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Determination of Teacher Candidates' ICT Competencies and Technology Addiction Levels

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Abstract: The aim of this study is to determine the ICT competency and technology addiction levels of teacher candidates in terms of some variables. As data collection tools for this purpose, the "Information and Communication Technologies (ICT) Sufficiency Perception Scale for Pre-service Teachers" and the "Technological Addiction Scale" were applied to 178 teacher candidates studying in different departments at Niğde Ömer Halisdemir University Faculty of Education in the fall semester of the 2019-2020 academic years. The collected data were analyzed by using a statistical program. As a result of the analyses, the level of competency in ICTs differs significantly according to gender and the departments and the average daily internet usage. In terms of technology addiction level, only computer ownership was found to be an important factor.

Keywords: Teacher candidates, technology addiction, ICT competencies.

1. Introduction

Recently, rapid developments have occurred in Information and Communication Technologies (ICT), and it is seen that people use the developments in technology in their workplaces, homes and learning environments (Bakırcı & Günbatar, 2017). Educational institutions have accelerated their technology integration processes in order to benefit from ICT technology in the learning and teaching process. In this direction, it has been tried to provide opportunities for students to benefit from internet and computer technologies in learning processes by creating information technology classes in educational institutions (Karaoğlan Yılmaz & Yılmaz, 2018).

Teachers have a great role to play in order for ICT to be used correctly and effectively in schools (Yağcı & Başarmak, 2016). Since educational institutions and teachers are faced with students who use technological tools such as computers, internet and mobile phones every day, it is inevitable that they will encounter significant difficulties if they do not develop their skills in using current technology products (Aksoy, 2003). Therefore, teachers are expected to have the necessary competence and infrastructure (Şad & Nalçacı, 2015). In order for pre-service teachers studying at universities to achieve the desired success in their professional lives, they must first accept the role of technology in education and have the ability to use technology (Erdemir, Bakırcı, & Eyduran, 2019).

When the studies are examined, there are studies that examine information and communication technologies in terms of different variables. Studies have concluded that information and communication technologies proficiency levels are higher in male students than in gender (Cai, Fan, & Du, 2017; Saygıner, 2016). In a study by Akkoyunlu and Soylu (2010), they said that there is a differentiation of digital competencies according to the department in which teachers study. In the study of Saygıner (2016), it was observed that there was no significant difference in the information and communication technologies proficiency levels of teacher candidates according to the department they studied.

Gross and Latham (2007) concluded in their study that 55% of the students had medium and advanced information literacy skills. Yirci and Aydoğar (2017) conducted a study to examine the attitudes of university students towards the use of ICT. In the study of Smarkola (2008), in which teachers' proficiency in technology use was discussed, it was concluded that there was a significant difference in the gender variable, and accordingly, female teachers' predisposition to ICT use was at a higher level than male teachers.

Al-Awidi and Alghazo (2012) concluded that technology use affects their perception of technology self-efficacy in their study to determine whether technology use situations affect pre-service teachers' perceptions of technology self-efficacy.

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It is said that while new technologies make our lives easier on the one hand, they also affect our lives positively or negatively (Karaman & Kurtoğlu, 2009). With the increasing prevalence of computer use and the increase in the level of internet use, technology addictions have emerged in humans (Aydın & Şimşek, 2017). The concept of addiction is defined as the willingness of individuals to a certain obsessive state that cannot be prevented from recurring, despite the damage to their health and social life (Köksal, 2016). Technology addiction, on the other hand, is defined as the psychological state of the person, as well as the damage to social and professional interactions due to excessive use of technology (Beard, 2005).

Balcı and Gülnar (2009) and Sağır and Doğruluk (2018) observed that there was no effect of gender on technology addiction levels in their study. However, Aydın and Şimşek (2017) observed in their study that the technology addiction levels are higher in male students than in female students. In a study by Kır and Sulak (2014), a significant difference was found in the technology addiction levels of teacher candidates according to the department they studied. Determining the technological competencies and addiction levels of teacher candidates is important in terms of evaluating the technology training given to them and evaluating their technology use.

1.1. Research Purpose

In this study, it is aimed to determine the ICT competency and technology addiction levels of teacher candidates in terms of different variables. For this purpose, answers to the following research questions were sought.

1. Do pre-service teachers' ICT competency and technology addiction levels differ according to gender?
2. Do pre-service teachers' ICT competency and technology addiction levels differ according to their computer ownership?
3. Do pre-service teachers' ICT competency and technology addiction levels differ according to the department they study?
4. Do pre-service teachers' ICT competency and technology addiction levels differ according to their daily internet use?

