Research article

Online learning for undergraduate health professional education during COVID-19: Jordanian medical students' attitudes and perceptions

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ABSTRACT

Background: The popularity of online learning has increased tremendously in response to the needs of students amid outbreaks of emerging infectious diseases. Few studies have concentrated on the learner's perspectives involved with the transition from traditional to online learning. The aim of this study was to assess students' attitudes towards online learning as well as the perceived preparedness and barriers.
Methods: A descriptive, cross-sectional, correlational web-based survey design was used to recruit eligible participants from five Jordanian government universities. A Facebook-based campaign and snowball sampling approach were used to recruit potential survey participants.
Results: The results show that 1,210 medical college students decided to take part in this online survey. Students' attitudes and perceived preparedness for online learning were moderate, while perceived barriers were high. This study revealed a connection between students' attitudes toward online learning and their gender, major, living area, college level, and prior experience. The main obstacles to online learning were an unstable Internet connection, a lack of motivation, and a lack of instructions.
Conclusion: The majority of students had mixed feelings about online learning and were largely supportive of conventional classroom learning. Students were pessimistic about their chances of learning professional skills and core competencies online. More research is required to determine whether students are ready and able to make greater use of online education in order to access high-quality learning opportunities.

1. Introduction

The current 2019 novel coronavirus disease (COVID-19) pandemic has challenged the education system across the world. It urged countries to shift to an entire distance mode of learning [1]. Because of the widespread availability of Internet access, online learning is often referred to as web-based learning [2, 3], resulting in a transition from on-campus to online learning. During the current COVID-19 pandemic, however, teachers and students were unexpectedly tasked with teaching and learning courses that had not been designed for online delivery [1]. As a result, university professors and students began exploring and accessing academic cyberspace, allowing them to interact with learning materials [4]. According to many researches, online and blended educational approaches are equivalent to conventional classroom models [5]. Other scholars, on the other hand, indicated that students had negative attitudes toward online learning, implying that they did not prefer it over traditional classroom learning [6]. According to Smart and Cappel (2006), the most common factor affecting satisfaction with online learning is the time taken to complete online modules designed for undergraduate courses. In the online elective courses, however, they found that overall satisfaction was high [7]. Furthermore, research has shown that web-based courses have the ability to develop learning environments in which students actively interact with their content in order to gain new information [8, 9].

While the COVID-19 pandemic is an unusual impetus for encouraging online learning, it is still uncertain if students believe they are ready and

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willing to use online education to access high-quality learning, and whether their attitudes, expectations, behaviors, and, as a result, the general themes of online education will change [10]. In social science, the concept of "attitude" has been thoroughly studied. A collection of emotions, feelings, values, and thoughts are expressed by the affective and cognitive components of attitude, while the behavioral component is represented by the outcome of previous actions or experiences toward a person, entity, or event [11, 12, 13].

Infection control and physical isolation measures are crucial for avoiding the spread of COVID-19 and aiding in the containment of the pandemic catastrophe. Jordan has implemented a precautionary strategy of physical distancing in response to the spread of COVID-19 infections and, in particular, the exponential rise in mortality [14]. Following this regulation, academic institutions were obligated to make necessary and timely alterations to continue offering education and preserving student academic growth. According to Anderson (2008) and Bogdanović. (2012), distance learning is a broad concept that refers to a regulated instructional technique, in which students are provided opportunities to communicate with their lecturers or facilitators when they are in different times and spaces [15, 16]. The learner is separated from the instructor by technology (e.g., a computer) and can communicate in a variety of ways (e.g., sent materials, TV, Internet). Bogdanović. (2012) asserted that the importance of distance education is increasing and is irreversible. When teaching and learning activities are obtained primarily via the Internet, this is referred to as online learning, or eLearning [5, 17, 18]. Online learning is founded on the principle of utilizing information technology to enhance educational quality. Online learning is currently widely employed in undergraduate education, sometimes in conjunction with more traditional ways of learning. While online learning provides enhanced convenience and accessibility to information regardless of location or time, it also has limitations, including challenges with Internet access, poor Internet connection quality, and respondents limited digital abilities [19, 20, 21, 22].

Despite the lack of a specific theoretical model to direct research on online learning, the TAM theory explains adoption and use of emerging technologies such as computers and the Internet to provide course material, facilitate collaboration, and perform assessments [23]. To emphasize information gathering and problem-solving skills, teachers act as more interactive mediators to promote knowledge gathering and problem-solving skills, while students can work on their material at different times and in different places while being able to easily record their ideas and opinions. According to the Technology Acceptance Model (TAM), two factors influence users' acceptance of a computer system, which is a fundamental component of customer learning. First, there is perceived usefulness, which is defined by Fred Davis as the perceived benefit of employing new technology in terms of enhanced productivity. Second, perceived ease-of-use, which reflects people's beliefs about the ease of using new technology. If the technology is simple to use, it will be less difficult to overcome the difficulties in the future. No one will be interested in using new systems if they are difficult to operate. Depending on the outcome of their interaction with technology, these factors will influence people's attitudes toward technology as well as their behavioral intentions, which will ultimately dictate how and when individuals will utilize new technology [23].

Perception is the process of gaining awareness of something, making mental models, or actively processing sensory information; it's how people notice things through their senses, which influences their decisions [24]. According to Walker and Avant (2005), many factors must be present for perception to occur, including sensory awareness, personal experiences, and understanding that can lead to a response [25]. Despite the fact that many studies found students to have positive attitudes toward online learning [26, 27, 28, 29], several studies also revealed that students face difficulties [30, 31]. These obstacles can hinder students' participation in online learning and contribute to negative attitudes [32, 33].

Additionally, Abbasi et al. (2020) assessed 382 students' attitudes toward online learning during COVID-19, showing that 77% of students had negative attitudes toward online learning, implying that students did not prefer online learning over traditional face-to-face classroom learning [6]. Teo (2009), on the other hand, conducted a study in three Thai public universities to examine students' preparedness for online education and discovered that participants' preparedness for online education was above average, and their attitudes toward technology-based distance education were significantly affected by their goal to use technology positively.

