



# Determining attitudes toward e-learning: what are the attitudes of health professional students?

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## Abstract

**Aim** The research was carried out to determine the attitudes of nursing undergraduate students toward e-learning implemented during the COVID-19 pandemic.

**Subject and methods** The study sample consisted of 320 undergraduate students studying at the Faculty of Health Sciences, Nursing Department of a state university. Personal Information Form and the Test of e-Learning Related Attitudes were administered to the research participants.

**Results** Of the students, 68.8% were female and 51.6% were between the ages of 21–24. The attitude of 55.3% (177) toward e-learning is negative. Attitude scores of students aged 25–29 were significantly higher compared to those aged 17–20 and 21–24 years old ( $p=0.002$ ). The attitude scores of the students who have a computer are significantly higher than those who do not ( $p=0.001$ ). Most students did not agree with the statement “E-learning will provide me with better learning opportunities than conventional learning methods.” (disagree  $n=121$ ; 37.8%, strongly disagree  $n=110$ ; 34.4%).

**Conclusion** It is noticed that e-learning is not sufficient in subjects such as conducting clinical and laboratory practices in health sciences fields with practical training like nursing, and students’ attitudes are generally negative. For undergraduate health sciences education, face-to-face and online education for support purposes can be used together in theoretical courses. In addition, it is recommended to use effective online communication techniques in online courses.

**Keywords** Attitude · E-learning · Students · Technology

## Introduction

Coronavirus disease (COVID-19) was first reported in December 2019 in the city of Wuhan, Hubei Province, China. Later, on March 11, 2020, the World Health

Organization declared the disease a pandemic (WHO 2020). The fact that this virus spread rapidly and became a threat to the whole world and impacted the global economy and countries brought about different measures and practices. Following the health sector, the education sector has been one of the sectors most affected by this situation (Telli and Altun 2020). The COVID-19 pandemic has impacted the education system worldwide and brought radical organizational changes to conventional teaching techniques. Many countries have resorted to e-courses and exams for medical/nursing students, and e-learning has been used as the primary method of teaching the curriculum (Singh et al. 2021).

The term e-learning is a relatively new term that emerged with the development and advancement of information and communication technologies. E-learning is considered a broad concept that describes the asynchronous or simultaneous transfer of knowledge to learners through electronic systems. The historical origin of the term e-learning is not exactly known. However, it started to develop with the use

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of the internet and personal computers (Sweileh 2021; Wang et al. 2021).

The success of e-learning depends on various factors such as accessibility, use of appropriate methods, course content, and assessment criteria. Like any teaching method, e-learning has pros and cons for both students and teachers. Problems related to internet access, lack of digital skills, social isolation, and lack of student–teacher interaction make up its limitations (Abbasi et al. 2020a, b; Bączek et al. 2021). In general terms, the reasons for its acceptability include its advantages such as applicability, ease of use, and flexibility (Abbasi et al. 2020a, b).

Health science education is a key element in the sustainability of healthcare services in any country. There is a growing interest in e-learning among health educators (Ruiz et al. 2006). The American Association of Critical-Care Nurses (AACN) reported that the courses and programs delivered through distance learning in nursing education are increasing gradually and it is indispensable to set some standards to achieve higher quality nursing education (AACN 2003). In addition, even if all the necessary criteria are met in the development of distance learning environments, the learner's attitudes and approaches toward these environments are monumental (Usta et al. 2016). The data obtained from this research will enable the assessment of nursing students' attitudes toward e-learning and will guide the training to be planned.

## Methods

**Sample selection** As in the whole world, Turkey had to apply distance education in higher education due to the COVID-19 pandemic. On March 23, 2020, education started in the digital environment in higher education institutions in Turkey. At the university where the research was carried out during the pandemic period, the courses were processed synchronously or asynchronously in the form of taking videos with the Camtasia program and uploading them to the system or defining online courses. Face-to-face education started in the 2021–2022 academic year.

The research was designed as a cross-sectional study. The population of the research consisted of 549 students studying at the Nursing Department of the Faculty of Health Sciences in the 2020–2021 academic year at a state university located in the Mediterranean region of Turkey. No sample selection was made, so it was aimed to reach all nursing students who agreed to participate in the study. Data were collected through an online survey between May–August, 2021. A Google Form containing the study questionnaire was sent to WhatsApp groups consisting of nursing students through class representatives to ensure proper selection of study participants. In the research, 1st, 2nd, 3rd, and 4th grade representatives were contacted and these students were provided the questionnaire to deliver to other participants. A friendly

reminder was sent to the participants so that the survey could be answered by eligible participants. The research was completed with 320 participants.

