

Research Article

The relationship between teachers' attitudes towards distance education and their digital literacy levels

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The purpose of this study was to examine the relationship between teachers' attitudes towards distance education and their digital literacy levels. Teachers' attitudes towards distance education and digital literacy levels were determined using a survey method. A total of 1059 teachers, 557 males and 498 females, volunteered to participate in the study. Data collection tools were a personal information form developed by the authors, the digital literacy scale developed by Ng (2012) and adapted to Turkish culture by Hamutoğlu et al. (2016), and the distance education attitude scale developed by Ağır (2007). Data were collected using an online form on Google Forms. Descriptive statistics and canonical correlation analysis was used for the statistical calculations. The results showed that teachers had moderate attitudes towards distance education and above moderate digital literacy level. Based on the results of the canonical correlation, teachers' attitudes towards distance education and their digital literacy levels were highly significant. In future studies, precautions should be taken to increase teachers' attitudes towards distance education and to enhance awareness, knowledge, and motivation. Also, it is recommended that teachers be provided with practical interventions to improve their digital literacy.

Keywords: Digital literacy; Distance education; Attitude; Canonical correlation; Survey method

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1. Introduction

The nature of human beings is not very suitable for innovations, new technologies and changing habits. This is more about the brain's control of energy use than habit. Getting the most efficient results by using the least energy is the basic working principle of the brain (Bostrom, 2005). However, in obligatory cases, it is inevitable to use of inventions, discoveries, innovations, new technologies, and the transfer of used technologies to different fields (Freeman, 1996). A similar situation has been experienced in the distance education process, which was put into practice with the suspension of face-to-face education during the COVID-19 pandemic period (Petronzi & Petronzi, 2020). According to Fojtik (2018), distance education has provided an opportunity for significant modification and development for both teachers and students with the change in educational requirements in recent years. The fact that distance education applications provide

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great opportunities in education by eliminating the time and space limitations has caused them to be used frequently by students and teachers, to be used not only in lessons but also in extracurricular activities, and to improve the distance education skills obtained (Hannay & Newvine, 2006; Van de Vord, 2010).

With the COVID epidemic in the world, countries have made a rapid transition to distance education activities in order to ensure continuity in education (Mocoşoğlu & Kaya, 2020). Along with this transition, many problems such as online group work, motivation in distance education, measurement-evaluation in distance education, and suggestions for solutions to these problems and skill development were also required. Carrillo and Flores (2020) stated that while the concept of distance education has also made the use of information technologies widespread in education, distance education applications have accelerated this situation and turned it into a necessity. This situation has necessitated the development of the characteristics that teachers should have according to the technological improvements. Studies emphasized the importance of teachers to receive education in accordance with developing technologies, to use digital media materials effectively and efficiently, to use the new media and the productivity of the media beneficially, and to be new media literate (Carrillo & Flores, 2020; Mocoşoğlu & Kaya, 2020).

The success of distance education on students and teachers is one of the most important research topics although many studies focus on comparing the effects of traditional and distance education (Joosten & Cusatis, 2020; Yeh et al., 2019). Nowadays, distance education is becoming economical and inevitable, especially since there is no time and place limitation, it offers education everywhere and anytime, and it is also applicable to all levels (Kışla, 2016; Kocayığıt & Uşun, 2020). It has seen that the distance education applications in the world have developed in parallel with the developments in science and technology, and this process, which started with a letter, provides the formation of different educational environments with the development of digital products. In addition, these developments show that science and technology gradually affect distance education programs directly or indirectly, and the demand for distance education will increase in all areas of education, depending on the internet being at the center of human life in the future (Ülkü, 2018). Nowadays, expectations of the education systems lead digitalization on education and show that it accelerates the transfer of education to the digital environment, especially during the pandemic period (Cardoso, 2019). According to Çizmeçi and Karabağ Köse (2021), distance education which has appeared as a crisis management process during the epidemic period is supposed to be managed properly. This is possible if realistic policies and accurate analysis of the human resources in the field.