Although globalization and the media may have diminished any substantial cross-cultural differences, Al Lily et al. (2020) constructed a theoretical framework for online education that addresses the ramifications of implementing distance education in the context of coronavirus within Arab culture [1]. An examination of social media posts, online classes, and interviews revealed a variety of implications. Unreadiness and incompetence can undermine education, both pedagogically and psychologically. Furthermore, staying at home can lead to concerns such as anxiety, despair, and domestic violence, which makes it difficult for students and teachers to study and interact. However, positive experiences have been found to be the most powerful elements influencing users' intentions and engagement with online learning [34, 35].

This study aimed to examine Jordanian medical college students' attitudes toward and perceptions of online learning. It also looked into the effect of selected variables on their attitudes toward online learning. In particular, the study attempted to answer the following research questions:

1. What are the Jordanian medical college students' attitudes toward online learning?
2. What are the Jordanian medical college students' perceptions of their level of preparedness for online learning?
3. What are the Jordanian medical college students' perceptions of the levels of barriers that impede the online learning process?
4. What is the effect of the selected sociodemographic variables (i.e., gender, age, student major, living area, college level, prior experience) on Jordanian medical college students' attitudes toward online learning?
5. To what degree does each of the selected variables of perceived preparedness, perceived barriers, and sociodemographic predict Jordanian medical college students' attitudes toward online learning?

2. Methods

2.1. Study design

A descriptive, cross-sectional, correlational web-based survey design was used to fit the research problems being examined. A web-based survey was used to recruit participants from five Jordanian government universities. A Facebook-based campaign was used to recruit potential survey participants. Since conventional survey methods were not feasible due to COVID-19 constraints, lockdowns, and social distancing, online surveys have become a significant tool for researchers [36].

2.2. Sample

The sample was selected using the non-probability snowball method, and it included 1,210 medical college students from Jordan University of Science and Technology, University of Jordan, Yarmouk University, Mu'tah University, and The Hashemite University majoring in Medicine, Pharmacy, and a Doctor of Pharmacy during the second semester of the academic year 2020/2021. With the rise of online surveys during the COVID-19 pandemic, reaching out to potential participants has become more challenging. Participants changing or using multiple e-mail addresses, mislabeling survey requests as "junk email," and technical issues with Web-based survey platforms, all have the potential to impede

research efforts to access the sampling frame [37, 38]. As a result, the snowball sampling technique was utilized in this study, in which respondents were asked in the introductory letter to assist the researchers by forwarding the survey link to other prospective participants for inclusion in the study. The G*Power software with a confidence interval of +/-3 and a confidence level of 95% were used to calculate the sample size. The sample size was determined to consist of 1,100 participants. The statistical package IBM SPSS® version 24.0 was utilized to analyze the data. The current study received ethical approval from the Institutional Review Board (IRB) at Jordan University of Science and Technology and informed consent was obtained from all participants.

2.3. Instruments

The survey items were developed based on extensive literature review and previously validated scales [39, 40, 41, 42, 43]; besides, some items were developed based on qualitative information collected during the pilot testing stage. Participants' attitudes and perceptions were evaluated as a collection of variables that form the basis of TAM and the theory of online learning [16, 23]. The survey used in this study included four sections; Sociodemographic characteristics scale (6 items), attitudes scale (16 items), and perceptions scale (4 items for perceived preparedness and 9 items for perceived barriers). To better understand medical college students' attitudes and preparedness, the respondents' college degrees were operationalized as Medicine, BPharm, and PharmD. Participants were also assessed if they resided in an urban or rural area. Finally, students were asked if they had any prior experience with online learning prior to the COVID-19 outbreak. Number of courses was operationalized as 1–3 online courses per semester, 4–5 online courses, and more than 5 online courses. Since students' attitudes, perceived preparedness, and perceived barriers toward online learning are limited and have yet to be assessed due to the abrupt shift away from the classroom setting, their responses were recorded using a 3-point Likert scale with response options: 1 = Disagree, 2 = Neutral, and 3 = Agree [44]. Since it is simple to read and complete, respondents were less likely to lose motivation to continue rating the items.

Negative statements were reverse coded so that larger values for all the items had the same direction, indicating a more positive attitude and more perceived barriers. A total summative score was calculated to measure attitudes, perceived preparedness, and perceived barriers for each respondent in this study. The student major, the number of online courses, and average daily time spent on the Internet were treated in the regression equation as dummy variables. A panel of eight experts in educational technology and socio-behavioral sciences were invited to evaluate the items to assess the face and content validity of the newly developed scales. The reliability of the scales was determined using Cronbach's alphas. The alpha for the 16-item attitude scale was 0.82, indicating that the items would form a scale of high internal consistency. The Cronbach's alphas for the 4-item perceived preparedness scale and the 9-item perceived barrier scale were 0.67 and 0.78, respectively, indicating acceptable internal consistency.

To analyze and rank the results of the 3-point Likert scale, the minimum and the maximum length is calculated by $(3 - 1 = 2)$ then divided by 3 as it is the greatest value of the scale $(2 \div 3 = 0.66)$ [45], as follows:

- (2.34–3.00) High score on the Likert scale/a high score on attitude/perception indicate a respondent's high level of attitude/perception
- (1.67–2.33) Medium score on the Likert scale/a moderate score on attitude/perception indicate a respondent's moderate level of attitude/perception
- (1.00–1.66) Low score on the Likert scale/a low score on attitude/perception indicate a respondent's low level of attitude/perception

2.4. Recruitment settings and procedures

Participants were recruited from both genders based on their age (>18 years) and university type (state universities such as Jordan University of Science and Technology, University of Jordan, Yarmouk University, Mu'tah University, and The Hashemite University). The respondents were then sorted into groups based on their level of academic achievement (i.e., first year, second year, up to the sixth year). A survey link to a Google Form containing the study questionnaire was distributed on medical students' Facebook pages from April 1st to May 1st, 2020. A specific question about students' major field of study and the name of the university they attended was used to ensure the proper selection of medical students. Before proceeding to the questionnaire, participants were asked for their consent to participate in the study by clicking on the survey link and signing the online consent form. To ensure that participants would not skip any question while using Google Forms, the validation option "Required" was applied to all questions. Participants were informed that their participation was completely voluntary and anonymous and that their responses would be kept confidential. The entire survey of 80 participants who always marked their answers as neutral or chose either extremely positive or extremely negative responses for every question were discarded. In addition, 15 participants were excluded from the study because they were from universities that were not included in the study, leaving a total of 1210 valid survey responses included in the study analysis.

