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Investigating the Relationship Between Turkish Teacher Candidates' Attitudes Towards E-Learning, E-Learning Readiness, Digital Literacy Levels and Academic Achievement in Distance Education Process

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ABSTRACT

This study aims to examine the relationship between Turkish teacher candidates' attitudes towards e-learning, e-learning readiness, digital literacy, and their academic achievement in distance education process. The study was conducted using a survey model. The study group consists of 271 teacher candidates studying at the Department of Turkish Language Teaching in the 2021-2022 academic year. The study used e-learning readiness scale, attitude towards e-learning scale and digital literacy scale as data collection tools. As a result of the study, it was found that Turkish teacher candidates' attitudes towards e-learning and digital literacy levels were moderate, while their e-learning readiness were high. No significant relationship was found between Turkish teacher candidates' attitude towards e-learning and their academic achievement, and no significant relationship was found between attitude towards e-learning and digital literacy. There was a significant negative relationship between attitude towards e-learning and e-learning readiness. It was revealed that there was a significant positive relationship between digital literacy and academic achievement and between readiness and attitude towards e-learning. There was also a positive relationship between readiness for e-learning and digital literacy. Academic achievement of Turkish teacher candidates was significantly predicted by readiness for e-learning; however, academic achievement was not significantly predicted by attitude towards e-learning and e-learning readiness.

Keywords:
Turkish teacher candidates, e-learning, e-learning readiness, digital literacy, attitude

INTRODUCTION

The unlimited and unpredictable progress of technology has greatly affected social life and led to major changes, especially in areas such as the business world, work life and education. These changes have become mandatory and the qualifications of the people to be educated in this process, as well as educational expectations and understandings, have been reformed and updated. As a part of this change process, e-learning and distance education practices have emerged in today's educational environments as an effective alternative that can support the current educational approach or replace the traditional educational process (Arbaugh, 2000; Kaleli-Yılmaz & Güven, 2015). Many factors such as the increase in technological opportunities, the continuous increase in the number of students, individuals' lifelong learning demands, time and space independent learning demands, lack of qualified teachers, the desire of institutions to train their employees in a more economical and faster way have led educational approaches to distance education (Alkan, 1998; Demir, 2014, Gillies, 2008; Yalın, 2001). This process has led to a transformation in educational environments and the widespread adoption of remote learning processes in today's world.

Education is one of the fundamental elements that shape the development of societies and with the rapid evolution of technology, transformations are occurring in the field of education. One of the most important transformations in this sense is distance education. Distance education is a learning method that goes beyond traditional classroom environments and enables online access to students, learning materials, and instructors (Demiray, 2013). The aforementioned method provides the advantages of overcoming geographical barriers, offering flexible learning hours and creating environments suitable for the different learning styles of students (Balaban, 2012; Offir, Barth, Lev & Shteinbok, 2003).

In recent years, unexpected events, such as the COVID-19 pandemic, have caused distance education to become even more widespread. This change has forced educators and students to reconsider traditional educational approaches and adapt to new technologies. The limitations of existing educational methods have been further exposed, especially in unexpected situations such as pandemics. As the COVID-19 pandemic spread around the world, schools and universities were forced to close and educational institutions had to turn to distance education, increasing the need for distance education. This period has been a time when educators and students need to rapidly adapt to digital learning environments (Akyüz, 2021). At this point, teacher candidates' attitudes towards distance education methods, their digital literacy levels, and their ability

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to interact successfully with this new learning paradigm gain value as the cornerstones of future education systems. In this context, the research variables that constitute the key points of the study are explained below, respectively:

Attitude refers to an affective psychological disposition that forms the basis for the expression of our reactions, thoughts and ideas about other people, situations and ideas, and this situation involves the necessity to show and explain the state of mind and mood in the external world to our environment to a certain extent (Bordens & Horowitz, 2002; Chapman, 1999; Eagly & Chaiken, 2007). In this context, attitudes are an important factor in explaining human behavior. Identifying positive or negative attitudes towards e-learning facilitates the teaching and learning process and supports the planning, design, and implementation stages of an appropriate learning environment (Prakasha, Sangeetha, Almeida & Chellasamy, 2022). This helps institutions achieve quality education, a successful student profile and permanent learning objectives (Guillasper, Soriano & Oducado, 2020; Liaw et al., 2007; Özgür & Tosun, 2010; Younis, Ahmed & Hussein 2021).

