The Effect of E-Learning Styles on Online Learning

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Abstract
In this study, students' e-learning styles (ELS) and attitudes towards online learning were examined. Besides, it was also aimed to reveal the relationship between students' ELS and their attitudes towards online learning.Another of the main aims of the study is; the aim of this study is to explain the effect of university students' e-learning styles on their attitudes towards online learning. In the study designed with the relational survey model, the population consisted of 19.879 university students. The sample consisted of 727 students. "E-Learning Styles Scale", "Online Learning Attitude Scale," and "Student Information Form" were used as data collection tools. Parametric analysis techniques were applied because it was determined that the data met the prerequisites of parametric analysis after the validity and reliability studies. In the study, it was concluded that students' attitudes towards online learning were at a moderate level. It has been determined that there is a positive, significant, low-level relationship between the ELS of the students and their attitudes towards online learning. It was concluded that the ELS of the students affected their attitudes towards online learning positively and that the ELS of the students explained 8% of the level of their attitude towards online learning. In the study, some suggestions were presented in order to contribute to education stakeholders.

Keywords: E-Learning Style, Online Learning, E-Learning, University Students

Introduction

It is seen that the effects of developing information and technology affect social life with an increasing speed day by day. The effects of internet-oriented technologies in many areas such as transportation, finance, marketing, communication, health, and education are quite high (Mukhopadhyay & Suryadevara, 2014; Tan & Wang, 2010). So much so that the effective use of the internet is now strongly felt in various areas, from paying bills to banking transactions, from shopping to commerce, and from social media to education (Bhuasiri, Xaymoungkhoun, Rho & Ciganek, 2012; Fallows, 2004). It is known that individuals' need for the internet has increased, especially with the COVID-19 pandemic (Singh, Javaid, Haleem & Suman, 2020; Turkmen & Onturk, 2021). The use of the Internet in educational processes can be in the form of direct distance education or in the form of blended learning approaches (Margulieux, McCracken, & Catrambone, 2016). In the related literature, it is seen that concepts such as e-learning, internet teaching, distance education, web-assisted teaching, virtual education, and online learning are used instead of the concept of distance education (Ozkul & Aydın, 2012; Usta, Uysal & Okur, 2016). Online learning is a learning process where the learner and the teacher are in different physical areas and learning is carried out with technology support (Moore, Dickson-Deane & Galyen, 2011).

Online learning has many advantages, such as accessibility, affordability, repeatability, and convenience (Chizmar & Walbert, 1999; Poole, 2000). However, in order for online learning to be carried out in a qualified manner, it is important for the learner to manage self-learning processes, to have self-management-self-control skills, and have a positive attitude towards online learning (Kocdar, 2015; Lim & Kim, 2003; Usta, Uysal, & Okur, 2016).

The attitude, which was first used by Jung in 1923, can be defined as the general tendency level of the individual's reactions to any element or process (Albarracin & Shavitt, 2018). By knowing the attitudes of individuals towards any element, predictions can be made about their behaviour towards that element (Albarracin & Shavitt, 2018). Therefore, knowing student attitudes about any strategy/method/technique can provide an opportunity to predict student motivation and success (Hepler & Albarracin, 2013). For this reason, it can be stated that this study is important in terms of determining students' attitudes towards online learning.

In online learning, as in face-to-face learning, it is important for learners to actively participate in the learning processes. In addition, knowing the characteristics of the learner in online learning can contribute to the design of the learning process, creation of content and effective assessment and evaluation (Alashwal, 2020). Because the learner mostly organizes, manages and supervises the learning process in online environments (Hrastinski, 2009; Shen, Cho, Tsai & Marra, 2013). For this reason, it is stated that knowing the learning styles of learners in online learning processes can be effective in realizing the learning outcomes (Zapalska & Brozik, 2006). According to Felder and Silverman (1988), learning styles are the learner's choices during the stages of acquiring knowledge, placing it in memory, and recalling it when necessary. It is known that the learning style of the learner in online learning affects learning. In addition, it can be stated that e-learning styles (ELS) and learning styles used in face-to-face learning may differ (Beadles & Lowery, 2007; Bencheva, 2010). For these reasons, it is important to know the eELS of learners in online learning environments (Shahabadi, & Uplane, 2015). Learning styles have been classified in various ways by different scientists. At this point, the studies of Jung, Gregorc, Kolb and Felder-Silverman are remarkable (Veznedaroglu & Ozgur, 2005). In this study, a data collection tool developed by Gulbahar and Alper (2014) that includes seven ELS was used in order to address the learning styles of learners in a wide range. Gulbahar and Alper (2014) listed ELS as Audio-Visual/AV, Verbal/V, Active-Learning/AL, Social-Learning/SL, Independent-Learning/Ind.L, Logical-Learning/LL and Intuitive-Learning/IL in their studies.

