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To cite this article:

Aslan, S. (2021). Analysis of digital literacy self-efficacy levels of pre-service teachers. *International Journal of Technology in Education (IJTE)*, 4(1), 57-67. <https://doi.org/10.46328/ijte.47>

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[International Society for Technology, Education, and Science \(ISTES\): www.istes.org](http://www.istes.org)

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Article Info

Article History

Received:

5 August 2020

Accepted:

25 November 2020

Keywords

Digital literacy

Self-efficacy

Pre-service teacher

Technology

Abstract

This research attempts to analyze the pre-service teachers' digital literacy self-efficacy in terms of various variables. The research used descriptive survey model, one of the survey models. The participants of the research consisted of 251 pre-service teachers learning at the departments of classroom teaching and social sciences teaching at a state university in Turkey. The participants were selected by convenience sampling method. The research employed Personal Information Form and Digital Literacy Self-Efficacy Scale as data collection tools. Descriptive statistical, t-test, one-way analysis of variance were used during data analysis. The research results revealed that the pre-service teachers' digital literacy self-efficacy levels significantly differed across their gender, department, the presence of computer and internet at home; whereas, no significant difference was identified across the pre-service teachers' digital literacy self-efficacy levels in terms of their class level, university entrance score type and the purposes of using technology.

Introduction

In recent years, great changes and advancements have been experienced in science and technology. There have been great changes in digital tools especially with the rapid development of artificial intelligence. These changes and advances have also affected education. Today, it will not be an exaggeration to mention that technology and digital technology, in particular, play a significant role in education. This has become an important issue for individuals to keep up with this advancement in science and technology. Enabling individuals to keep pace with this change has become the aim of education. In order to achieve this aim, it is essential that teachers be digital technology literate.

Digital literacy requires the ability to access, produce and share the accurate information and use technology in the learning-teaching processes along with using different technologies properly (Hamutoğlu, Canan-Güngören, Kaya-Uyanık & Gür-Erdoğan, 2017). Martin (2008) defined digital literacy as "awareness, attitude and ability to use digital tools so as to identify, access, manage, integrate and create new information through using metacognitive skills". Individuals who are digital literate possess some characteristics. A digital literate individual is an individual who is creative, innovative, who is able to cooperate, communicate, think critically, solve problems, have decision-making skills, know what technological concepts are, and use these concepts in this regard, and who can do what they need as a digital citizen (Ocak & Karakuş, 2018a). Teachers are expected to be digital literate and to have high self-efficacy. Because the age we live in is called digital age and therefore,

teachers should have the ability to use digital tools.

Self-efficacy is the judgment and belief of the individual about how successful s/he can be in overcoming the difficult situations s/he may encounter in the future (Senemoğlu, 2018: 234). In other words, self-efficacy is the belief of the learner's ability to successfully manage situations that may contain new and unpredictable elements (Gredler, 2017). Bandura (1997) defined self-efficacy as “an individuals’s belief in his/her capacity to execute the activities necessary to do a particular job successfully”. Individuals with high self-efficacy put forth the effort to accomplish the task, and they are more persistent and perseverant in this context. Furthermore, these individuals are more courageous for trying anything, and they can overcome the task more easily as they can control the environment more (Senemoğlu, 2018). It is of great importance for teachers to use technological tools, especially digital tools, effectively in the learning and teaching environments. In this way, they can ensure students' permanent learning. In fact, the 21st century individuals live together with digital technologies. These technological tools are irrevocable for these individuals. The studies have revealed that generation Z uses digital technology quite frequently in their daily lives. Altunbay and Bıçak (2018: 133) stated that Z generation uses technology much better than the other generations; moreover, they make portable technology products such as tablets, smart phones and computers a significant part of their lives. Therefore, teachers should use technology effectively in the teaching environment by taking into account the students’ characteristics and needs. Thus, they need to have higher digital literacy self-efficacy.

Digital literacy self-efficacy can be defined as individuals' belief in choosing technological tools in accordance with their goals, knowing the features of these tools and organizing, developing and using these tools. Those with high digital literacy self-efficacy know which technological tools should be used for what purpose, and they try to recognize and solve these technological tools. In addition, they try to cope with the problems they may encounter while using these technological tools and they develop different solutions. Today, the significance of technology is increasing in an educational platform, and various technological tools are used in the teaching environment. In this regard, it is of great significance for teachers to have high digital literacy self-efficacy. Because teachers can use technological tools effectively in the teaching environment providing they have high digital literacy self-efficacy.