Students' attitudes towards e-learning are an important factor influencing the effectiveness of distance education and e-learning processes. Students with positive attitudes can be more successful by being more positive about course materials and online interactions (Prakasha, Sangeetha, Almeida & Chellasamy, 2022). A positive attitude towards e-learning can increase student motivation and make the learning experience more enjoyable (Baturina & Simakov, 2023).

E-learning readiness is defined as the learners' ability to effectively use e-learning content and materials and multimedia tools (Kaur & Abas, 2004). In addition, Yurdugül and Demir (2017) considers the concept of e-learning readiness as a framework that includes factors such as motivation to learn, learner autonomy and self-directed learning, along with dimensions such as computer, internet, and online communication self-efficacy (Lopes, 2007). E-learning readiness also refers to students' ability to use technology and to learn effectively in online learning environments. This level includes factors such as students' confidence in technology, ability to use online tools and capacity to understand digital materials (McConnell, 2017). Students with adequate e-learning readiness can use distance education platforms more efficiently.

Digital literacy refers to a concept that includes more than just the ability to operate digital devices or use software (Eshet, 2004). Martin (2005) identifies the concept of digital literacy as the ability to identify, access and manage digital environments, integrate and evaluate these environments, organize new information, create communication tools to communicate with other people, and use the necessary digital tools and materials to design reflectively while doing all these. Digital literacy also includes students' ability to understand course content, use resources correctly and manage online interactions effectively. The level of digital literacy includes students' ability to access, evaluate, synthesize and communicate information in digital environments (Martin & Grudzuecki, 2006). Since information today is often accessed on digital platforms, students should have high levels of digital literacy. Ng (2012) defined digitally literate individuals as individuals who avoid being understood as if they were communicating face-to-face, could use respectful language, care about personal security and privacy, know what to do when threatened, and know where to go when encountering such situations.

Academic achievement in distance education depends on some factors such as students' level of participation in the e-learning process, their ability to understand course content and their exam performance (Amrai, Motlagh, Zalani & Parhon, 2011; Steinmayr, Meiṅer, Weideinger and Wirthwein, 2014). Students' positive attitudes, adequate e-learning readiness levels and digital literacy skills can positively affect their academic success. Likewise, poor e-learning habits or low levels of digital literacy can negatively affect academic achievement (Amrai, Motlagh, Zalani & Parhon, 2011).

In this context, Turkish teacher candidates' attitudes towards the distance education process, their readiness for e-learning, their digital literacy levels, and the effect of these factors on their academic achievement constitute an important research area. While Turkish teachers undertake the task of ensuring the correct and effective conveyance of language, they are also responsible for teaching students the beauties and subtleties of language. Therefore, how Turkish teacher candidates perceive the e-learning environment and how they can be successful in this environment is of great importance.

This study aims to examine the relationship between Turkish teacher candidates' attitudes towards the distance education process, e-learning readiness levels, digital literacy levels and academic achievement. The results of the study will help us understand how teacher candidates adapt to this new learning paradigm and the impact of this adaptation on their academic achievement.

The problem statement of the research: "What is the relationship between Turkish teacher candidates' attitudes towards e-learning, e-learning readiness, digital literacy levels and their academic achievement in the distance education process?" Depending on the problem statement, sub-problems were formed as follows.

1. What is the level of Turkish teacher candidates' attitudes towards e-learning, their e-learning readiness, and their digital literacy in the distance education process?

2. What is the relationship between Turkish teacher candidates' attitudes towards e-learning, e-learning readiness, digital literacy, and their academic achievement in the distance education process?

3. Are Turkish teacher candidates' attitudes towards e-learning, e-learning readiness, and digital literacy levels a significant predictor of their academic achievement in the distance education process?

METHOD

In this section, information about the methodology of the study, study group, data collection tools and data analysis are provided.

Study Method

The present study aiming to investigate the relationship between Turkish teacher candidates' attitudes towards e-learning, e-learning readiness, digital literacy levels and their academic achievement made use of relational screening model. The survey model is a research approach that aims to describe a past or current situation as it exists. The subject of the research, an individual or an object, is defined within its own conditions and as it exists (Karasar, 2019). In this method, the relationship between two or more variables is examined without any intervention (Büyüköztürk, Kılıç-Çakmak, Akgün, Karadeniz, & Demirel, 2014). The relational scanning model refers to a scanning approach that aims to determine the presence of co-variation among two or more variables (Karasar, 2019). Within the scope of the research, scales were applied to determine Turkish teacher candidates' attitudes towards e-learning, e-learning readiness, and digital literacy levels, and the relationship between these variables was detected by doing appropriate analyses.

