) stated that teacher training programmes should be supported with courses that will enable the use of technology based on pedagogy and content knowledge of pre-service teachers. Fluck and Dowden (2011) revealed that pre-service teachers need information about the use of computers as educational tools instead of ICT skills. It is stated that lecturers' enabling ICT integration in their lectures will contribute to the

understanding of how pre-service teachers can use technology for pedagogical purposes (Otero et al., 2005). Tondeur et al. (2012) reported that pre-service teachers' observation of their teachers while using technology is an important motivation tool in integrating technology into their own practices. In the context of being a model for effective ICT use, many studies have revealed the need for teacher educators to act as a role model for ICT use in their courses (Göktaş et al, 2009; Tezci, 2011; Martinovic & Zhang, 2012; Demirli, 2013).

The aim of this study is to determine the pre-service teachers' perceptions of education and support for ICT and ICT competencies and to determine the relationship between these two variables. For this purpose, answers to the following questions were sought.

• What are the pre-service teachers' perceptions of education and support for ICT and ICT competency levels?

• Do pre-service teachers' perceptions about education and support for ICT and ICT competency levels differ according to gender, grade level and programmes they study?

• Is there a relationship between pre-service teachers' perceptions of education and support for ICT and ICT competency levels?

RESEARCH METHOD

Research Model

The correlational survey model, which is one of the quantitative research methods, was used in the study. In the studies designed with the survey model, it is aimed to describe a situation that existed in the past or still exists as it is (Karasar, 1999). In this study, the pre-service teachers' perceptions of education and support for ICT and ICT competency levels were determined and compared according to gender, grade level and the programme they study in, and the relationship between these two variables was revealed.

Participants

The sample of the study consists of 420 randomly selected pre-service teachers studying in the faculty of education at a state university in Turkey in 2019. The data about the sample of the research are given in Table 1.

Table 1. Demographic data of the pre-service teachers in the research

Categories	Groups	n
Gender	Female	306
	Male	114
Grade Level	3rd Grade	179
	4th Grade	241
Programme	Mathematics and Science Education	58
	Pre-school Education	48
	Special Education	72
	Primary Education	98
	Social Studies Education	97
	Turkish Education	47

As can be seen in Table 1, 306 (72.9%) of the pre-service teachers who participated in the research were female and 114 (27.1%) were male. Of the pre-service teachers, 179 (42.6%) were in the 3rd grade and 241 (57.4%) were in the 4th (final) grade. Of the total of 420 pre-service teachers; 98 (23.3%) were from Primary education, 97 (23.1%) were from Social Studies Education, 72 (17.1%) were from Special Education, 58 (13.8%) were from Mathematics and Science Education, 48 (11.4%) were from Pre-school Education, and 47 (11.2%) were from Turkish Education programmes.

Data Collection Tools

In order to collect data, Education and Support Perceptions Scale for ICT, Pre-service Teachers' ICT Competencies Scale and personal information form developed by the researcher were used.

Education and Support Perceptions Scale for ICT: It is a scale that can be used to reveal the perceptions of pre-service teachers about the level of support and education required to integrate technology into classroom activities. The scale originally developed by Tondeur et al (2016) and adapted to Turkish is in the structure of 6 point likert scale consisting of (1) "I strongly disagree", (2) "I disagree", (3) "I do not agree", (4) "I partly agree", (5) "I agree" and (6) "I strongly agree". The scale which is in a one-dimensional structure consists of a total of 22 items in the scope of "Role Model" (4 items), "Reflection" (4 items), "Instructional Design" (4 items), "Collaboration" (4 items), Authentic Experiences" (3 items) and "Feedback" (3 items) themes. The variance explained by the scale about the quality measured is 63%. In the four-item "Role Model" theme, there are items reflecting the model status of pre-service teachers such as "I saw useful examples of ICT practices that inspired me to use ICT applications in the classroom by myself. In the four-item "Reflection" theme, there are items that reflect the situation where pre-service teachers are given the opportunity to demonstrate what they have learned during their training such as "I was given the opportunity to express the role of ICT in the training. In the four-item "Instructional Design" theme, there are items which reflect their use of ICT in designing courses and materials such as "I have received sufficient assistance in designing ICT-integrated courses". In the four-item "Collaboration" theme, there are items which reflects the experience and importance of ICT collaboration in the educational environment, such as "I had the opportunity to work sufficiently with other students on the use of ICT in training". In the three-item "Authentic Experiences" theme, there are items such as "I have had sufficient opportunities to test different ways of using ICT in the classroom". And in the three-item "Feedback" theme, there are items such as "I have received sufficient feedback on the use of ICT in my classes". The internal consistency coefficient for the overall scale is .95. The lowest score that can be obtained from the scale is 22 and the highest score is 132. The high score which can be obtained from the scale indicates that pre-service teachers' perceptions of education and support for ICT are high.

