



Attitude and influencing factors of e-learning education among health pre-professional students during COVID-19 pandemic.

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ABSTRACT

INTRODUCTION: COVID-19 pandemic obliged teachers and students to quickly move from face-to-face to full e-learning education. The attitude can positively influence the use and success of e-learning. The objective was to assess the attitude towards e-learning and its influencing factors among students of pre-professional program.

MATERIAL AND METHODS: The design was cross-sectional among health pre-professional female students enrolled at College of Basic Science and Health Profession (COSHP) at King Saud bin Abdul-Aziz University for Health Science (KSAU-HS) in Jeddah (Saudi Arabia) between May and September 2021. The data were collected using an online questionnaire.

RESULTS: A total 92 students were included in analysis. The mean attitude score was 59.9%. The score was higher in students with previous e-learning experience before COVID19 (64.2%±18.8% versus 50.6%±16.6%, p=0.003). The main advantages were "assignments can be submitted on specified deadline" (59.8%), "interaction and communication during classes" (57.6%), and "feedback for assignments and examinations" (55.4%). The main disadvantages were "facing difficulty to focus in home environment" (62.0%), "struggle with internet connection" (59.8%), and "limited assigned time to complete online examinations" (57.6%). Main barriers include "slow internet connectivity" (44.6%) and "lack of teacher and classmates contacts" (38.0%). Suggested improvements included "having access to additional help during courses" (72.8%), "doing interactive activities such as games" (70.7%), and "solving technical problems" (70.7%). Students with higher positive attitude significantly reported less disadvantages/barriers but reported more advantages/improvements.

CONCLUSIONS: The current study showed moderately favorable attitude towards e-learning among female students in pre-Medicine/ pre-Applied Medical Science, and pre-Nursing programs. The current finding provide policymaker with a list of required changes from students' perspective to achieve successful and acceptable learning experience.

KEY WORDS: Coronavirus disease, COVID-19, e-learning, healthcare, students, attitude, Saudi Arabia.

INTRODUCTION

Since the pandemic announcement by the World Health Organization (WHO) in March 2020, COVID-19 pandemic affected every aspect of our life, including physical and mental health, economy, social life, travel, and education [1,2]. Schools and Universities across the world were ordered to close for variable durations as one of the measures to reduce the community spread of COVID-19 [3]. The sudden closure in the middle of the academic year obliged teachers and students to quickly move from face-to-face to full electronic (online) learning (e-learning). E-learning is defined as the use of computer network technology including a wide set of applications and processes to deliver information and instructions to individuals [4].

Transition to e-learning has been associated with several challenges and opportunities [5-7]. The challenges included information technology (IT) infrastructure, teacher and student readiness, student acceptability, clinical practice, and fair assessment methods [6,8]. On the other hand e-learning positively impacted the university digitalization, professional educational skills, self-directed learning, learning flexibility and adaptability, and hybrid learning [5-7].

Several e-learning guidelines and strategies were developed to ensure effective, engaging, and acceptable experience during education in healthcare professions [9-11]. Student perceptions towards e-learning is an important factor for its continuation [12]. Internationally, studies on perceptions of health professions' students showed mixed findings, with slightly more studies showed positive perceptions [13]. Previous studies in Saudi Arabia showed generally a positive attitude towards e-learning among medical, dental, and pharmacy students [14-17]. None of the previous local studies on attitude studied pre-professional students.

Moreover, the factors influencing positive attitude and self-reported barriers and improvement factors were largely lacking. The objective of the current study was to assess the attitude towards e-learning and its influencing factors among students in pre-professional program. These include e-learning related experience, advantages, disadvantages, barriers, and suggested improvements.

MATERIAL AND METHODS

Setting

The current study was conducted at the College of Basic Science and Health Profession (COSHP) at King Saud bin Abdul-Aziz University for Health Science (KSAU-HS) in Jeddah (Saudi Arabia). COSHP offers a pre-professional program, which is a two-year academic program that include necessary courses to prepare students for their professional studies in health sciences colleges such as Medicine, Nursing, and Applied Medical Sciences colleges.

The program is designed to introduce the basic concepts of sciences and English language skills. In the first year, the college offered two tracks, the pre-Medicine/pre-Applied Medical Science (unified track) and the pre-Nursing track.