**Data collection tools** Two types of forms were used in this study. These are “Personal Information Form” and “Test of e-Learning Related Attitudes”.

**Personal information form** The personal information form consisted of eight questions to identify some characteristics of individuals such as age, gender, income level, internet access, and the presence of their computer.

**Test of e-learning related attitudes** A Test of e-Learning Related Attitudes (TeLRA) scale was developed by Kisanga (2016) to identify attitudes toward e-learning; the scale is a four-point Likert type and is rated as 1-strongly disagree, 2-disagree, 3-agree and 4-strongly agree. The adaptation of the scale to Turkish culture and language was made by Biçer (2019). The reliability of this scale, which includes 23 items and four factors, adapted to identify attitudes toward e-learning, is  $\alpha=0.789$ . Within this regard, the factors have been termed as “tendency to use technology,” “satisfaction,” “motivation,” and “usefulness”. The scale includes some reverse worded items (Biçer and Korucu 2020; Kisanga 2016). In this study, the Cronbach's Alpha value was 0.896 (Table 1).

**Statistical analysis of data** SPSS (IBM SPSS for Windows, ver.26) statistical package software was used for the analysis. Measurement data were expressed as numbers, percent (%), and mean  $\pm$  standard deviation. As the data showed normal distribution (Table 1), the t-test was used for the analysis of two variables, and one way ANOVA was used for the analysis of more than two variables. Post-hoc Bonferroni test was conducted to determine between-groups-variance for three or more groups. The results were evaluated at the 95% confidence level, at the  $p < 0.05$  level.

**Ethical aspect of the study** Ethics Committee approval was obtained from the Non-Invasive Clinical Research Ethics Committee for the study. (Date: October 30th, 2019 Session: 2019/20 Decision No: 04). Consent of the participants was obtained through Google Forms, after reading the explanation text of the research before starting the survey and clicking the “Yes” button to the question that they participated in the study voluntarily.

## Results

Of the nursing students participating in the study, 68.8% were female and 51.6% were between the ages of 21–24; 34.7% of the students were in the 3rd grade and 6.9% of them live in the dormitory; 52.2% of the students have a

**Table 1** Descriptive statistics for TeLRA and subscales

Variable	Mean	Std. Deviation	Minimum–maximum	Skewness	Kurtosis	Cronbach's Alpha
TeLRA total score (23 items)	56.74	12.52	28–92	.047	–.111	0.896
TeLRA mean score	2.45	0.5	1–4	.047	–.111	
Tendency to use technology (6 items)	15.50	4.1	6–24	–.100	–.373	0.768
Satisfaction (5 items)	13.24	3.5	5–20	–.199	–.466	0.743
Motivation (6 items)	13.70	4.3	6–24	.238	–.292	0.847
Usefulness (6 items)	13.30	4.1	6–24	–.020	–.643	0.777

Scoring: 1–4-point Likert-type scale from strongly disagree to strongly agree

computer and 86.9% have internet access; 78.8% of the students stated their income level as middle income; 70.3% of nursing students considered themselves adequate in terms of technological knowledge (Table 2).

When the analysis results of some demographic variables of nursing students and their general attitude scores toward E-learning are examined, it was found that students aged 25–29 obtained higher scores for E-learning compared to those aged 17–20 and 21–24 years old ( $F=6.216$ ,  $p=0.002$ ). The general attitude scores of the students who have a computer are significantly higher compared to those who do not ( $t=3.782$ ,  $p=0.001$ ). However, no significant correlation was found between gender ( $t=0.065$ ,  $p=0.948$ ), grade ( $F=1.589$ ,  $p=0.192$ ), persons the student lives with ( $F=1.118$ ,  $p=0.328$ ), economic status ( $F=2.470$ ,  $p=0.086$ ), availability of internet connection ( $t=1.456$ ,  $p=0.146$ ), evaluation of technological knowledge ( $F=2.631$ ,  $p=0.074$ ), and general attitude scores (Table 2).

The distribution of students' attitudes toward e-learning is presented in Fig. 1. The analysis revealed that 55.3% ( $n=177$ ) of the students had a negative attitude toward e-learning, and 44.7% ( $n=143$ ) had a positive attitude toward e-learning (Fig. 1).