Within the scope of the research, permissions were obtained from those who developed the Perceptions of Education and Support Scale for ICT before the data collection process from the pre-service teachers. A language specialist and an academician working in the field of Computer and Instructional Technologies, who has undergone an English field education, have been consulted for assistance in order to translate the items of the scale, which was in English, to Turkish. In order to ensure the construct validity of the scale, confirmatory factor analysis was performed by collecting data from 165 pre-service teachers outside the sample group. The compatibility of the one-dimensional scale with the index of fit was examined and Table 2 was obtained.

Table 2. Fit indexes obtained as a result of confirmatory factor analysis and acceptance criteria

Fit Index Name	Fit Index Value	Acceptance Criteria
$\mathbf{x^2}$/sd	2.15	<5
GFI	.82	≥ .90
NFI	.93	≥ .90
IFI	.96	≥ .90
TLI	.96	≥ .90
CFI	.96	≥ .95
RMSEA	.08	≤.08

When Table 2 is examined, it can be seen that the degree of freedom of the Chi square (x^2/sd) and NFI, IFI, TLI, CFI and RMSEA values meet the criteria, only GFI is slightly lower (.08). Based on the findings obtained from the confirmatory factor analysis, it can be said that this scale structure with a single factor is acceptable. The path diagram for the scale items is shown in Figure 1.

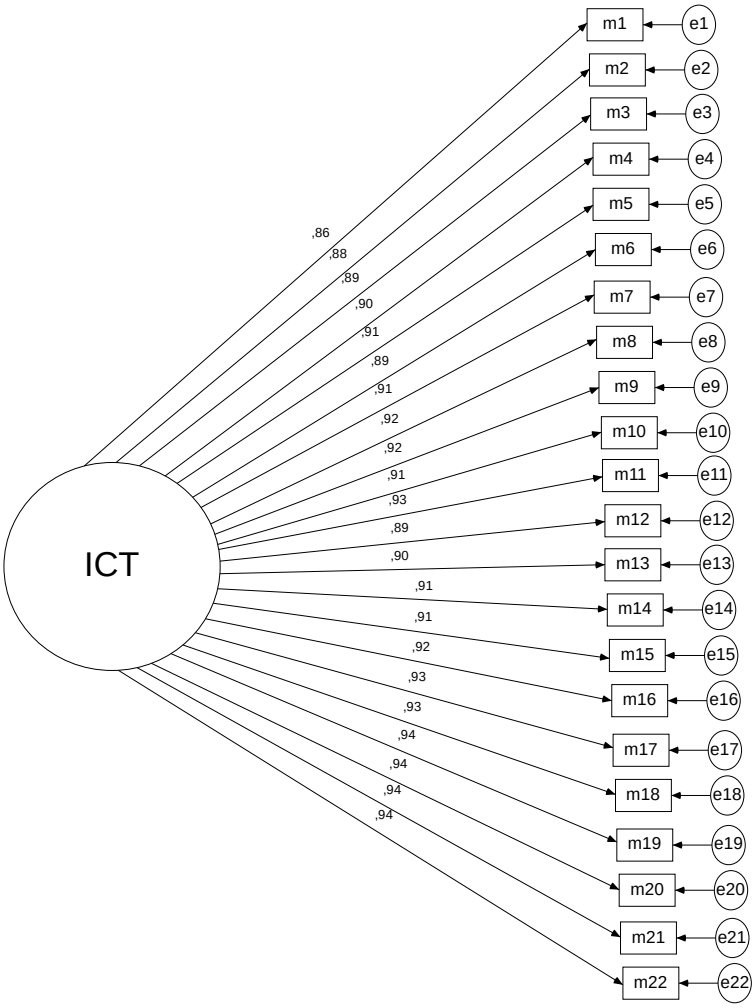

Figure 1. Figure of Training and Support Perceptions Scale for ICT

Pre-service Teachers' ICT Competencies Scale: This scale can be used to determine the ICT competencies of individuals. The scale which was originally developed by Tondeur et al (2017) and adapted to Turkish by Alkan and Emmioğlu-Sarıkaya (2018) is in 19-item 5 point likert structure, consisting of (1) "I strongly disagree", (2) "I disagree", (3) "I am undecided", (4) "I agree and (5) "I strongly agree". The scale has two dimensions including "Students' ICT Competencies in Supporting Students' Use of ICT" and "ICT Competencies for Instructional Design". The variance explained by these dimensions about the quality measured by the scale is 56.3%. Factor loads of the items in the scale range from 0.57 to 0.85. The 11-item "Students' ICT Competencies in Supporting ICT Uses" dimension includes items reflecting the pre-service teachers' feelings of being qualified to educate their students about using ICT when they start teaching in the future, such as "I can support students in search of information through ICT". In the 8-item "ICT Competencies for Instructional Design" dimension, there are items which reflect the pre-service teachers' feeling of being competent in using ICT in the process of designing instruction, such as "I can select ICT applications effectively when I create a learning environment. The Cronbach alpha internal consistency coefficient of the scale's first factor is .94 and the Cronbach's alpha internal consistency coefficient of the second factor is .89. The lowest score that can be obtained from the scale is 19 and the highest score is 95. The high score that can be obtained from the scale shows that the pre-service teachers' ICT competencies are high.