Study design

The current study design was cross-sectional among pre-professional students enrolled in the COSHP between May and September 2021. The study obtained all required ethical approvals from the institutional review board of King Abdullah International Medical Research Center in Jeddah, Saudi Arabia.

Population

The study participants were female students of the first year of the pre-professional program at the COSHP, KSAU-HS, Jeddah, Saudi Arabia. All the participants approved an informed consent that explain the objectives of the study before filling the online questionnaire. Male students, those in the first year of the program, were not included in the study.

Sample size and sampling

It was estimated that at least 92 students will be required given the fact that the target population was 120 students, with 50% expected attitude, 5% confidence limit, and 95% confidence level. Students were recruited using convenience sampling. All target students were invited using their official emails, 101 started the online questionnaire, and 92 gave the consent and completed the questionnaire.

Data collection

The data were collected using an online questionnaire, which had questions covering different perspectives of e-learning during the COVID-19 pandemic. These included demographic information, technical skills and experience related to e-learning before the COVID-19 pandemic, attitude towards e-learning education, advantages and disadvantages of e-learning, and lastly e-learning barriers and expectations from the instructor and university to improve the e-learning experience. Face and content validity of the questionnaire were assessed at the COSHP, KSAU-HS. The reliability of the questionnaire was assessed using Cronbach's Alpha and proved to be high (0.89).

Statistical methods

Categorical variables were presented as frequencies and percentages while continuous variables were presented as means and standard deviations (SD). The responses to attitude questions were coded as five from strongly agree, four for agree, three for neutral, two for disagree, and one for strongly disagree. Attitude score was calculated as the sum of responses to 11 attitude questions. The score was then converted into 100-point scale for easy interpretation. The score was also categorized into > median score (>59.1%) and ≤ median score (≤59.1%).

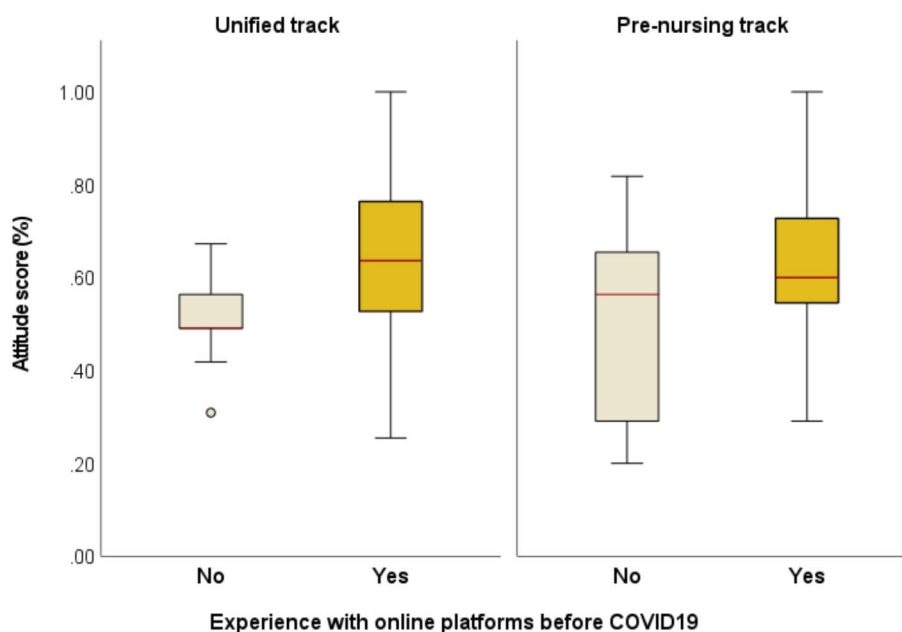
Demographic characteristics and e-learning experience, advantages, disadvantages, barriers, and improvements were compared between those who had high (>median score) and low (≤ median score) positive attitude. Chi-square test or Fisher's exact test, as appropriate, were used to compare categorical variables. T-test or Mann-Whitney test, as appropriate, were used to compare continuous variables. All P-values were two-tailed. A p-value <0.05 was considered significant. Statistical Package for the Social Sciences software (SPSS Version 27.0. Armonk, NY: IBM Corp) were utilized for statistical analysis.

