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Preservice Teachers' E-Learning Styles and Attitudes Toward E-Learning

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Abstract

This study aimed to investigate preservice teachers' e-learning styles and their attitudes toward e-learning and present the relationship between them via a correlational survey model, a quantitative method. The study group was composed of 322 preservice teachers. The Demographic Information Form, the E-learning Styles Scale, and the Attitude Scale Toward E-Learning were used online to collect data during the the fall semester of the 2020–2021 academic year, when training was carried out completely in the form of distance education due to the COVID-19 pandemic. Preservice teachers were found to have the highest e-learning style score in the independent learning style. Their attitudes toward e-learning were above average. Independent learning style differed by gender, and verbal and logical learning styles differed by department. While there was no difference in the attitude toward e-learning by gender, a significant difference was found by department and place of residence. A low-level positive correlation was identified between preservice teachers' attitudes toward e-learning and visual-auditory, social, independent, and logical learning styles.

Keywords: Preservice teacher; e-learning style; e-learning attitude

Introduction

Today, distance education, which has become compulsory in universities and national education due to the COVID-19 pandemic, has increased the significance of electronic learning (e-learning). E-learning can be defined as the realization of learning-teaching activities through electronic media and the transfer of knowledge and skills with electronic technologies (Gülbahar, 2019). E-learning is also defined as a type of information and communication technology that facilitates learning to improve the quality of teaching and learning (Suri & Sharma, 2014). E-learning refers to the use of technology in learning in a much broader sense than internet-based learning, mobile learning, and computer-assisted education (Krishnakumar & Rajesh, 2011). E-learning uses interactive technologies and communication systems to develop better learning experiences (Suri & Sharma, 2014).

E-learning covers a wide range of pedagogical tools and approaches to meet the needs of students and educators by offering opportunities to create environments in which students and educators can share knowledge (Kar et al., 2014). Universities and companies have expanded their use of e-learning to provide better and more cost-effective ways of teaching and training (Suri & Sharma, 2014). E-learning creates equal opportunities in education and provides the opportunity for ubiquitous learning with the use of information and communication technologies (Biçer & Korucu, 2020). Since e-learning is a process controlled by students, it is important to know their abilities and skills (Gülbahar & Alper, 2014). Quality in e-learning

is multidimensional; therefore, its measurement is also multidimensional (Ramírez-Correa et al., 2017). Many variables, such as learning style, cognitive style, attitude, and prior knowledge, should be taken into account while developing content for e-learning environments (Güngör & Aşkar, 2004).

E-Learning Style

Students are different from each other in many ways, and how they receive and process information determines their learning styles (Ramírez-Correa et al., 2017). Learning style is one of these individual differences (Weng et al., 2019). When learners and educators have knowledge about learning styles, the teaching and learning experience can be enriched, and learning performance can be improved (Ramírez-Correa et al., 2017).

A learning style model classifies students according to where they fit on various scales based on how they receive and process information (Felder & Silverman, 1988). Learning styles are classified in different ways in the literature. Kolb (1981) specifies diverging, assimilating, converging, and accommodating learning styles. Felder and Silverman (1988), on the other hand, discuss learning styles in four dimensions: sensing-intuitive, visual-verbal, active-reflective, and sequential-global.

Learning styles are the key factors in designing a distance education environment because they affect both students' reactions to distance education and their academic achievement (Gülbahar & Alper, 2014). Learning styles may be useful to help students and educators to understand how they can improve learning and teaching methods, respectively (İlçin et al., 2018). Therefore, educators should consider individual differences and present learning content according to students' learning styles (Khamparia & Pandey, 2020). Gülbahar and Alper (2014) identify students' learning styles as independent, social, auditory, visual, concrete, abstract, logical, and intuitive and explain them as follows:

Independent learners: These learners prefer to work on their own, take a long time to think about issues related to life, prefer to work independently with guidance, take responsibility for their own learning, are confident in their ability to learn, etc.

Social learners: These learners like to participate in interactive group activities, attach importance to interacting with the instructor and other students, prefer activities and projects that require group work, think that learning is the joint responsibility of the instructor and the student, etc.

Auditory learners: These learners think that they learn best by hearing, like to listen to music while working and traveling, enjoy listening to other people's experiences, distinguish different sounds and notice what each one sounds like, etc.