Personal Information Form: The pre-service teachers were asked to mark their gender, grade level and their field of education in this form, which was developed by the researcher.

Data Analysis

The data collected within the scope of the research were first transferred to computer environment.

Inaccurate or incomplete data forms were identified as inappropriate for the purpose of the study and were excluded from the scope of the study. After the determination of incorrectly entered data in the data form, they were corrected and made ready for analysis. Firstly, the data were examined to see whether they showed normal distribution or not. It was determined that skewness and kurtosis values of education and support perceptions for ICT were between .30 and .12, and -.23 and .24, and the skewness and kurtosis values of ICT competencies were between -.41 and .12 and -.30 and .24. Since the normality and skewness values between -1.5 and +1.5 are thought to be appropriate for the normal distribution of the data according to Tabachnick and Fidell (2013), it is assumed that the data showed normal distribution. Descriptive statistics were used to determine the pre-service teachers' perceptions of education and support for ICT and ICT competencies. Independent sample t test was used to determine the differentiation of pre-service teachers' perceptions of education and support for ICT and ICT competencies according to their gender and grade levels, and one-way analysis of variance was used to determine the status of differentiation according to the programmes they study. Pearson correlation and multiple regression analyzes were used to reveal the relationships between pre-service teachers' perceptions of education and support for ICT and ICT competencies.

FINDINGS

Within the scope of the research, the findings of the pre-service teachers' perceptions of education and support for ICT and ICT competencies and the relationship between them were revealed.

Findings Regarding Pre-service Teachers' Perceptions of Education and Support for ICT

In this study, the mean and standard deviation values of the pre-service teachers' perceptions of education and support for ICT were examined. The findings are presented in Table 3.

Table 3. Findings regarding the pre-service teachers' perception of education and support for ICT

	N	$\bar{x}$	SD	k	$\bar{x}$/k	Min	Max
Role model	420	13.77	4.62	4	3.44	4	24
Reflection	420	11.19	4.50	4	2.80	4	24
Instructional Design	420	11.70	4.76	4	2.92	4	24
Collaboration	420	11.50	4.69	4	2.88	4	24
Authentic Experiences	420	8.53	3.62	3	2.84	3	18
Feedback	420	8.11	3.67	3	2.70	3	18
ESP for ICT	420	64.80	22.62	22	2.95	22	132

As a result of the analysis, the findings of the pre-service teachers' perception of education and support for ICT are shown in Table 3. It can be said that pre-service teachers' perceptions of education and support for ICT are below the medium level ($\bar{x}$= 2.95). Since the number of items included in the themes of the education and support perceptions of pre-service teachers for ICT was different, the mean of each theme was divided by the number of items and a new average score was formed. When these scores were compared, the highest average score belonged to the theme of "Using teacher trainers as a role model" ($\bar{x}$= 3.44); and the lowest average score belonged to the theme of "Providing continuous feedback ($\bar{x}$= 2.70).

In the study, t-test was used for independent samples to determine whether pre-service teachers' perception of education and support for ICT changed according to their genders. The results of the analysis are presented in Table 4.

Table 4. Comparison of pre-service teachers' perceptions of education and support for ICT by gender

Variable	Group	N	$\bar{x}$	SD	df	t	p

Education and Support Perception for ICT	Female	306	63.50	22.09	418	1.95	.05
	Male	114	68.31	23.72			

When Table 4 is examined, it can be said that male pre-service teachers' perceptions of education and support for ICT are higher than female pre-service teachers ($t_{(418)}$= 1.95; p= .05).

Table 5 shows the status of pre-service teachers' perceptions of education and support for ICT according to their grade levels.

Table 5. Comparison of pre-service teachers' perceptions of education and support for ICT by grade level

Variable	Group	N	$\bar{x}$	SD	df	t	p
Education and Support Perception for ICT	3rd Grade	179	66.99	21.60	418	1.71	.09
	4th Grade	241	63.18	23.25			

When Table 5 is examined, it can be seen that the perceptions of pre-service teachers about education and support for ICT do not differ according to the grade level they study at ($t_{(418)}$= 1.71; p> .05).

Table 6 shows the status of pre-service teachers' perceptions of education and support for ICT according to the programmes they study in.

Table 6. Status of pre-service teachers' perceptions of education and support for ICT by the programme

Programme	N	$\bar{x}$	SD
Mathematics and Science Education	58	76.05	21.51
Pre-school Education	48	58.44	23.31
Special Education	72	71.08	20.79
Primary Education	98	62.09	19.31
Social Sciences Education	97	59.70	25.86
Turkish Education	47	63.98	18.63

When the findings were analyzed, it was observed that the perceptions of pre-service teachers', who were studying in Mathematics and Science Education programmes, about education and support for ICT had the highest mean score ($\bar{x}$= 76.05). 58.44), while the perceptions of pre-service teachers' studying in Pre-school Education program about education and support for ICT had the lowest mean score ($\bar{x}$= 58.44). One-way analysis of variance was used to determine whether there was a significant difference between the pre-service teachers' perceptions of education and support for ICT according to the programmes they study in. Table 7 was obtained as a result of the analysis.