Study Group

The study group of the research consists of the students studying in the Department of Turkish Language Teaching at Necmettin Erbakan University in the 2021-2022 academic year. Information about the students in the study group is shown in Table 1:

Table 1. Demographic information of the students in the study group

Variables		f	%
Gender	Female	207	76.4
	Male	64	23.6
Age	17-20 years	104	38.4
	20-25 years	151	55.7
	25-30 years	7	2.6
	30-35 years	3	1.1
Duration of technology usage	0-1 hour	6	2.2
	1-3 hours	83	30.6
	3-5 hours	113	41.7
	Over 5 hours	69	25.5
Having internet access	Yes	203	74.9
	No	68	25.1
	Total	271	100

As seen in Table 1, 76% (f=207) of the students in the study group were female and 23% of them (f=64) were male; 38% of the students (f=104) were between the ages of 17-20, 55% of them were(f=151) between 20-25, 2% of them were (f=7) between 25-30, and 1% of them were (f=3) between 30-35. 2% (f=6) of the students use technology for 0-1 hour, 30% of them use technology (f=83) for 1-3 hours, 41% of them (f=113) for 3-5 hours, 25% of them (f=69) for more than 5 hours; 74% of the students (f=203) have an internet connection that they can use comfortably, while 25% of them (f=68) do not have such an opportunity.

Data Collection Tools

In this study, the following data collection tools were used: the data collection tool prepared by the researchers, the attitude towards e-learning scale developed by Kisanga (2016) and adapted into Turkish by Biçer (2019), the digital literacy scale developed by Ng (2012) and adapted into Turkish by Üstündağ, Güneş, and Bahçivan (2017), and the e-learning readiness scale developed by Yurdugül and Demir (2017).

E-learning readiness scale: The items of the e-learning readiness scale for university students were designed in 7-point Likert type. The options for the items on the scale range from "Not suitable for me (1)" to "completely suitable (7)". The scale consists of 33 items in 6 factors. Computer self-efficacy factor, internet self-efficacy factor, online communication self-efficacy factor, self-directed learning factor, learner autonomy factor and motivation for e-learning factor consist of 5, 4, 5, 8, and 7 items, respectively. A maximum score of 231 and a minimum score of 33 can be obtained from the scale. The construct validity coefficient of the scale was found to be 0.98. Cronbach's alpha reliability coefficient was calculated as 0.85 for the computer self-efficacy factor, 0.85 for the internet self-efficacy factor, 0.84 for the online communication self-efficacy factor, 0.89 for the self-directed learning factor, 0.92 for the learner autonomy factor, 0.95 for the motivation towards e-learning factor and 0.93 for the whole scale. Hierarchical confirmatory factor analysis was conducted to determine the superstructures to which the factors of the e-learning readiness scale were directed, and it was seen that the goodness of fit coefficients between the hypothetical model and the estimated model indicated good fit (GFI=0.96; CFI=0.96; NFI=0.96; NNFI=0.94).

E attitude towards learning scale: The scale for attitudes towards e-learning developed by Kisanga (2016) and adapted into Turkish by Biçer (2019) is scored as 1 - strongly disagree, 2 - disagree, 3 - agree and 4 - strongly agree. The 4-point Likert type scale consists of 23 items. Exploratory factor analysis was conducted to determine the construct validity of the scale and it was found that the scale consisted of four factors: "Tendency to Use Technology" (F1), "Satisfaction" (F2), "Motivation" (F3) and "Usefulness" (F4). The items on the scale explain 44.94% of the total variance. Cronbach's alpha reliability coefficient was calculated as 0.72 for the tendency to use technology factor, 0.71 for the satisfaction factor, 0.75 for the motivation factor, 0.68 for the usefulness factor and 0.78 for the whole scale. As a result of confirmatory factor analysis, goodness of fit values was found to be $\chi 2(sd=253, N=1721)= 8821.036$, $p<.000$, RMSEA= 0.061, RMR=0.049, S-RMR= 0.042, GFI= 0.95, AGFI= 0.93, CFI= 0.93, NFI= 0.98 and IFI= 0.98. All goodness values were found to be acceptable.

Digital literacy scale: The digital literacy scale developed by Ng (2012) and adapted into Turkish by Üstündağ, Güneş, and Bahçivan (2017) was scored as 1 - strongly disagree, 2 - disagree, 3 - agree, 4 - agree and 5 - strongly agree. The 5-point Likert type scale consists of 10 items. Exploratory factor analysis was conducted to determine the construct validity of the scale and it was observed that the scale consisted of a single factor and the factor loadings ranged between 0.46 and 0.74. The single-factor scale explained 40% of the total variance. As a result of the analysis, it was detected that the KMO value was .90 and the Bartlett's test of sphericity was significant at the $p< 0.00$ level with a chi-square value of 3383 (n=979). The Cronbach Alpha value for the reliability of the scale was found as 0.86.