2.5. Data analysis procedures

Descriptive statistics were used to describe the demographics of the research participants and the total attribute scores. Means, ranges, and standard deviations were used for continuous variables, while percentages and frequencies were used for grouped measures. Inferential statistics (i.e., independent samples t test, ANOVA, and regression) were performed to test the relationships between variables of interest and draw conclusions. Prior to drawing statistical inferences, the assumptions (e.g., normality, multicollinearity, autocorrelation, and homoscedasticity) were fulfilled. In order to address the current study questions, descriptive analysis, including the frequency and percentage, was performed for questions 1, 2, and 3. In answering question 4, the t test and one-way ANOVA were used, and in answering question 5, multiple linear regression was performed.

3. Results

3.1. Sociodemographic statistics

The valid returned surveys included 1210 medical college students enrolled in at least one online for-credit course at one of Jordan's five government universities. The majority of participants were female students (80.5%). Almost two-thirds of the participants were 18–21 years old ($M = 20.7$, $SD = 1.94$). More than half (59.3%) of the students were pursuing a bachelor's degree in Pharmacy or Doctor of Pharmacy. The sociodemographic characteristics of the participants are illustrated in Table 1.

3.2. Students' attitudes towards online learning

The level of attitudes toward online learning among medical students was moderate ($M = 1.78$, $SD = 0.39$). Many students agreed that "I prefer face-to-face (in class) contact with my instructors and colleagues for more efficient learning" (71.5%, $n = 865$), others agreed on the following statements "I prefer the on-campus approach since it allows me to better communicate with my professors and colleagues" (66.8%, $n = 808$) and "online learning leads to the increased academic burden on students" (62.6%, $n = 757$). Only a few students expressed positive attitudes with the following items "online learning helps in brainstorming in a better way in contrast to on-campus approach (14.1%, $n = 171$) and that "I can get enrolled in all of my online courses without facing any obstacles" (15.1%, $n = 183$), (see Tables 2 and 5).

Table 1. Frequent distribution of sociodemographic characteristics of participants (N = 1,210).

Variable	n (%)
Gender	
Male	236 (19.5)
Female	974 (80.5)
Age group	
18-19	325 (26.9)
20-21	504 (41.7)
22-23	324 (26.8)
Above 23	57 (4.7)
College Level	
Freshmen (first year)	267 (22.1)
Sophomore (second year)	229 (18.9)
Junior (third year)	306 (25.3)
Senior (fourth year)	150 (12.4)
Senior (fifth year)	211 (17.4)
Senior (sixth year)	47 (3.9)
The College Degree (Major Field of Study)	
Medicine	492 (40.7)
Bachelor of Pharmacy (BPharm)	199 (16.4)
PharmD	519 (42.9)
Area of living	
Urban	783 (64.7)
Rural	427 (35.3)
Prior Experience with Online education	
Yes	456 (37.7)
No	754 (62.3)

3.3. Students' perceived preparedness for online learning

The level of the perceived preparedness for online learning found to be moderate ($M = 1.97$, $SD = 0.52$). Some students agreed that "I am well-prepared for online learning" ($n = 241$, 19.9%), while others agreed that "I believe that I have satisfactory programming skills for coping with online course/assignments" ($n = 419$, 34.6 %). As shown in Tables 3 and 5, more students reported that their university supported online education after the emergence of the novel coronavirus disease compared to before the epidemic.

3.4. Students' perceived barriers to online learning

The level of the perceived barrier for online learning found to be high ($M = 2.57$, $SD = 0.44$). Students mainly agree on the main barriers for online learning that included "Unstable/Slow Internet connection" ($n = 998$, 82.5%), "Lack of motivation" ($n = 909$, 75.1%) and "Lack of instructions" ($n = 899$, 74.3%). More than half of the students ($n = 694$, 57.4%) said they had technical problems with online learning tools, and 62.7% agreed that online learning was a time-consuming process, (see Tables 4 and 5).

3.5. Predictors of attitudes toward online learning

The independent samples t test and one-way ANOVA were conducted to investigate the association between students' attitudes toward online learning and sociodemographic characteristics. The t test results showed a significant effect of gender (t (1,208) = 3.28, $p = 0.001$), living area (t (1,208) = 2.34, $p = 0.019$), and prior experience (t (1,208) = 6.20, $p = 0.000$) on the overall attitude score. One-way ANOVA results also showed a significant effect of students' major (F (2, 1207) = 8.8, $p = 0.001$), and college-level (F (5, 1204) = 7.1, $p = 0.000$) on the overall attitude score (see Table 6a). After performing the ANOVA tests, post-hoc

Tukey tests were executed to determine which groups differed significantly from others (see Table 6b).

Multiple linear regression was conducted to predict the levels of students' attitudes toward online learning based on significant variables found in the One-way ANOVA tests as well as several variables of interest (i.e., number of current online courses, number of hours you spent on the Internet, perceived barriers). The regression model revealed that the total score of students' attitudes towards online learning was significantly predicted by gender ($\beta = 0.061$, $p < 0.05$), student major ($\beta = -0.058$ and -0.077, $p < 0.05$), college-level ($\beta = -0.092$, $p < 0.05$), prior experience ($\beta = 0.056$, $p < 0.05$), preparedness ($\beta = 0.528$, $p < 0.05$), number of current online courses ($\beta = -0.070$, $p < 0.05$), and perceived barriers ($\beta = -0.365$, $p < 0.05$). The other factors included in the equation were not found to be significant in affecting the attitudes toward online learning, results are illustrated in Tables 7a and 7b.