The results of the analysis of the sub-dimension scores of the scale according to descriptive information are given in Table 3. Students aged 25–29 scored significantly higher in the sub-dimensions of usefulness ( $p=0.000$ ) and motivation ( $p=0.007$ ) compared to those aged 17–20. Students with a computer scored significantly higher than students without a computer in all of the sub-dimensions of using technology ( $p=0.001$ ), satisfaction ( $p=0.034$ ), motivation ( $p=0.002$ ), and usefulness ( $p=0.047$ ). The tendency to use the technology sub-dimension scale score of students with internet connections were found to be significantly higher than those without internet connections ( $p=0.025$ ). The students with sufficient technological knowledge had a higher tendency to use technology sub-dimension score than those with insufficient technological knowledge ( $p=0.013$ ) (Table 3).

Table 4 shows students' attitudes toward e-learning statements. One hundred twenty-one (37.8%) students disagreed

and 110 (34.4%) strongly disagreed with the statement “E-learning will provide me with better learning opportunities than traditional learning methods” in item 15. This item received the lowest score compared to other items on the scale (Table 4).

## Discussion

Our study demonstrated that 55.3% of the nursing students included in the study had negative attitudes toward e-learning. Likewise, in the study by Diab and Elgahsh (2020), 61.6% of nursing students were found to have a negative attitude toward e-learning (Diab and Elgahsh 2020). Studies by Bączek et al. (2021) and Olum et al. (2020) with students studying health science, including medical, dentistry, and nursing students, have revealed a generally negative attitude toward e-learning (Bączek et al. 2021; Olum et al. 2020). Our study supported the literature in this regard.

In this study, it was found that students aged 25–29 had significantly higher scores on e-learning compared to those aged 17–20 and 21–24 years old. Moreover, students aged 25–29 scored significantly higher on the usefulness and motivation scale sub-dimensions compared to those aged 17–20. Contrary to our study, a study argued that e-learning imposes more limitations on older students (Ramos-Morcillo et al. 2020). It was considered that the students in the older age group were most likely in the upper grades and had experience in hospital practice before the COVID-19 pandemic, which might have affected their TeLRA scores. Medical and health science students need physical contact with patients to learn necessary skills and personally experience patient care (Abbasi et al. 2020a, b; Rose 2020). On the other hand, it has been revealed in the literature that there is a lack of preparation, skills, and training during the pandemic (Farooq et al. 2020; Ramos-Morcillo et al. 2020).

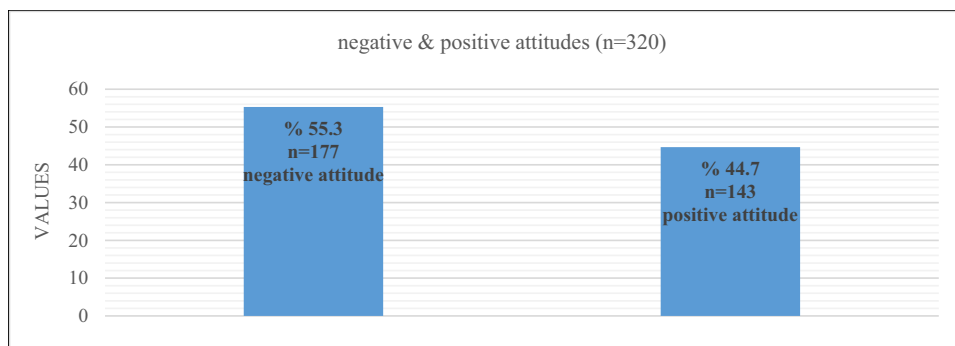
In the study, the computer ownership status of the students impacted their attitude scores. The attitude score of the students who had a computer was found to be significantly higher than those who did not have a computer.

**Table 2** The analysis results of some demographical variances of nursing students and their attitude toward E-learning