Data Analysis

The normal distribution of the data set is one of the important assumptions of parametric tests (Büyüköztürk, 2012). In an ideal normal distribution, arithmetic mean, mode, and median values should be close to each other and the histogram should resemble a symmetrical bell curve (Can, 2017: 62). In the analysis, it was figured out that the mean, mode, and median values were close to each other, the histogram was symmetrical, and the skewness and kurtosis values of the independent variables ranged between -1 and +1. The fact that skewness and kurtosis values are between -2 and +2 is an indication that the data are normally distributed (George & Mallery, 2004). Since the data were normally distributed, parametric tests were used for the analysis.

Arithmetic mean, standard deviation and standard error were used to identify the attitudes towards e-learning, e-learning readiness and digital literacy levels of the students participating in the study. Pearson Product Moment Correlation Coefficient was used to determine the relationship between attitudes towards e-learning, e-learning readiness, digital literacy, and academic achievement. Multiple regression analysis was used to determine the predictive power of attitudes towards e-learning, e-learning readiness, and digital literacy on academic achievement. The correct results of the regression process depend on the absence of a high degree of correlation between the predictor variables. A correlation above .80 indicates that there may be multicollinearity, while a correlation of .90 and above indicates high multicollinearity. While examining whether there is multicollinearity, it is also possible to delve into the tolerance value and VIF values that can be obtained during regression analyses. A tolerance value less than .20 and a VIF value equal to or higher than 10 display that there is multicollinearity (Büyüköztürk, 2012). When the relationships between the independent variables were examined, it was clear that they varied between .10 and .60. The highest VIF value

was 1.58 and the lowest tolerance value was 0.63. These values show that there is no multicollinearity between the variables.

FINDINGS

The main purpose of the research is to uncover the relationship between Turkish teacher candidates' attitudes towards e-learning, their e-learning readiness, their digital literacy levels and their academic achievement in the distance education process. The findings obtained from the analysis of the data collected within the scope of the research are presented in tables. First, the sub-problem "What is the level of Turkish teacher candidates' attitudes towards e-learning, e-learning readiness and digital literacy in the distance education process?" was analyzed and the findings are shown in Table 2.

Table 2. Findings related to students' attitudes towards e-learning, their e-learning readiness and their digital literacy (mean, standard deviation, minimum value and maximum value)

	Mean	SD	Min.	Max.
Tendency to use technology	14.45	3.30	6	24
Satisfaction	13.52	2.82	5	20
Motivation	14.50	3.47	6	24
Usefulness	15.95	3.20	7	24
Attitude towards e-learning (ATEL)	58	4.08	47	74
Computer self-efficacy (CSE)	22.65	5.32	5	35
Internet self-efficacy (ISE)	23.80	4.92	4	28
Online communication self-efficacy (OCSE)	24.73	7.29	5	35
Self-directed learning (SDL)	41.93	9.95	8	56
Learner control (LC)	21.13	5.58	4	28
Motivation towards e-learning (MTEL)	25.39	11.57	7	49
E-learning readiness (ELR)	159.91	36.06	33	231
Digital literacy (DL)	34.57	5.66	18	50

As seen in Table 2, the arithmetic mean of the students' attitudes towards e-learning scores is 58, the standard deviation is 4.08, the lowest value is 47, and the highest is 74. The arithmetic mean value of the tendency to use technology sub-dimension is 14.45, the standard deviation value is 3.30, the lowest score is 6, and the highest score is 24. The arithmetic mean value of the satisfaction sub-dimension is 13.52, the standard deviation value is 2.82, the lowest score obtained from this factor is 5, and the highest score is 20. The arithmetic mean value of the motivation sub-dimension is 14.50, standard deviation value is 3.47, the lowest score is 6, and the highest score is 24. The arithmetic mean value of the usefulness sub-dimension is 15.95, standard deviation value is 3.20, the lowest score is 7, and the highest score is 24. The arithmetic mean value of the e-learning readiness score is 159.91, the standard deviation value is 36.06, the lowest score is 33, and the highest score is 231. The arithmetic mean value of the computer self-efficacy sub-dimension is 22.65, the standard deviation value is 5.32, the lowest score is 5 and the highest score is 35. The arithmetic mean value of the Internet self-efficacy sub-dimension is 23.80, the standard deviation value is 5.04, the lowest score is 4 and the highest score is 28. The arithmetic mean value of the online communication self-efficacy sub-dimension is 24.73, the standard deviation value is 7.29, the lowest score is 5, and the highest score is 35. The arithmetic mean value of the self-directed learning sub-dimension is 41.93, the standard deviation value is 9.95, the lowest score is 8 and the highest score is 56. The arithmetic mean value of the learner autonomy sub-dimension is 21.13, the standard deviation value is 5.58, the lowest score is 4, the highest score is 28. The arithmetic mean value of the motivation towards e-learning sub-dimension is 25.39, the standard deviation value is 11.57, the lowest score is 7 and the highest score is 49. The arithmetic mean value of digital literacy score is 34.57, the standard deviation value is 5.66, the lowest score is 18, and the highest score is 50.