Visual learners: These learners think that they learn best by seeing; they are more interested in subjects such as mathematics, science, and technology; they find their way easily by using maps; they prefer documents containing images, such as pictures, tables, and cartoons; etc.

Concrete learners: These learners think that they learn best by doing, they like physical activities such as sports and dance, they like to work with handicrafts such as

ceramics and sculptures, they like to touch different objects such as clothes and furniture, etc.

Abstract learners: These learners think that they learn best by reading; like to associate their daily conversations with what they have heard and seen before; enjoy telling jokes and stories; prefer to study subjects such as literature, history, and foreign languages; etc.

Logical learners: These learners learn best by thinking in detail, like activities that require calculation, enjoy solving puzzles and playing logic games, prefer to work step by step within a plan, etc.

Intuitive learners: These learners think that they learn best by getting in touch with their emotions, prefer random processes instead of hierarchical processes, use their intuition when solving problems, like to be presented with different resources and options, etc. (Gülbahar & Alper, 2014)

The literature review conducted for this research presents prior studies examining e-learning in relation to attitudes, achievement, and style. Güngör and Aşkar (2004) conducted an experimental study comparing e-learning and face-to-face learning and found no difference in achievement between the two but identified a difference based on style and internet self-efficacy. Jose et al. (2019) did not find a significant difference in learning style among students in face-to-face learning and online learning. Orhun (2007) concludes that while university students' attitudes did not change according to gender, their learning styles did. In their research, Costa et al. (2020) tried to relate the theory of learning styles to the behaviors displayed by distance education students and observed no correlation between styles and behavior variables. Ramírez-Correa et al. (2017) conducted a study with university students and demonstrated that learning styles had a regulatory effect on the success of a learning management system.

Surjono (2015) concludes that university students whose multimedia preferences and learning styles matched the material presented in online e-courses were more successful than students whose multimedia preferences and learning styles did not match the material presented in online e-courses. In their research, Hassan et al. (2021) identified students' learning styles in e-learning platforms through a model. They conclude that providing adaptive experiences according to learning style increased students' motivation and reduced the dropout rate. Lwande et al. (2021) developed a model that predicts students' learning style and cognitive characteristics in online learning environments. They state that this model can contribute to the creation of cooperative teamwork for students with similar behaviors. Thus, studies show the importance of determining the learning styles of learners in electronic learning environments.

Attitude Toward E-Learning

Attitude is a tendency that organizes the thoughts, feelings, and behaviors of individuals toward a psychological object (Guido, 2018), and it is one of the important variables in explaining individuals' behaviors (Biçer & Korucu, 2020). Attitude refers to a learned tendency that is displayed in an individual's positive or negative response to a person, object, situation, or program (Guido, 2018; Mazana et al., 2019).

Attitude is an important variable in the use of technology as well. Attitude toward e-learning is among the main components of the technology acceptance model, which addresses users' technology acceptance (Davis et al., 1989). In the technology acceptance model, the acceptance of a system is represented by the user's attitude toward using the system and the purpose of use (both determined by perceived usefulness) (Wojciechowski & Cellary, 2013). Technology usage intention is the best predictor of actual system usage, and usage intention is determined by the attitude toward using technology (Davis & Venkatesh, 1996).

Krishnakumar and Rajesh (2011) found that teachers had a positive attitude toward e-learning and conclude that teachers who were familiar with technology had different attitudes toward e-learning from teachers who were unfamiliar with technology. Liaw and Huang (2011) examined university students' e-learning attitudes in terms of gender, experience with computers, self-efficacy, and motivation and found that females had more positive attitudes. Their results show that computer-related experience was an important predictor of self-efficacy and motivation toward e-learning. Egbo et al. (2011) investigated the attitudes and perceptions of university students toward the effectiveness and acceptance of e-learning. Students displayed a positive attitude toward the use of technology in teaching, learning, and research. Egbe (2014) investigated the relationship between e-learning and university students' attitudes toward e-learning within the framework of the technology acceptance model and conclude that students had a positive attitude toward e-learning as they found the system easy to use and useful for their studies. In their study with secondary school students, Weng et al. (2019) found that students who adopted a multimedia-based teaching style had a higher learning attitude compared to students with traditional learning styles. They also observed that the use of multimedia-based teaching materials had significant effects on students' learning styles and learning attitudes.