In this study, it was aimed to determine the eELS of university students and their level of attitude towards online learning. Besides, it was also aimed to reveal the relationship between university students' ELS and their attitudes towards online learning. Another of the main aims of the study is; The aim of this study is to explain the effect of university students' e-learning styles on their attitudes towards online learning.

Method

Model of the Study

The relational survey model gives the researcher the chance to reveal the relationship, impact and predic Deciency levels between the variables he deals with in an objective way. (Crano, Brewer, & Andrew, 2002). For this reason, the study was designed with a relational survey model, one of the quantitative designs, since it is based on the relationship between the variables and the level of influence of the dependent variable (attitude toward online learning) from the independent variable (e-learning style).The research model created in this regard is given in Figure 1.

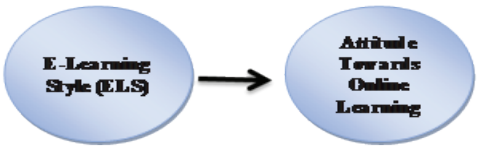

Figure 1 Research Model

The research questions to be answered within the scope of the research model determined in line with the objectives are as follows:

1. What are the e-learning styles-ELS of university students and their level of attitude towards online learning?
2. Is there a significant relationship between university students' e-learning style-ELS and their level of attitude towards online learning?
3. Do the e-learning styles-ELS of university students have an effect on their attitudes towards online learning?

Population and Sample

The population consists of a total of 19.879 students at the associate degree (6.289), undergraduate (11.868) and graduate (1.722) students at Kafkas University. The sample consists of at least 377 students. The sample size calculated using the Random (Simple Random) sampling method was calculated with the following formula (n: Sample size; p: Incidence; q: Incidence; t: Significance level; d: Error).

$n=(t^2\ pq)/d^2 =((1.96)^2\ (0.5)(0.5))/((0.5)^2) = 377749$(reached) = 727 (valid)

As shown in the formula, at least 377data are needed; Data were obtained from 749 students, 22 data were not evaluated and as a result, 727 data were analyzed. Table 1 shows the distribution of the sample according to gender, higher education level, grade, grade and teacher education status (SEAD)

Table 1 Qualifications of the Sample

Characteristics of the Sample		n	%
Gender	Female	400	55.0
	Male	327	45.0
University degree	Associate degree	217	29.8
	Undergraduate	433	59.6
	Graduate degree	77	10.6
Mark	2.00 altı	65	8.9
	2.01-3.00	395	54.3
	3.01-4.00	267	36.7
Grade	1	245	33.7
	2	283	38.9
	3	124	17.1
	4	75	10.3
SEAD	Taking	357	49.1
	Not taking	370	50.9

As can be seen in Table 1, 55% of the sample consists of women. While undergraduate students constitute the majority in the distribution of the sample, the grade point average of more than half of the sample is between 2.01 and 3.00 Dec. While 72.6% of the sample were first and second graders, more than half of them do not have teacher training.

Data Collection Tools; Validity and Reliability

In the study, data were obtained with the "E-Learning Styles Scale-ELSS", "Online Learning Attitude Scale-OLAS" and "Student Information Form-SIF". Developed by Gulbahar and Alper in 2014, ELSS consists of 38 items and seven sub-dimensions (*Audio-Visual/AV=1-8; Verbal/V=9-15; Active Learning/AL=16-21; Social Learning/ SL=22-27; Independent Learning/Ind.L=28-31; Logical Learning/LL=32-34; Intuitive Learning/ IL=35-38*). Developed by Usta, Uysal, and Okur in 2016, OLAS consists of 20 items and four sub-dimensions (*General Acceptance/GA=1-7; Self Awareness/SA=8-13; Usefulness/U=14-16; Active Participation/AP=17-20*). SIF consists of five statements that include the relevant variables of students [*gender, education level (associate/ undergraduate/graduate), mark, grade, and teacher education status*]. The structure of ELSS and OLAS is a five-point Likert scale. Therefore, the lowest evaluation range is "Very low" with 1.00-1.80. The 1.00-1.80 range is followed by the "Low" level with

1.81-2.60. It is followed by the "Intermediate" level with 2.61-3.40. The fourth of the evaluation ranges is "High" with 3.41-4.20. The final evaluation range is "Very high" with 4.21-5.00.