The second sub-problem of the study was determined as "What is the relationship between Turkish teacher candidates' attitudes towards e-learning, e-learning readiness, digital literacy, and their academic achievement in the distance education process?". The analysis and findings related to the second sub-problem are shown in Table 3.

Table 3. The relationship between Turkish teacher candidates' attitudes towards e-learning, e-learning readiness, digital literacy, and academic achievement in the distance education process

		AA	TUT	Satisfaction	Motivation	Usefulness	ATEL	CSE	ISE	OCSE	SDL	LC	MTEL	ELR	DL
	r	-0.49	1												
TUT	p	0.36													
	r	**0.17***	**-0.54***	1											
Satisfaction	p	0.00	0.00												
	r	0.08	**-0.57***	**0.67***	1										
Motivation	p	0.10	0.00	0.00											
	r	-0.88	**0.75**	**-0.54***	**-0.63***	1									
Usefulness	p	0.10	0.00	0.00	0.00										
	r	0.03	**0.41***	**0.28***	**0.26***	**0.36***	1								
ATEL	p	0.20	0.00	0.00	0.00	0.00									
	r	**0.16***	**-0.48***	**0.35***	**0.31***	**-0,33***	**-0,13***	1							
CSE	p	0,00	0,00	0,00	0.00	0.00	0.01								
	r	**0.14***	**-0.33***	**0.27***	**0.20***	**-0.29***	**-0.13***	**0.67***	1						
ISE	p	0.05	0.00	0.00	0.00	0.00	0.02	0.00							
	r	0.10	**-0.47***	**0.35***	**0.33***	**-0.31***	-0.10	**0.69***	**0.65***	1					
OCSE	p	0.05	0.00	0.00	0.00	0.00	0.13	0.00	0.00						
	r	**0.12***	**-0.28**	**0.29***	**0.27***	**-0.27***	-0.01	**0.51***	**0.56***	**0.57***	1				
SDL	p	0.02	0.00	0,00	0.00	0.00	0.76	0.00	0.00	0.00					
	r	**0,19***	**-0.30***	**0.24***	**0.21**	-0.27	-0.10	**0.54***	**0.62***	**0.62***	**0.81***	1			
LC	p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
	r	0.09	**-0.51***	**0.52***	**0.65***	**-0.57***	0.03	**0.35***	**0.21***	**0.42***	**0.41***	**0.36***	1		
MTEL	p	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
	r	**0.19***	**-0.53***	**0.47***	**0.48***	**-0.48***	-0.07	**0.77***	**0.72***	**0.82***	**0.83***	**0.81***	**0.48***	1	
ELR	p	0.00	0.00	0.00	0.00	0.00	0.19	0.00	0.00	0.00	0.00	0.00	0.00		
	r	**0.12***	**-0.40***	**0.36***	**0.28***	**-0.25***	-0.04	**0.69***	**0.48***	**0.58***	**0.44***	**0.47***	**0.26***	**0.60***	1
DL	p	0.02	0,00	0.00	0.00	0.00	0.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Skew.		-0.48	0.14	-0.01	0.15	0.18	0.66	-0.29	-1.47	-0.42	-0.51	-0.51	0.24	0.25	
Kur.		-0.29	-0.26	0.44	-0.13	-0.33	0.65	-0.30	1.14	-0.41	-0.06	-0.22	-0.84	0.26	

