

## DEVELOPMENT OF MEDICAL SCHOOL STUDENTS' ATTITUDES TOWARDS ONLINE LEARNING SCALE AND ITS RELATIONSHIP WITH E-LEARNING STYLES

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### ABSTRACT

This study aims at determining students' attitudes towards distance education/online learning through a scale developed by the authors and determine the relationship between these attitudes and e-learning styles. The study carried out on students of Canakkale Onsekiz Mart University Faculty of Medicine using the online system of the university., the sample group consists 815 students from different classes, the participation rate was 89.46%. Following the explanatory factor and confirmatory factor analysis resulting structure of the scale was confirmed. Construct validity, criterion validity and internal consistency of the scale were high. Multivariate regression analysis was conducted to assess the predictive strength of the students' learning styles which were determined using the e-Learning Styles Scale for Electronic Environments for the attitudes towards online learning. Presented Medical School Students' Attitudes Towards Online Learning Scale was valid and reliable instrument to measure medical school students' attitudes towards distance/online learning. Although students' attitudes toward online/distant education were divided, it was negative on the average. The regression modeling showed that the learning styles are significant predictors for attitudes towards online education and the audio-visual learning style was determined as has the highest predictive strength for attitudes towards online education. The developed tool can be used to monitor medical school students' attitudes towards distance/online learning and will contribute to preparing medical education for a change towards distance learning.

**Keywords:** Faculty of Medicine, online learning, e-learning style, attitude.

## INTRODUCTION

The transformation from order to disorder is a law of nature and called entropy in physics. Successful systems must constantly develop and innovate to keep their mechanism alive and respond to the requirements of the era. Ozdemir (2003) stated that to keep up with the times, the changes in the education system should be taken into account regarding the educational models used in medical education. Even if there are no continuous improvement, innovation awareness, and change within the system, non-system factors can be a driving force. The COVID-19 pandemic, which affected the entire world in 2020 and also Turkey as of March, has played such a role. Educators at every level and discipline had to adapt to the pandemic conditions and act accordingly.

The term “Distance” has been used to refer to a form of education in which learners and teachers and resources do not coexist, share the same time or place since the first day it started with the letter. The journey of distance education that started with letters and online learning that started with the internet has entered a new era with the Covid-19 pandemic, which is effective worldwide and all face-to-face education activities have been transformed into distance education and mostly online learning due to the closure of schools / universities in order to fight against the epidemic. However, distance education is “a complex process that requires careful planning, design and setting goals to create an effective learning ecology” (Bozkurt & Sharma, 2020).

At such a critical time, there has been a big change in how teaching and learning takes place and learners physically move out of school, separating the teacher and the co-learner. Education practices during the Covid-19 pandemic are expressed in different terms in different countries (for example, distance education, e-learning, online education, homeschooling, etc.). However, these terms do not fully cover those applied during interruption of education; instead it may be better to describe these applications as Emergency Remote Education. Considering that the terms used in different countries are different, these terms are derivatives of distance education as a general term. The notable difference between emergency distance learning and distance learning is that the first is an obligation and the second is an option. With such an understanding, it is very important to approach because mistakes in definitions drive us to make mistakes in practice. For example, distance education is a planned activity, and its application is based on theoretical and practical knowledge specific to the field and field. Emergency distance education, on the other hand, is about keeping education alive with all the offline and online resources available in times of crisis (Bozkurt et al., 2020)

It can be argued that the vast majority of educators who retreat to their homes with the pandemic do not have sufficient knowledge, experience and time in distance education, and in most cases, lack of infrastructure, equipment, hardware and software, therefore, distance education studies carried out under these conditions cannot be considered exactly distance education. In addition, it is important to create a learning process that “supports different types of interaction” in order to ensure both cognitive and social participation of individuals living in separate spaces in distance education (Hodges et al., 2020)

However, it can be said that the process is not a complete distance education process in this respect, both due to the social effects of the process and the lack of experience and time to effectively design an interactive design in online courses. Hodges et al. (2020), and distance education, instructional technology etc. researchers working on the fields propose to name this period as “emergency distance education” in order to distinguish it from distance education carried out under ordinary conditions. The emphasis on the concept of “teaching” instead of education stems from the fact that this urgent process is carried out under the responsibility of the trainers (Hodges et al., 2020).

Regardless of how its name is accepted at the end of the day, this process seems to pass as an exceptional period in the history of education in general and in the history of education technology and distance education in particular (Yildirim, 2020).