2. Method

Quantitative research design was used in this study, and it is aimed to examine the information and communication technologies competency and technology addiction levels of teacher candidates participating in the research in terms of various variables. For this purpose, the relational survey method, which is included in the descriptive survey model, was used in the research. Survey model; It is a research model for examining facts, events and situations as they are and presenting the findings in this direction (Karasar, 2012).

2.1. Research Purpose

The Information and Communication Technologies Sufficiency Perception Scale for Teacher Candidates and the Technological Dependency Scale were applied to a total of 178 pre-service teachers studying at the 4th grade of Niğde Ömer Halisdemir University, Faculty of Education, in the fall semester of 2019-2020. After the examinations made on the questionnaires collected from the teacher candidates, the collected data were analyzed accordingly. Demographic data of teacher candidates participating in the research are given in Table 1.

Table 1. Demographic data of the participants

Variables	Values	N	%
Gender	Female	128	71,9
	Male	50	28,1
Departments	Mathematic teaching	54	30,3
	Science teaching	42	23,7
	Social studies teaching	41	23,0
	Turkish teaching	41	23,0
Computer ownership	Yes	118	66,3
	No	60	33,7
Daily Average Internet Usage Duration	0-3 hours	14	7,9
	4-6 hours	33	18,5
	7-9 hours	49	27,5
	10 and more hours	82	46,1
Total		**178**	**100,0**

As seen in Table 1, 128 (71.9%) of the 178 pre-service teachers participating in the research were female and 50 (28.1%) were male. In addition, 54 (30.3%) of them are studying in the Department of Primary Mathematics Teaching, 42 (23.6%) in Science Teaching, 41 (23.0%) in Social Studies Teaching, and 41 (23.0%) in Turkish Teaching. While 118 (66.3%) of the teacher candidates have their own computer, 60 (33.7%) do not have their own computer.

2.2. Data Collection Tools

Three different tools were used to collect the data. The first of these tools is the "Demographic Characteristics Form", the second is the "Information and Communication Technologies Sufficiency Perception Scale for Pre-service Teachers" and the third is the "Technological Dependency Scale". Demographic characteristics form, which is the first part of the data collection tool presented to teacher candidates; It has been prepared to collect information such as gender, department of education, computer ownership, daily internet usage duration and proficiency level in using technology.

2.2.1. ICTs Competition Perception Scale for Teacher Candidates

ICTs Competition Perception Scale for Pre-service Teachers consisting of 30 items created in a 5-point likert (1: quite insufficient, 5: quite sufficient) type developed by Şad and Nalçacı (2015) was used to determine the information and communication technologies proficiency levels of teacher candidates. As a result of the reliability and validity studies, it was observed that the item-total correlations varied between 0.488-0.733. Guttman test-halving formulas and Cronbach alpha were used to calculate the internal consistency of the scale items. As a result of the calculations, the Guttman two-part consistency coefficient was found to be 0.938 and the Cronbach Alpha coefficient to be 0.962 (Şad & Nalçacı, 2015). As a result, it can be said that the scale is reliable and valid.

2.2.2. Technological Addiction Scale

In order to determine the technology addiction levels of teacher candidates, the "Technological Addiction Scale" consisting of 31 items developed by Güçlü (2015) in a 5-point Likert (1: never, 5: always) type was used. Cronbach's Alpha Coefficient of the pre-application data was found to be .92 for Technology Dependence. As a result of the pre-application of the scale, after necessary changes were made on the 11th item, the Cronbach Alpha Coefficient for Technology Addiction was found to be .93. This result shows that the scale is reliable of the scale (Güçlü, 2015).

2.3. Data Analysis

The suitability of the data collected from the pre-service teachers was analyzed first, and no erroneous or incomplete scale was found after the examinations made in the form of demographic characteristics. For 178 valid data, 5-point Likert items of the Information and Communication Technologies Sufficiency Perception Scale for Pre-service Teachers were scored as 1- quite inadequate, 2- insufficient, 3- partially sufficient, 4- adequate, 5- quite adequate. The Technological Dependence Scale, on the other hand, was scored with 5-point Likert items as 1- never, 2- rarely, 3- sometimes, 4- often, and 5- always.