The importance of teachers' ability to use technological tools has been clearly emerged during the COVID-19 pandemic period (Bozkurt, 2020). Teachers have responsibilities as individuals and parents to be digitally literate. In distance education, teachers should pay attention some concepts such as planning and executing the process properly eventhough there is space and time limitation. In addition, teachers should solve problems which are the provision, supervision and use of materials, the participation of students in distance education and the follow-up control of course problems (Gonzalez et al., 2020).

Studies have defined the digital literacy as a right for children, and to have a high level of digital literacy skills for teachers to be role models in order for students to access and use this right (Aksoy et al., 2021). Digital literacy is one of the most important literacy due to the presence of internet and technology in education, society and daily activities (Chetty et al., 2018). Digital literacy in general is defined as the ability to accurately identify digital resources, access resources, direct, adapt, analyze and synthesize, make sense of new information and interact with other people, and engage in constructive social action (Martin, 2005). Digital literacy is also important for Turkish education system. Turkish Qualifications Framework determined by the Ministry of National Education indicated eight competencies which are communication in mother tongue, communication in foreign language, literacy, basic skills in mathematics and science, learning to learn, social and civic responsibility, initiative and entrepreneurship, cultural awareness and

creativity, and digital competencies. K-12 students must have these competencies in order to graduate and continue university education. Acquiring digital competencies is one of these eight competencies and all Turkish students are expected to have this competency (Arslan, 2020).

In literature, there are few studies examining teachers' attitudes towards distance education (Karakuş & Erşen, 2021; Kocayiğit & Uşun, 2020; Mocoşoğlu & Kaya, 2020; Yahşi & Kırkıç, 2020). Especially studies focusing on different subject teachers' attitudes toward distance education are rare (Alea et al., 2020). Despite studies examining attitudes towards distance education and teachers' digital literacy among pre-service teachers (Bartan et al., 2021; Şahin, 2021), there are few studies involving teachers. Hence, the purpose of this research was to examine the relationship between the teachers' attitudes toward distance education and their digital literacy.

2. Method

2.1. Research Design

Descriptive survey method was used in order to determine teachers' attitudes towards distance education and their digital literacy levels. The descriptive survey method is defined as approaches that aim to objectively describe the past or present situations, thoughts, feelings, attitudes and views of the sample group (Karasar, 2017; McNeill, 2006).

2.2. Participants

This study involved 1059 teachers, 557 males and 498 females. Different opinions have been expressed in the literature regarding how large a sample size should be in a descriptive survey. Nunnally (1967), Everitt (1975), and Tavşancıl (2002) indicated that the sample size should be 10 times the number of items on the scale to represent the population in a valid way. Comrey and Lee (1992) define 50 people as very few, 100 people as weak, 200 people as sufficient, and 300 people as a good sample size. The number of participants we had was 1059, and this number is good for representing the entire population. Table 1 summarizes the characteristics of the participants.

2.3. Data Collection Tools

2.3.1. Personal information form

The form was created by the first author and expert opinion was followed in order to examine the participants' gender, age, major subject, year of experience, school type where they work, educational background, and distance education experience.

2.3.2. Digital literacy scale

The scale was developed by Ng (2012) for prospective teachers studying at a university in Australia. The scale originally consisted of 17 items and 4 sub-dimensions (technical, attitude, cognitive and social). Hamutoğlu et al. (2016) translated this scale to Turkish culture. Cronbach's alpha coefficient was used in the reliability analysis of the sub-dimensions. Cronbach's alpha values of the sub-dimensions were determined as .88 for attitude, .89 for technique, .70 for cognitive and .72 for social sub-dimension

2.3.3. Attitude toward distance education scale

Attitude toward distance education scale was developed by Ağır (2007) to examine teachers' attitudes towards distance education. The scale consists of 14 positive and 7 negative items, a total of 21 items. Cronbach's alpha coefficient was used for the reliability analysis of the scale. The total Cronbach's alpha coefficient of the scale was determined as .84.