During the last twenty years, digital learning technologies have become widespread in almost all learning fields including health/medical education. Although digital learning technologies and accompanying innovations have been used in medical education frequently in medical education, online learning strategies for medical education is a new research topic (Ruiz, Mintzer, & Leipzig, 2006; Cook et al., 2008). Technologic developments have been forced medical schools to integrate new education models supported

by technological tools as an alternative to traditional education. These alternative education models provide students an active learning environment by allowing students more interaction with the materials (a medical device, simulated patient, or medical equipment, etc.). These education models allow students to focus more on clinical problems and aims at understanding disease mechanisms by self-directed learning and deep learning through active participation (Fieschi et al., 2002).

Although some efforts made to improve medical education by alternative learning models, the actual method employed is face-to-face learning. Several medical schools made efforts to improve the effectiveness of the education program and provide students with clinical reasoning skills through some practices such as problem-based learning activities, simulated patient cases, and evidence-based medical practices. Some medical schools carried out problem-based learning activities on digital platforms due to lack of place, time, and guiders such as human resources (Mistry et al., 2019). Some medical schools across the globe conduct anatomy, histology, and evidence-based medicine practices through distance education methods (Kazoka, & Pilmane, 2019). Not only educators and educational institutions but also students should be ready for these changes in the education system. The COVID-19 pandemic is affecting the world and also Turkey and therefore, forced especially medical schools to implement distance learning methods. The success of the change in the educational processes depends not only on the accuracy and convenience of the educational models implemented but also on understanding the learner characteristics of the medical school students. Accordingly, an accurate determination of the student profiles and learner characteristics is important for medical education and also other professional training fields (Ozdemir, 2003).

On the other hand, changes in the learning environments highlight the issue of student participation. Finn and Zimmer (2012) described students' participation in the learning environment through social, cognitive, emotional, and academic elements. Social participation includes monitoring the behaviors in a learning environment; cognitive participation includes the use of cognitive resources in complex operations; emotional participation refers to the level of emotional participation in the learning activities; and finally, academic participation refers to the observable behaviors, namely, outcomes that are directly related to the learning (Cirigliano, Guthrie, & Pusic, 2020). It is believed that more participating students are more successful compared to those with lower ones. In recent studies, direct indicators of academic participation were identified including the student's attention, completion of the given activities, the time needed for the tasks, and academic participation outside the classroom (Cirigliano, Guthrie, & Pusic, 2020).

Several studies pointed out the importance of students' participation in distance learning methods and therefore, students' participation should be encouraged (Bagriacik Yilmaz, & Banyard, 2020). In medical schools, especially in the first three years in which the basic sciences are taught, students' participation is very low. However, distance learning may improve students' participation. Schools including distinctive education procedures such as medical schools increase the value of the efforts to promote distance learning and students' participation becomes more important. In a scale development study conducted in Turkey to measure students' attitudes towards problem-based learning, a sub-scale was developed to measure students' attitudes towards problem-based learning environments on digital platforms (Kemahli, & Alper, 2006).

In a study (Kyaw et al., 2019), which included 12 studies conducted on 2101 medical students and conducted on the effectiveness of digital communication skills training, online modules were also used and they obtained evidence that digital education is as effective as traditional face-to-face training. However, in this study, clear information about students' satisfaction with this education system and their attitudes could not be obtained.

Vogelsang et al. (2018) stated in the study they conducted in Medical Faculties providing education in German that the expectations of Generation Z towards learning were different and that the expectations of Medical Education students should be investigated.

Since there are no scales measuring students' attitudes on providing all stages of the medical education through distance learning methods and since the COVID-19 pandemic made it necessary to provide medical education through online learning techniques, the authors believe that such a study could provide a strong contribution to its field of research. Accordingly, this study aims at determining medical school students' attitudes towards distance learning/online education and to determine the relationship between these attitudes and e-learning styles.

## METHOD

The study is a quantitative correlational study (Creswell, 2012; Fraenkel, Wallen, & Hyun, 2012). This paper aims at determining medical school students' attitudes towards distance learning/online education and examining its relationship with e-learning styles.