RESULTS

A total 92 students were included in the current analysis. Table 1 shows the responses to attitude questions regarding e-learning. The questions that received high agreement (strongly agree or agree) included conducive and peaceful learning environment at home (54.3%), upfront planning process is a key to success online course (48.9%), and willing to submit questions and comments on chat box during online class (48.9%). The questions that received low agreement (strongly disagree or disagree) included feeling more active and energetic (18.5%), feeling sociable and more motivated (19.6%) and ability to ignore distraction (22.8%). The median and mean positive attitude score for all students was 59.1% and 59.9%, respectively. As shown in Figure 1, the score was significantly more positive among students with previous experience with online platforms before COVID-19 (64.2%±18.8% versus 50.6%±16.6%, $p=0.003$), irrespective of the pre-professional program track (61.5%±18.6% in pre-Medicine/ pre-Applied Medical Science versus 57.8%±19.9% in pre-Nursing, $p=0.773$).

Table 1. Responses to attitude questions regarding e-learning.

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Well-organized and self-disciplined	19 (20.7%)	23 (25.0%)	26 (28.3%)	9 (9.8%)	15 (16.3%)
Enjoying attending online lectures	11 (12.0%)	18 (19.6%)	23 (25.0%)	19 (20.7%)	21 (22.8%)
Willing to collaborate and interact with my classmates	17 (18.5%)	23 (25.0%)	24 (26.1%)	12 (13.0%)	16 (17.4%)
Willing to submit questions and comments on chat box during online class	19 (20.7%)	26 (28.3%)	23 (25.0%)	15 (16.3%)	9 (9.8%)
Managing my time effectively	16 (17.4%)	15 (16.3%)	31 (33.7%)	8 (8.7%)	22 (23.9%)
Feeling myself sociable and more motivated	13 (14.1%)	5 (5.4%)	33 (35.9%)	12 (13.0%)	29 (31.5%)
Feeling myself more active and energetic	12 (13.0%)	5 (5.4%)	31 (33.7%)	14 (15.2%)	30 (32.6%)
Having upfront planning process is a key to success online course	26 (28.3%)	19 (20.7%)	29 (31.5%)	12 (13.0%)	6 (6.5%)
Having someone who can help me in any computer problems	21 (22.8%)	13 (14.1%)	26 (28.3%)	15 (16.3%)	17 (18.5%)
Having ability to ignore distraction while I'm learning	11 (12.0%)	10 (10.9%)	25 (27.2%)	15 (16.3%)	31 (33.7%)
Having conducive and peaceful learning environment at home	22 (23.9%)	28 (30.4%)	17 (18.5%)	8 (8.7%)	17 (18.5%)



The median attitude score for all students was 59.1%.

Figure 1. Attitude score by health pre-professional program track and the experience with online platforms before COVID19.

Table 2 shows the demographic characteristics and e-learning related experience by attitude towards e-learning. The majority (77.2%) of the students were 20 years old or less. Approximately, 56.5% of the students were pre-Medicine/ pre-Applied Medical Science students and 43.5% were pre-Nursing students. The majority of the students were using handheld devices such as laptop, iPad, or tablet (97.8%), consider handheld devices as an ideal device to access online courses (85.9%), and have access to an average internet speed at home (77.2%). More than two-thirds (68.5%) of the students had an experience with online platforms before COVID-19. Blackboard was the main platform used regularly for e-learning before COVID-19 (55.6%), followed by Zoom (22.2%) and Microsoft teams (7.9%). The platforms were used mainly for live/recorded lectures (84.1%), assignments (81.0%), and quizzes (76.2%). Blackboard was the main online platform used regularly for e-learning after COVID-19 (89.1%), followed by Microsoft teams (6.5%) and Zoom (4.3%). Frequent computer skills in e-learning included using applications (71.7%), using online (70.7%), and browsing and searching the internet (63.0%). Out of all above factors, only previous experience with online platforms before COVID-19 was associated with higher positive attitude ($p=0.043$).

Table 3 shows the advantages and disadvantages of e-learning. The most frequently reported advantages were “assignments can be completed and submitted on the specified deadline” (59.8%), “interaction and communication during classes is encouraged by the instructor” (57.6%), and “feedback for assignments and examinations is provided by the instructor” (55.4%).