Frequency and percentage were used in the analysis of demographic characteristics. Skewness and Kurtosis values were checked for normality test. Skewness and Kurtosis values for the scale for determining ICT proficiency levels were -0.122 and -0.724; For the technology addiction scale, it was calculated as 0.120 -0.551. Kurtosis and Skewness values in the range of + and -1 indicate that the data are normally distributed (Tabachnick & Fidell, 2013). The t-test was used to determine whether the prospective teachers showed a significant difference according to their gender and whether they had a computer or not. In order to determine whether the department and daily internet usage of teacher candidates show a significant difference or not, One-way ANOVA technique was used. SPSS 22 statistical program was used in the analysis of the data and the significance level was taken as .05.

3. Findings

In line with the sub-purposes of the research, the findings of the answers obtained from 178 pre-service teachers are given in the form of headings.

3.1. The ICT Competency and Technology Addiction Levels of Teacher Candidates by Gender

The relationship between pre-service teachers' information and communication technologies proficiency levels and technology addiction levels was examined according to gender. In this context, it was observed whether there was a significant difference between the answers given by 128 female and 50 male teacher candidates. The results obtained are shown in Table 2 and Table 3.

Table 2. T-Test Results of Pre-service Teachers' ICT Competencies by Gender

Gender	N	$\overline{X}$	Sd	df	t	P
Female	128	72,62	21,134	176	-2,796	,006*
Male	50	83,12	25,721			

*p<.05

In Table 2, when the information and communication technologies proficiency levels of teacher candidates are compared according to the gender variable, it is seen that female teacher candidates ($\overline{X}$= 72.62) are lower than male teacher candidates ($\overline{X}$= 83.12). When Table 2 is examined [$t_{(2-176)}$=-2,796; p<0.05] was significant because the significance level was .006 < 0.5. According to this result, it can be said that the information and communication technologies proficiency levels of the teacher candidates differ according to the gender variable and the mean of the male teacher candidates is significantly higher than the female teacher candidates.

Table 3. T-Test Results of Technology Addiction Levels of Teacher Candidates by Gender

Gender	N	$\overline{X}$	sd	df	t	P
Female	128	113,21	16,879	176	,431	,667
Male	50	111,92	20,508			

*p<.05

When the technology addiction levels of teacher candidates are compared according to the gender variable in Table 3, it can be said that female teacher candidates ($\overline{X}$= 113.21) are at the same level as male teacher candidates ($\overline{X}$= 111.92) since they have close test scores. When Table 3 is examined [$t_{(2-176)}$ = ,431; p<0.05], since the significance level was .667 > 0.5, no significant difference was observed in the result. It can be said that the technology addiction levels of teacher candidates do not differ according to the gender variable.

3.2. Examination of the ICT Competency and Technology Addiction Levels of Teacher Candidates According to Computer Ownership

The relationship between pre-service teachers' information and communication technologies competency levels and technology addiction levels was examined according to their computer ownership. In this context, it has been observed whether there is a significant difference between the answers given by the teacher candidates. The results obtained are given in Table 4 and Table 5.

Table 4. T-Test Results of Pre-service Teachers' ICT Competency Levels According to Computer Ownership

Computer Ownership	N	$\overline{X}$	Sd	df	t	P
Yes	118	75,44	23,486	176	-,108	,914
No	60	75,83	22,002			

*p<.05

In Table 4, the mean of ICT usage levels of pre-service teachers whether have computers or not were compared with the t-test in order to determine the effect of pre-service teachers' computer ownership on their ICT levels. As a result of the comparison, there was no significant difference between the test score average of the teacher candidates who have a computer ($\overline{X}$= 75.44) and the test point average of the teacher candidates who do not have a computer ($\overline{X}$= 75.83). When Table 3 is examined [$t_{(2-176)}$ = -,108; p<0.05], since the significance level is ,914 > 0.5, it can be said that having a computer does not have a significant effect on the information and communication technologies proficiency levels.

Table 5. T-Test Results of Pre-service Teachers' Technology Addiction Levels According to Computer Ownership

Computer Ownership	N	$\overline{X}$	Sd	df	t	P
Yes	118	115,77	17,317	176	3,126	,002*
No	60	107,10	17,838			

*p<.05

In Table 5, when the technology addiction levels of the pre-service teachers are compared according to their computer ownership, it is seen that the pre-service teachers who have a computer ($\overline{X}$= 115.77) have a higher test score average than the pre-service teachers who do not have a computer ($\overline{X}$= 107.10). When Table 5 is examined [$t_{(2-176)}$ = 3,126; p<0.05] was significant because the significance level was .002 < 0.5. According to this result, it can be said that the technology addiction levels of the pre-service teachers differ according to their computer ownership, and the test score averages of the pre-service teachers who have a computer are significantly higher than those who do not have a computer.