### The Sample

This study conducted at Canakkale Onsekiz Mart University Faculty of Medicine with the permission numbered KAEK-27/2020-2000058519 obtained from Canakkale Onsekiz Mart University Clinical Trials Ethics Committee. The data were collected during the COVID-19 pandemic. In this period, formal education in Turkey was suspended starting 16 March 2020, and since all educational activities of the universities were provided through the online education, the Ethics Committee allowed research on the condition using only online data collection tools. Therefore, the data was obtained simultaneously through online system of the university. A consent form was displayed when the students log in to the system of the university. The scales were presented to the students who agreed to participate in the research voluntarily. Accordingly, a total of 815 medical school students from different grades (from 1 to 6) were responded to the questionnaires and the data were collected accordingly. At that period, the medical school had a total of 911 students and the participation rate in the research was calculated as 89.46%. Therefore, the research sample became a purposeful sample since the data could not be obtained from the whole population (Christensen, Johnson, & Turner, 2014).

Since the collected data will be used for exploratory and confirmatory factor analysis as a part of the scale development and also for the examination of the relationship between students' attitudes towards online learning and students' e-learning styles, the dataset was split randomly into two groups. The exploratory factor analysis (EFA) file included data of 394 students and the confirmatory factor analysis (CFA) file for the examination of the relationship included data of 421 students. Based on the suggestions provided in the literature regarding the sample size for a scale development study (Arrindell, & van der Ende, 1985), the authors paid attention to ensure the data size in the EFA file was about 10 times of the number of items in the instrument. Some information regarding the participants of both groups is given in Table 1.

**Table 1.** Demographic characteristics of the sample

Variable		EFA group		CFA and relationship analyze group	
		f	%	f	%
Gender	female	201	51	211	50
	male	193	49	210	50
Grade	grade 1	70	17.8	103	24.5
	grade 2	63	16	106	25.2
	grade 3	79	20.1	48	11.4
	grade 4	75	19	35	8.3
	grade 5	52	13.2	42	10
	grade 6	55	14	87	20.7
total		394	100	421	100

### Data Collection Tools

#### Medical School Students' Attitudes towards Distance Education/Online Learning Scale (MATDLS)

Medical School Students' Attitudes Towards Distance Education/Online Learning Scale was developed by authors. The target group of the MATDLS is medical school students. The scale was structured as a Likert type including 40 items through a literature survey and expert opinions. Ten items of the scale were reverse coded since they reflect negative emotions and thoughts towards online learning.

Some scholars recommended conducting EFA using principal axis factoring (PAF) for a scale development study with a non-specific theoretical framework (Warner, 2008). The EFA analyze revealed that the items 4, 11, 13, 14, 15, 16, 17, 18, 19, 24, 29, 30, 32, 33, 34, 35, 36, and 37 did not provide the item correlation value (0.300 and above) suggested by scholars (Büyükoztürk, 2013). Therefore, these items were excluded from the scale. The KMO value of the EFA was 0.967, and Bartlett's Test of Sphericity was calculated as 10045.068 (sd=253, p<0.05). The calculated values were higher than those suggested in the previous studies (Cokluk, Sekercioglu, & Buyukozturk, 2010; Field, 2018; Tabachnick, & Fidell, 2013). A varimax axis rotation was performed to clearly define the items of the sub-scales (Ozdamar, 2013). Following the rotation, remaining items were grouped under two sub-scales: a) Attitudes Towards Online Learning (ATOL) and b) Attitudes Towards Online Medical Education (ATOME). The sub-scales and the items are presented in Table 2.