The validity-reliability levels of the ELSS were checked by Gulbahar and Alper, and the validity-reliability levels of the OLAS were checked by Usta, Uysal, and Okur. Within the scope of this study, the content and face validity of SIF, ELSS, and OLAS were controlled by three educational fields of science experts. Construct validity was checked with Confirmatory Factor Analysis-CFA. Reliability levels were checked with the Cronbach Alpha internal consistency coefficient (CAICC-α) and two-half-test technique. In this regard, the visual and fit indices obtained as a result of CFA applied to the data are presented in Figure 2/Table 2.

When the CFA results in Figure 2 are examined, the item factor loads of the ELSS and OLAS are greater than .30. Since it was stated that items greater than .30 according to Harrington (2009) were significant for the existing structure, the item of OLAS2 and ELSS6 (item factor load of OLAS2 = .19;item factor load of ELSS = .24) was removed from the scale. The fit indices obtained as a result of the CFA were examined, and in order to make the fit index data more appropriate, both the ELSS (1-2, 2-8, 11-12, 13-14, 16-19, 17-19, 19-20, 28-29) as well as items (1-3, 6-7, 11-12, 19-20) were modified. After the modification, the fit indices of the ELSS and the OLAS and the fit indices accepted as the reference are presented in Table 3.

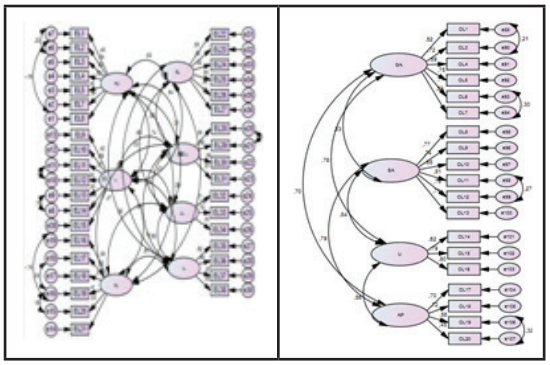

Figure 2 ELSS and OLAS CFA Results

Table 3 Compliance Indexes and Reference Values (Hooper, Coughan & Mullen, 2008)

Fit İndeces	Reference Ranges		Results		Assessment	
	Good	Acceptable(A)	ELSS	OLAS	ELSS	OLAS
CMIN/D.F.	$0<\chi 2/D.F.\leq 3$	$3<\chi 2/D.F.\leq 5$	2.619	2.650	Good	Good
R.M.S.E.A.	$0\leq R.M.S.E.A.\leq .05$	$.05\leq R.M.S.E.A.\leq .08$	.047	.048	Good	Good
G.F.I.	$.90<G.F.I.\leq 1$	$.85<G.F.I.\leq .90$	.89	.95	A	Good
A.G.F.I.	$.90<G.F.I.\leq 1$	$.85<A.G.F.I.\leq .90$	.87	.93	A	Good
C.F.I.	$.95<C.F.I.\leq 1$	$.90<C.F.I.\leq .94$	.87	96	A(Close value)	Good
R.M.R.	$0\leq R.M.R.\leq .05$	$0.05\leq R.M.R.\leq .10$	.072	.054	A	A
T.L.I.	$.95<T.L.I.\leq 1$	$.90<T.L.I.\leq .94$	.88	.96	A(Close value)	Good
D.F.			600	142		
CMIN			1571.168	376.311		

It can be stated that the fit index values determined in Table 3 are within the reference ranges specified by Hooper, Coughan and Mullen (2008) and Stevens (2001). On the other hand, considering that it is difficult to talk about sharp distinctions (standardization) in fit index values according to Schermelleh-Engel, Moosbruger, and Muller (2003), the CFI and TLI values of the ELSS were accepted because they were close to the reference ranges. As a result of the CFA, the structures of the ELSS and OLAS were accepted.