Table 7. Comparison of pre-service teachers' perceptions of education and support for ICT according to the programmes they study.

Variance Source	Sum of Squares	df	Mean Square	F	p	Differences
Between Groups	15400.96	5	3080.19			1-2
Wirhin Groups	198923.64	414	480.49	6.41	.00	1-4
Total	214324.60	419				1-5

1. Mathematics and Science Education
2. Pre-school Education
3. Special Education
4. Primary Education
5. Social Sciences Education
6. Turkish Education

It can be said that pre-service teachers' perceptions of education and support for ICT differ statistically according to the programmes they study in ($F_{(5,414)}$= 6.41; p< .05). Scheffe test was used to determine among which programmes the pre-service teachers are studying in the difference occurred in the perception of education and support for ICT. As a result of the analysis, it can be said that the perceptions of pre-service teachers studying in the Mathematics and Science Education programmes about education and support for ICT are higher than the pre-service teachers studying in Pre-school Education, Primary education and Social Studies Education programmes.

Findings Regarding ICT Competencies of Pre-service Teachers

In this study, the mean and standard deviation values regarding the pre-service teachers' ICT competencies were examined. The findings are presented in Table 8.

Table 8. Findings regarding ICT competencies of pre-service teachers

Variable	N	$\bar{x}$	SD	k	$\bar{x}$/k
Dimension 1	420	36.00	12.03	11	3.27
Dimension 2	420	24.69	8.70	8	3.09
ICT Competencies	420	60.69	19.97	19	3.19

Dimension 1: ICT Competencies of Students in Supporting the Use of ICT
Dimension 2: ICT Competencies for Instructional Design

As a result of the analysis, the findings regarding the ICT competencies of the pre-service teachers are shown in Table 8. It is seen that the score of ICT competencies of the pre-service teachers is 3.19. Since the numbers of items in the sub-dimensions of pre-service teachers' ICT competencies were different, a new mean score was formed by dividing each sub-dimension by the number of items. While the mean of the "ICT Competencies of students in supporting the use of ICT" sub-dimension was 3.27, the mean of the "ICT Competencies for Instructional Design" sub-dimension was 3.19.

In the study, t-test was used in order to determine whether ICT competencies of pre-service teachers changed according to gender. The result of the analysis is presented in Table 9.

Table 9. Comparison of ICT competencies of pre-service teachers by gender

Variable	Group	N	$\bar{x}$	SD	df	t	p
Dimension 1	Female	306	35.53	11.88	418	1.31	.19
	Male	114	37.26	12.39			
Dimension 2	Female	306	34.17	8.63	418	2.00	.05
	Male	114	26.07	8.78			
ICT Competencies	Female	306	59.70	19.73	418	1.66	.10
	Male	114	63.33	20.45			

Dimension 1: ICT Competencies of Students in Supporting the Use of ICT
Dimension 2: ICT Competencies for Instructional Design

When Table 9 is examined, it can be said that ICT competencies of pre-service teachers do not differ according to gender ($t_{(418)}$= 1.66; p> .05). It can be said that male pre-service teachers have higher ICT competencies for Instructional Design than female teachers ($t_{(418)}$= 2.00; p= .05).

The status of ICT competencies of pre-service teachers according to their grade levels are given in Table 10

Table 10. Comparison of ICT competencies of pre-service teachers by grade level

Variable	Group	N	$\bar{x}$	SD	df	t	p
Dimension 1	3.Sınıf	179	37.21	11.36	418	1.78	.08
	4.Sınıf	241	35.10	12.46			
Dimension 2	3.Sınıf	179	25.79	7.97	418	2.26	.02
	4.Sınıf	241	23.88	9.13			
ICT Competencies for Pre-service teachers	3.Sınıf	179	63.01	18.46	418	2.06	.04
	4.Sınıf	241	58.97	20.89			

Dimension 1: ICT Competencies of Students in Supporting the Use of ICT
Dimension 2: ICT Competencies for Instructional Design

When the Table 9 is examined, it can be said that ICT competencies of the 3rd grade pre-service teachers are higher than the 4th grade pre-service teachers ($t_{(418)}$= 2.06; p< .05).

The ICT competencies of pre-service teachers according to the programmes they are studying in are given in Table 11.

Table 11. Status of ICT competencies of pre-service teachers according to programmes they study in.

Programme	N	$\bar{x}$	SD
Mathematics & Science Education	58	66.50	18.20
Pre-school Education	48	4835	21.90
Special Education	72	59.97	17.75
Primary Education	98	65.97	17.97
Social Sciences Education	97	58.22	22.27
Turkish Education	47	61.30	16.00

When the findings are examined, it is seen that ICT competencies of the pre-service teachers studying in Mathematics and Science Education programmes has the highest mean ($\bar{x}$= 66.50), while the pre-service teachers studying in the Pre-school Education programme have the lowest mean ($\bar{x}$= 48.35). One-way analysis of variance was conducted to determine whether there was a significant difference between ICT competencies of pre-service teachers according to the programmes they study in. Table 12 was obtained as a result of the analysis.