**Table 2.** The sub-scales determined using the “Varimax” axis rotation and the items included in these sub-scales

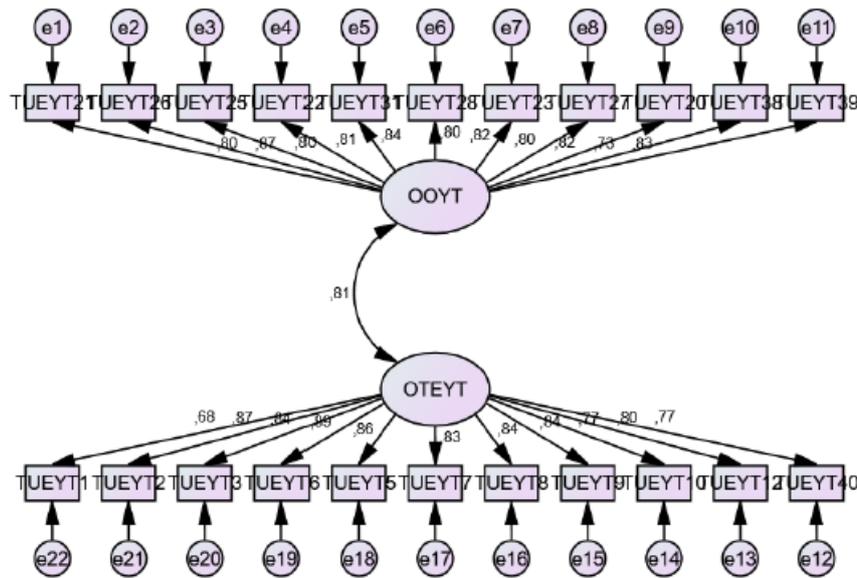
Items	sub-scales		name and properties of the sub-scales
	1	2	
21. Making classroom lessons through the online system contributes to personalize my study program. (Sinif derslerinin online sisteme gecirilmesi, ders calisma programimi kisisellestirmeme katki saglar.)	0.826		
26. Online education allows me to use my time more efficiently compared to classroom lessons. (Online egitim zamanini sinif derslerinden daha verimli kullanmami saglar.)	0.807		
25. I adapt easily to online education. (Online egitime kolayca uyum saglarim.)	0.781		
22. Online education contributes to the use of audio-visual materials. (Online egitim gorsel-isitsel ogelerin kullanimina katki yapar.)	0.764		
31. Online education is very rich since it's audio-visual interactive. (Online egitim gorsel, isitsel, etkilesimli olarak buyuk zenginliklidir.)	0.764		Attitudes Towards Online Learning (ATOL).
28. Online access to lecture notes about lessons/internships, makes me feel free. (Dersler/stajlarla ilgili ders notlarına online erisim bana kendimi ozgur hissettirir.)	0.762		Includes 11 items. No reverse coded items.
23. Online education is better than classroom education which has physical limitations. (Online egitim fiziksel kisitliliklara sahip sinif egitiminden ustundur.)	0.760		The score that can be obtained from the scale varies between 11-55. This factor explains 36% of the variance.
27. I like being informed about lecture notes through the distance learning environment. (Uzaktan egitim ortamindaki ders notlarından bilgi edinmekten hoslanirim.)	0.728		
20. The classroom lessons in medical education can be provided online without any loss. (Tip egitimindeki sinif dersleri bir kayip olusturmadan online olarak verilebilir.)	0.711		
38. I encourage my classmates to take online education. (Sinif arkadaslarimin online egitim almaları için onları tesvik ederim.)	0.700		
39. I support all efforts to extend distance education. (Uzaktan egitimi yayginlastiracak her tur cabayi desteklerim.)	0.692		

3. Doctor training can be made by distance education. (Uzaktan egitimle hekim yetistirilebilir.)	0.853	
6. The attitudes that a doctor should have can be gained online. (Bir hekimin sahip olmasi gereken tutumlar online olarak edinilebilir.)	0.838	
2. The goals of medical education can be achieved using distance education methods. (Uzaktan egitim yontemleriyle tip egitimi amacina ulasabilir.)	0.838	
5. The skills that a doctor should have can be provided online. (Hekim yetistirmek icin gerekli beceriler online olarak kazandirabilir.)	0.823	
7. The communication way of a doctor with his patient and patient's relatives can be taught online. (Hekimin, hastasi ve yakinlariyla nasil iletisim kuracagi online olarak ogretilebilir.)	0.788	Attitudes Towards Online Medical Education (ATOME). Includes 11 items. No reverse coded items. The score that can be obtained from the scale varies between 11-55. This factor explains 35% of the variance.
9. Patient consultation can be taught online. (Bir hastanin nasil muayene edilecegi online olarak ogretilebilir.)	0.779	
12. Emergency medicine practice can be taught online. (Acil tip uygulamalari online ogretilebilir.)	0.736	
8. I can use the information that I gained through distance education (for example, measuring blood pressure) as a skill when I face with a patient. (Uzaktan egitimle kazandigim bilgileri (ornegin tansiyon olcme) hastayla karsilastigimda beceri olarak sergileyebilirim.)	0.707	
10. The skills about giving bad news (such as notifying of a death) can be taught online. (Zor haber verme [olum haberi verme gibi] becerisi online ogretilebilir.)	0.674	
40. I enable doctor training through distance education if I'm the Health Minister. (Saglik bakani olsam uzaktan egitimle hekim yetistirilmesini saglarim.)	0.655	
1. Online access to lecture notes about lessons/internships is ideal for doctor training. (Derslerle/stajlarla ilgili ders notlarına online erişim hekim yetistirmede idealdir.)	0.607	

To examine the criterion validity of ATOL and ATOME sub-scales of the MATDLS, correlation analyses were conducted between the total scores of the sub-scales and student's scores on Attitude Towards e-Learning Scale and the correlation values were calculated as 0.78 and 0.72, respectively. These results considered a high level of criterion validity.