4. Discussion

4.1. Students' attitudes towards online education

Because of the dramatic rise in the number of local cases, colleges and schools have been forced to partly suspend face-to-face classes in favor of an online learning approach. According to the results of this study, medical college students' attitudes toward online learning were medium. This may be explained by universities providing students with technological resources for online learning, easy access to the Internet to participate in online learning, enhanced English language skills as a result of online learning, easy collaboration with other students, and timely responses from professors. Many participants in this study had negative attitudes toward online learning and its potential role in achieving their future plans, having a high-quality learning experience, and enhancing communications capacity, similar findings reported by Coman et al (2020) [46].

Approximately 62% of students agreed that online learning could add to their academic workload and impede their brainstorming efforts. These results could be explained by a lack of exposure to online learning and a struggle to cope with online education resources, which could increase academic stress and, as a result, make learning time-consuming and less enjoyable. In addition, students' inclination to collect a variety of ideas and express their own viewpoints can reflect their attitudes toward the nature of classroom interactions.

4.2. Perceived preparedness for online learning

The results of this study indicated that students' perceptions of their preparedness for online learning were moderate, which could be clarified by having adequate computer skills for coping with online courses, universities' support for online education prior to the emergence of the novel coronavirus disease, and students' well-preparedness for online learning. This study found that only 19.9% of students were well-prepared for online learning, suggesting that online learning was not perceived as traditional education because it was introduced quickly and unreadily, similar results were reported by Al Lily et al. (2020) [1]. Although Coman et al. (2020) found that most of students had prior experience with an eLearning platform [46], this study found that only 37.7% of students had prior experience with online learning. This may be due to the fact that certain elective courses were previously eligible for online enrollment prior to the outbreak of COVID-19 in Jordan, but not all students were enrolled in these courses. In line with previous studies [15, 17], this study emphasized the importance of preparing students to immediately begin online learning and to be able to handle a wide range of online learning challenges from the beginning. Universities should also provide technical and instructional support while these preparations are taking place.

Table 2. Frequent distribution of students' attitudes toward online learning.

Statements	Agree	Neutral	Disagree
	n (%)		
I prefer face-to-face (in class) contact with my instructors and colleagues for more efficient learning	865 (71.5)	199 (16.4)	146 (12.1)
I prefer the on-campus approach since it allows me to better communicate with my professors and colleagues	808 (66.8)	204 (16.9)	198 (16.4)
Online learning leads to increased academic burdens on students	757 (62.6)	220 (18.2)	233 (19.3)
My university provides technical support for online learning	313 (25.9)	469 (38.8)	428 (35.4)
I am able easily access the Internet to get enrolled in online education	383 (31.7)	267 (22.1)	560 (46.3)
My English language can be improved more in online courses rather than in the classroom	242 (20)	391 (32.3)	577 (47.7)
I can easily work within a group in online courses	258 (21.3)	352 (29.1)	600 (49.6)
In general, my university provides a high-quality online learning experience	232 (19.2)	412 (34)	566 (46.8)
I can ask my professors questions and receive a quick response in online courses	211 (17.4)	413 (34.1)	586 (48.4)
Online learning helps students to organize their time efficiently and to their HomeWorks and assignments	272 (22.5)	224 (18.5)	714 (59)
Online learning helps me to achieve my future plans	206 (17)	322 (26.6)	682 (56.4)
I feel comfortable to actively communicate with my instructors and colleagues online	234 (19.3)	255 (21.1)	721 (59.6)
Online learning helps in brainstorming in a better way in contrast to on-campus approach	171 (14.1)	287 (23.7)	752 (62.1)
I feel that taking my courses online helps me to study them and master them better	200 (16.5)	218 (18)	792 (65.5)
I would prefer Online learning to continue being used and to become the new norm	210 (17.4)	179 (14.8)	821 (67.9)
I can get enrolled in all of my online courses without facing any obstacles	183 (15.1)	216 (17.9)	811 (67)

4.3. Perceived barriers to online learning

Participating students reported numerous technological and self-motivation challenges for their involvement in online education. The results of this study showed that students have a high perception of the potential barriers to online education, which could be attributed to an unstable Internet connection, a lack of motivation, a lack of instructions, a home environment that is not prepared for online learning, Internet access fees, online learning being boring, and the time commitment of online learning. Similar findings were reported in previous studies [19, 30, 31, 47]. Sukendro et al. (2020) suggested that facilitating conditions such as a suitable environment and quick access to the Internet would encourage students to engage in e-learning during the pandemic [48]. In accordance with Toe (2009), the majority of participants in this study were concerned about potential barriers to online learning (57.4%) as well as the sophistication of educational resources (84.9%) [27].

These results contradicted previous research from Saudi Arabian universities, which found that students successfully used educational technology resources in learning [26, 31]. Furthermore, according to Alshwaier et al. (2012), students were pleased with the various services offered by Google educational applications [49]. According to Lis and Paula (2015), 89% of students used educational technology effectively in learning [29]. The disparity may be explained by the fact that the previous studies were performed under normal circumstances rather than

during a disease outbreak. As a result, students' expectations and attitudes can vary depending on the surrounding situation.

4.4. Determinants of online education attitudes

This research found a significant association between gender, major, living area, college level, and prior experience, and students' attitudes toward online learning. The fact that male students had more positive attitudes toward online learning could be explained by their previous experience with online tools. Furthermore, the majority of male students lived in urban areas, which may explain their convenient access to online educational services and tools. Previous research has found that men and women have similar attitudes toward online learning [50, 51]. Pharmacy students expressed higher attitudes towards online learning compared to either PharmD or Medical students, this may indicate that Pharmacy students were more comfortable with the attainable levels of knowledge and skills designed in their educational program. In a survey of Polish students, Bczek et al. (2021) found that the majority of medical students considered a lack of interactions with patients as a major disadvantage of online learning [22]. Medical students may prefer face-to-face interactions to obtain the required knowledge and skills to

Table 3. Perceptions of students' preparedness for online learning.