Table 2. Responses to attitude questions regarding e-learning

	> median score	≤ median score	Total	p-value
Age group				
≤20 years	36 (78.3%)	35 (76.1%)	71 (77.2%)	0.804
>20 years	10 (21.7%)	11 (23.9%)	21 (22.8%)	
Pre-professional program track				
Pre-medicine/ pre-applied (unified) track	25 (54.3%)	27 (58.7%)	52 (56.5%)	0.674
Pre-nursing track	21 (45.7%)	19 (41.3%)	40 (43.5%)	
Device used to access online courses				
Handheld devices (laptop, iPad, or tablet)	45 (97.8%)	45 (97.8%)	90 (97.8%)	>0.99
Desktop PC	2 (4.3%)	4 (8.7%)	6 (6.5%)	0.677
Smartphone	4 (8.7%)	5 (10.9%)	9 (9.8%)	>0.99
Ideal device to access online courses				
Handheld devices (laptop, iPad, or tablet)	41 (89.1%)	38 (82.6%)	79 (85.9%)	0.369
Desktop PC	5 (10.9%)	8 (17.4%)	13 (14.1%)	0.369
Internet speed access at home				
Excellent	6 (13.0%)	7 (15.2%)	13 (14.1%)	>0.99
Average	36 (78.3%)	35 (76.1%)	71 (77.2%)	
Poor	4 (8.7%)	4 (8.7%)	8 (8.7%)	
Experience with online platforms before COVID19				
No	10 (21.7%)	19 (41.3%)	29 (31.5%)	0.043
Yes	36 (78.3%)	27 (58.7%)	63 (68.5%)	
Online platform used for e-learning before COVID19				
Blackboard	16 (44.4%)	19 (70.4%)	35 (55.6%)	0.190
Zoom	11 (30.6%)	3 (11.1%)	14 (22.2%)	
Microsoft teams	3 (8.3%)	2 (7.4%)	5 (7.9%)	
Unspecified	6 (16.7%)	3 (11.1%)	9 (14.3%)	
Tools used for e-learning before COVID19				
Live / recorded lectures	29 (80.6%)	24 (88.9%)	53 (84.1%)	0.494
Discussion board	13 (36.1%)	15 (55.6%)	28 (44.4%)	0.124
Assignments	29 (80.6%)	22 (81.5%)	51 (81.0%)	0.926
Quizzes	25 (69.4%)	23 (85.2%)	48 (76.2%)	0.147
Emails	26 (72.2%)	18 (66.7%)	44 (69.8%)	0.634
Online platform used regularly for e-learning after COVID19				
Blackboard	40 (87.0%)	42 (91.3%)	82 (89.1%)	0.102
Zoom	4 (8.7%)	0 (0.0%)	4 (4.3%)	
Microsoft teams	2 (4.3%)	4 (8.7%)	6 (6.5%)	
Skills to efficiently utilize computers				
Using applications required for my education (Word, Excel, PowerPoint)	36 (78.3%)	30 (65.2%)	66 (71.7%)	0.165
Using online platforms (Blackboard, Microsoft teams, Zoom)	36 (78.3%)	29 (63.0%)	65 (70.7%)	0.109
Internet Browsing and searching	28 (60.9%)	30 (65.2%)	58 (63.0%)	0.666

Table 3. Advantages and disadvantages of e-learning by groups of positive attitudes towards e-learning.

	> median score	≤ median score	Total	p-value
Advantages of e-learning				
Number of advantage items recognized	5.09±2.99	3.65±2.33	4.37±2.76	0.012
I am able to complete and submit the assignment on the specified deadline	29 (63.0%)	26 (56.5%)	55 (59.8%)	0.524
The instructor encourages interaction and communication during classes	30 (65.2%)	23 (50.0%)	53 (57.6%)	0.140
Instructor provides a feedback for assignments and examinations	26 (56.5%)	25 (54.3%)	51 (55.4%)	0.834
Assignments and quizzes are given in regular basis	30 (65.2%)	20 (43.5%)	50 (54.3%)	0.036
Instructor responds clearly to questions in a timely manner	23 (50.0%)	22 (47.8%)	45 (48.9%)	0.835
Instructor is open to student suggestions	26 (56.5%)	18 (39.1%)	44 (47.8%)	0.095
Instructor provides different instructional materials to support the online lecture	28 (60.9%)	15 (32.6%)	43 (46.7%)	0.007
Able to communicate and interact during the online classes	25 (54.3%)	6 (13.0%)	31 (33.7%)	<0.001
Alternative method of assessments has been used during the course	17 (37.0%)	13 (28.3%)	30 (32.6%)	0.374
Disadvantages of e-learning				
Number of disadvantage items recognized	2.78±2.01	3.87±2.05	3.33±2.09	0.012
Facing difficulty to focus during the online classes	22 (47.8%)	35 (76.1%)	57 (62.0%)	0.005
Struggling with internet connection that make it difficult to stay connected for the whole class	21 (45.7%)	34 (73.9%)	55 (59.8%)	0.006
The assigned time to complete the online examinations is limited	26 (56.5%)	27 (58.7%)	53 (57.6%)	0.833
I prefer on-campus examination	17 (37.0%)	29 (63.0%)	46 (50.0%)	0.012
I faced technical problems during online examination	22 (47.8%)	23 (50.0%)	45 (48.9%)	0.835
The online examinations have a negative impact on grades	8 (17.4%)	17 (37.0%)	25 (27.2%)	0.035
I faced difficulty in submitting the assignments on time	12 (26.1%)	13 (28.3%)	25 (27.2%)	0.815