Universities around the world have switched to student-centered teaching due to the need for a workforce that is open to lifelong learning, innovation, and adaptation (Chang-Tik, 2018). However, many individual differences affect the education and training processes (Karakuyu & Karakuyu, 2016). Attitude and learning style are among the factors that affect achievement in e-learning environments (Guido, 2018; Güngör & Aşkar, 2004). In addition, knowing students' learning styles makes it easier for teachers to adapt their teaching to students' learning styles (Ramírez-Correa et al., 2017). Instructors' awareness of student characteristics will guide them in designing appropriate teaching materials and organizing teaching activities and will make the teaching process more efficient (Gülbahar & Alper, 2014).

The COVID-19 pandemic has led to a rise in the use of distance education technologies and increased the number of e-learning environments. In the future, preservice teachers will particularly become the practitioners of these environments in their professional lives. Therefore, they are expected to be able to integrate current technologies in their fields and adapt to and follow technological developments (Babacan & Şaşmaz Ören, 2017).

However, first of all, it is important to present preservice teachers' learning styles and their attitudes toward these technologies and to show whether there is a relationship between learning styles and attitude in this regard. This research will benefit course designers, practitioners, and researchers in the field of e-learning environments. The studies in the literature on preservice teachers' learning styles and attitudes toward e-learning are limited. However, considering the possibility that distance or blended education may continue with the changes brought by the onset of COVID-19, it would be beneficial to focus on the e-learning variables in academic studies. Hence, this study investigated the learning styles of preservice

teachers in e-learning environments and their attitudes toward e-learning. The sub-problems of the research are provided below:

1. Do preservice teachers' e-learning styles change according to gender and the department in which they are studying?
2. Do preservice teachers' attitudes toward e-learning change according to gender, department in which they are studying, and their place of residence?
3. Is there a relationship between preservice teachers' e-learning styles and their attitudes toward e-learning?

Method

Research Model

This study utilized the correlational survey model, a quantitative method. This model examines the relationship between two or more variables without trying to influence any of the variables (Fraenkel et al., 2012). Hence, the model was found suitable to examine preservice teachers' attitudes toward e-learning according to their e-learning styles. In this study, preservice teachers attended all of their courses via distance education.

Participants

This study was conducted with 322 preservice teachers in their second year at the Faculty of Education at a state university studying in different departments: Turkish education (TE), primary mathematics education (PME), social science education (SSE), primary school education (PSE), psychological counseling and guidance (PSG), and early childhood education (ECE). These preservice teachers continued their education via distance education beginning in March 2020. The study data were collected from the preservice teachers in the fall semester of the 2020–2021 academic year, at the end of the semester, when they had attended all courses via distance education due to the COVID-19 pandemic.

Table 1. Participants by Demographic Information

Gender	N	%
Female	238	73.9
Male	84	26.1
Total	322	100
Department	N	%
Primary mathematics education (PME)	51	15.8
Social science education (SSE)	44	13.7
Primary school education (PSE)	68	21.1
Turkish education (TE)	52	16.1
Early childhood education (ECE)	39	12.1
Psychological counseling and guidance (PCG)	68	21.1
Total	322	100
Device used for distance education	N	%
Computer	144	44.7
Smartphone	277	55.0
Tablet	1	0.3
Total	322	100

Place of Residence	N	%
Village	159	49.4
District	109	33.9
City center	54	16.8
Total	322	100

Table 1 demonstrates that the majority of the participants were females, and the majority of the participants were from the PSE and PCG departments. They mostly used smartphones for distance education. In addition, the majority of the participants attended distance education from villages, their places of residence.

Data Collection Tools

The Demographic Information Form, the E-Learning Styles Scale, and the Attitude Scale Toward E-Learning were used to collect data within the scope of this research.

The Demographic Information Form was developed by the researcher. The form includes information about participants such as gender, devices used for courses, and place of residence during distance education.

The E-Learning Styles Scale was developed by Gülbahar and Alper (2014) to present students' learning styles in online learning environments. The validity and reliability studies of the scale were carried out with 2,722 distance education university students. As a result of reliability and exploratory and confirmatory factor analyses, the researchers concluded that the five-point Likert-type scale with 38 items is valid and reliable with seven dimensions: independent learning (4 items, reliability: 0.82), social learning (6 items, reliability: 0.87), visual-auditory learning (8 items, reliability: 0.86), active learning (6 items, reliability: 0.83), verbal learning (7 items, reliability: 0.86), logical learning (3 items, reliability: 0.77), and intuitive learning (4 items, reliability: 0.72).