With a view to developing teachers' digital literacy self-efficacy, it is paramount in determining their digital literacy self-efficacy with pre-service training programs. Hence, this research examined the pre-service teachers’ digital literacy self-efficacy in terms of various variables. The research also attempts to analyse as to whether the pre-service teachers' digital literacy self-efficacy significantly varied across their gender, class level, department, university entrance score types, the presence of computer and internet at home, and the purposes of using technology. The reason for this is that these variables are thought to have an impact on pre-service teachers' digital literacy self-efficacy.

Besides, the relevant literature includes various studies regarding the effects of these variables on digital literacy (Arslan, 2019; Ocak & Karakuş, 2018b; Kıyıcı, 2008; Kozan, 2018). An analysis and description of the pre-service teachers’ digital literacy self-efficacy in terms of the various variables are expected to contribute to the

related literature in Turkey. What is more, there is a limited number of studies examining the pre-service teachers' digital literacy self-efficacy in Turkey (Ocak & Karakuş, 2018b). Thus, this research is expected to fill the gap in the literature. Based upon all these reasons, it was decided to conduct such a research, which is expected to be a feedback both for pre-service teachers and faculty members working at teacher training institutions.

This research attempts to analyse the pre-service teachers' digital literacy self-efficacy in terms of various variables. In this regard, answers to the following questions were sought:

1. Does the pre-service teachers' digital literacy self-efficacy significantly differ across their gender?
2. Does the pre-service teachers' digital literacy self-efficacy significantly differ across their class level?
3. Does the pre-service teachers' digital literacy self-efficacy significantly vary across their department?
4. Does the pre-service teachers' digital literacy self-efficacy significantly vary across their university entrance score types?
5. Does the pre-service teachers' digital literacy self-efficacy significantly vary across the presence of a computer at home?
6. Does the pre-service teachers' digital literacy self-efficacy significantly vary across having the internet in their home?
7. Does the pre-service teachers' digital literacy self-efficacy significantly differ across the purpose of using technology at most?

Method

Research Design

This research used descriptive survey model. Descriptive survey is "research conducted on larger groups, where the individuals' opinions and attitudes regarding a phenomenon and event are taken, and the phenomena and events are tried to be described" (Karakaya, 2012, p. 59). The main goal of a descriptive survey is to accurately describe or illustrate the characteristics of a situation or phenomenon. Descriptive survey model is used in the education field in order to learn people's attitudes, opinions, beliefs and their demographic characteristics (Johnson & Christensen, 2014). Therefore, this research utilized a descriptive research model as it aimed to describe the pre-service teachers' digital literacy self-efficacy and examined in terms of various variables.

Participants

The participants of the research consisted of 251 pre-service teachers learning at the departments of classroom teaching and social sciences teaching at a state university in Turkey. The participants were selected by convenience sampling method. Those from whom the data are obtained in the easiest way are included in the scope of sampling. This method gives speed and practicality to the research (Altındış & Ergin, 2017, p. 59). Hence, the researcher used the convenience sampling method since the participants who were easily contacted were included in the research. Volunteer participation was ensured with a great attention. Table 1 depicted the participants' demographic characteristics.

Table 1. The Characteristics of the Participants

Gender	<i>f</i>	%
Female	170	68
Male	81	32
Class		
1 st grade	66	26
2 nd grade	67	27
3 rd grade	66	26
4 th grade	52	21
University Entrance Score Type		
Verbal	98	39
Numerical	5	2
Equally weighted	148	59
Department		
Classroom teaching	151	60
Social sciences teaching	100	40
The Presence of a Computer		
Yes	199	79
No	52	21
The Presence of the Internet		
Yes	199	79
No	52	21
The Purpose of Using Technology		
Doing homework-research	48	19
Playing games	21	8
Social media	139	55
Shopping	14	6
Personal affairs	29	12
Total	252	100

Table 1 depicted that the participants mostly consist of female pre-service teachers (68%), most of the pre-service teachers are in the second grade (27%) and they learn at classroom teaching department (60%). Moreover, the pre-service teachers' university entrance score type is equally-weighted (59%); they have both computers and the internet (79%) and they mostly use technology to follow social media (55%).