The most frequently reported disadvantages were “facing difficulty to focus during the online classes in home environment” (62.0%), “struggle with internet connection” (59.8%), and “limited assigned time to complete the online examinations” (57.6%). Compared with those with lower positive attitude, students with higher positive attitude significantly reported more advantages but less disadvantages ($p=0.012$ for each). This was true for three advantages and four disadvantages. For example, students with higher positive attitude were more likely to report the advantage “different instructional materials to support the online lecture is provided by the instructor” (60.9% versus 32.6%, $p=0.007$) but less likely to report the disadvantage “facing difficulty to focus during the online classes” (47.8% versus 76.1%, $p=0.005$).

Table 4 shows the barriers and improvements of e-learning. The most frequently reported barriers were “slow internet connectivity” (44.6%) and “lack of contact with teacher and classmates” (38.0%). The most frequently suggested improvements were “having access to additional help in e-learning courses” (72.8%), “doing interactive activities such as games which make e-learning exciting and engaging” (70.7%), and “solving technical problems” (70.7%). Compared with those with lower positive attitude, students with higher positive attitude significantly reported less barriers but more improvements ($p<0.001$ and $p=0.024$, respectively). This was true for all barriers and two improvements.

Table 4. Barriers and improvements of e-learning by groups of positive attitude towards e-learning.

	> median score	≤ median score	Total	p-value
Barriers to e-learning				
Number of barrier items recognized	0.61±0.83	2.02±1.27	1.32±1.28	<0.001
Slow internet connectivity	13 (28.3%)	28 (60.9%)	41 (44.6%)	0.002
Lack of teacher and classmates contacts	5 (10.9%)	30 (65.2%)	35 (38.0%)	<0.001
Difficult Blackboard instructions	5 (10.9%)	20 (43.5%)	25 (27.2%)	<0.001
Inadequate experience in using technology	5 (10.9%)	15 (32.6%)	20 (21.7%)	0.011
Improvements for e-learning				
Number of improvement items recognized	6.78±3.91	8.15±3.98	7.47±3.99	0.024
Always have access to additional help in e-learning courses	30 (65.2%)	37 (80.4%)	67 (72.8%)	0.101
Do interactive activities such as games which make e-learning exciting and engaging	35 (76.1%)	30 (65.2%)	65 (70.7%)	0.252
Solve technical problems	29 (63.0%)	36 (78.3%)	65 (70.7%)	0.109
Create social media groups where students can communicate, interact, and share documents	32 (69.6%)	31 (67.4%)	63 (68.5%)	0.822
Respond to student email through 48 hours	28 (60.9%)	35 (76.1%)	63 (68.5%)	0.116
Support services such as tutors	28 (60.9%)	34 (73.9%)	62 (67.4%)	0.182
Assign one weekday off in schedule	26 (56.5%)	36 (78.3%)	62 (67.4%)	0.026
Offer online training to develop e-learning Skills	25 (54.3%)	34 (73.9%)	59 (64.1%)	0.050
Give rewards certificates and grades for participation as it encourages and motivates me	26 (56.5%)	30 (65.2%)	56 (60.9%)	0.393
Have more than a 10-minute time break between online classes to be ready for the next class	22 (47.8%)	33 (71.7%)	55 (59.8%)	0.019
Reduce the online lecture duration	21 (45.7%)	26 (56.5%)	47 (51.1%)	0.297
Change classes time from morning to afternoon	10 (21.7%)	13 (28.3%)	23 (25.0%)	0.470