Characteristics	N (%)	Mean	t/F	p value	Bonferroni test
Age (n = 320)					
17-20 years (1)	140 (43.8)	55.25 ± 12.4			3 > 1
21-24 years (2)	165 (51.6)	57.10 ± 12.1			3 > 2
25-29 years (3)	15 (4.7)	67.28 ± 13.8	6.216	<b><sup>a</sup>0.002</b>	
Gender (n = 320)					
Female	220 (68.8)	56.76 ± 12.8			
Male	100 (31.3)	56.67 ± 11.8	0.065	<sup>b</sup> 0.948	
The class of study (n = 320)					
1st	105 (32.8)	56.25 ± 13.1			
2nd	48 (15.0)	53.64 ± 15.7			
3rd	111 (34.7)	58.19 ± 10.3			
4th	56 (17.5)	57.39 ± 12.1	1.589	<sup>a</sup> 0.192	
With whom does he/she live (n = 320)					
Family	283 (88.4)	56.57 ± 12.5			
Dormitory	22 (6.9)	55.63 ± 10.3			
With friends at a student house	15 (4.7)	61.33 ± 15.3	1.118	<sup>a</sup> 0.328	
Ownership of a computer (n = 320)					
Yes	167 (52.2)	59.22 ± 12.4			
No	153 (47.8)	54.02 ± 12.1	3.782	<b><sup>b</sup>0.001</b>	
Do you have an internet connection? (n = 320)					
Yes	278 (86.9)	57.13 ± 12.7			
No	42 (13.1)	54.11 ± 10.9	1.456	<sup>b</sup> 0.146	
How do you define your economic condition?(n = 320)					
Bad	44 (13.8)	54.70 ± 14.3			
Medium	252 (78.8)	56.62 ± 11.8			
Good	24 (7.5)	61.66 ± 15.4	2.470	<sup>a</sup> 0.086	
How do you define your technological know-how? (n = 320)					
Sufficient	225 (70.3)	57.57 ± 11.7			
Insufficient	54 (16.9)	53.24 ± 12.5			
Very insufficient	41 (12.8)	56.75 ± 15.7	2.631	<sup>a</sup> 0.074	

<sup>a</sup> ANOVA, <sup>b</sup> t test 1,2,3, post hoc bonferroni. The percentages are calculated over N

**Fig. 1** Attitudes toward e-learning



In our study, no significant correlation was found between students’ considering themselves technologically competent and the scale total score, but the tendency to use technology sub-dimension scores of students who consider themselves sufficient in terms of technological knowledge

were found to be significantly higher. Furthermore, students with internet access had a significantly higher “technology usage tendency” sub-scale score. It is well-known that e-learning is interrupted due to technical problems such as computer and connection problems, even if the student

**Table 3** Comparison of scale sub-dimension scores according to descriptive information

Variables	Tendency to use technology		Satisfaction		Motivation		Usefulness	
	Mean	<i>p</i> value	Mean	<i>p</i> value	Mean	<i>p</i> value	Mean	<i>p</i> value
Gender								
Female	15.46		13.21		13.61		14.48	
Male	15.59	<sup>b</sup> 0.794	13.29	<sup>b</sup> 0.857	13.89	<sup>b</sup> 0.596	13.90	<sup>b</sup> 0.235
Age								
17-20(1)	15.32		12.84		13.12		13.96	
21-24(2)	15.45		13.50		13.92		14.22	
25-29(3)	17.86	<sup>a</sup> 0.091	14.07	<sup>a</sup> 0.175	16.78	<sup>a</sup> 0.007 <b>3 &gt; 1</b>	18.57	<sup>a</sup> 0.000 <b>3 &gt; 1, 3 &gt; 2</b>
The class of study								
1st	15.60		12.96		13.35		14.34	
2nd	15.13		12.21		12.81		13.50	
3rd	15.74		13.84		14.18		14.43	
4th	15.16	<sup>a</sup> 0.756	13.45	<sup>a</sup> 0.041	14.13	<sup>a</sup> 0.193	14.64	<sup>a</sup> 0.497
With whom does he/she live								
Family	15.50		13.19		13.68		14.21	
Dormitory	14.95		13.23		13.13		14.32	
With friends at a student house	16.27	<sup>a</sup> 0.642	14.20	<sup>a</sup> 0.554	14.86	<sup>a</sup> 0.479	16.00	<sup>a</sup> 0.250
Ownership of a computer								
Yes	13.63		16.46		14.40		14.73	
No	12.80	<sup>b</sup> 0.001	14.46	<sup>b</sup> 0.034	12.93	<sup>b</sup> 0.002	13.83	<sup>b</sup> 0.047
Do you have an internet connection?								
Yes	15.70		13.32		13.72		14.38	
No	14.17	<sup>b</sup> 0.025	12.67	<sup>b</sup> 0.259	13.52	<sup>b</sup> 0.777	13.76	<sup>b</sup> 0.357
How do you define your economic condition?								
Bad	15.57		11.95		14.02		14.16	
Medium	15.56		13.44		13.42		14.20	
Good	16.58	<sup>a</sup> 0.142	13.50	<sup>a</sup> 0.032	15.95	<sup>a</sup> 0.020	15.63	<sup>a</sup> 0.251
How do you define your technological know-how?								
Sufficient(1)	15.88		13.50		13.77		14.42	
Insufficient(2)	14.09		12.94		12.74		13.46	
Very insufficient(3)	15.27	<sup>a</sup> 0.013 <b>1 &gt; 2</b>	12.17	<sup>a</sup> 0.065	14.56	<sup>a</sup> 0.113	14.76	<sup>a</sup> 0.223