It is aimed to test the reliability of measurement tools. Therefore, CAICC-α was checked. In addition, two-half-tests were also applied to the data.α takes a value between 0 and 1 and these values are interpreted as 0-.40=insufficient/.41-.60=low/. 61-.80=medium/.81-1=high level (Can, 2018). Obtained α values are presented in Table 4.

Table 4 ELSS and OLAS α Values

ELSS/SubDimensions	CAICC-α	OLAS/SubDimensions	α
Visual-Aural learning item 7	.75	General acceptance item 6	.82
Verbal learning item 7	.71	Individual awareness item 6	.88
Active learning item 6	.61	Usefulness item 3	.78
Social learning item 6	.75	Active participation item 4	.75
Independent learning item 4	.70	**OLAS (1-19) 19 madde**	**.93**
Logical learning item 3	.71	**First part (10 items)**	**.90**
Intiutive learning item 4	.67	**Second part (9 items)**	**.86**
ELSS (1-37) 37 madde	**.89**		
First part (19 items)	**.81**		
Second part (18 items)	**.83**		

The values in Table 4; it has been understood that the data obtained with the ELSS and the OLAS have medium/high reliability. As a result of the validity-reliability evaluations, it was seen that the data collection tool was valid-reliable and the analysis process was started.

Data Analysis

In order to determine the appropriate statistical techniques in the data analysis process, the normality distribution of the data was checked first. For this reason, normality test values of the distribution (Kolmogorov-Smirnov/KS and Shapiro-Wilk/SW), skewness/kurtosis, median/mean/standard deviation data, and scatter plots (q-q plot, box plot and histogram) were examined. Relevant data are in Table 5.

Table 5 Normality Data

Scales-Sub-Dimensions		KS			SW			Skewness	Kurtosis	$\overline{x}$	Median	S.D.
		İst.	Sd	p	İst.	Sd	p					
ELSS	Vis-Aur.	.065	727	.000	.973	727	.000	-.597	.903	3.87	3.88	.62
	Verbal L.	.056	727	.000	.992	727	.001	.009	.091	3.49	3.57	.64
	Active L.	.052	727	.000	.991	727	.000	-.083	-.190	3.42	3.50	.72
	Social L.	.064	727	.000	.985	727	.000	-.273	-.056	3.61	3.67	.74
	Indepen. L.	.095	727	.000	.966	727	.000	-.419	.104	3.80	3.75	.76
	Logical L.	.102	727	.000	.965	727	.000	-.332	-.529	3.37	3.33	1.03
	Intiutive L.	.083	727	.000	.976	727	.000	-.241	-.125	3.57	3.50	.82
	GENERAL	.036	727	.069	.996	727	.083	-.017	.115	3.61	3.61	.40
OLAS	General Ac.	.080	727	.000	.983	727	.000	-.382	.188	3.23	3.29	.79
	Indiv. Aw.	.069	727	.000	.977	727	.000	-.152	-.673	3.01	3.17	1.03
	Usefulness	.108	727	.000	.962	727	.000	-.409	-.240	3.37	3.33	1.00
	Active Par.	.091	727	.000	.970	727	.000	-.457	.037	3.40	3.50	.91
	GENERAL	.047	727	.051	.991	727	.064	-.140	.003	3.22	3.23	.68

According to Table 5; Considering that George and Mallery (2001) stated that the normality assumption was met in cases where the skewness/kurtosis values were ±1, it was concluded that the data were normally distributed. For this reason, it was decided to use parametric test techniques. While calculating the Pearson correlation coefficient (r) in determining the relationship between students' ELS and their attitudes towards online learning; The effect of students' ELS on their attitudes towards online learning was evaluated with the structural equation model.

Results

Levels of ELSS and OLAS

The first question of the study was "1. What are the e-learning styles of university students and their level of attitude towards online learning?" In order to give an answer, Table 6 was created by calculating the mean ($\bar{x}$) and standard deviation (sd) from the data of the ELSS and OLAS.