Table 3 reveals that there is a low, positive and significant relationship between readiness for e-learning and academic achievement. There is a moderate, positive, significant relationship between e-learning readiness and satisfaction and motivation which are sub-dimensions of attitude towards e-learning (r=0.47, p<.00), and there is a moderate, negative, significant relationship between usefulness (r=0.48, p<.00). There is a moderate, positive, significant relationship between readiness for e-learning and digital literacy (r=0.60, p<.00). There is a moderate, positive, significant relationship between digital literacy and computer self-efficacy (r=0.69, p<.00), internet self-efficacy (r=0.48, p<.00), online communication self-efficacy (r=0.58, p<.00), self-directed learning (r=0.44, p<.00), learner autonomy (r=0.47, p<.00), and a low level, significant, positive relationship between motivation towards e-learning (r=0.26, p<.00). There is a low, positive and significant relationship between digital literacy and academic achievement (r=0.12, p<.00). No significant relationship was found between attitude towards e-learning and academic achievement. There is a low, negative, significant relationship between attitude towards e-learning and computer self-efficacy (r=-0.13, p<.00), and internet self-efficacy (r=-0.13, p<.00), which are among the sub-dimensions of e-learning readiness. No significant relationship was found between attitudes towards e-learning and digital literacy.

Regression analysis was conducted to figure out whether Turkish teacher candidates' attitudes towards e-learning, e-learning readiness, and digital literacy levels significantly predict their academic achievement. In this context, the analysis and findings related to the third sub-problem "Are Turkish teacher candidates' attitudes towards e-learning, e-learning readiness, digital literacy levels a significant predictor of their academic achievement in the distance education process?" are shown in Table 4.

Table 4. Multiple regression analysis results of Turkish teacher candidates' attitudes towards e-learning, e-learning readiness, and digital literacy levels in predicting academic achievement

	B	Standard Error	β	t	p	Tolerance	VIF
Fixed	2.16	0.61		3.51	0.00		
Attitude	0.01	0.00	0.07	1.48	0.13	0.99	1.00
Readiness	0.00	0.00	0.17	0.93	0.01	0.63	1.57
Digital literacy	0.00	0.00	0.03	0.42	0.67	0.63	1.58

Predicted variable: Simple knowledge

R=.20, R2 =.04, adjusted R2= .03, F (6.227) = 3.817, p<.01

As seen in Table 4, multiple regression analysis results revealed that the academic achievement of Turkish teacher candidates is significantly predicted by e-learning readiness (β=.17, t= 0.93, p<.05). However, academic achievement was not significantly predicted by attitude towards e-learning (β=.07, t= 1.48, p>.05) and digital literacy (β=.03, t= .42, p>.05). According to the findings, a one-point increase in academic achievement creates a 0.17-point increase in e-learning readiness. The results of the analysis reveal that3% of Turkish teacher candidates' academic achievement is explained by e-learning readiness (adjustedR2=.03; p<.05).

RESULT, DISCUSSION AND SUGGESTIONS

In this study, the relationship between Turkish teacher candidates' attitudes towards e-learning, their readiness for e-learning, their digital literacy levels and their academic achievement was investigated. In this framework, firstly, Turkish teacher candidates' attitudes towards e-learning, their readiness for e-learning, and their digital literacy levels were identified.

The attitude scores of Turkish teacher candidates towards e-learning were found to be 58. Considering that the highest score that can be obtained from the scale is 92, it can be put forward that Turkish teacher candidates' attitudes towards e-learning are at the medium level. In previous studies, Bahadır (2021) and Barış (2015) found that students' attitudes towards e-learning are low; Haznedar (2012), Durmuş and Kaya (2010), Yağcı, Alsancak Sarıkaya and Özüdoğru (2015) found as "moderate"; Yakar and Yıldırım Yakar (2021) found as "low" close to the moderate; Şahin (2021), Şimşek, İskenderoğlu and İskenderoğlu (2010) found that they are "indecisive"; Dikbaş (2006) found as "positive"; Kar, Saha and Mondal (2014) found it as "high". These studies revealed that students' attitudes towards e-learning are at different levels. Both this study and most of the other studies in the literature show that students' attitudes towards e-learning are moderate. Haznedar (2012) explains the moderate level of students' attitudes towards e-learning with the fact that students do not have sufficient knowledge and experience towards e-learning; Tarım and Uyandıran (2021) explain it with university students' lack of knowledge and experience about distance education and e-learning. Most students do not have previous distance education experience and they had to receive distance education with the uncertainties brought on by the covid-19 pandemic; Şimşek et al. (2010) explain their ambivalent attitudes

towards distance education with their belief in the effectiveness of face-to-face education and having insufficient knowledge about distance education. Yıldız (2011) concluded that a web-based synchronous learning environment increased pre-service teachers' attitudes towards distance learning; Özkul and Aydın (2012) found that half of the students preferred blended learning over face-to-face and fully open and distance learning, which supports the view of previous researchers. The uncertainty experienced in the Covid-19 process and those students have no knowledge and experience regarding e-learning explain the moderate attitude they have towards e-learning.