<sup>a</sup> ANOVA, <sup>b</sup> *t* test 1,2,3, post hoc *bonferroni*

is technologically competent. In the study by Sharma et al. (2021) with medical and dentistry students, most of the students stated that they had difficulties in online classes due to internet and electricity problems (Sharma et al. 2021). In the study of Abbasi et al. (2020a, b) with health sciences students, 41% of the students stated that e-learning was hindered due to network problems (Abbasi et al. 2020a, b). In fact, in many studies, it has been suggested that situations such as telecommunications infrastructure, technological difficulties, limited technical skills, technical and management support, instructor's qualifications, power cuts, internet costs, family distraction, communication difficulties, and lack of security are the major reasons that will increase dissatisfaction with online learning (Al-Balas

et al. 2020; Diab and Elgahsh 2020; Dost et al. 2020; Fawaz and Samaha 2020; Mukasa et al. 2021; Olum et al. 2020; Singh et al. 2021).

In this study, the majority of the students did not agree with the statement "E-learning will provide me with better learning opportunities than traditional learning methods." Similar to our study, in the study of Eltaybani et al. (2021), it was stated that 72.9% of nursing students believed that traditional learning was more effective than e-learning (Eltaybani et al. 2021). In the study by Singh et al. (2021) on e-learning methods in nursing and medical education, only 20.4% of the students stated that they felt that e-learning could replace traditional teaching (Singh et al. 2021). Studies have demonstrated that students studying in health

**Table 4** Attitudes of study participants toward statement for e-learning

	1(%)	2(%)	3(%)	4(%)	mean ± SD
Tendency to use technology					
1. I make errors frequently when using a Computer.	48(15.0)	68(21.3)	126(39.4)	78(24.4)	2.73 ± 0.9
2. It will be difficult for me to become skilful in the use of e-learning tools.	36(11.3)	63(19.7)	136(42.5)	85(26.6)	2.84 ± 0.9
3. Using a computer at home is very frustrating.	55(17.2)	68(21.3)	99(30.9)	98(30.6)	2.75 ± 1.0
4. I find computer online interaction unexciting.	90(28.1)	97(30.3)	80(25.0)	53(16.6)	2.30 ± 1.0
5. Communicating through electronic mails is annoying.	105(32.8)	90(28.1)	80(25.0)	45(14.1)	2.20 ± 1.0
6. E-learning infrastructure is very expensive for the government to afford.	41(12.8)	100(31.3)	102(31.9)	77(24.1)	2.67 ± 0.9
Satisfaction					
7. E-learning is very economical for educational institutions to adopt.	43(13.4)	95(29.7)	125(39.1)	57(17.8)	2.61 ± 0.9
8. I believe using e-learning will improve the quality of my work.	76(23.8)	104(32.5)	85(26.6)	55(17.2)	2.37 ± 1.0
9. Computers make work more interesting.	75(23.4)	104(32.5)	83(25.9)	58(18.1)	2.38 ± 1.0
10. It is easier to revise electronic educational materials than printed material.	43(13.4)	63(19.7)	104(32.5)	110(34.4)	2.88 ± 1.0
11. I prefer using a computer to prepare my lessons.	30(9.4)	57(17.8)	118(36.9)	115(35.9)	2.99 ± 0.9
Motivation					
12. Working with computers is exciting.	87(27.2)	114(35.6)	82(25.6)	37(11.6)	2.22 ± 0.9
13. My institution has enough teaching-learning resources to carry out e-learning.	107(33.4)	107(33.4)	68(21.3)	38(11.9)	2.12 ± 1.0
14. I like discussing about new e-learning innovations.	68(21.3)	112(35.0)	100(31.3)	40(12.5)	2.35 ± 0.9
15. E-learning will provide me with better learning opportunities than traditional means of learning.	110(34.4)	121(37.8)	62(19.4)	27(8.4)	2.02 ± 0.9
16. Using e-learning technologies will allow me to accomplish more work than would otherwise be possible.	38(11.9)	99(30.9)	136(42.5)	47(14.7)	2.60 ± 0.8
17. I enjoy teaching using computers.	67(20.9)	106(33.1)	99(30.9)	48(15.0)	2.40 ± 0.9
Usefulness					
18. E-learning reduces quality of knowledge attained.	73(22.8)	81(25.3)	115(35.9)	51(15.9)	2.45 ± 1.0
19. E-learning requires expensive technical support.	82(25.6)	97(30.3)	102(31.9)	39(12.2)	2.31 ± 0.9
20. Delivering a lecture through electronic technologies is very difficult.	59(18.4)	83(25.9)	101(31.6)	77(24.1)	2.61 ± 1.0
21. Interacting with the computer system is often frustrating.	68(21.3)	111(34.7)	100(31.3)	41(12.8)	2.36 ± 0.9
22. Discussions on e-learning technologies are uninteresting.	65(20.3)	98(30.6)	118(36.9)	39(12.2)	2.41 ± 0.9
23. Teaching through e-learning is tiresome.	93(29.1)	111(34.7)	86(26.9)	30(9.4)	2.17 ± 0.9