The Attitude Scale Toward E-Learning was developed by Kisanga (2016) to reveal attitudes toward e-learning. The scale was adapted for the Turkish context by Biçer and Korucu (2020). Validity and reliability studies of the scale were carried out with 1,721 university students. At the end of the reliability and exploratory and confirmatory factor analyses, the four-point Likert-type scale with 23 items was concluded to be valid and reliable with four dimensions: tendency to use technology (6 items, reliability: 0.729), satisfaction (6 items, reliability: 0.717), motivation (5 items, reliability: 0.757), and usability (6 items, reliability: 0.689).

The data were collected from preservice teachers at the end of the distance education process implemented in the fall semester of the 2020–2021 academic year. In the process, the university carried out the courses synchronously and asynchronously through its own learning management system, into which a live conference system was integrated. Exams were conducted in the form of online exams or take-home exams. After obtaining the necessary permissions, data collection tools were administered online to preservice teachers who participated in the study on a voluntary basis.

Data Analysis

The data were analyzed with the SPSS 22 program. The normality distribution and kurtosis and skewness values were in the range of 0.002–0.997. Since the values were in the range of

+1, -1, the data displayed normal distribution (Büyüköztürk, 2010). Descriptive statistics, the unrelated samples *t*-test, one-way analysis of variance (ANOVA), and regression analysis were performed in the data analysis process. Preservice teachers' e-learning style and e-learning attitude scores were analyzed with descriptive statistics. The independent samples *t*-test was utilized to detect the differences caused by gender, one-way ANOVA was used to identify the differences caused by department of education, and simple (Pearson) correlation analysis was used to examine the relationship between the two variables (style and attitude). The level of significance was accepted as $p < .05$ in the analyses.

Findings

Table 2 presents preservice teachers' e-learning style scores.

Table 2. Preservice Teachers' E-Learning Style Scores

Learning Styles	X	Sd	Min	Max
Visual-Auditory	3.90	0.57	2.00	5.00
Verbal	3.31	0.63	1.57	5.00
Active	3.21	0.75	1.33	5.00
Social	3.37	0.85	1.00	5.00
Independent	3.93	0.78	1.50	5.00
Logical	3.09	1.06	1.00	5.00
Intuitive	3.41	0.82	1.00	5.00

Table 2 demonstrates that the preservice teachers obtained the highest score in the independent learning style dimension, while they had the lowest score in the logical learning style dimension. A score of three or more on a five-point Likert scale can be interpreted as above average.

Table 3. *t*-Test Results of E-Learning Styles by Gender

Learning Styles	Gender	N	\bar{X}	sd	df	t	p
Visual-Auditory	Female	238	3.90	0.58	320	-0.002	.998
	Male	84	3.90	0.52			
Verbal	Female	238	3.32	0.65	320	-0.620	.535
	Male	84	3.27	0.56			
Active	Female	238	3.22	0.75	320	-0.611	.542
	Male	84	3.16	0.78			
Social	Female	238	3.37	0.83	320	0.016	.987
	Male	84	3.38	0.91			
Independent	Female	238	4.00	0.76	320	-2.621	.009*
	Male	84	3.74	0.81			
Logical	Female	238	3.04	1.06	320	1.500	.135
	Male	84	3.24	1.05			
Intuitive	Female	238	3.42	0.83	320	-0.261	.794
	Male	84	3.39	0.76			

$p < .05$

Table 3 demonstrates that there was a statistically significant difference by gender only in the independent learning style ($p < .05$). The independent learning style scores of female

preservice teachers were found to be higher than those of male preservice teachers. Table 4 demonstrates whether the e-learning styles of preservice teachers differed by department.