	Agree	Neutral	Disagree
	n (%)		
My university supported online education after the emerging of the novel coronavirus disease	755 (62.4)	292 (24.1)	163 (13.5)
I feel that I have satisfactory computer skills for dealing with online course/assignments	419 (34.6)	360 (29.8)	431 (35.6)
My university supported online education before the emerging of the novel coronavirus disease	379 (31.3)	353 (29.2)	478 (39.5)
I am well-prepared for online learning	241 (19.9)	321 (26.5)	648 (53.6)

Table 4. Students' perceptions of online learning barriers.

Barriers	Agree	Neutral	Disagree
	n (%)		
Unstable/Slow Internet connection	998 (82.5)	148 (12.2)	64 (5.3)
Lack of motivation	909 (75.1)	185 (15.3)	116 (9.6)
Lack of instructions	899 (74.3)	208 (17.2)	103 (8.5)
The home environment is not prepared for online learning	863 (71.3)	220 (18.2)	127 (10.5)
The Internet connection fees	822 (67.9)	222 (18.3)	166 (13.7)
Online learning is boring	766 (63.3)	229 (18.9)	215 (17.8)
Online learning is highly time-consuming	759 (62.7)	245 (20.2)	206 (17)
The cost of the equipment needed for online education	738 (61)	268 (22.1)	204 (16.9)
Technical difficulty in dealing with online learning tools	694 (57.4)	301 (24.9)	215 (17.8)

Table 5. Means and standard deviations on respondents' attitudes and perceptions toward online learning.

Statements	Means	Standard Deviations	Rank
I prefer face-to-face (in class) contact with my instructors and colleagues for more efficient learning	2.59	0.69	high
I prefer the on-campus approach since it allows me to better communicate with my professors and colleagues	2.50	0.76	high
Online learning leads to increased academic burdens on students	2.43	0.79	high
My university provides technical support for online learning	1.91	0.78	moderate
I am able easily access the Internet to get enrolled in online education	1.85	0.87	moderate
My English language can be improved more in online courses rather than in the classroom	1.72	0.78	moderate
I can easily work within a group in online courses	1.72	0.79	moderate
In general, my university provides a high-quality online learning experience	1.72	0.76	moderate
I can ask my professors questions and receive a quick response in online courses	1.69	0.75	moderate
Online learning helps students to organize their time efficiently and to their HomeWorks and assignments	1.63	0.83	low
Online learning helps me to achieve my future plans	1.61	0.76	low
I feel comfortable to actively communicate with my instructors and colleagues online	1.60	0.79	low
Online learning helps in brainstorming in a better way in contrast to on-campus approach	1.52	0.73	low
I feel that taking my courses online helps me to study them and master them better	1.51	0.76	low
I would prefer Online learning to continue being used and to become the new norm	1.50	0.77	low
I can get enrolled in all of my online courses without facing any obstacles	1.48	0.74	low
My university supported online education after the emerging of the novel coronavirus disease	2.49	0.72	high
I feel that I have satisfactory computer skills for dealing with online course/assignments	1.99	0.84	moderate
My university supported online education before the emerging of the novel coronavirus disease	1.92	0.84	moderate
I am well-prepared for online learning	1.66	0.79	moderate
Unstable/Slow Internet connection	2.77	0.53	high
Lack of motivation	2.66	0.65	high
Lack of instructions	2.66	0.63	high
The home environment is not prepared for online learning	2.61	0.67	high
The Internet connection fees	2.54	0.72	high
Online learning is boring	2.46	0.78	high
Online learning is highly time-consuming	2.46	0.77	high
The cost of the equipment needed for online education	2.44	0.76	high
Technical difficulty in dealing with online learning tools	2.40	0.77	high

fulfill their degree requirements and career expectations, according to a previous study [52], The results of this study revealed that students in urban areas scored higher on the attitude scale than students in rural areas, implying that students in urban areas were less likely to experience Internet connectivity issues. They may also use modern electronic devices with Internet access, which may have a positive impact on their overall attitudes. Students who were in the early stages of their program formed positive attitudes toward online learning, suggesting their satisfaction and desire to participate in online courses, which supported the findings reported by Stanković et al. (2015) [52]. Similar to the findings of previous studies [34, 35], students who had previous experience with online learning had higher attitude scores than those who had no prior experience. Prior online learning experience and user satisfaction may aid in lowering uncertainty and increasing students' intention to use e-learning [35].

According to the TAM theory, students' use intention and behavior toward online learning can be predicted by their attitudes formed by perceived usefulness and ease of use [23], which may explain why students who demonstrated readiness to participate in online learning had more favorable attitudes toward it than their counterparts. The findings also revealed that taking more online courses can cause students to become frustrated and anxious as they become overburdened with their course load, negatively impacting their attitudes. Furthermore, more perceived barriers to joining online learning could obstruct students' interactive participation in online learning and contribute to negative attitudes. Efficient communication, interaction, and motivation were also found to be contributing factors to students' active participation in the online learning process [32, 33].