The Cronbach's alpha coefficients were also calculated to check the internal consistency of both sub-scales. The Cronbach's alpha is calculated as 0.96 for the ATOL, and 0.92 for the ATOME, and 0.97 for the whole scale. These values indicated a high internal consistency for both sub-scales and the whole scale.

The two-factor structure obtained with the EFA was analyzed with CFA. The diagram obtained with the DFA is shown in Fig. 1.



**Figure 1.** Path diagram (standardized values) of the confirmatory factor analysis for Medical School Students' Attitudes Towards Distance Education/Online Learning Scale (MATDLS [TUEYT in Turkish]). ATOL (OOYT in Turkish): Students' Attitudes Towards Online Learning, ATOME (OTEYT in Turkish): Students' Attitudes Towards Online Medical Education

The fit indexes of the path diagram of the CFA given in Fig.1 were calculated as  $\chi^2/df=2.99$ , RMSEA=0.049, RMR=0.048, NFI=0.961, IFI=0.982, CFI=0.970, AGFI=0.927, and GFI=0.933. These values are the recommended values for fitting in the previous studies (Anderson, & Gerbing, 1984; Bentler, 1990; Cokluk, Sekercioglu, & Buyukozturk, 2010; Hooper, Coughlan, & Mullen, 2008; Hu, & Bentler, 1999; Kline, 2005; Marsh, Balla, & McDonald, 1988; Ozdamar, 2013, Simsek, 2007; Tabachnick, & Fidell, 2013, Vieira, 2011).

### e-Learning Styles Scale for Electronic Environments

This scale was developed by Gulbahar and Alper (2014) to determine students' learning styles in online learning environments. The scale was developed with the students registered in the distance learning program of the university. As a result of the validity and reliability analyzes, the scale was determined as consists of seven factors including 38 items. These factors are independent learning (4 items), social learning (6 items), audio-visual learning (8 items), active learning (6 items), verbal learning (7 items), logical learning (3 items), and intuitive learning styles (4 items). This was a 5-point Likert type scale. The developers of the scale were calculated the fit indexes of the confirmatory factor analysis as RMSEA=0.056, SRMR=0.047, GFI=0.90, AGFI=0.88, CFI=0.98, NNFI=0.97, and IFI=0.98. The Cronbach's alpha values for the reliability of the sub-scales were found as varied between 0.72-0.87.

### General Attitude Scale towards e-Learning

This scale was developed by Haznedar and Baran (2012) to measure the general attitudes of teacher education students towards e-learning. This is a Likert type scale consists of 20 items. The scale was used as a one-factor scale when the negative items reverse coded. The reliability of the one-factor scale was calculated as 0.93. General Attitude Scale Towards e-Learning was used in the present study to determine the concurrent validity of the MATDLS scale were was developed by the authors. MATDLS and General Attitude Scale Towards e-Learning was applied to the medical school students, the correlation coefficient between the obtained data was calculated and the calculated coefficient was determined as the concurrent validity value of the MATDLS.

## Analysis of Data

Before conducting EFA, CFA, and other data analysis methods, the dataset was checked and had no missing values were found. Based on the Central Limit Theorem which argues if the sample size is large enough (>30) it should represent a normal distribution, and a violation of the normality assumption will not cause a big problem (Everitt, & Howell, 2005; Field, 2018; Pallant, 2016; Tabachnick, & Fidell, 2013), we decided to adopt parametric statistical techniques for analysis.

## FINDINGS

### The Relationships Between Medical School Students' Attitudes Towards Online Learning And E-Learning Styles

Medical School Students' Attitudes Towards Distance Education/Online Learning Scale (MATDLS) and e-Learning Styles Scale for Electronic Environments were used in this study. MATDLS has two sub-factors, Attitudes Towards Online Learning (ATOL) and Attitudes Towards Online Medical Education (ATOME). E-Learning Styles Scale consists of independent learning, social learning, audio-visual learning, active learning, verbal learning, logical learning, and intuitive learning sub-factors. The descriptive statistics of the participating students' scores on these sub-factors are given in Table 3.