Table 12. Comparison of ICT competencies of pre-service teachers according to the programmes they study in

Variance Source	Sum of Squares	df	Mean Square	F	p	Differences
Between Groups	12641.53	5	2528.31			
Wirhin Groups	154486.62	414	373.16	6.78	.00	1-2
Between Groups	167128.15	418				

1. Mathematics and Science Education
2. Pre-school Education
3. Special Education
4. Primary Education
5. Social Sciences Education
6. Turkish Education

It can be said that ICT competencies of pre-service teachers differ statistically according to the programmes they study in ($F_{(5,414)}$= 6.78; p< .05). Scheffe test was used to determine among which programmes the difference in ICT competencies of pre-service teachers are studying occurs. As a result of the analysis, it can be said that ICT competencies of pre-service teachers studying in Mathematics and Science Education programmes are higher than pre-service teachers studying in Pre-school Education programmes.

Findings regarding the Relationship between Perceptions of Education and Support for ICT and ICT Competencies

Correlation analysis was conducted to determine whether there is a significant relationship between pre-service teacher's perceptions of education and support for ICT and ICT competencies. The data obtained from the analysis are presented in Table 13.

Table 13. The relationship between perceptions of education and support for ICT and ICT competencies

		ICT Competencies
ICT Training and Support Perceptions	r	.52
	P	.00
	N	420

As a result of the correlation analysis, it was found that there was a positive and moderate relationship between the pre-service teachers' perceptions of education and support for ICT and ICT competencies (r= .52; p< .01).

In addition, regression analysis was conducted to determine the degree of pre-service teachers' perceptions of education and support for ICT to predict their ICT competencies and the findings are presented in Table 14.

Table 14. The results of multiple regression analysis on the power of pre-service teacher' perceptions of education and support for ICT to predict ICT competencies

Variable	B	Standard Error	Beta	T	P
CONSTANT	29.34	2.72	-	10.80	.00
Role model	1.02	.25	.24	4.03	.00
Reflection	-.30	.31	-.07	-.99	.33
Instructional Design	.25	.39	.06	.65	.51
Collaboration	.45	.36	.11	1.27	.20
Authentic Experiences	1.64	.51	.30	3.24	.00
Feedback	-.19	.45	-.04	-.42	.67

R= .54 R^2= .30 F= 28.95 p< .01

As seen in Table 14, it was found that pre-service teachers' perceptions of education and support for ICT were a significant predictor of ICT competencies. (R= .54; R^2= .30; p< .01). According to these findings, the themes of education and support perceptions for ICT explain 30% of ICT competences. When the p values related to the significance of the regression coefficients were examined, it was found that the themes of "Authentic Experiences" and "Role Model" were significant predictors of ICT competencies while the "Reflection", "Instructional Design", "Collaboration" and "Feedback" themes were not significant variables in predicting ICT competencies.

DISCUSSION AND CONCLUSION

In this study, which aims to determine the pre-service teachers' perceptions of education and support for ICT and ICT competencies in terms of gender, grade level and programme variables and to reveal the relationship between these two variables, it is seen that pre-service teachers' perceptions of education and support for ICT are "below the medium level". When the scores were compared in terms of the sub-factors of the scale, it was seen that the highest mean score belonged to the "Using teacher trainers as a role model" theme and the lowest mean score belonged to the "Providing continuous feedback" theme. When the ICT proficiency levels of pre-service teachers are examined, it is seen that they are "close to sufficient level", while the highest mean score for the evaluation carried out in terms of the sub-factors of the scale is in the "ICT competencies in supporting students' use of ICT", and the lowest mean score is in the "ICT competencies for instructional design". When this finding is examined, it is seen that for pre-service teachers, who will train the next generations, to graduate from their faculties with sufficient academic equipment, they need to be able to receive a more adequate training to develop their perception of education and support for ICT and ICT competencies at a higher level. In this regard, Koehler and Mishra (2009) stressed that in order for teachers to integrate technology into their courses; they should be educated in the context of technology, pedagogy and content knowledge, and be able to establish the relationship between them correctly. Similarly, Kul, Birişçi and Kutay (2019) emphasized that teachers should have some competencies to place ICTs in their educational activities properly. Teachers' attitudes towards ICT, competences and their integration into their courses have an important power in influencing student learning, attitudes towards this technology and equipping them with the knowledge and skills required by the era (Çakır & Önal, 2015). Regarding the integration of technology into education in pre-service teachers' education, the perception of education and support for ICT and the development of ICT competencies is an important issue that needs to be addressed.