4.5. Study implications and suggestions

Since students were suddenly and unreadily advised to shift to an online learning mode because of the COVID-19 pandemic, this might impact students' experience of autonomy and their ability to make informed decisions about their preferable educational methods. Students in this study highlighted a moral aspect in the online learning process, namely, the inability to access the Internet, which is the key element for the continuity and success of online education. Policymakers and stakeholders need to pay attention to other ethical concerns such as injustice in opportunities among students, especially that not all students have the competency and financial ability to ensure their access to online learning programs. Participants of this study were concerned about the lack of instructor-student interactions, lack of technical support, unpreparedness to use the available online tools, and barriers to online learning, which might be ethically problematic. If students' autonomy is compromised in the name of beneficence and nonmaleficence, the rationale of adopting online learning should be justified in terms of learning outcomes as well as students' and instructors' expectations. Otherwise, constraining autonomy might limit students' competency and critical thinking skills utilized in practice [53]. Moreover, this study did not provide clear evidence to support the role of the Internet and online learning in social inclusion, however, a small percentage of participants felt comfortable sharing their thoughts while taking classes online. However, further assessments are needed to ensure that the advantages of online education will also include learners who are socially and economically disadvantaged. The majority of students in this study recorded their preferences of the traditional form of education in an attempt to efficiently

Table 6a. One-way analysis of variance summary table comparing selected sociodemographic variables and attitudes toward online learning.

Source of Variable	Attitudes						
		Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Gender	Between Groups	572.4	1	572.4	10.8	0.001	0.009
	Within Groups	64125.9	1208	53.1			
	Total	64698.3	1209				
Student Major	Between Groups	930.4	2	465.2	8.8	0.001	0.014
	Within Groups	63767.9	1207	465.2			
	Total	64698.3	1209				
Living Area	Between Groups	293.5	1	293.4	5.5	0.019	0.005
	Within Groups	64404.8	1208	53.3			
	Total	64698.3	1209				
College Level	Between Groups	1829.3	5	365.8	7.1	0.000	0.028
	Within Groups	62869.0	1204	52.2			
	Total	64698.3	1209				
Prior Experience	Between Groups	1996.6	1	1996.5	38.4	0.00	0.31
	Within Groups	62701.7	1208	51.9			
	Total	64698.3	1209				

The statistical significance level is set at p value < 0.05.

Table 6b. Results of post-hoc pairwise comparison of ANOVA model results pertaining to students' attitudes towards online learning.

Variables	Mean Difference	Standard Error	Sig.
The College Degree (Major Field of Study)			
Medicine vs. BPharm	-2.525	0.610	0.000
Medicine vs. PharmD	-1.028	0.457	0.064
PharmD vs. BPharm	-1.496	0.606	0.036
College Level			
First year vs. Fifth year	3.573	0.665	0.000
First year vs. Sixth year	2.946	0.689	0.000
Second year vs. Fifth year	2.065	0.737	0.058
Third year vs. Fifth year	2.056	0.605	0.009

The Significant level of the mean difference is at $p < 0.05$.

communicate with their instructors and classmates, which shed light on the urgent need for managing confidentiality and data protection in the online environment [54]. The TAM Theory should be widely applied to better meet students' needs when utilizing e-learning services and to overcome technical and physical impediments. According to the TAM framework, stakeholders should prepare for online learning by enhancing necessary skills and competencies and transforming student input into actions in order to provide a high-value e-learning experience [23, 48].

Table 7b. Simultaneous multiple regression analysis summary for perceived preparedness, perceived barriers, gender, student major, living area, college level, and prior experience predicting attitude towards online learning (N = 1,210).

Variables	Unstandardized Coefficients		β	t	Sig.
	B	Std. Error			
Constant	1.75	0.09	0.01	18.96	0.00
Gender	0.05	0.02	0.04	1.99	0.04
Student Major (Ref. BPharm) Major (MD)	-0.09	0.03	-0.09	-3.00	0.00
Major (PharmD)	-0.06	0.03	-0.06	-1.99	0.04
College Level	0.02	0.01	0.07	3.35	0.00
Living Area	0.01	0.02	0.01	-0.44	0.65
Prior Experience	0.04	0.02	0.04	2.05	0.04
Perceived Preparedness	0.42	0.02	0.45	19.53	0.00
Perceived Barriers	-0.38	0.02	-0.36	-15.59	0.00
Number of Online Courses (Ref. 1–3 courses) 4–5 Online Courses	-0.02	0.03	-0.02	-0.70	0.47
>5 Online Course	-0.07	0.02	-0.07	-2.70	0.00

Dependent Variable: Attitudes. Ref.: reference group; standardized regression coefficients (β); BPharm: A Bachelor of Pharmacy; MD: Medicine; PharmD: Doctor of Pharmacy.

Table 7a. Means, standard deviations, and intercorrelations for attitude towards online learning and predictor variables (N = 1210)."

Variables	M	SD	Attitude	Gender	Major (MD)	Major (PharmD)	College Level	Living Area	Prior Experience	Perceived Preparedness	Perceived Barriers	4-5 Courses	>5 Courses
Attitude	1.61	0.47	1	.15*	-.1*	.01	.14*	0.05	-.11*	.59*	-.56*	-.02	-.07*
Gender	0.2	0.4		1	.01	-.09*	-.09*	-0.04	.01	.07	-.02*	.03	-.09*
Major (MD)	0.4	0.49			1	-0.72*	-.14*	.06*	.01	-.01	.12*	.17*	-.12*
Major (PharmD)	0.43	0.49				1	.23*	-0.03	-.04	.04	.01	-.1*	.24*
College Level	2.96	1.49					1	.07*	-.16*	.18*	-.05*	-.16*	.24*
Living Area	0.64	0.47						1	-.09*	.11*	-.05*	-.04*	.08*
Prior Experience	0.63	0.48							1	-.25	.10	.03	-.07*
Perceived Preparedness	2.01	0.51								1	-.38*	-.05*	.04
Perceived Barriers	2.55	0.45									1	.03	.11*
4-5 Courses	0.27	0.44										1	-.63*

* P-value < 0.05, M: Means; SD: Standard Deviations.

5. Limitations

Since this is a purely online survey and the sample mainly consisted of students who use social networking sites, it is already subject to selection bias. This might neglect the participation of other groups of students who are not active social media users or have limited Internet access. Furthermore, the survey had a study population consisting of Medical, PharmD, and BPharmacy students only. Thus, the variation in responses among students from different majors was not obtained. Additionally, the authors cited many studies on online learning conducted prior to the COVID-19 pandemic, which might have affected the interpretation of some findings.