The percentages are calculated over N, 1- strongly disagree, 2- disagree, 3- agree, 4- strongly agree, SD, standard deviation

sciences have low satisfaction with e-learning (Al-Balas et al. 2020; Olum et al. 2020; Sindiani et al. 2020).

Regarding the preferred learning methods in the literature, Dost et al. (2020)'s study with medical students showed that most students preferred face-to-face teaching (Dost et al. 2020). In the studies conducted by Bhattarai et al. (2021) and Olum et al., (2020) with health science students such as medicine, nursing, and dentistry, most students preferred to combine online learning with traditional learning (Bhattarai et al. 2021; Olum et al. 2020). Moreover, in the study by Elsalem et al. (2020) with nursing, dentistry, pharmacy, and applied medical sciences students, 32% of the students stated that they experience more stress in e-exams (Elsalem et al. 2020).

E-learning provides students with time savings, flexibility, and the ability to study at their own pace and their convenience. Hence, flexibility and convenience are the primary

factors behind the demand for online education (Al-Balas et al. 2020; Dost et al. 2020). On the other hand, e-learning is not effective in acquiring clinical and technical skills (Olum et al. 2020). E-learning has proven to be equivalent to or superior to conventional learning, but when used to replace conventional programs, unique challenges arise in clinical teaching and learning experiences (Tashkandi 2021). Teaching health evaluation in nursing in the digital age is a challenging process. It involves cognitive, procedural, and psychomotor learning and is a subject that fails to provide "readiness for practice" (McDonald et al. 2018). According to Sheikhaboumasoudi et al. (2018), combining traditional learning methods with e-learning methods could be an effective support in improving the clinical skills of nursing students. The key factor in designing a training program is to make learning simple and effective (Sheikhaboumasoudi et al. 2018). E-learning content should be compatible

with its design, teaching pedagogy, and learning outcomes (Prosen et al. 2022). To make e-learning more meaningful for evidence-based nursing practice, educators should plan, perform, and assess appropriate online activities (Song and Park 2021).

## Limitations

The research results are based on the statements of the participants. The fact that the study was single-centered and the sample size was small limits the generalization of the study.

## Conclusion

E-learning, which has been applied quickly and widely due to the COVID-19 pandemic, has increased the interest of researchers in assessing the students' attitudes. This cross-sectional study was carried out to determine the attitudes of nursing students, who continued distance learning due to the COVID-19 pandemic, toward e-learning. In our study, it was revealed that more than half of the nursing students had a negative attitude toward e-learning. Having a computer, having an internet connection, age, and technological knowledge variables were found to be associated with the attitude and affected the scores attitude toward e-learning. Nevertheless, it is seen that e-learning is not adequate in subjects such as clinical and laboratory practices in health sciences with applied education such as nursing. For undergraduate health sciences education, face-to-face and online education for support purposes can be used together in theoretical courses. In addition, it is recommended to solve the existing technical problems in online courses and to use effective online communication techniques. Further studies can be conducted to compare students' attitudes toward e-learning in theoretical and applied courses.

**Authors' contributions** All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by AG, MK, and ŞA. The first draft of the manuscript was written by AG and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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## Declarations

**Ethics approval** Ethics Committee approval was obtained from the Non-Invasive Clinical Research Ethics Committee for the study. (Date: October 30th, 2019 Session: 2019/20 Decision No: 04).

**Consent to participate** Each study participant provided written informed consent. Privacy and confidentiality of the respondents during data collection were maintained strictly.

**Consent for publication** The corresponding author confirms that the manuscript has been read and approved for submission by all the named authors.