Table 4. ANOVA Results for E-Learning Styles by Department

Learning Styles	Department	N	\bar{X}	sd	df	F	p	Significant Difference
Visual-Auditory	PME	5 1	3.90	0.6 1	32 1	0.949	.450	-
	SSE	4 4	3.84	0.6 0				
	PSE	6 8	3.82	0.6 1				
	TE	5 2	3.96	0.4 0				
	ECE	3 9	4.03	0.5 8				
	PCG	6 8	3.92	0.5 8				
Verbal	PME	5 1	3.08	0.6 2	32 1	2.650	.023 *	ECE> PME
	SSE	4 4	3.26	0.5 7				
	PSE	6 8	3.26	0.6 2				
	TE	5 2	3.42	0.5 0				
	ECE	3 9	3.51	0.8 7				
	PCG	6 8	3.33	0.5 5				
Active	PME	5 1	3.15	0.7 7	32 1	0.840	.552	-
	SSE	4 4	3.20	0.7 8				
	PSE	6 8	3.29	0.7 4				
	TE	5 2	3.11	0.7 0				
	ECE	3 9	3.37	0.7 9				
	PCG	6 8	3.15	0.7 7				

Social	PME	5 1	3.56	0.7 9	32 1	0.745	.590	-
	SSE	4 4	3.34	0.7 8				
	PSE	6 8	3.30	0.8 7				
	TE	5 2	3.31	0.8 7				
	ECE	3 9	3.30	0.9 5				
	PCG	6 8	3.42	0.8 5				
Independent	PME	5 1	3.78	0.8 7	32 1	0.911	.474	-
	SSE	4 4	3.98	0.7 9				
	PSE	6 8	3.88	0.7 3				
	TE	5 2	4.07	0.7 3				
	ECE	3 9	4.01	0.7 8				
	PCG	6 8	3.89	0.7 9				
Logical	PME	5 1	4.05	0.8 1	32 1	18.64 4	.000 *	PME >all
	SSE	4 4	2.57	0.9 9				PME>PSE,SSE,TE
	PSE	6 8	3.25	0.9 5				TE<PME,PCG
	TE	5 2	2.49	0.8 8				PCG<PME,PSE, PCG>TE
	ECE	3 9	2.82	1.0 3				ECE<PME
	PCG	6 8	3.16	0.9 8				
Intuitive	PME	5 1	3.25	0.7 9	32 1	1.758	.121	-
	SSE	4 4	3.31	0.9 2				
	PSE	6 8	3.64	0.7 9				
	TE	5 2	3.45	0.7 7				
	ECE	3 9	3.39	0.9 6				
	PCG	6 8	3.35	0.7 2				

p < .05

Table 4 points to statistical differences in verbal and logical learning styles by department ($p < .05$). These differences were examined by post hoc tests. Table 4 displays the source of the differences. Table 5 presents preservice teachers' attitude scores toward e-learning.

Table 5. Descriptive Statistics of Preservice Teachers' Attitude Scores Toward E-Learning

Attitude	X	Sd	Min	Max
Tendency to use technology	2.75	0.65	1.00	4.00
Satisfaction	2.54	0.65	1.00	4.00
Motivation	2.33	0.69	1.00	4.00
Usability	2.45	0.66	1.00	4.00
Total	2.52	0.49	1.00	3.87

As Table 5 shows, preservice teachers' attitudes were above average in all dimension scores. Table 6 shows whether preservice teachers' e-learning styles differed by gender.

Table 6. *t*-Test Results for Attitudes Toward E-Learning by Gender

Gender	N	\bar{X}	sd	df	t	p
Female	238	2.53	0.50	320	-1.021	.308
Male	84	2.47	0.46			

$p < .05$

Table 6 demonstrates that there was no statistically significant difference in preservice teachers' e-learning attitudes by gender ($p > .05$). Table 7 shows whether preservice teachers' attitudes toward e-learning differed by the departments they attended.

Table 7. ANOVA Results for Attitudes Toward E-Learning by Department

Department	N	\bar{X}	sd	df	F	p	Significant Difference
PME	51	2.63	0.54	321	2.640	.023*	PME>TE
SSE	44	2.58	0.46				
PSE	68	2.45	0.45				
TE	52	2.34	0.42				
ECE	39	2.54	0.53				
PCG	68	2.58	0.49				

$p < .05$

Table 7 points to statistical differences in attitudes toward e-learning by department ($p < .05$). These differences were examined by post hoc tests. The preservice teachers attending the PME department had a significantly higher attitude than the preservice teachers attending the TE department. Table 8 shows whether preservice teachers' attitudes toward e-learning differed by their place of residence.