Data Collection Tool

This research deployed two data collection tools. These are:

Personal Information Form

Personal information form was used in the research. This form was finalized by taking into account the experts' views and the studies available in the relevant literature. The form included the questions related to gender, class level, department, university entrance score types, the presence of a computer and the internet at home, the purpose of using technology at most.

Digital Literacy Self-Efficacy Scale

The research employed “*Digital Literacy Self-Efficacy Scale*” developed by Ocak and Karakuş (2018a). Being a 5-point likert type, the tool possesses 35 items. Exploratory and confirmatory factor analyses were used during scale development process. The lowest score that can be obtained from the scale is 35, while the highest score is 195. The exploratory factor analysis was conducted with 334 pre-service teachers and 448 in confirmatory factor analysis. The exploratory factor analysis results revealed that the scale holds four factors. The explained variance value of the scale was identified to be 53.169%, and the eigen value calculated in determining the factors was found as 37.379% in the first factor, 7.676% in the second, 4.72% in the third and 3.373% in the fourth factor. The item-total test correlation values that determine the discrimination of the items in the scale were determined to range from .35 to .72. The Cronbach Alpha value of the factors was determined as .90, .88, .86 and .81, respectively. The Cronbach Alpha internal consistency coefficient was found to be .96 for the overall scale. The confirmatory factor analysis performed after the exploratory factor analysis suggested that the scale had acceptable fit indices (Ocak & Karakuş, 2018a). The Cronbach Alpha coefficient of the scale was examined for this study after obtaining the necessary permission from the researchers who developed the scale. Accordingly, the Cronbach Alpha coefficient of the scale was found to be .95, meaning that the scale is quite reliable (Fraenkel, Wallen & Hyun, 2014).

Data Collection

The research data were collected in the spring term of the 2019-2020 academic year between 2-13 / 03/2020. The necessary permissions were taken and the ethical committee decision (Number: 87432956 / 1054.991) was issued during data collection process. Volunteer participation was ensured with a great attention. The data were collected in a way that did not affect the pre-service teachers' educational status. The pre-service teachers filled the personal information form and the scale items in approximately 15 minutes. Ethical principles were followed in all stages of the research.

Data Analysis

At first, univariate normality assumption was examined before data analysis. Therefore, the results of the Kolmogorov-Smirnov test were analysed. The analysis results indicated that the data showed a normal distribution ($K-S=.043$, $p>.05$). Descriptive statistics, independent samples t-test and one-way analysis of variance (ANOVA) were used during data analysis. In order to use the independent samples t-test, the

assumptions of the two groups must be random and independent of each other, univariate normality must be ensured and the variances of the universes represented by the scores must be homogeneous (Green & Salkind, 2014). In order to perform ANOVA, the assumptions that the dependent variable should show normal distribution for each group and the variances of the groups related to the dependent variable data should be met (İyilikci, 2020). In this context, all assumptions were met within the scope of the research.

Findings

In this section, the findings are presented in line with the sub-problems. Based on the first sub-problem of the research, the research examined whether the pre-service teachers' digital literacy self-efficacy levels significantly differed across their gender, and the findings were presented in Table 2.

Table 2. t-Test Results Related to Gender Variable

	Gender	n	\bar{X}	SD	t	p	d
Digital literacy self-efficacy	Female	170	3.93	.57	-2.94	.00*	.39
	Male	81	4.16	.56			
Levene: .164		p: .68					

*p<.05

Table 2 displayed a statistically significant difference between the pre-service teachers' digital literacy self-efficacy levels in terms of their gender ($t=-2.94$, $p<.05$). As is seen in Table 2, a significant difference was identified in favor of male pre-service teachers ($\bar{X}=4.16$). Table 3 presented the ANOVA results regarding the second sub-problem of the research to determine whether the pre-service teachers' digital literacy self-efficacy levels significantly differed across their class level.