Table 6 Levels of ELSS and OLAS

SCALES		Sub Dimensions	n	$\bar{x}$	S.S.	Meaning
	ELSS	Visual-Aural	727	3.87	.62	Higher
		Verbal L.	727	3.49	.64	Higher
		Active L.	727	3.42	.72	Higher
		Social L.	727	3.61	.74	Higher
		Independent L.	727	3.80	.76	Higher
		Logical L.	727	3.37	1.03	Mid
		Intiutive L.	727	3.57	.82	Higher
		General	**727**	**3.61**	**.40**	**Higher**
	OLAS	General Acceptance	727	3.23	.79	Mid
		Individual Awareness	727	3.01	1.03	Mid
		Usefulness	727	3.37	1.00	Mid
		Active Participation	727	3.40	.91	Mid
		General	**727**	**3.22**	**.68**	**Mid**

In Table 6, it was understood that the ELSS "Logical Learning" sub-dimension had the lowest mean value and medium level (=3.37 and sd=1.03). It was determined that all of the other sub-dimensions of ELSS and the overall ELSS were at the high level (=3.61 and sd=.40). On the other hand, it has been determined that ELS with the highest average is the audio-visual ELS (=3.37 and sd=1.03). This finding shows that students' level of learning through logical-mathematical work/operations is lower than other ELS. When the data belonging to OLAS were evaluated in Table 6, it was observed that the mean value for all sub-dimensions of OLAS and the scale varied between 3.01 and 3.40, and this value corresponded to the medium level. This finding shows that students' attitudes towards online learning are at a moderate level. When Table 6 is evaluated as a whole; students' ELS are generally high (except for logical learning); however, it can be stated that their attitudes towards online learning are at a moderate level.

The Relationship Between ELSS and OLAS

The second question of the study was "2. *Is there a significant relationship between university students' e-learning styles and their level of attitude towards online learning?*" In order to give an answer, the Pearson Correlation coefficient was calculated between the sub-dimensions and the overall scales. The data obtained are presented in Table 7.

Table 7 The Relationship between ELSS and OLAS

Scales/ Sub-Dimensions	1	1-a	1-b	1-c	1-d	1-e	1-f	1-g	2	2-a	2-b	2-c	2-d	
1-ELSS	r	1												
	p	-												
1-a.V-A	r	.454*	1											
	p	.000	-											
1-b.V	r	.344*	.517*	1										
	p	.000	.000	-										

1-c.AL	r	.464*	.430*	.465*	1									
	p	.000	.000	.000	-									
1-d.SL	r	.445*	.391*	.303*	.348*	1								
	p	.000	.000	.000	.000	-								
1-e.Ind.L	r	.244*	.354*	.294*	.263*	.280*	1							
	p	.000	.000	.000	.000	.000	-							
1-f.LL	r	.312*	.418*	.377*	.370*	.372*	.378*	1						
	p	.000	.000	.000	.000	.000	.000	-						
1-g.IL	r	.720*	.765*	.709*	.725*	.629*	.548*	.645*	1					
	p	.000	.000	.000	.000	.000	.000	.000	-					
2-OLAS	r	.140*	.272*	.214*	.186*	.164*	.217*	.230*	.294*	1				
	p	.000	.000	.000	.000	.000	.000	.000	.000	-				
2-a.GA	r	.247*	.253*	.218*	.212*	.223*	.250*	.253*	.343*	.859*	1			
	p	.000	.000	.000	.000	.000	.000	.000	.000	.000	-			
2-b.SA	r	.258*	.217*	.163*	.094*	.053*	.172*	.193*	.178*	.900*	.665*	1		
	p	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	-		
2-c.U	r	.120*	.205*	.140*	.173*	.152*	.170*	.150*	.230*	.836*	.630*	.697*	1	
	p	.001	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	-	
2-d.AP	r	.138*	.243*	.194*	.172*	.146*	.116*	.149*	.246*	.763*	.513*	.577*	.619*	1
	p	.000	.000	.000	.000	.000	.002	.000	.000	.000	.000	.000	.000	-

*p<.01

When the r and p values presented in Table 7 were examined, it has been understood that there is a positive, low-level significant relationship between students' ELS and their attitudes towards online learning (r=.140, p<.01). Similar to this finding, positive-low-significant correlations were observed between students' ELS and their attitudes towards online learning in all sub-dimensions [*(rOLAS-V-A=.272, p<.01); (rOLAS-V=.214, p<.01); (rOLAS-AL=.186,p<.01); (rOLAS-SL=.164,p<.01); (rOLAS-Ind.L=.217, p<.01); (rOLAS-LL=.230, p<.01); (rOLAS-IL=.294, p<.01)//(rELSS-GA=.247, p<.01); (rELSS-SA=.258, p<.01); (rELSS-U=.120, p<.01); (rELSS-AP=.138, p<.01)*]. These data reveal that there is a significant relationship between students' ELS and their attitudes towards online learning, but this relationship is at a low level.