Table 8. ANOVA Results for Attitudes Toward E-Learning by Place of Residence

Place of Residence	N	\bar{X}	sd	df	F	p	Significant Difference
Village	159	2.56	0.49	321	3.285	.039*	Village>City center
District	109	2.51	0.44				
City center	54	2.37	0.54				

p < .05

Table 8 shows statistical differences in attitudes toward e-learning by place of residence (p < .05). These differences were examined by post hoc tests. Those living in villages had significantly higher attitude scores toward e-learning than those living in a city center. Table 9 shows whether there was a relationship between preservice teachers' e-learning styles and their attitudes toward e-learning.

Table 9. The Relationship Between E-Learning Styles and Attitudes Toward E-Learning

Attitudes toward e-learning	Visual-Auditory	Verbal	Active	Social	Independent	Logical	Intuitive
	r=0.122	r=0.081	r=0.063	r=0.111	r=0.126	r=0.210	r=-0.027
	p=0.029*	p=0.147	p=0.262	p=0.046*	p=0.024*	p=0.000*	p=0.633

p < .05

Finally, Table 9 shows a low positive correlation between preservice teachers' attitudes toward e-learning and visual-auditory, social, independent, and logical e-learning styles (p < 0.05). A correlation coefficient of less than 0.30 is interpreted as a low-level relationship (Büyüköztürk, 2010).

Conclusion, Discussion, and Suggestions

The first research finding shows that the preservice teachers had the highest score in the independent e-learning style. They also scored above average in all e-learning styles. A significant difference was identified in learning style by gender in the independent learning style in favor of female preservice teachers. There were differences in verbal and logical learning styles by department as well. These findings may be related to the fact that preservice teachers attended classes more independently during the distance education process for three semesters. Therefore, the use of methods and techniques that encourage an independent learning style in e-learning environments may be beneficial. The verbal learning style was the highest for the preservice teachers attending the PCG department and the lowest for the preservice teachers studying in the PME department, while the logical learning style was the highest for the preservice teachers attending the PME department. This finding could be related to the type of department that the participants attended. Jose et al. (2019) suggest that online instructors should use pedagogical tools that specifically appeal to independent learners. In their study with preservice teachers, Karamustafaoğlu et al. (2017) conclude that the highest learning style score was obtained in the visual learning style. There are studies in the literature indicating that learning styles vary according to gender (Dikmen et al., 2018; Karamustafaoğlu et al., 2017; Orhun, 2007; Şentürk & Cığerci, 2018).

Based on the second research finding, this study concluded that preservice teachers' e-learning attitude scores were above average. There was no significant difference in their e-learning attitudes by gender, but there was a difference in attitude toward e-learning by

department. The preservice teachers attending the PME department had a significantly more positive attitude toward e-learning than the preservice teachers attending the TE department did. As for the place of residence, those living in a village had a significantly more positive attitude toward e-learning than those living in a city center. Above-average e-learning attitude scores may be because preservice teachers were already accustomed to this process and had sufficient experience in distance education. Kar et al. (2014) conclude in their research that university students had high attitude scores toward e-learning. Similarly, there are other studies in the literature indicating that university students had a positive attitude toward technology use and e-learning (Egbe, 2014; Egbo et al., 2011).

While there are studies pointing to a difference in favor of female students regarding attitude toward e-learning (Liaw & Huang, 2011), other studies have found no difference (Dikmen et al., 2018; Kar et al., 2014; Suri & Sharma, 2013; Weng et al., 2019). Also, Azizoğlu and Çetin (2009) found differences in attitudes toward course according to gender, but Orhun (2007) concludes that there was no significant difference in attitudes toward classes by gender. Similar to the results of the present research, Suri and Sharma (2014) found a relationship between university students' attitudes toward e-learning and their departments.

The final result of this study demonstrated a low-level positive correlation between preservice teachers' attitudes toward e-learning and visual-auditory, social, independent, and logical learning styles. Similarly, Federico (2000) found a relationship between learning style and attitude. Focused on attitudes among individuals with different learning and cognitive styles in internet-based instruction, the researcher found that students with assimilating and accommodating learning styles displayed significantly more acceptable attitudes toward various aspects of internet-based instruction than students with diverging and converging learning styles. On the other hand, there was no significant difference between the attitudes of primary school students toward classes and different learning styles (Azizoğlu & Çetin, 2009) or between university students' learning styles and their learning attitudes (Dikmen et al., 2018).