Table 1
Characteristics of the participants

	<i>N</i>	<i>f</i>
Subjects	122	11.5
Classroom teacher	68	6.4
Math teacher	71	6.7
Science and technology teacher	74	7.0
Social science teacher	89	8.4
Turkish language teacher	108	10.2
Physical education and sport teacher	73	6.9
Pre-school teacher	85	8.1
Special education teacher	94	8.9
Religious culture and moral knowledge teacher	91	8.6
Foreign language teacher	101	9.4
Visual arts teacher	83	7.9
Music teacher	122	11.5
Age		
22-29	233	22.0
30-39	374	35.3
40-49	347	32.8
50 and over	105	9.9
Year of experience		
1-4 year	198	18.7
5-9 year	204	19.3
10-15 year	242	22.9
16-20 year	202	19.1
21 year and over	213	20.0

2.4. Data Collection Process

In order to reach more participants, the scale items were moved to Google Forms. Participants received this form via e-mail and were notified by phone. A detailed description of the scales was provided by the first author. The data collection process was carried out in a safe and effective manner by providing teachers with investigative feedback.

2.5. Data Analysis

In order to analyze the data collected from the study, descriptive statistics and canonical correlation analysis were used. An analysis of canonical correlation examines the relationship between data sets containing more than one variable and data sets containing more than one variable (Manly, 2005). This study examined the relationship between attitudes towards distance education and digital literacy. Since each data set in the study contained two or more variables, canonical correlation analysis was preferred.

2.6. Assumptions of Canonical Correlation

It is necessary to satisfy some assumptions before applying canonical correlation analysis. The assumptions are normality, linearity, multiple correlation, and covariance. Tabachnick and Fidell (2012) state that providing these assumptions will ensure maximum efficiency.

The histogram, q-q plots, skewness, and kurtosis values were used to check for normality. According to Tabachnick and Fidell (2012), skewness and kurtosis are expected to be between +3 and -3. The assumption of normality was provided based on the results obtained. Linearity and covariance assumptions were checked on the scatter diagram. A linear relationship is required between the variables of the test and their scores in the diagram. The scatter diagram provides linearity and covariance. According to Field (2005), there should be no correlation greater than .90

between the canonical correlation variables if there is a multiple correlation assumption. Based on the results, there was no high correlation between the canonical correlation variables. In this analysis, all assumptions of canonical correlation are met.

3. Results

In this section, we reported descriptive and canonical correlation results as well as MANOVA results of independent variables in terms of attitude towards distance education and digital literacy.

3.1. Descriptive Results

Means and standard deviations of teachers' attitudes towards distance education and digital literacy were presented in Table 2.

Table 2

Descriptive statistics of teachers' attitudes towards distance education and digital literacy

	<i>M</i>	<i>SD</i>
Digital Literacy		
Attitude	3.58	.92
Technical	2.50	.62
Cognitive	3.78	.99
Social	3.49	1.05
Attitudes towards Distance Education		
Advantage	2.58	.74
Disadvantage	2.38	.89

According to Table 2, it was determined that the sub-dimensions of the participants' attitudes towards distance education were moderate ($M=2.58$, $SD=.74$) and disadvantage ($M=2.38$, $SD=.89$). In digital literacy, results of attitude ($M=3.58$, $SD=.92$), cognitive ($M=3.78$, $SD=.99$) and social ($M=3.49$, $SD=1.05$) sub-dimensions were found to be above the average. The average of the technical ($M=3.58$, $SD=.92$) sub-dimension of the digital literacy scale is moderate.

3.2. Canonical Correlation Results

The relationship between the sub-dimensions of attitude towards distance education (advantages and disadvantages) and the sub-dimensions of digital literacy (attitude, technical, cognitive and social) was examined.