The Effect of ELSS on CSTO

The third question of the study was "3.Do the e-learning styles of university students have an effect on their attitudes towards online learning?" Structural Equation Model (SEM) and path analysis were used in order to give an answer and test the research model. The data obtained are presented by means of tables and figures.

In Figure 3 and Table 8, the regression coefficient (ß), standard regression coefficient (ß), standard error (S.E.), critical ratio (C.R.), multiple specificity value (R2) and significance level obtained as a result of SEM are given. When the table was evaluated, it was determined that there is a correlation between attitudes towards online learning and eELS levels (ß=.290, R2=.081, p<.05). Based on these data, it was determined that students' ELS explained 8% of their attitudes towards online learning. Based on these findings, it can be stated that the increase in students' ELS levels increases their attitudes towards online learning, albeit at a low level.

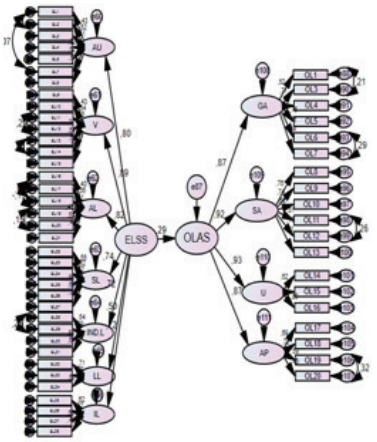

Figure 3 Path Analysis (ELSS->OLAS)

Table 8 SEM Fit Indices and SEM Results

Reference						
Index	**Good**	**Acceptable (A)**	**Result**	**Assessment**		
CMIN/D.F.	$0<\chi^2/D.F.\leq 3$	$3<\chi^2/D.F.\leq 5$	2.123	**Good**		
R.M.S.E.A.	$0\leq R.M.S.E.A.\leq .05$	$.05\leq R.M.S.E.A.\leq .08$	.039	**Good**		
G.F.I.	$.90<G.F.I.\leq 1$	$.85<G.F.I.\leq .90$	.86	**A**		
A.G.F.I.	$.90<G.F.I.\leq 1$	$.85<A.G.F.I.\leq .90$	.85	**A**		
C.F.I.	$.95<C.F.I.\leq 1$	$.90<C.F.I.\leq .94$	.91	**A**		
R.M.R.	$0\leq R.M.R.\leq .05$	$0.05\leq R.M.R.\leq .10$	.079	**A**		
T.L.I.	$.95<T.L.I.\leq 1$	$.90<T.L.I.\leq .94$	.90	**A**		
D.F.			1461			
CMIN			3.101,506			
Structural Equation Model (SEM) Analysis Result						
Structural Relationship Status	**Estimate(ss)**	**Standardize Estimate(ss)**	**S.E.**	**C.R.**	***R2***	***p***
OLAS<----ELSS	**.328**	**.290**	**.055**	**5.935**	**.081**	***

Conclusion and Discussion

As a result of the analysis of the first question of the study, *"What are the e-learning styles of university students and their level of attitude towards online learning?",* it was understood that the logical-mathematical ELS levels of the students (Intermediate Level) were lower than the other ELS and the ELS of the students were generally "High Level". It was concluded that the students' attitudes towards online learning were at a moderate level. It is significant that although students' ELS are high, their attitudes towards online learning are moderate. From this point of view, it can be stated that students are sufficient in the learning styles they use in e-learning, but their attitudes towards online learning are not high enough.

As a result of the analyzes for the second question of the study, *"Is there a significant relationship between the ELS of university students and their attitudes towards online learning?";* a positive and significant relationship was observed between students' e-learning styles and their attitudes towards online learning. However, this relationship was found to be at a low level. Based on this result, the increase in students' ELS levels may cause an increase in their attitudes towards online learning; however, it can be stated that this positive movement is realized at a low level.

As a result of the analysis for the last question of the study, *"Does the e-learning styles of 3rd*

university students have an effect on their attitudes towards online learning?", it has been observed that students' ELS positively affect their attitudes towards online learning. It was concluded that students' ELS explained 8% of their attitudes towards online learning. Based on these results it can be stated that the increase in students' ELS levels affects their attitudes towards online learning, albeit slightly.