Table 3. ANOVA Results Related to the Class Level Variable

Digital Literacy Self-efficacy	Class Level	n	\bar{X}	SD	Groups	Sum of Squares	df	Mean of squares	F	p	η^2
	1 st grade	66	3.93	.61	Between groups	.55	3-247	.18	.55	.64	.00
	2 nd grade	67	4.00	.46							
	3 rd grade	66	4.04	.62	Within groups	82.64		.33			
	4 th grade	52	4.01	.60	Total	83.20					
Levene: 2.465		p: .06									

Upon analyzing Table 3, no significant difference was noted across the pre-service teachers' digital literacy self-efficacy levels in terms of the class level ($F=.55$, $p>.05$). Based on the third sub-problem, the research examined whether the pre-service teachers' digital literacy self-efficacy levels significantly varied across their department, and the findings were depicted in Table 4.

Table 4. t-Test Results Related to the Department Variable

Digital literacy self-efficacy	Department	n	\bar{X}	SD	t	p	d
	Classroom Teaching	151	4.08	.53	2.67	.00*	.34
	Social Sciences Teaching	100	3.89	.61			
Levene: .582	p: .44						

*p<.05

Considering the results in Table 4, a significant difference was identified across the pre-service teachers' digital literacy self-efficacy levels in terms of their department ($t=2.67$, $p<.05$). The difference was determined in favor of those ($\bar{X}=4.08$) studying at classroom teaching. Table 5 suggested the ANOVA results regarding the fourth sub-problem of the research to conclude whether the pre-service teachers' digital literacy self-efficacy levels significantly differed across their university entrance score types.

Table 5. ANOVA Results Related to the University Entrance Score Type

Digital literacy self-efficacy	Score type	n	\bar{X}	SD	Groups	Sum of squares	df	Mean of Squares	F	p	η^2
		Verbal	98	3.90	.61	Between groups	1.95	2-248	.97	2.97	.05
	Numerical	5	4.09	.72							
	Equally-weighted	148	4.08	.53	Within groups	81.25		.32			
					Total	83.20					
Levene: 2.465	p: .06										

As observed in Table 5, no significant difference was found among the pre-service teachers' digital literacy self-efficacy levels in terms of their university entrance score type ($F=2.97$, $p>.05$). For the fifth sub-problem, the research analyzed whether the pre-service teachers' digital literacy self-efficacy levels significantly differed across the presence of a computer at home, and the findings were given in Table 6.

Table 6. t-Test Results Related to the Presence of a Computer Variable

Digital literacy self-efficacy	Literacy	Self-Computer	n	\bar{X}	SD	t	p	d
		Yes	199	4.05	.55	2.36	.01*	.36
		No	52	3.84	.62			
Levene: 2.284	p: .13							

*p<.05

Given the results in Table 6, a significant difference was identified across the pre-service teachers' digital literacy self-efficacy levels in terms of the presence of a computer at home ($t=2.36$, $p<.05$). This difference was found in favor of the pre-service teachers ($\bar{X}=4.05$) having a computer. When it comes to the sixth sub-problem, the research sought whether the pre-service teachers' digital literacy self-efficacy levels significantly

varied across the presence of the internet at home and the findings were presented in Table 7.

Table 7. t-Test Results Related to the Presence of the Internet

Digital Literacy Self- efficacy	Internet	n	\bar{X}	SD	t	p	d
	Yes	199	4.08	.53			
No	52	3.72	.65				
Levene: 1.065		p: .30					

*p<.05

Table 7 displayed a significant difference between the pre-service teachers' digital literacy self-efficacy levels depending on the presence of the internet ($t=4.13$, $p<.05$). As shown in Table 7, a significant difference was identified in favor of those ($\bar{X}=4.08$) having the internet. Table 8 presented the ANOVA results regarding the seventh sub-problem of the research to identify whether the pre-service teachers' digital literacy self-efficacy levels significantly varied across their purpose of using technology.

Table 8. ANOVA Results Related to the Purpose of Using Technology Variable

Purpose	n	\bar{X}	SD	Groups	Sum of Squares	df	Mean of Squares	F	p	η^2
Playing games	21	4.20	.70			4-246		1.31	.26	.02
Social media	13 9	4.00	.57	Within groups	81.46					
Shopping	14	4.06	.41	Total			.33			
Personal affairs	29	3.83	.54		83.20					
Levene: .865		p: .48								

When Table 8 was analyzed, no significant difference was found across the pre-service teachers' digital literacy self-efficacy levels depending upon their purpose of using technology ($F=1.31$, $p>.05$).