**Table 3.** Descriptive statistics of attitudes towards online learning and e-learning styles

Scales	N	Mean ( $\bar{X}$ )	Median	Mode	S
Audio & visual learning style	421	26.51	27	24	7.34
Verbal learning style	421	20.78	21	21	5.82
Active learning style	421	18.42	18	18	5.22
Social learning style	421	18.22	18	18	5.33
Independent learning style	421	12.94	12	12	3.96
Logical learning style	421	9.98	9	9	3.13
Intuitive learning style	421	12.06	12	12	3.46
Attitudes Towards Online Learning (ATOL)	421	27.02	28	33	10.07
Attitudes Towards Online Medical Education (ATOME)	421	22.83	22	11	9.71

The lowest score that can be obtained from the audio & visual learning sub-factor is 8 and the highest score is 40. The arithmetic mean of the students' scores on this factor was 26.51. The lowest score that can be obtained from the verbal learning sub-factor is 7 and the highest score is 35. The arithmetic mean of the students' scores on this factor was 20.78. The lowest score that can be obtained from the active learning sub-factor is 6 and the highest score is 30. The arithmetic mean of the students' scores on this factor was 18.42. The lowest score that can be obtained from the social learning sub-factor is 6 and the highest score is 30. The arithmetic mean of the students' scores on this factor was 18.22. The lowest score that can be obtained from the independent learning sub-factor is 4 and the highest score is 20. The arithmetic mean of the students' scores on this factor was 12.94. The lowest score that can be obtained from the logical learning sub-factor is 3 and the highest score is 15. The arithmetic mean of the students' scores on this factor was 9.98. The lowest score that can be obtained from the intuitive learning sub-factor is 4 and the highest score is 20. The arithmetic mean of the students' scores on this factor was 12.06. The mean scores for all learning sub-dimensions were higher than the half of the highest score than can be obtained from the corresponding sub-dimension. Therefore, it can be argued that all the learning styles of the students were higher for e-learning. The lowest score that can be obtained from the sub-factor of attitudes towards online learning is 11 and the highest score is 55. The arithmetic mean of the students' scores on this factor was 27.02. This mean score is lower than half of the highest score than can be obtained from this factor but almost equal to the half. Accordingly, it can be stated that the students' attitudes towards online learning torn between positive and negative.

The lowest score that can be obtained from the sub-factor of attitudes towards online medical education is 11 and the highest score is 55. The arithmetic mean of the students' scores on this factor was 22.83. This mean score is lower than the half of the highest score than can be obtained from this factor. Therefore, it can be argued that students' attitudes towards online medical education were negative.

The predictive strength of the Medical School Students' e-Learning Styles for Students' Attitudes towards Online Learning

In the current study, the prediction of medical school students' e-learning styles for students' attitudes towards distance education/online learning was examined using multivariate regression analysis. The goodness of fit results for multivariate regression models were presented in Table 4.

**Table 4.** Goodness of fit for regression models

Variables	N	R <sup>2</sup>	F	p
Audio & visual learning style	421	0.064	14.374	0.000
Verbal learning style	421	0.085	19.291	0.000
Active learning style	421	0.061	13.613	0.000
Social learning style	421	0.068	15.177	0.000
Independent learning style	421	0.112	26.224	0.000
Logical learning style	421	0.036	7.759	0.001
Intuitive learning style	421	0.089	20.373	0.000

As seen in Table 4, the models of seven variables (Audio-visual, Verbal, Active, Social, Independent, Logical, and Intuitive learning style), which are the predictors of the output variables (ATOL and ATOME) were significant (F=14.374, F=19.291, F=13.613, F=15.177, F=26.224, F=7.759, and F=20.373 p<0.05). Accordingly, the obtained regression models were deemed appropriate. The maximum predictive strength was obtained for the independent learning style (R<sup>2</sup>=0.112, 11%) and followed by intuitive, verbal, social, audio-visual, active, and logical learning styles, respectively. The predictions regarding the regression models are shown in Table 5.