Presenting students' styles in e-learning environments will be beneficial in many ways. Such information can also be used in distance education to facilitate student learning and to change educational planning (Costa et al., 2020). In addition, learning style is a predictor of academic achievement in the e-learning environment (Kurnaz & Ergün, 2019). The results of this research will provide insights to the designers, practitioners, and researchers in e-learning environments.

Taking e-learning styles into consideration when programming e-learning environments would be beneficial for preservice teachers. Educators can diversify their course materials by considering these styles. Future studies may explore the status and position of educators and administrators regarding different variables in e-learning environments. Preservice teachers can be trained on the use of technology, and those lacking technological materials can be supported. Qualitative research can be used to investigate what affects preservice teachers' attitudes in e-learning environments. Similar studies can be conducted with a larger sample of preservice teachers from different regions.

Dr. Gül Özüdoğru is an Assistant Professor at Kırşehir Ahi Evran University, Faculty of Education, Department of Educational Sciences. Her PhD is in computer education and instructional technology. Her research focuses on technology integration, digital learning environments, digital storytelling, distance education, and preservice teachers' education.

References

- Azizoğlu, N., & Çetin, G. (2009). Six and seventh grade students' learning styles, attitudes towards science and motivations. *Kastamonu Education Journal*, 17(1), 171–182.
- Babacan, T., & Şaşmaz Ören, F. (2017). The effect of technology assisted micro teaching practices on prospective science teachers' perceptions of technology usage. *Educational Technology Theory and Practice*, 7(2), 193–214.
- Biçer, H., & Korucu, A. T. (2020). The adaptation of the attitude scale towards e-learning into Turkish. *Educational Technology Theory and Practice*, 10(1), 237–256.
- Büyüköztürk, Ş. (2010). *Sosyal bilimler için veri analizi el kitabı*. İstatistik, araştırma, SPSS uygulamaları ve yorum. Pegem Akademi: Ankara.
- Chang-Tik, C. (2018). Impact of learning styles on the community of inquiry presences in multi-disciplinary blended learning environments. *Interactive Learning Environments*, 26(6), 827–838. <https://doi.org/10.1080/10494820.2017.1419495>
- Costa, R. D., Souza, G. F., Valentim, R. A., & Castro, T. B. (2020). The theory of learning styles applied to distance learning. *Cognitive Systems Research*, 64, 134–145.
- Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science*, 35(8), 982–1003.
- Davis, F. D., & Venkatesh, V. (1996). A critical assessment of potential measurement biases in the technology acceptance model: Three experiments. *International Journal of Human-Computer Studies*, 45(1), 19–45.
- Dikmen, M., Tunver, M., & Şimşek, M. (2018). The relationship between learning styles and attitudes toward learning. *The Journal of International Social Research*, 11(57), 388–400.
- Egbe, A.-O. (2014). Attitude of students towards e-learning in south-west Nigerian universities: An application of technology acceptance model. *Library Philosophy and Practice*, 1035, 1–18.
- Egbo, O. P., Okoyeuzu, C. R., Ifeancha, I. C., & Onwumere, J. U. (2011). Gender perception and attitude towards e-learning: A case of business students, University of Nigeria. *International Journal of Computer Application*, 1(2), 135–148.
- Federico, P. A. (2000). Learning styles and student attitudes toward various aspects of network-based instruction. *Computers in Human Behavior*, 16(4), 359–379.
- Felder, R. M., & Silverman, L. K. (1988). Learning and teaching styles in engineering education. *Engineering Education*, 78(7), 674–681.
- Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2012). *How to design and evaluate research in education*. McGraw-Hill.