**Conflict of interest** All authors declare no conflict of interest.

## References

- Abbasi MS, Ahmed N, Sajjad B et al (2020a) E-learning perception and satisfaction among health sciences students amid the COVID-19 pandemic. *Work* 1–8. <https://doi.org/10.3233/wor-203308>
- Abbasi S, Ayoob T, Malik A et al (2020b) Perceptions of students regarding E-learning during Covid-19 at a private medical college. *Pakistan J Med Sci* 36(COVID19-S4):S57–S61. <https://doi.org/10.12669/pjms.36.covid19-s4.2766>
- Al-Balas M, Al-Balas HI, Jaber HM et al (2020) Distance learning in clinical medical education amid COVID-19 pandemic in Jordan: current situation, challenges, and perspectives. *BMC Med Educ* 20(1):341. <https://doi.org/10.1186/s12909-020-02257-4>
- American Association of Colleges of Nursing (AACN), 2003 Position statements: alliance for nursing accreditation statement on distance education policies. <https://www.aacnnursing.org/News-Information/Position-Statements-White-Papers/Distance-Education>. Accessed 01 Feb 2022
- Bączek M, Zagańczyk-Bączek M, Szpringer M et al (2021) Students' perception of online learning during the COVID-19 pandemic. *Medicine* 100(7):e24821. <https://doi.org/10.1097/md.00000000000024821>
- Bhattarai B, Gupta S, Dahal S et al (2021) Perception of online lectures among students of a medical College in Kathmandu: a descriptive cross-sectional study. *J Nepal Med Assoc* 59(235):234–238. <https://doi.org/10.31729/jnma.6276>
- Biçer H (2019) E-öğrenmeye yönelik tutum: Ölçek uyarlama çalışması (Yüksek lisans tezi). Necmettin Erbakan Üniversitesi Eğitim Bilimleri Enstitüsü, Konya. [https://tez.yok.gov.tr/UlusalTezMerkezi/TezGoster?key=Mir2IXQK1dkmQ9Ige3PZbo10lgsYSfAHJ1590YKzfzyshIqNjhnk9vnqCxSHz\\_Ke](https://tez.yok.gov.tr/UlusalTezMerkezi/TezGoster?key=Mir2IXQK1dkmQ9Ige3PZbo10lgsYSfAHJ1590YKzfzyshIqNjhnk9vnqCxSHz_Ke). Accessed 10 Oct 2019
- Biçer H, Korucu AT (2020) E-Öğrenmeye Yönelik Tutum Ölçeğinin Türkçeye Uyarlanması. *Eğitim Teknolojisi Kuram ve Uygulama* 10(1):237–256. <https://doi.org/10.17943/Etku.632178>
- Diab GMAEH, Elgahsh NF (2020) E-learning during COVID-19 pandemic: obstacles faced nursing students and its effect on their attitudes while applying it. *American journal of Nurs Sci* 9(4):295–309. <https://doi.org/10.11648/j.ajns.20200904.33>
- Dost S, Hossain A, Shehab M et al (2020) Perceptions of medical students towards online teaching during the COVID-19 pandemic: a national cross-sectional survey of 2721 UK medical students. *BMJ Open* 10(11):e042378. <https://doi.org/10.1136/bmjopen-2020-042378>
- Elsalem L, Al-Azzam N, Jum'ah AA et al. (2020) Stress and behavioral changes with remote E-exams during the Covid-19 pandemic: a cross-sectional study among undergraduates of medical sciences. *Ann Med Surg* 60:271–279. <https://doi.org/10.1016/j.amsu.2020.10.058>
- Eltaybani S, Abdelhalim GE, Abdelgawad ME (2021) Nursing students' and educators' experience with e-learning during a pandemic: an online survey. *Nurs Forum* 56(4):878–888. <https://doi.org/10.1111/nuf.12634>