**Table 5.** The predictive strength of the e-learning styles for attitudes towards distance education/online learning

		β	Standard Error	t	p
Audio & visual learning style	Constant	22.512	1.004	22.43	0.000
	ATOL	0.277	0.056	4.96	0.000
	ATOME	-0.152	0.058	-2.64	0.009
Verbal learning style	Constant	16.218	0.787	20.60	0.000
	ATOL	0.109	0.044	2.50	0.013
	ATOME	0.070	0.045	1.55	0.122
Active learning style	Constant	15.045	0.714	21.06	0.000
	ATOL	0.147	0.039	3.70	0.000
	ATOME	-0.026	0.041	-0.63	0.527
Social learning style	Constant	14.489	0.727	19.93	0.000
	ATOL	0.135	0.040	3.33	0.001
	ATOME	0.004	0.042	0.09	0.926
Independent learning style	Constant	9.689	0.528	18.36	0.000
	ATOL	0.174	0.029	5.94	0.000
	ATOME	-0.064	0.030	-2.10	0.037
Logical learning style	Constant	8.718	0.435	20.04	0.000
	ATOL	0.088	0.024	3.66	0.000
	ATOME	-0.049	0.025	-1.97	0.051
Intuitive learning style	Constant	9.299	0.467	19.93	0.000
	ATOL	0.103	0.026	3.97	0.000
	ATOME	-0.001	0.027	-0.03	0.977

The constant term is significant in all predictions. Accordingly, there may some variables which may significantly predictive that not included in the regression model. Independent learning, social learning, audio-visual learning, active learning, verbal learning, logical learning, and intuitive learning styles are positive significant predictors ( $p < 0.05$ ) for attitudes towards online learning. In other words, the higher use of these learning styles, the higher the positive attitudes towards online learning. Verbal learning, active learning, social learning, logical learning, and intuitive learning styles are not positive significant predictors ( $p > 0.05$ ) for attitudes towards online medical education. The audio-visual and independent learning styles are negative significant predictors ( $p < 0.05$ ) for attitudes towards online medical education. Therefore, the higher use of the audio-visual learning style and independent learning styles indicate higher negative attitudes towards online medical education.

## RESULTS, DISCUSSION AND RECOMMENDATIONS

The study presents an instrument to measure medical school students' attitudes towards distance education/online learning. The attitudes of students with different learning styles towards online medical education were compared and explained. Currently, there are no examples across the world regarding providing all stages of medical education through distance education methods. However, during the COVID-19 pandemic, medical schools had to provide education through distance education/online learning as in all formal and higher education. The results obtained in the current study presents an instrument to measure medical school students' attitudes towards distance education/online learning as well as examines the attitudes of the students in the sample group towards such education techniques and the effect of the learning styles on these attitudes. As an overall evaluation, students' attitudes towards online learning were determined as torn between positive and negative, on the other hand, they exhibit negative attitudes towards online medical education.

Harden initiated a practice, "International Virtual Medical School (IVIMEDS)" in 2002 which also called as the future of medical education and he stated that independent learning is one of the properties of CRISIS, the education model they conducted in this platform including continued medical education practices (Harden, 2005; Harden, & Hart, 2002). A sub-dimension of the Attitudes Towards Distance Learning/Online Education Scale introduced in the current study is independent learning. It was emphasized that independent learning is important for both learning processes of medical school students and sustained medical education processes that continue after graduation.

In a study carried out by Mubayrik (2020) on medical school graduates, it was found that 67% of the participants who had previously attended one of the distance education methods had positive attitudes towards distance education due to its advantages and flexibility in time. This result highlighted the importance of distance education methods on widening continued medical education to the international level.

The results of a previous study revealed that 95% of the students are motivated to online and digital medical education practices as a result of offering rich audio-visual materials or digital materials that help stimulating more senses (Kazoka, & Pilmane, 2019). In a study carried out by Yurdal (2015), among students of the Faculty of Medicine, a positive and significant relationship was found between students' willingness to learn, self-control skills, and learning in the web environment. Although this research was conducted in the same faculty, it cannot be said that students' attitudes towards online learning are positive.

Some studies suggested that pre-graduate medical education can be standardized through distance education regardless of the clinical experiences of the students (Michaelsen, 2001). The number of students enrolling in medical schools is limited to schools' clinical practice capacity. As a result of the need for more doctors, there are many medical schools across the world with such restrictions. In Turkey, currently, 117 medical schools are active and provide education. Since medical universities are fully autonomous regarding preparing and implementing the curriculums, there are no mechanisms that compare the equivalency of medical universities' curriculums. As an easy solution to this issue, accreditations of medical curriculums are not accessed in all medical schools and there is no such obligation for this yet. Under these circumstances, providing a part of curriculums through distance education/online learning may contribute to providing equivalent curriculums among different schools. However, the suitability of online education methods for medical education, especially for clinical education is a controversial issue. To the best of our knowledge,

there are no studies addressing medical school students' attitudes towards distance learning/online education. The present paper provides information as well as presents a valid and reliable instrument than can be used in future studies.