- Guido, R. M. D. (2018). Attitude and motivation towards learning physics. *International Journal of Engineering Research & Technology*, 2(11), 2087–2093.
- Gülbahar, Y. (2019). *E-öğrenme* [E-learning]. Pegem Publishing.
- Gülbahar, Y., & Alper, A. (2014). Development of e-learning styles scale for electronic environments. *Education and Science*, 39(171), 421–435.
- Güngör, C., & Aşkar, P. (2004). The effects e-learning and cognitive style on achievement and perceived internet self-efficacy. *Hacettepe University Journal of Education*, 27, 116–125.
- Hassan, M. A., Habiba, U., Majeed, F., & Shoaib, M. (2021). Adaptive gamification in e-learning based on students' learning styles. *Interactive Learning Environments*, 29(4), 545–565.
- İlçin, N., Tomruk, M., Yeşilyaprak, S. S., Karadibak, D., & Savcı, S. (2018). The relationship between learning styles and academic performance in Turkish physiotherapy students. *BMC Medical Education*, 18(1), 1–8.
- Jose, B., Berry, M., & Andrews, L. (2019). Course format and student learning styles: A comparison of political science courses. *American Journal of Distance Education*, 33(4), 262–275.
- Kar, D., Saha, B., & Mondal, B. C. (2014). Attitude of university students towards e-learning in west Bengal. *American Journal of Educational Research*, 2(8), 669–673.
- Karakuyu, Y., & Karakuyu, A. (2016). The contribution of motivation and self-efficacy on preservice primary school teachers' technological pedagogical content knowledge (TPCK). *Usak University Journal of Educational Research*, 2(1), 89–100.
- Karamustafaoğlu, O., Tutar, M., & Sontay, G. (2017). Investigation of science teachers' learning styles with various variables. *Journal of Computer and Education Research*, 5(10), 255–280.
- Khamparia, A., & Pandey, B. (2020). Association of learning styles with different e-learning problems: A systematic review and classification. *Education and Information Technologies*, 25(2), 1303–1331.
- Kisanga, D. (2016). Determinants of teachers' attitudes towards e-learning in Tanzanian higher learning institutions. *International Review of Research in Open and Distributed Learning*, 17(5), 109–125.
- Kolb, D. A. (1981). Learning styles and disciplinary differences. In A. Chickering (Ed.), *The modern American college*. Jossey Bass.
- Krishnakumar, R., & Rajesh, K. M. (2011). Attitude of teachers of higher education towards e-learning. *Journal of Education and Practice*, 2(4), 48–54.

- Kurnaz, F. B., & Ergün, E. (2019). Investigation of the relations between e-learning style and academic achievement in e-learning environment. *Journal of Theoretical Educational Science, 12*(2), 532–549.
- Liaw, S. S., & Huang, H. M. (2011). A study of investigating learners' attitudes toward e-learning. In *5th International Conference on Distance Learning and Education* (Vol. 12, pp. 28–32).
- Lwande, C., Muchemi, L., & Oboko, R. (2021). Identifying learning styles and cognitive traits in a learning management system. *Heliyon, 7*(8), e07701.
- Mazana, M. Y., Montero, C. S., & Casmir, R. O. (2019). Investigating students' attitude towards learning mathematics. *International Electronic Journal of Mathematics Education, 14*(1), 207–231.
- Orhun, N. (2007). An investigation into the mathematics achievement and attitude towards mathematics with respect to learning style according to gender. *International Journal of Mathematical Education in Science and Technology, 38*(3), 321–333.
<https://doi.org/10.1080/00207390601116060>
- Ramírez-Correa, P. E., Rondan-Cataluña, F. J., Arenas-Gaitan, J., & Alfaro-Perez, J. L. (2017). Moderating effect of learning styles on a learning management system's success. *Telematics and Informatics, 34*(1), 272–286.
- Şentürk, C., & Ciğerci, F. M. (2018). Sınıf öğretmenlerinin e-öğrenme stillerinin incelenmesi. *Kahramanmaraş Sütçü İmam Üniversitesi Sosyal Bilimler Dergisi, 15*(1), 69–88.
- Suri, G., & Sharma, S. (2013). The impact of gender on attitude towards computer technology and e-learning: An exploratory study of Punjab University, India. *International Journal of Engineering Research, 2*(2), 132–136.
- Suri, G., & Sharma, S. (2014). Students' attitude towards e-learning: A case study. *Skyline Business Journal, 10*(1), 38–42.
- Surjono, H. D. (2015). The effects of multimedia and learning style on student achievement in online electronics course. *Turkish Online Journal of Educational Technology, 14*(1), 116–122.
- Weng, F., Ho, H. J., Yang, R. J., & Weng, C. H. (2019). The influence of learning style on learning attitude with multimedia teaching materials. *Eurasia Journal of Mathematics, Science and Technology Education, 15*(1), em1659.
- Wojciechowski, R., & Cellary, W. (2013). Evaluation of learners' attitude toward learning in ARIES augmented reality environments. *Computers & Education, 68*, 570–585.