In the relevant literature, studies with similar/different results can be found with the results obtained in this study. In the study conducted by Fahy and Ally (2005), it was revealed that the learning styles used by the students in the online learning processes were effective on the learning (achievement) of the students. Hiltz (1995) stated in his study that the level of attitude towards online learning is high and that students are satisfied with their online learning processes. Ozcan (2009) determined in his study that students' attitudes towards online learning are at a low level. In the study conducted by Dag and Gecer (2009), it was concluded that there is a significant relationship between online learning and the learning styles of students. Zapalska and Dallas (2006) revealed in their study that learning styles can positively affect online learning. In the study conducted by Lu, Jia, Gong, and Clark (2007), it was concluded that Kolb's learning styles affect online learning. In Neuhauser's (2002) study, it was seen that learning styles were effective on the achievements of online learning. The relevant literature was evaluated and it was seen that there are few studies that deal with online learning and learning styles as a whole.

Suggestions

As a result of the holistic evaluation of the results of other studies in the literature and the results of this study, various suggestions are presented below (in order to contribute to students, teachers, administrators-administrators, parents, researchers, writers, etc.):

- The reasons why students' attitudes towards online learning are not high can be investigated and blended learning models such as flipped learning can be used to increase their attitudes towards online learning.
- In-service trainings can be organized in order to inform the instructors about active teaching methods-techniques that can be used in online learning. In this way, students can be more effective in online learning processes and their attitudes towards online learning can be increased.
- Activities, games, competitions, seminars, conferences, etc. are the skills that can be used as problem solving and creative thinking that can improve students' logical-mathematical learning styles.
- It can be ensured that students get to know themselves and realize their e-learning styles. Thus, the level of attitudes towards online learning can also be positively affected.
- Online learning processes can be designed in accordance with the e-learning styles of students.
- Various reinforcers can be used in online learning processes in order to increase students' motivation levels for online learning.
- Similar studies can be carried out with students at different educational levels. In order to obtain in-depth data and to reveal the reasons for the current situation (level-relation-effect), it may be recommended to conduct experimental or qualitative/mixed-patterned studies.

References

Alashwal, M. (2020). Curriculum development based on online and face-to-face learning in a Saudi Arabian university. *Journal of Curriculum and Teaching*, 9(3), 141-148.

Albarracin, D., & Shavitt, S. (2018). Attitudes and attitude change. *Annual Review of Psychology*, 69, 299-327.

Beadles, N., & Lowery, C. (2007). Self-Selection into degree programs: Differences in preferred learning styles between online students and traditional students. *Academy of Educational Leadership Journal*, 11(2). 103-112.

Bencheva, N. (2010). Learning styles and E-learning face-to-face to the traditional learning. *Scientific Papers of Rusena University*, 49(3.2), 63-67.

Bhuasiri, W., Xaymoungkhoun, O., Zo, H., Rho, J. J., & Ciganek, A. P. (2012). Critical success factors for e-Learning in developing countries:

A comparative analysis between ICT experts and faculty. *Computers & Education*, 58(2), 843-855.

Can, A. (2018). *Quantitative Data Analysis in the Scientific Research Process with SPSS*. Ankara: Pegem Academy Publishing.

Chizmar, J. F., & Walbert, M. S. (1999). Web-based learning environments guided by principles of good teaching practice. *The Journal of Economic Education*, 30(3), 248-259.

Crano, W. D., Brewer, M. B., & Lac, A. (2014). *Principles and Methods of Social Research*. Routledge.

Dag, F., & Gecer, A. (2009). Relations between online learning and learning styles. *Procedia-Social and Behavioral Sciences*, 1(1), 862-871.

Fallows, D. (2004). *The Internet and Daily Life*. Washington, DC: Pew Internet & American Life Project.

Fahy, P. J., & Ally, M. (2005). Student learning style and asynchronous Computer-Mediated Conferencing (CMC) interaction. *The American Journal of Distance Education*, 19(1), 5-22.

Felder, R. M. (2002). Learning and teaching styles in engineering education. *Engineering Education*, 78(7), 674-681.

George, D., & Mallery, P. (2003). *SPSS for Windows Step by Step: A Simple Guide and Reference*. Allyn and Bacon.