Providing all stages of medical education through distance education will improve the effectiveness of individualized education programs considering the e-learning styles of the students. Moreover, to improve the effectiveness of distance medical education, establishing relevant institutions such as "Center of Excellence for Online Medical Education" may be useful (Ruiz, Mintzer, & Leipzig, 2006).

Continuous change in education procedures and methods, as well as providing medical education through distance education methods require reorganization of the curriculums considering these techniques. Therefore, considering the fact that medical schools provided educational content that prepared for face-to-face education through distance education during the pandemic, this education becomes a controversial issue.

Students combine different learning styles in themselves uniquely. On the other hand, the current curriculums are solid and do not have any flexibility for different student profiles. Many studies indicated that medical school students have different learning styles (Kalaca, 2004; Gulpinar, 2014; Salihu et al., 2020; Javaeed et al., 2020). The findings of the present study also showed the presence of a wide range of learning styles among participants. It is highly possible that distance education/online learning can be more suitable for students with different learning styles. Accordingly, the regression modeling conducted in this study revealed that learning styles are significant predictors for attitudes towards online education. It should be noted that the audio-visual learning style displayed the highest predictive power for attitudes towards online education ( $\beta=0.277$ ).

As suggested in several studies and taking into account the students' negative attitudes towards distance medical education, although distance education is unlikely to replace classroom education, updating of teaching philosophy, optimizing teaching, establishing flexible and diverse assessment systems can promote the reform of traditional undergraduate medical education (Zhao, Li & Feng, 2018).

In 1999, the "United States Medical Licensing Exam" (USMLE) moved to computer-based testing, and some medical school graduates in Turkey are also entered this exam. On the other hand, Lim et al. (2006) carried out a study determining medical school students' attitudes towards computer-based testing. Students of the National University of Singapore, Yong Loo Lin School of Medicine participated in that study and results revealed that 79.8% of the students preferred computer-based exams instead of paper-based exams. However, in this study, during the development of MATDLS, the items measuring the student's attitudes towards distance assessment and evaluation systems were excluded from the scale since these items were not helpful. It can be argued that the medical school student's attitudes towards distance assessment and evaluation systems are not developed yet or students may have no opinions about distance assessment of medical students.

In a study carried out by Mirmoghtadaie et al. (2019), it was found that students who have medical education through e-learning methods had no idea whether this education method increased their academic success or not. Considering the answers of the students to the MATDLS that developed in this study, it was found that the students believe that e-learning increases their academic success.

According to the MATDLS scale, while medical school students had no positive attitudes towards gaining required skills through online learning, they also had no negative attitudes. In a study carried out by Bhatti and Bertoni (2019), it was revealed that the gaps in the learning achievements, especially outcomes related with the skills that may occur as a result of distance medical education can be bridged through an online education supported with case-based discussions, skills-based training, and short lessons.

Pre-graduate medical education curricula should be designed with an approach that can continue education in crises as in Covid-19, and students and educators should also be prepared for this, however, it is not seen that the students of the Faculty of Medicine have a positive attitude towards distance education, and they have a program design that includes more practical applications despite theoretical training in the background of medical education.

In addition to theoretical applications, medical education programs that include many Basic Professional Skills applications in order to prevent students from depriving of many practical skills that cannot be compensated in emergency situations, case discussions including virtual reality, augmented virtual reality, artificial intelligence applications, online applications that will improve clinical skills should also be improved. The creation of such experiences may be of vital importance due to the low level of authentic patient encounter among clinical period (clerkship) students, where practical training is the majority. Such practices will also be useful for students to use review strategies and learning reinforcement during face-to-face training in the post-Covid 19 normalization period. Of course, this situation can be seen as a factor that encourages learning for the student. On the other hand, an instructional design that blends online learning and face-to-face education will prepare for universal education platforms and extraordinary conditions.

In addition, online education options will be offered as a complementary education option in medical education programs, and educational system components will be prepared for education programs that include distance education methods that are likely to replace face-to-face education, whose permanence is doubtful in the future.

When it is considered for educators, as some research points out (O'Doherty et al., 2018; Rhim & Han, 2020), in order to prevent such emergency distance education from being interrupted and to continue education, it would be appropriate to equip medical educators with skills on the use of technology in education in the pedagogical education received by medical educators.

Covid 19 period can be an opportunity to eliminate the differences between technology use skill levels between learners and educators, for whom the definition of Generation Z is made. Moreover, considering that healthcare professionals should be lifelong learners, it will be able to support medical students of this period in lifelong learning; it can be said that self-directed learning, independent learning skills and skills towards reaching the source of information can be improved.

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