3.3. Examination of Teacher Candidates' ICT Competency Levels and Technology Addiction Levels by Departments

The relationship between pre-service teachers' ICT Competency and technology addiction levels according to the department they studied was examined. In this context, it has been observed whether there is a significant difference between the answers given by the teacher candidates. The results obtained are given in Table 7 and Table 9.

Table 6. Teacher Candidates' ICT Competency Levels According to Their Education Departments

Departments	N	$\overline{X}$	Sd
1- Mathematic teaching	54	69,07	17,487
2- Science teaching	42	79,78	23,419
3- Social studies teaching	41	81,92	27,265
4- Turkish teaching	41	73,46	22,254
Total	**178**	**75,57**	**22,935**

Table 7. ANOVA Results of the ICT Levels of the Teacher Candidates According to the Departments

	Sum of Squares	df	Mean Square	F	P
Between groups	4863,800	3	1621,267	3,197	,025*
Within groups	88241,751	174	507,136		
Total	**93105,551**	**177**			

*p<.05

As can be seen in Table 7, whether the information and communication technologies competency levels of teacher candidates differed according to the department they studied, was examined by one-way analysis of variance and the difference between the scores was found to be significant [$F_{(3\text{-}174)}$ = 3.197; p<0.05]. In other words, the information and communication technologies proficiency levels of teacher candidates differ according to the department they are studying. As a result of the LSD test, which was conducted to determine which departments made this difference, it was concluded that the difference was significant between pre-service teachers studying in Education Mathematics Education and Science Education and Social Studies Education departments.

Table 8. Descriptive Statistics of Teacher Candidates' Technology Addiction Levels According to Departments

Departments	N	$\overline{X}$	S
1- Mathematic teaching	54	107,7	17,136
2- Science teaching	42	117,5	13,625
3- Social studies teaching	41	114,5	18,294
4- Turkish teaching	41	113,0	21,119
Total	**178**	**112,8**	**17,922**

Tablo 9. ANOVA Results of the Technology Addiction Levels of the Teacher Candidates According to the Departments

	Sum of Squares	sd	Mean Square	F	P
Between groups	2449,208	3	816,403	2,611	,053
Within groups	54405,696	174	312,676		
Total	**56854,904**	**177**			

*p<.05

As seen in Table 8, one-way analysis of variance was used to examine whether the technology addiction levels of teacher candidates differ according to the department they studied, and no significant difference was found between the scores [$F_{(3\text{-}174)}$ = 2.611; p<0.05]. In other words, the technology addiction levels of teacher candidates do not differ according to the departments.

3.4. Examination of Teacher Candidates' ICT Competency Levels and Technology Addiction Levels According to Daily Internet Use Duration

The relationship between teacher candidates' ICT Competency and technological addiction levels according to their daily internet usage durations was examined. In this context, it was examined whether there was a significant difference between the answers given by the teacher candidates. The results obtained are given in Table 10, 11, 12 and Table 13.

Table 10. ICT Compentecy Levels According to Daily Internet Usage Times

Daily Internet Usage Durations	N	$\overline{X}$	Sd
0-3 hours	14	59,1	14,458
3-6 hours	33	71,9	21,660
6-9 hours	49	76,5	25,676
9 hours or more	82	79,2	21,760
Total	**178**	**75,5**	**22,935**

In order to determine whether the difference in ICT competency according to daily internet usage is significant, the groups were compared with one-way analysis of variance, and the results are given in Table 11.

Table 11. ANOVA Test Results of Teacher Candidates s' ICT Competency Levels According to Daily Internet Use

	Sum of Squares	**df**	**Mean Square**	**F**	**P**
Between groups	5374,213	3	1791,404	3,553	,016
Within groups	87731,337	174	504,203		
Total	93105,551	177			

*p<.05

A one-way analysis of variance was used to determine whether the ICT competency levels of the teacher candidates given in Table 10 differ according to their daily internet usage durations, and the difference between the scores was found to be significant [$F_{(3\text{-}174)}$ = 3,553; p<0.05]. In other words, the information and communication technologies proficiency levels of teacher candidates differ according to their daily internet usage durations. It has been determined that this difference is significant between pre-service teachers with 0-3 hours of daily internet use and pre-service teachers with 6-9 hours, 9 hours or more.