In the study, although there was no significant difference between the perceptions of pre-service teachers regarding education and support for ICT and ICT competencies in terms of gender variable, the mean score of male pre-service teachers was higher than the mean score of female pre-service teachers for both variables. Similarly, studies regarding that the gender variable does not create a significant difference in perception, attitude and competency towards technology can be seen in the literature (Danner & Pessu, 2013; Şad & Nalçacı, 2015; Teo, Fan & Du, 2015; Gökçearslan, Karademir Coşkun & Şahin, 2018). Regarding this issue, when Cam, Yarar, Toraman & Erdamar (2016) analysed the effect of gender on attitudes towards computer-assisted teaching by meta-analysis, they found that gender had no effect on the computer-assisted instruction. On the other hand, studies which show that gender variable has a significant effect on

perception, attitude and competency towards technology can also be found in the literature (Lee, 2003; Hew & Leong, 2011; Çetin & Güngör, 2014).

While there was no significant difference in the evaluation of pre-service teachers' perceptions of education and support for ICT in terms of grade level variable, a significant difference in the evaluation of ICT competencies of pre-service teachers in terms of grade level variable arose. Similarly, while Şendağ (2014) found that there was a significant difference in terms of grade level variable in his study in which he investigated pre-service teachers' readiness of using technology in classes, Bakırcı and Günbatar (2017) stated that students attitudes towards information and communication technologies differed according to grade level, and Eryılmaz (2018) found that students' competencies for information and communication technologies differed according to their grade levels. On the other hand, Gökçearslan et al (2018) found that the grade level variable had no effect on ICT competencies of pre-service teachers. Further studies are needed with different samples of this variable to investigate the reason for this difference.

It was found that there was a significant difference between the pre-service teachers' perceptions of education and support for ICT and ICT competencies. When the source of this difference is examined, it is determined that the mean score of the students who are studying in the field of Mathematics and Science Education programmes is higher than the mean score of students studying in the Pre-school Education, Primary Education and Social Studies Education programmes. Similarly, in terms of ICT competencies of pre-service teachers, it was determined that the mean score of the students studying in the field of Mathematics and Science Education programmes was higher than the mean score of the pre-service teachers studying in the field of Pre-school Education programme. It can be thought that this difference arises from the fact that students studying in the Mathematics and Science Education programmes are more prone to numerical knowledge, and technology is accepted as a numerical tool. Similarly, studies showing that the department of study makes a significant difference in terms of attitude, perception and self-efficacy towards technology can be reached in the literature (Akbulut, Uysal, Odabaşı & Kuzu, 2008; Şad & Nalçacı, 2015; Bakırcı & Günbatar, 2017).

In the study, it was also found that there was a positive and moderate significant relationship between pre-service teachers' perceptions of education and support for ICT and ICT competencies, and that perceptions of education and support for ICT were a significant predictor of their ICT competences. As can be seen, it can be stated that education and support for ICT which will be given to pre-service teachers in their education process will enable them to have a higher level of ICT competency in their professional lives and that can create more positive support on them to integrate technology into their learning and teaching processes. Therefore, the necessity of informing, raising awareness and supporting pre-service teachers about the use of technology in pre-service trainings and courses emerges. In the light of these findings, pre-service teachers can be shown technological applications in terms of both classes and courses, and they can be enlightened about the subject. By providing technology integration of teacher trainers to their courses, and by providing more effective use of support to pre-service teachers in the use of technology, being a role model can be ensured both for the development of support perceptions and increasing their ICT competencies. This research was conducted within the framework of some limitations. In this research, ICT competencies of the pre-service teachers were collected based on their individual perceptions. Observation, interview or achievement tests can be used to collect and analyse data. Data were collected only from a faculty of education. Data collection from other education faculties may contribute to the generalization of the findings.

REFERENCES

Akbulut, Y., Uysal, Ö., Odabaşı, H.F., & Kuzu, A. (2008). Influence of gender, program of study and PC experience on unethical computer using behaviors of Turkish undergraduate students. *Computers and Education, 51(*2), 485-492. doi: 10.1016/j.compedu.2007.06.004

Alkan, M.F., & Emmioğlu-Sarıkaya, E. (2018). Adaptation of preservice teachers' information and communication technology competencies scale into Turkish culture. *Bartın University Journal of Faculty of Education, 7(*2), 665-691. doi: 10.14686/buefad.375745

Bakırcı, H., & Günbatar, M.S. (2017). Öğretmen adaylarının bilgi okuryazarlık düzeyleri ile bilgi ve iletişim teknolojilerine yönelik tutumları. *Ahi Evran Üniversitesi Kırşehir Eğitim Fakültesi Dergisi, 18(*3), 543-563. doi: 10.29299/kefad.2017.18.3.029

Birch, A., & Irvine, V. (2009). Preservice teachers' acceptance of ICT integration in the classroom: applying the UTAUT model. *Educational Media International, 46(*4), 295-315. doi: 10.1080/09523980903387506

Brun, M., & Hinostroza, J.E. (2014). Learning to become a teacher in the 21st century: ICT integration in Initial teacher education in Chile. *Educational Technology & Society, 17(*3), 222-238.

Çakır, H., & Önal, N. (2015). Ortaokul matematik öğretmenlerinin bilişim teknolojileri yeterlilikleri. *Eğitimde Kuram ve Uygulama, 11(*3), 1021-1042.