- Farooq F, Rathore FA, Mansoor SN (2020) Challenges of online medical education in Pakistan during COVID-19 pandemic. *J Coll Physicians Surg Pak* 30(6):67–69. <https://doi.org/10.29271/jcpsp.2020.Supp1.S67>
- Fawaz M, Samaha A (2020) E-learning: depression, anxiety, and stress symptomatology among Lebanese university students during COVID-19 quarantine. *Nurs Forum* 56(1):52–57. <https://doi.org/10.1111/nuf.12521>
- Kisanga DH (2016) Determinants of teachers' attitudes towards e-learning in Tanzanian higher learning institutions. *The international review of research in open and distributed. Learning* 17(5):109–125. <https://doi.org/10.19173/irrodl.v17i5.2720>
- McDonald EW, Boulton JL, Davis JL (2018) E-learning and nursing assessment skills and knowledge – an integrative review. *Nurse Educ Today* 66:166–174. <https://doi.org/10.1016/j.nedt.2018.03.011>
- Mukasa J, Otim M, Monaco B et al (2021) Nursing students' perspectives and readiness to transition to E-learning during COVID-19 in the UAE: a cross-sectional study. *Adv Med Educ Pract* 12:1505–1512. <https://doi.org/10.2147/amep.s335578>
- Olum R, Atulinda L, Kigozi E et al (2020) Medical education and E-learning during COVID-19 pandemic: awareness, attitudes, preferences, and barriers among undergraduate medicine and nursing students at Makerere University, Uganda. *J Med Educ Curric Dev* 7:238212052097321. <https://doi.org/10.1177/2382120520973212>
- Prosen M, Karnjuš I, Ličen S (2022) Evaluation of E-learning experience among health and allied health professions students during the COVID-19 pandemic in Slovenia: an instrument development and validation study. *Int J Environ Res Public Health* 14(19(8)):4777. <https://doi.org/10.3390/ijerph19084777>
- Ramos-Morcillo AJ, Leal-Costa C, Moral-García JE et al (2020) Experiences of nursing students during the abrupt change from face-to-face to e-learning education during the first month of confinement due to COVID-19 in Spain. *Int J Environ Res Public Health* 17(15):5519. <https://doi.org/10.3390/ijerph17155519>
- Rose S (2020) Medical student education in the time of COVID-19. *Jama* 323(21):2131–2132. <https://doi.org/10.1001/jama.2020.5227>
- Ruiz JG, Mintzer MJ, Leipzig RM (2006) The impact of E-learning in medical education. *Acad Med* 81(3):207–212. <https://doi.org/10.1097/00001888-200603000-00002>
- Sharma N, Bhusal CK, Subedi S et al (2021) Perception towards online classes during COVID-19 among MBBS and BDS students in a medical College of Nepal: a descriptive cross-sectional study. *J Nepal Med Assoc* 59(235):276–279. <https://doi.org/10.31729/jnma.5348>
- Sheikhaboumasoudi R, Bagheri M, Hosseini SA et al (2018) Improving nursing Students' learning outcomes in fundamentals of nursing course through combination of traditional and e-learning methods. *Iran J Nurs Midwifery Res* 23(3):217–221. [https://doi.org/10.4103/ijnmr.IJNMR\\_79\\_17](https://doi.org/10.4103/ijnmr.IJNMR_79_17)
- Sindiani AM, Obeidat N, Alshdaifat E et al (2020) Distance education during the COVID-19 outbreak: a cross-sectional study among medical students in north of Jordan. *Ann Med Surg* 59:186–194. <https://doi.org/10.1016/j.amsu.2020.09.036>
- Singh HK, Joshi A, Malepati RN et al (2021) A survey of E-learning methods in nursing and medical education during COVID-19 pandemic in India. *Nurse Educ Today* 99:104796. <https://doi.org/10.1016/j.nedt.2021.104796>
- Song CE, Park H (2021) Active learning in E-learning programs for evidence-based nursing in academic settings: a scoping review. *J Continuing Educ Nurs* 52(9):407–412. <https://doi.org/10.3928/00220124-20210804-05>
- Sweilch WM (2021) Global research activity on E-learning in health sciences education: a bibliometric analysis. *Med Sci Educator* 31(2):765–775. <https://doi.org/10.1007/s40670-021-01254-6>
- Tashkandi E (2021) E-learning for undergraduate medical students. *Adv Med Educ Pract* 12:665–674. <https://doi.org/10.2147/amep.s314509>
- Telli SG, Altun D (2020) Coronavirüs ve Çevrimiçi (Online) Eğitim Önlenebilir Yükselişi. *Üniversite Araştırmaları Dergisi* 3(1):25–34. <https://doi.org/10.32329/uad.711110>
- Usta İ, Uysal Ö, Okur MR (2016) Çevrimiçi öğrenme tutum ölçeği: Geliştirilmesi, geçerliliği ve güvenilirliği. *Uluslararası Sosyal Araştırmalar Dergisi* 9(43):2215–2222
- Wang ZY, Zhang LJ, Liu YH et al (2021) Process evaluation of E-learning in continuing medical education: evidence from the China-Gates Foundation tuberculosis control program. *Infect Dis Poverty* 10(1):23. <https://doi.org/10.1186/s40249-021-00810-x>
- WHO (2020) Director-General's opening remarks at the media briefing on COVID-19—11 March 2020. <https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19—11-march-2020>. Accessed 18 Feb 2022

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