DISCUSSION

The current study showed that the mean positive attitude score towards different aspects of e-learning was approximately 60% among female students in pre-Medicine/ pre-Applied Medical Science, and pre-Nursing programs. Comparing such finding to previous studies is challenging, due to different tools used, different aspects of e-learning covered, different student population, and lack of score calculation. For example, out of four local studies identified [14-17], none of them examined pre-professional students, only one focused on female students, and only two reported an overall score for the attitude. Nevertheless, the current finding is generally similar to or slightly lower than previous studies, both locally and internationally. For example, favorable attitude score were 66.8% in male and female pharmacy students in Riyadh [15], 69.9% in male and female medical students in Jeddah [17], 57% in medical students in Turkey [18], and 58.9% in female nursing students in Nepal [19].

On the other hand, Saudi students who actually practiced e-learning in health professions during the current pandemic reported low willingness to continue exclusive e-learning [20-22]. For example, 56% believed e-learning is probably not suitable for medical students [22] and 54% preferred hybrid learning (face-to-face and online) [21].

The current study showed that previous experience with online platforms before COVID-19 was significantly associated with more favorable attitude towards e-learning. It should be noted that more than two-thirds of the current students were using some kind of e-learning before the COVID-19 pandemic. The current finding is consistent with Technology Acceptance Model where perceived easy use and usefulness (both can be built from previous experience) are positively influencing attitude which in turn is positively influencing the intention to continue use e-learning [12]. Consistent with the current findings, Ibrahim and colleagues found significant associations between positive attitude towards e-learning and good experience with e-learning and higher rating compared with face-to-face learning but not age, gender, and type of study (basic/clinical) [17].

The current finding listed the advantages and disadvantages of e-learning as perceived by students. The reported advantages and disadvantages were generally similar to those reported before [4] and after [22-25] the start of COVID-19 pandemic. Using variable frequencies, they all focused on flexibility, easy access, and feedback as advantages of e-learning while problems in internet or tool, social isolation, difficulty to focus in home environment, and limited clinical access as disadvantages of e-learning. Interestingly, several advantages reported in the current study were directly related to the good instructor behavior such as feedback, communication, and interaction. This is consistent with the positive attitude, professional experience, and training offered to faculty and staff working in health colleges in Saudi Arabia [26]. A unique finding of this study was "positive attitude was significantly associated more advantages and less disadvantages". This may indicate that self-reported advantages and disadvantages are largely subjective. Actually, some items like time and interaction can be reported as advantages or disadvantages based on the student experience/setting [22-25].

The current finding listed the barriers and improvements of e-learning. Technical issues related to internet and IT infrastructure was the main barrier reported in the current study and previous studies [25, 27, 28]. Additionally, our female students were considering lack of contact with teacher and classmates as one of the main barriers of e-learning. More help and interaction during teaching while solving technical problems were the main suggested improvements in the current study and previous studies [17, 24, 29]. Again, students with higher positive attitude significantly reported less barriers but more improvements. This may indicate real spirit to improve, perception of usefulness, and intention to future use of e-learning. The current finding provide policymaker with a list of required changes from the students' perspective to achieve successful and acceptable leaning experience. This is especially important as e-learning is expected to be incorporated in regular education after the COVID-19 pandemic [17, 30].

While the current study is not the first local study to examine the attitude of college students towards e-learning, it the first to examine pre-professional students and to examine the association between attitude and several factors including e-learning related previous experience, advantages, disadvantages, barriers, and suggested improvements. As the study is a single center study that included relatively smaller sample size, the generalizability of the results should be done with caution.

CONCLUSIONS

In conclusion, the current study showed approximately 60% favorable attitude towards e-learning among female students in pre-Medicine/ pre-Applied Medical Science and pre-Nursing programs. Previous experience with online platforms before COVID-19 was significantly associated with more favorable attitude towards e-learning. Students with higher positive attitude significantly reported less disadvantages/barriers but more advantages/improvements. The current finding provide policymaker with a list of required changes from students' perspective to achieve successful and acceptable leaning experience.

SUPPLEMENTARY INFORMATION

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Institutional Review Statement: The study was conducted according to the guidelines of the Declaration of Helsinki.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The datasets generated and analyzed during the current study are available from the corresponding author on reasonable request.

Conflicts of Interest: The authors declare no conflicts of interest.

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