At the end of the analysis, the readiness score of Turkish teacher candidates for E-learning was found to be 159.22. Considering that the highest score that can be obtained from the scale is 231 and the lowest score is 33, it is possible to state that this score is moderate level close to high. According to the research, Turkish teacher candidates' e-learning readiness scores are higher than their e-learning attitude scores. When the literature is examined, Bilici and Bağcı (2020), and Talan (2021) found students' readiness for e-learning was moderate; Tarım and Uyandıran (2021) found it as moderate close to high; Yağcı, Alsancak Sarıkaya, and Özüdoğru (2015) found it to be between moderate and high; Hung, Chou, Chen, and Own (2010), Yılmaz, Sezer, and Yurdugül (2019), Demir Öztürk and Eren (2021), Gömleksiz and Pullu (2020), and Baygeldi, Öztürk, and Dikkartın Övez (2021) found that it was high. The fact that students' e-learning readiness is higher can be explained by the fact that the use of information and communication technology skills has increased in all areas of life, enabling university students to have the necessary computer/network skills for online learning (Aktaş & Çaycı, 2013; Hung et al. 2010).

The digital literacy level of Turkish teacher candidates was found to be 34.63. Considering that the highest score that can be obtained from the digital literacy scale is 50, it is possible to state that the digital literacy score of 34.63 is moderate close to high. When the literature is examined, Göldağ (2021) revealed the digital literacy of university students as moderate, Şahin (2021) as above moderate and positive; Boyacı (2019) as partially high; Bay (2021), and İşçioğlu and Kocakuşak (2012) as high; Sarıkaya (2019) determined the digital literacy levels of prospective Turkish teachers, Kozan and Bulut Özek (2019) identified the digital literacy levels of prospective teachers in the Department of CEIT (Computer Education and Instructional Technology) as high. The review of the literature displays that there are studies claiming the digital literacy levels of university students as moderate, above moderate and high, but the general trend is that it is above moderate. This finding of the present study is consistent with the literature. Digital literacy requires individuals to be able to use digital technology effectively and to be able to critically filter the information they obtain from these sources. The fact that teacher candidates use digital tools intensively and that they are prone to analyze the messages coming from digital tools due to both their age and the education they receive affect this result.

University students' attitudes towards e-learning do not differ significantly on the basis of academic achievement (Haznedar, 2012). Haznedar (2012) explains this situation with the student's lack of e-learning experience. Şahin (2021) found a moderate, positive and significant relationship between the digital literacy levels of pre-service RCMK (Religious Culture and Moral Knowledge) teachers and their attitudes towards e-learning.

In the second part of the study, analyses were carried out to figure out the relationship between Turkish teacher candidates' attitudes towards e-learning, e-learning readiness, digital literacy and academic achievement in the distance education process. As a result, no significant relationship was found between attitude towards e-learning and academic achievement; no significant relationship was found between attitude towards e-learning and digital literacy. This finding shows that there is no relationship between attitude towards e-learning and academic achievement and between attitude towards e-learning and digital literacy. Bahadır (2021), in his study conducted with education faculty students, unfolded that the relationships between students' attitudes towards e-learning and their achievement are very low. Similarly, Barış (2015) stated that students' attitudes towards e-learning are low, while Abbasi, Ayoob, and Memon (2020) expressed that students' attitudes towards e-learning were negative. Eroğlu and Özbek (2018) uncovered that students' attitude towards e-learning is relatively high. Moreover, Dikbaş (2006) asserted that students' attitudes towards e-learning were positive.

There is a significant negative relationship between attitude towards e-learning and e-learning readiness. This relationship was found in computer self-efficacy and internet self-efficacy sub-dimensions of e-learning readiness. It shows that the relationship is negatively affected as attitude or readiness levels increase. On the other hand, in the study conducted by Yakar and Yıldırım Yakar (2021) on education faculty students, it was

found that there was a moderate relationship between attitude towards distance education and e-learning readiness. In a similar study, Akgün (2015) ascertained that there was a positive but low relationship between students' attitudes towards web-based teaching and their self-efficacy perceptions towards online technologies. These findings are in line with the results of Yurdugül and Demir (2017) and Hung et al. (2010), which shows that the results obtained in this study are different from the literature.