Table 3

Table of canonical correlation results

	<i>First Canonical Variate</i>	
	<i>Correlation</i>	<i>Coefficient</i>
Attitude toward distance education		
Advantages	.86	.83
Disadvantages	.55	.51
Percentage of variance	.52	
Redundancy	.41	
Digital Literacy		
Attitude	.43	.22
Technical	.73	.35
Cognitive	.40	.18
Social	.26	.41
Percentage of variance	.25	
Redundancy	.20	
Canonical correlation value	.89	

According to Table 3, canonical correlation coefficient (r_c) was determined as .89. This value shows that there is a highly significant relationship between teachers' attitudes towards distance education and digital literacy sub-dimensions. The first canonical variable of the analysis was .52 and the second canonical variable was .25. According to these findings, the first canonical variable explains 52% of the attitude towards distance education variables, while the second canonical variable explains 25% of the digital literacy variables. In addition, attitude towards distance education variables explain 41% of the total variance of digital literacy variables. Digital literacy variables, on the other hand, explain 20% of the attitude towards distance education variables.

The first canonical variable indicated that a statistically significant relationship was established between teachers' attitudes towards distance education and digital literacy variables. ($\chi^2(8)=300.01, p =.00$).

3.3. MANOVA Results of Digital Literacy

The MANOVA analysis showed that there was no statistically significant interaction among gender, age and experience year variables ($F_{(16, 3077)}=.99, p >.05$). Because there was no interaction, main effects were examined and presented in Table 4. Before checking the results, significance value was divided the number of independent variable ($p =.05/3 = .017$).

Table 4

MANOVA results of digital literacy

	<i>df</i>	<i>M</i> ²	<i>F</i>	<i>Sig.</i>
Gender				
Attitude	1	2.11	2.51	.113
Technical	1	.16	.43	.512
Cognitive	1	.84	.86	.354
Social	1	1.38	1.24	.266
Age				
Attitude	3	2.19	2.60	.051
Technical	3	1.75	4.58	.003*
Cognitive	3	.41	.42	.736
Social	3	.03	.03	.994
Year of experience				
Attitude	4	2.04	2.43	.046
Technical	4	1.34	3.52	.007*
Cognitive	4	1.68	1.72	.142
Social	4	1.52	1.37	.244
Error				
Attitude	1010	.84		
Technical	1010	.38		
Cognitive	1010	.97		
Social	1010	1.11		
Total				
Attitude	1039			
Technical	1039			
Cognitive	1039			
Social	1039			

Table 4 indicated that there were statistically significant difference between age and technical sub-domain of digital literacy ($F_{(3, 1010)}= 4.58, p <.05$). Follow-up results showed that participants aging 20-29 years had higher technical ability than those aging 40-49 years. There was no difference between age and other sub-domains of digital literacy.

In experience year variable, there was a significant difference on technical sub-domain of digital literacy ($F_{(4, 1010)}= 3.52, p <.05$). Bonferonni follow-up test indicated that participants having 1-4

year experience had higher technical ability than those having 16-20 years of experience. Other digital literacy sub-domains had no difference on experience year.

3.4. MANOVA Results of Attitude towards Distance Education

MANOVA results indicated that there were no significant interaction among independent variables which were gender, age and experience year ($F_{(8, 2018)}=.87, p >.05$). After interaction was checked and found non-significant, main effects were examined. Main effects were presented in Table 5 and p value was divided the number of independent variables ($p =.05/3=.017$).

Table 5

MANOVA results of attitude towards distance education

	<i>df</i>	<i>M</i> ²	<i>F</i>	<i>Sig.</i>
Gender				
Advantage	1	.11	.20	.656
Disadvantage	1	3.28	4.17	.041
Age				
Advantage	3	2.13	3.93	.008*
Disadvantage	3	1.82	2.31	.075
Yer of experience				
Advantage	4	1.15	2.12	.076
Disadvantage	4	1.35	1.72	.144
Error				
Advantage	1010	.54		
Disadvantage	1010	.79		
Total				
Advantage	1039			
Disadvantage	1039			

Main effect results showed that there were significant difference between age and advantage sub-domain of attitude towards distance education ($F_{(3, 1010)}= 3.93, p <.05$). Follow-up test was checked and found that participants aging 22-29 years and 30-39 years had higher advantage of attitude towards distance education. No significant difference was detected between age and other sub-domains.