Table 12. Technology Addiction Levels of Teacher Candidates According to Daily Internet Usage Period

Daily Internet Usage Durations	**N**	$\overline{X}$	**Sd**
0-3 hours	14	115,21	18,039
3-6 hours	33	112,78	16,013
6-9 hours	49	108,53	17,894
9 hours or more	82	115,04	18,479
Total	**178**	**112,84**	**17,922**

In order to determine the difference of technology addiction according to daily internet usage duration, the analysis results for the difference of the averages of the groups are shown in Table 13.

Table 13. ANOVA Test Results of Teacher Candidates' Technology Addiction Levels According to Daily Internet Use

	Sum of Squares	df	Mean Square	F	P
Between groups	1389,023	3	463,008	1,452	,229
Within groups	55465,881	174	318,769		
Total	56854,904	177			

*p<.05

When examined in Table 12, it can be seen that the technology addiction levels of teacher candidates are not different according to their daily internet usage duration [$F_{(3\text{-}174)}$ = 1.452; p<0.05]. In other words, the technology addiction levels of teacher candidates do not differ according to their daily internet usage duration.

4. Result and Discussions

ICT competency and technology addiction levels of teacher candidates were examined in terms of different variables. It was observed that the gender variable, which is one of these variables, had a higher effect on ICT competency levels in male, while it was concluded that the gender variable had no effect on technology addiction levels. Sayginer (2016) stated in his study that male students have higher information and communication technologies proficiency levels. Balcı and Gülnar (2007) and Sağır and Doğruluk (2018) stated that there is no effect of gender variable on technology addiction levels in their study. However, in the study of Aydın and Şimşek (2017), it was stated that the level of technology addiction is higher in male students than in female students.

It was found that pre-service teachers' ICT usage proficiency did not differ according to having a computer, but differed according to daily internet usage duration. The fact that ICT usage proficiency does not change according to computer ownership can be explained by the equality of opportunity that pre-service teachers have in technology access. While Tondeur, Sinnaeve, Van Houtte, and Van Braak (2011) stated in their study that there is no relationship between socio-economic level and computer ownership, they stated that computer ownership is no longer an important factor in acquiring ICT competencies. On the other hand, daily internet usage duration is an important factor in terms of ICT usage proficiency. This situation can be accepted as a reflection of the attitude towards technology. Hassan et al. (2011) stated that the time spent is an important indicator of a positive attitude towards technology and has a positive effect on ICT proficiency.

On the other hand, it was found that computer ownership has a significant effect on technology addiction. Kawabe et al. (2016) also stated that there is a relationship between laptop, game console, phone or smartphone ownership, which is a symptom of addiction. Al-Hantoushi and Al-Abdullateef (2014), on the other hand, stated that dependency increased

due to technology access. Another important finding of the study, the fact that technology addiction does not differ according to the average daily internet usage duration, can be explained by purposeful use. The fact that teacher candidates spend time on the internet for certain purposes may have affected the difference in technology addiction. As a matter of fact, Dadischeck (2021) stated that in today's digitalizing world, the time spent in digital environments has reached a certain standard, and how much of it is meaningful gains importance.

In this study, a significant difference was determined in the information and communication technologies competency levels of the pre-service teachers according to the departments. It was concluded that this difference was significant between the prospective teachers studying in the Departments of Primary Education, Mathematics Teaching, Science Teaching and Social Studies Teaching. Gündüz (2020) stated that pre-service teachers' ICT competencies differ according to the programs they study. Akkoyunlu and Yılmaz Soylu (2010) stated in a study they conducted that digital competencies differ according to the department they study. However, in the study of Saygıner (2016), it was observed that there was no significant difference in the information and communication technologies proficiency levels of teacher candidates according to the department they studied. There was no difference in the level of technology addiction of teacher candidates according to the department they studied. However, in a study by Kır and Sulak (2014), a significant difference was found in the level of technology addiction of teacher candidates according to the department they studied. The reason why a similar result was not reached may be due to the different sections preferred in the studies.

In this study, while pre-service teachers' ICT competencies differed according to computer ownership, the fact that they did not differ according to the duration of internet use made the issue of usage important. In this respect, the effect of computer ownership and technology usage period focused on purposeful use in ICT use can be investigated. It can be suggested to investigate the relationships between the proficiency of using mobile technologies and variables such as mobile phone, social media, shopping addiction, which are different dimensions of technology addiction.

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