It was concluded that there was a significant positive relationship between digital literacy and academic achievement. This finding shows that as the digital literacy levels of Turkish teacher candidates increase, their academic achievement also increases. In his study, Akman (2021) revealed that digital literacy levels increase the willingness of university students for academic achievement. In the literature, it has been observed that various studies indirectly support this finding (Ahmed & Roche, 2021; Wong, Ho, Chen, Gu, & Zeng, 2015). In addition, while examining the relationship between digital literacy and academic achievement, it was also taken into consideration that academic motivation is a key determinant of academic achievement and performance (Jung & Zhang, 2016). These studies have revealed that the students who have difficulty accessing the internet, which is an important element of digital literacy, have significantly lower academic achievement and motivation levels. Furthermore, it has been found that practices to improve digital literacy can increase students' academic achievement and the permanence of this achievement (Shopova, 2014; Yustika & Iswati, 2020). The positive relationship between digital literacy and academic achievement may stem from online teaching practices that have become widespread, especially during the pandemic period. In this context, it can be considered that students are satisfied with a more flexible and individualized learning process supported by technology compared to traditional teaching methods. Differences such as students' being able to attend lectures and exams in a more comfortable environment, being less physically tired and wasting less time may help them focus better on the learning process. This factor may positively affect students' academic motivation.

While there is a positive relationship between the e-learning readiness and attitude towards e-learning satisfaction and motivation sub-dimensions, there is a negative relationship in the usefulness sub-dimension. In this sense, it was determined that Turkish teacher candidates' readiness and attitude towards e-learning were low in terms of usefulness. In terms of satisfaction and motivation, it is noted that they have more positive tendencies. Baygeldi, Öztürk, and Dikkartın Övez (2021) revealed in their study that the online learning readiness levels and motivation of education faculty students are positively related. There are similarities between that research and the present study. Moreover, the positive relationship between readiness and motivation emphasizes the need to focus more on human factors influencing the effectiveness and success of distance education. It has been highlighted that motivation is needed in order to explore and adapt to new learning environments (Nguyen & Huynh, 2020). Therefore, when developing e-learning contents, predetermining factors such as readiness and motivation can play an important role to increase students' efficiency, focus and effectiveness in e-learning processes.

A positive relationship was detected between Turkish teacher candidates' e-learning readiness and digital literacy, which indicates that e-learning readiness positively affects digital literacy among Turkish teacher candidates. It also reveals that there is a positive relationship between computer self-efficacy, internet self-efficacy, online communication self-efficacy, self-directed learning, learner autonomy and motivation for e-learning sub-dimensions. In this sense, the results of this study are similar to the results of Akman's (2021) study. In the present study, it was revealed that positive relationships were found in terms of digital literacy and academic motivation.

The third part of the study investigated whether Turkish teacher candidates' attitudes towards e-learning, their e-learning readiness, and their digital literacy levels are significant predictors of their academic achievement in the distance education process. As a result, academic achievement of Turkish teacher candidates was significantly predicted by e-learning readiness, which is also observed in the study of Korkmaz, Çakır, and Tan (2015). The present study revealed that students' readiness levels for e-learning affect their academic achievement. In both studies, students believe that their characteristics are suitable for e-learning and that their academic achievement will increase when they have the necessary characteristics for e-learning. Watkins, Leigh, and Triner (2004) also revealed that there is a relationship between e-learning readiness and academic achievement. However, academic achievement was not significantly predicted by attitude towards e-learning and readiness.

As a result, it was figured out that Turkish teacher candidates' attitudes towards e-learning and digital literacy levels were at moderate level. However, it was determined that their level of e-learning readiness was high. No significant relationship was found between Turkish teacher candidates' attitude towards e-learning and their academic achievement, and no significant relationship was found between attitude towards e-learning and digital literacy. On the other hand, there is a significant negative relationship between attitude towards e-learning and e-learning readiness. It was revealed that there is a significant positive relationship between digital literacy and academic achievement. A positive relationship was found between Turkish teacher candidates' readiness and attitude towards e-learning. A positive relationship was also found between e-learning readiness and digital literacy. Academic achievement of Turkish teacher candidates was significantly predicted by e-learning readiness; however, academic achievement was not significantly predicted by attitude towards e-learning and readiness.

This study contributes to the understanding of the relationship between Turkish teacher candidates' attitudes towards e-learning, digital literacy, e-learning readiness, and academic achievement in the distance education. Educational programs should consider these factors and support the development of digital skills to prepare teacher candidates better. Further studies can help researchers understand the above-mentioned relationships more deeply and conduct the distance education processes more effectively.

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