4. Discussion and Conclusion

The purpose of this study was to examine the relationship between teachers' attitudes towards distance education and their digital literacy. It was determined that teachers had moderate attitudes towards distance education and had a digital literacy level above the middle. In addition, there was a highly significant relationship between teachers' digital literacy levels and their attitudes towards distance education. According to the findings, when teachers' digital literacy levels increase, their attitudes towards distance education increases. On the other hand, when the digital literacy levels of the teachers decrease, their attitudes towards distance education also decreases.

Similar findings have been detected the literature. Kocayigit and Uşun (2020) studied on teachers' attitudes towards distance education and found that teachers had high attitudes towards distance education. According to Mocoşoğlu and Kaya (2020, teachers' attitudes towards distance education are generally at the level of "I do not agree". In the study of Yahşi and Kırkıç (2020), it was observed that while the advantages and total attitudes of teachers towards distance education differed according to the variable of teaching type, their attitudes about the limitations towards education did not differ, and it was concluded that teachers' attitudes towards distance education differed according to the variable of education level. Akdağ and Eyerci (2013) examined the attitudes of 40 English language instructors towards distance education and determined that the attitudes of the participants were moderate. Carr et al. (2002) examined the distance education

experiences of a total of 639 university students. The findings determined that the participants' experiences were positive and slightly above average. As a result of the study, it shows that a well-designed distance education program is an approach that can be an alternative to the traditional curriculum.

In the current study, teachers had average score on technical sub-dimension of digital literacy. Results also showed that attitude, cognitive and social sub-dimensions were slightly above the average. Studies in literature had similar findings (Kaeophanuek et al., 2018; Lukitasari et al., 2022; Üstündağ et al., 2017). The digital literacy levels of teachers in Arslan's study (2019) were found to be high. According to teachers' digital literacy levels and all factors, a significant difference was found in terms of having a personal computer, branch and time spent on the internet. Aksoy et al. (2021) found that classroom teachers consider themselves digitally literate at a high level.

Results showed that female and male teachers were digitally literate at a similar level. It has been observed that primary school teachers' digital literacy the level decreases as the age increases in. In addition, the digital literacy levels of teachers with postgraduate education were found to be higher than teachers with other education levels. Results also showed that the digital literacy levels of teachers with 21-25 years of seniority were found to be lower than teachers with other seniority. There was no significant difference in terms of teachers' daily internet usage and daily use of digital tools.

Kaeophanuek et al. (2018) examined the digital literacy levels of informatics students. Findings showed that information science students had an average level of digital literacy. Lukitasari et al. (2022) examined the digital literacy levels of 318 university students who have recently studied at different universities. They reported that the digital literacy level of the participants was above the average.

In the digitalized world, teachers are expected to prepare themselves for distance education (Prensky, 2012; Tzifopoulos, 2020). In this direction, teachers need to develop their digital literacy and distance education skills. Canonical correlation findings showed that there was a highly significant relationship between teachers' attitudes towards distance education and their digital literacy levels. There are few studies in the literature examining the relationship between digital literacy and attitude towards distance education. One of these studies was carried out by Maphosa and Bhebhe (2019) who reported that there was a positive relationship between digital literacy and distance education. They also found that the level of digital literacy significantly affected the level of learning in distance education. Kayaduman and Battal (2021) examined the relationship between the perceptions of distance education and digital literacy of 40 students studying in the engineering department. Findings revealed that students' digital literacy and their perceptions of distance education had a positive relationship. In a recent study, Aydın and Erol (2021) examined the Turkish teachers' thoughts on digital literacy and distance education. The data were collected from 100 teachers with the semi-structured interview method and results showed that teachers had both positive and negative thoughts about distance education.

Future studies should be followed to enhance awareness, knowledge and motivation to increase teachers' attitudes towards distance education. It is highly recommended to conduct the intervention studies to increase the digital literacy level of teachers.

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