Cam, S.S., Yarar, G., Toraman, C., & Erdamar, G.K. (2016). The effects of gender on the attitudes towards the computer assisted instruction: A meta-analysis. *Journal of Education and Training Studies, 4(*5), 250-261. doi: 10.11114/jets.v4i5.1515

Çetin, O., & Güngör, B. (2014). İlkogretim ögretmenlerinin bilgisayar öz-yeterlik inançları ve bilgisayar destekli öğretime yönelik tutumları. *Ondokuz Mayıs Üniversitesi Egitim Fakültesi Dergisi, 33(*1), 55-78. doi: 10.7822/egt206

Danner, R.B., & Pessu, C.O.A. (2013). A survey of ICT competencies among students in teacher preparation programmes at the University of Benin, Benin City, Nigeria. *Journal of Information Technology Education: Research, 12*, 33-49. doi: 10.28945/1762

Demirli, C. (2013). ICT usage of pre-service teachers: Cultural comparison for Turkey and Bosnia and Herzegovina. *Kuram ve Uygulamada Eğitim Bilimleri (KUYEB) 13(*2) 1095-1105.

Doering, A., Hughes, J., & Huffman, D. (2003). Preservice teachers: Are we thinking with technology? *Journal of Computing in Teacher Education, 35(*3), 342-361. doi: 10.1080/15391523.2003.10782390

Ersoy, M., Yurdakul, I. K. & Ceylan, B. (2016). Investigating preservice teachers' TPACK competencies through the lenses of ICT skills: An experimental study. *Education and Science, 41(*186), 119-135.

Eryılmaz, S. (2018). Öğrencilerin bilgi ve iletişim teknolojileri yeterliliklerinin belirlenmesi: Gazi Üniversitesi, Turizm Fakültesi örneği. *Elektronik Sosyal Bilimler Dergisi, 17(*65), 37-49.

Fluck, A., & Dowden, T. (2013). On the cusp of change: Examining pre-service teachers' beliefs about ICT and envisioning the digital classroom of the future. *Journal of Computer Assisted Learning, 29(*1), 43-52. doi: 10.1111/j.1365-2729.2011.00464.x

Gökçearslan, Ş, Karademir Coşkun, T., & Şahin, S. (2019). Öğretmen adayi bilgi ve iletişim teknolojisi yeterlikleri ölçeğinin Türkçe'ye uyarlanması. *Kastamonu Eğitim Dergisi, 27(*4), 1435-1444. doi: 10.24106/kefdergi.2828

Göktaş, Y., Yıldırım, S., & Yıldırım, Z. (2009). Main barriers and possible enablers of ICTs integration into pre-service teacher education programs. *Educational Technology & Socirty, 12(*1), 193-204.

Gülbahar, Y. (2008). Improving the technology integration skills of prospective teachers through practice: a case study. *The Turkish Online Journal of Educational Technology – TOJET, 7(*4), 71-81.

Gündüz, Ş., & Odabaşı, F. (2004). Bilgi çağinda öğretmen adaylarinin eğitiminde öğretim teknolojileri ve material geliştirme dersinin önemi. *The Turkish Online Journal of Educational Technology – TOJET, 3(*1), 43-48.

Hammond, M., Reynolds, L.J., & Ingram, J. (2011) How and why do student teachers use ICT? Journal of *Computer Assisted Learning, 27(*3), 191-203.

Hew, K. & Brush, T. (2007). Integrating technology into K-12 teaching and learning: Current knowledge gaps and recommendations for future research. *Educational Technology Research and Development, 55(*3), 223-252.

Hew, T.S., & Leong, L.Y. (2011). An empirical analysis of Malaysian pre-university students ICT competency gender differences. *International Journal of Network and Mobile Technologies, 2(*1), 15-29.

Jamieson-Proctor, R., Finger, G., & Albion, P.R. (2010). Auditing the TK and TPACK Confidence of Pre-service Teachers: Are they ready for the profession? *Australian Educational Computing, 25(*1), 8-17.

Kabakçı Yurdakul, I. (2011). Öğretmen adaylarinin teknopedagojik eğitim yeterliklerinin bilgi ve iletişim teknolojilerini kullanimlari açisindan incelenmesi. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 40*, 397-408.

Karasar, N. (1999). *Bilimsel araştırma yöntemi*. Ankara: Nobel Yayın Dağıtım

Koçak Usluel, Y., Kuşkaya Mumucu, F., & Demiraslan, Y. (2007). ICT in the learning-teaching process: Teachers' views on the integration and obstacles. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 32*, 164-178.

Koehler, M. & Mishra, P. (2009). What is technological pedagogical content knowledge (TPACK). Contemporary Issues in Technology and Teacher Education, 9(1), 60-70.

Korkmaz, Ö. & Demir, B. (2012). MEB hizmetiçi eğitimlerinin öğretmenlerin bilgi ve iletişim teknolojilerine ilişkin tutumlarına ve bilgisayar öz-yeterliklerine etkisi. *Eğitim Teknolojisi Kuram ve Uygulama, 2(*1), 1-18.