6. Conclusion

Online education seems to be an appropriate answer to many educational institutions during COVID-19 and few studies have been carried in developing nations to assess students' attitudes and their experience with different online tools to improve their interactive learning experiences. An extensive review of the literature reveals a paucity of studies regarding students' attitudes toward online learning. In this current work, the theoretical framework, TAM, served as a valuable and highly reliable model. Lack of preparedness and prior experience regarding online learning were prevalent among students. The majority of students had moderate attitudes towards online learning and were generally supportive of traditional classroom learning. Students were not optimistic about gaining professional skills and core competencies online, their concerns about the unstable or slow Internet connection, lack of instruction, lack of motivation, and home environment were seen as potential barriers to be successfully engaged in online learning. Further research is needed to assess whether learners are ready and willing to make greater use of online education to obtain high-quality learning opportunities, which can totally change educators' and students' attitudes and impressions, and subsequently the general themes of online education.

Declarations

Author contribution statement

Suhaib Muflih: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Sawsan Abuhammad: Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Sayer Al-Azzam, Karem H. Alzoubi, Reema Karasneh: Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Mohammad Muflih: Conceived and designed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

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Data will be made available on request.

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

References

[1] A.E. Al Lily, A.F. Ismail, F.M. Abunasser, R.H.A. Alqahtani, Distance education as a response to pandemics: coronavirus and Arab culture, Technol. Soc. 63 (2020) 101317.

[2] B.C. Lee, J.O. Yoon, I. Lee, Learners' acceptance of e-learning in South Korea: theories and results, Comput. Educ. 53 (4) (2009) 1320–1329.

[3] J. Wasim, S.K. Sharma, I.A. Khan, J. Siddiqui, Web based learning, Int. J. Comput. Sci. Inf. Technol. 5 (1) (2014) 446–449. Available at, http://ijcsit.com/docs/Volume%205/vol5issue01/ijcsit2014050194.pdf.

[4] A.T. Bates, Building an Effective Learning Environment. Teaching in a Digital Age, second ed., 2019. Available at: https://pressbooks.bccampus.ca/teachinginadigitalagev2/.

[5] A. Ali, I. Ahmad, Key factors for determining student satisfaction in distance learning courses: a study of Allama Iqbal Open University, Contemp. Educ. Technol. 2 (2) (2011) 118–134.

[6] S. Abbasi, T. Ayoob, A. Malik, S.I. Memon, Perceptions of students regarding E-learning during Covid-19 at a private medical college, Pakistan J. Med. Sci. 36 (COVID19-S4) (2020) S57.

[7] K.L. Smart, J.J. Cappel, Students' perceptions of online learning: a comparative study, J. Inf. Technol. Educ. 5 (1) (2006) 201–219. Retrieved April 15, 2021, from, https://www.learntechlib.org/p/111541/.

[8] P.S.D. Chen, A.D. Lambert, K.R. Guidry, Engaging online learners: the impact of Web-based learning technology on college student engagement, Comput. Educ. 54 (4) (2010) 1222–1232.

[9] A. Ituma, An evaluation of students' perceptions and engagement with e-learning components in a campus based university, Act. Learn. High. Educ. 12 (1) (2011) 57–68.

[10] R. Watkins, D. Leigh, D. Triner, Assessing readiness for e-learning, Perform. Improv. Q. 17 (4) (2004) 66–79.

[11] D. Albarracín, B.T. Johnson, M.P. Zanna, G.T. Kumkale, Attitudes: introduction and scope, in: The Handbook of Attitudes, 2005, Lawrence Erlbaum Associates Publishers, 2005, pp. 3–19. Retrieved April 10, 2021, from, https://www.researchgate.net/profile/Dolores-Albarracin/publication/261796577_Attitudes_Introduction_and_scope/links/5fc3adac458515b79784f6ef/Attitudes-Introduction-and-scope.pdf.

[12] A.H. Eagly, S. Chaiken, The Psychology of Attitudes, Harcourt brace Jovanovich college publishers, 1993.

[13] L.R. Fabrigar, T.K. MacDonald, D.T. Wegener, The structure of attitudes, in: D. Albarracín, B.T. Johnson, M.P. Zanna (Eds.), The Handbook of Attitudes, Lawrence Erlbaum Associates Publishers, 2005, pp. 79–125.

[14] D. Baud, X. Qi, K. Nielsen-Saines, D. Musso, L. Pomar, G. Favre, Real estimates of mortality following COVID-19 infection, Lancet Infect. Dis. 20 (7) (2020) 773.

[15] M. Bogdanović, Growing importance of distance education, IJ Modern Educ. Comp. Sci. 3 (2012) 35–41.

[16] T. Anderson (Ed.), The Theory and Practice of Online Learning, Athabasca University Press, 2008. Retrieved, https://auspace.athabascau.ca/bitstream/handle/2149/411/?sequence=1. (Accessed 10 April 2021).

[17] M. Simonson, S.M. Zvacek, S. Smaldino, Teaching and Learning at a Distance: Foundations of Distance Education, seventh ed., 2019.

[18] J. Watson, Keeping Pace with K-12 Online Learning: A Review of State-Level Policy and Practice, Learning Point Associates/North Central Regional Educational Laboratory (NCREL), 2005. Retrieved April 10, 2021, from, https://files.eric.ed.gov/fulltext/ED489514.pdf.

[19] D. Howlett, T. Vincent, N. Gainsborough, J. Fairclough, N. Taylor, J. Cohen, R. Vincent, Integration of a case-based online module into an undergraduate curriculum: what is involved and is it effective? E-Learning Digital Media 6 (4) (2009) 372–384.

[20] R. Sadeghi, M.M. Sedaghat, F.S. Ahmadi, Comparison of the effect of lecture and blended teaching methods on students' learning and satisfaction, J. Adv. Med. Educ. Professional. 2 (4) (2014) 146. Retrieved April 10, 2021, from, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4235559/pdf/jamp-2-146.pdf.