Gulbahar, Y., & Alper, A. (2014). Development of e-learning styles scale for electronic environments. *Education and Science*, 39(171).

Harrington, D. (2009). *Confirmatory Factor Analysis*. Oxford University Press.

Hepler, J., & Albarracín, D. (2013). Attitudes without objects: Evidence for a dispositional attitude, its measurement, and its consequences. *Journal of Personality and Social Psychology*, 104(6), 1060-1076.

Hiltz, S. R. (1995). Teaching in a virtual classroom. *International Journal of Educational Telecommunications*, 1(2), 185-198.

Hooper, D., Coughlan, J., & Mullen, M. (2008). Structural equation modelling: Guidelines for determining model fit. *Electronic Journal of Business Research Methods*, 6(1), 53–60.

Jung, C. G. (1923). *Psychological Types or the Psychology of Individuation* (H.G. Baynes, Trans.). Harcourt.

Kocdar, S. (2015). Strategies and tools used in the development of self-management skills of learners in online environments. *Journal of Open Education Practices and Research*, 1(1), 39-55.

Lim, D. H., & Kim, H. (2003). Motivation and learner characteristics affecting online learning and learning application. *Journal of Educational Technology Systems*, 31(4), 423-439.

Lu, H., Jia, L., Gong, S., & Clark, B. (2007). The relationship of Kolb learning styles, online learning behaviors and learning outcomes. *Journal of Educational Technology & Society*, 10(4), 187-196.

Margulieux, L. E., Michael McCracken, W., & Catrambone, R. (2016). A taxonomy to define courses that mix face-to-face and online learning. *Educational Research Review*, 19, 104-118.

Moore, J. L., Dickson-Deane, C., & Galyen, K. (2011). E-Learning, online learning, and distance learning environments: Are they the same?. *The Internet and Higher Education*, 14(2), 129-135.

Mukhopadhyay, S. C., & Suryadevara, N. K. (2014). *Internet of Things: Challenges and Opportunities*. New Zealand: Springer International Publishing.

Neuhauser, C. (2002). Learning style and effectiveness of online and face-to-face instruction. *The American Journal of Distance Education*, 16(2), 99-113.

Ozcan, M. (2009). *Determination of Technology Adaptation of Learners in Online Learning Supported Foreign Language Learning by Attitudes, Self-Efficacy Perceptions and Frequency of Use of Different Environments*. Anadolu University.

Ozkul, A. E., & Aydin, C. H. (2012). Opinions of prospective students on open and distance learning. *Academic Informatics*, 1(3).

Poole, & D. M. (2000). Student participation in a

discussion-oriented online course: A case study. *Journal of Research on Computing in Education*, 33(2), 62-177.

Schermelleh-Engel, K., Moosbrugger, H., & Muller, H. (2003). Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of-fit measures. *Methods of Psychological Research Online*, 8(2), 23-74.

Shahabadi, M. M., & Uplane, M. (2015). Synchronous and asynchronous e-learning styles and academic performance of e-Learners. *Procedia-Social and Behavioral Sciences*, 176, 129-138.

Shen, D., Cho, M., Tsai, C., & Marra, R. (2013). Unpacking online learning experiences: Online learning self-efficacy and learning satisfaction. *The Internet and Higher Education*, 19, 10-17.

Singh, R. P., Javaid, M., Haleem, A., & Suman, R. (2020). Internet of Things (IoT) applications to fight against COVID-19 pandemic. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, 14(4), 521-524.

Stevens, J. P. (2012). *Applied Multivariate Statistics for the Social Sciences*. Routledge.

Tan, L., & Wang, N. (2010). Future internet: The internet of things. *3rd International Conference on Advanced Computer Theory and Engineering*.

Turkmen, H., & Senem, O. (2021). Investigation of science teachers' integrating educational technologies into the COVID-19 pandemic process. *Shanlax International Journal of Education*, 9(4), 265-274.

Usta, İ, Uysal, O., & Okur, M. R. (2016). Online learning attitude scale: Development, validity and reliability. *Journal of International Social Research*, 9(43).

Veznedaroglu, R. L., & Oytun Ozgur, A. (2005). Learning styles: Definitions, models and functions. *Elementary Education Online*, 4(2), 1-16.

Zapalska, A., & Brozik, D. (2006). Learning styles and online education. *Campus-Wide Information Systems*, 23(5), 325-335.

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