Kul, Ü., Birişçi, S., & Kutay, V. (2019). Adaptation of teachers' ICT integration proficiency scale into Turkish. *Bartın University Journal of Faculty of Education, 8(*2), 437-456. doi: 10.14686/buefad.442836

Lee, A.C.K. (2003). Undergraduate students' gender differences in it skills and attitudes. Journal of *Computer Assisted Learning, 19*, 488-500. doi: 10.1046/j.0266-4909.2003.00052.x

Martinovic, D., & Zhang, Z. (2012). Situating ICT in the teacher education program: Overcoming challenges, fulfilling expectations. *Teaching and Teacher Education, 28(*3), 461-469. doi: 10.1016/j.tate.2011.12.001

Otero, V., Peressini, D., Meymaris, K.A., Ford, P., Garvin, T., Harlow, D., Reidel, M., Waite, B., & Mears, C. (2005). Integrating technology into teacher education: A critical framework for implementing reform. *Journal of Teacher Education, 56(*1), 8-23. doi: 10.1177/0022487104272055

Russell, M., Bebell, D., O'Dwyer, L., & O'Connor, K. (2003). Examining teacher technology use: implications for preservice and inservice teacher preparation. *Journal of Teacher Education, 54(*4), 297-310.

Sang, G., Valcke, M., & Tondeur, J. (2010). Student teachers' thinking processes and ICT integration: Predictors of prospective teaching behaviors with educational technology. *Computers & Education, 54(*1), 103-112. doi: 10.1016/j.compedu.2009.07.010

Şad, S. N., & Nalçacı, Ö. İ. (2015). Öğretmen adaylarının eğitimde bilgi ve iletişim teknolojilerini kullanmaya ilişkin yeterlilik algıları. *Mersin Üniversitesi Eğitim Fakültesi Dergisi, 11(*1), 177–197.

Şahin Izmirli, Ö., & Kabakçı Yurdakul, I. (2014). Investigation of prospective teachers' information and communication technology integration practices in terms of transformative learning theory. *Kuram ve Uygulamada Eğitim Bilimleri (KUYEB) 14(*6) 2293-2303. doi: 10.12738/estp.2014.6.2076

Şendag, S. (2014). Preservice science teachers' preparedness to use ICT in the classroom: A case of Turkey's Mediterranean region. *Journal of Theory & Practice in Education (JTPE), 10(*5), 1156-1176. doi:10.17244/eku.69399

Siddiq, F., Scherer, R., & Tondeur, J. (2016). Teachers' emphasis on developing students' digital information and communication skills (TEDDICS): A new construct in 21st century education. *Computers & Education, 92–93*, 1-14. doi: 10.1016/j.compedu.2015.10.006

Tabachnick, B.G., & Fidell, L.S. (2013). *Using multivariate statistics (sixth ed.)* Boston: Pearson,

Teo, T. (2011). *Modelıng technology acceptance among pre-service teachers.* Timothy Teo (Ed.), In Technology Acceptance in Education Research and Issues. Rotterdam: Sense Publishers.

Teo, T. (2015). Comparing pre-service and in-service teachers' acceptance of technology: Assessment of measurement invariance and latent mean differences. *Computers & Education, 83*, 22-31. doi: 10.1016/j.compedu.2014.11.015

Teo, T., Chai, C.S., Hung, D., & Lee, C.B. (2008) Beliefs about teaching and uses of technology among pre-service teachers. *Asia-Pacific Journal of Teacher Education, 36(*2), 163-174, doi: 10.1080/13598660801971641

Teo, T., Fan, X., & Du, J. (2015). Technology acceptance among pre-service teachers: Does gender matter. *Australasian Journal of Educational Technology, 31(*3), 235-251. doi: 10.14742/ajet.1672

Tezci, E. (2011). Factors that influence pre-service teachers' ICT usage in education. *European Journal of Teacher Education, 34(*4), 483-499. doi: 10.1080/02619768.2011.587116

Tondeur, J., Aesaert, K., Pynoo, B., Braak, J. v., Fraeyman, N., & Erstad, O. (2017). Developing a validated instrument to measure preservice teachers' ICT competencies: Meeting the demands of the 21st century. *British Journal of Educational Technology, 48(*2), 462–472. doi:10.1111/bjet.12380

Tondeur, J., van Braak, J., Sang, G., Voogt, J., Fisser, P., & Ottenbreit-Leftwichd, A. (2012). Preparing pre-service teachers to integrate technology in education: A synthesis of qualitative evidence. *Computers & Education, 59(*1), 134-144. doi: 10.1016/j.compedu.2011.10.009

Tondeur, J., van Braak, J., Siddiq, F., & Scherer, R. (2016). Time for a new approach to prepare future teachers for educational technology use: Its meaning and measurement. *Computers & Education, 94*, 134-150. doi: 10.1016/j.compedu.2015.11.009

Uşun, S. (2009). *Information and communication technologies (ICT) in teacher education (ITE) programs in the World and Turkey*. Procedia Social and Behavioral Sciences 1(2009), 331-334.