Discussion and Conclusions

Research results revealed that the pre-service teachers' digital literacy self-efficacy levels significantly varied across their gender in favour of males, which is an interesting result of the research. This can be evaluated in terms of the concept of social gender. Social gender is a concept referring to the duties and responsibilities of men and women created by society (Takkin, 2020). Male dominated society is welcomed in Turkey. In this

regard, men are much freer in society. Besides, while families favour all kinds of development of boys, they are hesitant in providing this support for girls. Whereas boys rub shoulders with more technology, girls are not held with using technological tools. Therefore, this may be the reason for the emergence of a significant difference in favour of male pre-service teachers. The results of some studies conducted in Turkey were in line with that of this research (Çetin, 2016; Kılıcı, 2008; Özerbaş & Kuralbayeva, 2018; Özoğlu, 2019). In the research conducted by Yaman (2019), no significant difference was identified across the pre-service teachers' digital literacy in terms of their gender.

Another result of the research suggested a significant difference between the digital literacy self-efficacy levels of the pre-service teachers in favour of those studying at classroom teaching department. Namely, department may be interpreted as a variable that makes a significant difference on the pre-service teachers' digital literacy self-efficacy. The pre-service teachers studying classroom teaching take courses from different disciplines such as science, mathematics and life sciences teaching. This situation leads them to use more digital tools in the teaching-learning environment, which may be the reason for such a difference. In addition, the fact that faculty members teaching at classroom teaching department use more technology in their lessons may have caused such a result.

Research results also indicated a significant difference across the pre-service teachers' digital literacy self-efficacy levels in favour of those who have computers and the Internet. Thus, the presence of computers and the internet at homes significantly affect the pre-service teachers' digital literacy self-efficacy. This is an expected research result as individuals having computers and internet in their homes are into technology. This affects individuals' digital literacy self-efficacy. In the studies carried out by Özerbaş and Kuralbayeva (2018), Öçal (2017), Arslan (2019) and Yaman (2019), a significant relationship was found between the status of having a personal computer and the level of digital literacy. The results of these studies are parallel to those of this research. However, Kozan (2018) identified no significant difference between the digital literacy of the pre-service teachers and the presence of computers. The result of this research is inconsistent with that of this research. In the research conducted by Kozan (2018), the fact that the research was conducted with the pre-service teachers studying in a different teacher training program may have caused this difference. Yaman (2019) and Özerbaş and Kuralbayeva (2018) concluded that the frequency of using the internet is an effective variable on the pre-service teachers' digital literacy levels. In the study carried out by Öçal (2017), the parents' digital literacy competencies were determined to significantly differ across the frequency of using the internet. All these studies showed that the internet use has a significant impact on digital literacy levels. The results of these studies are in harmony with those of this research.

No significant difference was found across the pre-service teachers' digital literacy self-efficacy levels in terms of the class level, the university entrance score type and the purpose of using technology. Based on this result, it can be said that these three variables are not the variables that make a significant difference on pre-service teachers' digital literacy self-efficacy. Moreover, the pre-service teachers' digital literacy self-efficacy was determined to be close and high depending on these three variables. Yaman (2019), Özerbaş, Kuralbayeva (2018) and Kozan (2018) unveiled a significant difference between the digital literacy levels and the class level.

The results of these studies do not coincide with those of this research. The reasons may be the use of different scales and the administration of the scales to the pre-service teachers studying at different universities.

Recommendations

Based upon the research results, the following recommendations were provided:

1. This research found a significant difference between the pre-service teachers' digital literacy self-efficacy levels in favour of males. Conducting in-depth research on the reasons for this situation will contribute to the relevant literature.
2. A significant difference was identified across the pre-service teachers' digital literacy self-efficacy levels in favour of those having computers and the internet in their homes. University and education faculty administrations may offer support to pre-service teachers in terms of providing computers and internet.
3. Conducting studies that compare the digital literacy self-efficacy levels of the pre-service teachers studying in teacher training programs at universities located within the different regions of Turkey will contribute to the related literature.
4. It is recommended that studies using qualitative and mixed research models be conducted to make an in-depth analysis of the pre-service teachers' digital literacy self-efficacy.

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