[21] V. Niebuhr, B. Niebuhr, J. Trumble, M.J. Urbani, Online faculty development for creating E-learning materials, Educ. Health 27 (3) (2014) 255.

[22] M. Bączek, M. Zagańczyk-Bączek, M. Szpringer, A. Jaroszyński, B. Wożakowska-Kapłon, Students' perception of online learning during the COVID-19 pandemic: a survey study of Polish medical students, Medicine 100 (7) (2021).

[23] F.D. Davis, User acceptance of information technology: system characteristics, user perceptions and behavioral impacts, Int. J. Man Mach. Stud. 38 (3) (1993) 475–487.

[24] Longman Dictionary, 2020. Retrieved April 15, 2021, from, https://www.ldoceonline.com/dictionary/perception.

[25] L.O. Walker, K.C. Avant, Strategies for Theory Construction in Nursing (Vol. 4), Pearson/Prentice Hall, Upper Saddle River, NJ, 2005. Retrieved April 1, 2021, from, http://catalogue.pearsoned.ca/assets/hip/ca/hip_ca_pearsonhighered/preface/0134754077.pdf.

[26] A. Al-Zahrani, Toward digital citizenship: examining factors affecting participation and involvement in the Internet society among higher education students, Int. Educ. Stud. 8 (12) (2015) 203–217.

[27] T. Teo, Evaluating the intention to use technology among student teachers: a structural equation modeling approach, Int. J. Technol. Teach. Learn. 5 (2) (2009). Retrieved April 1, 2021, from, https://sicet.org/main/wp-content/uploads/2016/11/ijttl-09-02-2_Teo.pdf.

[28] A. Alshwaier, A. Youssef, A. Emam, A new trend for e-learning in KSA using educational clouds, Adv. Comp. 3 (1) (2012) 81.

[29] T. Lis, B. Paula, The use of cloud computing by students from technical university–The current state and perspectives, Procedia Comp. Sci. 65 (2015) 1075–1084.

[30] A. Saekow, D. Samson, E-learning readiness of Thailand's universities comparing to the USA's cases, Int. J. e-Educ. e-Busin. e-Manag. e-Learn. 1 (2) (2011) 126.

[31] A.N. Tashkandi, I.M. Al-Jabri, Cloud computing adoption by higher education institutions in Saudi Arabia: an exploratory study, Cluster Comput. 18 (4) (2015) 1527–1537.

[32] M. Hartnett, A. St George, J. Dron, Examining motivation in online distance learning environments: complex, multifaceted, and situation-dependent, Int. Rev. Res. Open Dist. Learn. 12 (6) (2011) 20–38.

[33] B. Poellhuber, M. Chomienne, T. Karsenti, The effect of peer collaboration and collaborative learning on self-efficacy and persistence in a learner-paced continuous intake model, Int. J. E-Learn. Distanc. Educ. Revue internationale du e-learning et la formation à distance 22 (3) (2008) 41–62. Retrieved April 1, 2021, from, http://www.ijede.ca/index.php/jde/article/view/451/591.

[34] Y.J. Joo, H.J. So, N.H. Kim, Examination of relationships among students' self-determination, technology acceptance, satisfaction, and continuance intention to use K-MOOCs, Comput. Educ. 122 (2018) 260–272.

[35] H. Mohammadi, Investigating users' perspectives on e-learning: an integration of TAM and IS success model, Comput. Hum. Behav. 45 (2015) 359–374.

[36] T.G. Hlatshwako, S.J. Shah, P. Kosana, E. Adebayo, J. Hendriks, E.C. Larsson, J.D. Tucker, Online health survey research during COVID-19, Lancet Digital Health 3 (2) (2021) e76–e77.

[37] D. Andrews, B. Nonnecke, J. Preece, Electronic survey methodology: a case study in reaching hard-to-involve Internet users, Int. J. Hum. Comput. Interact. 16 (2) (2003) 185–210.

[38] B. Gunter, D. Nicholas, P. Huntington, P. Williams, Online versus offline research: implications for evaluating digital media, ASLIB Proc. 54 (4) (2002) 229–239.

[39] C. Keller, L. Cernerud, Students' perceptions of e-learning in university education, J. Educ. Media 27 (1-2) (2002) 55–67.

[40] T.M. Link, R. Marz, Computer literacy and attitudes towards e-learning among first year medical students, BMC Med. Educ. 6 (1) (2006) 1–8.

[41] S. Panda, S. Mishra, E-Learning in a mega open university: faculty attitude, barriers and motivators, Educ. Media Int. 44 (4) (2007) 323–338.

[42] M.H. Rajab, A.M. Gazal, K. Alkattan, Challenges to online medical education during the COVID-19 pandemic, Cureus 12 (7) (2020).

[43] S.M. Salter, A. Karia, F.M. Sanfilippo, R.M. Clifford, Effectiveness of E-learning in pharmacy education, Am. J. Pharmaceut. Educ. 78 (4) (2014).

[44] W.M. Vagias, Likert-type Scale Response Anchors, Clemson International Institute for Tourism & Research Development, Department of Parks, Recreation and Tourism Management. Clemson University, 2006.

[45] R.L. Doran, Basic Measurement and Evaluation of Science Instruction, Connecticut Ave., National Science Teachers Association, NW, Washington, DC, 1980, p. 1742, 20009. Retrieved April 1, 2021, from, https://files.eric.ed.gov/fulltext/ED196733.pdf.

[46] C. Coman, L.G. Tiru, L. Mesesan-Schmitz, C. Stanciu, M.C. Bularca, Online teaching and learning in higher education during the coronavirus pandemic: students' perspective, Sustainability 12 (24) (2020) 10367.

[47] S. Siritongthaworn, D. Krairit, N.J. Dimmitt, H. Paul, The study of e-learning technology implementation: a preliminary investigation of universities in Thailand, Educ. Inf. Technol. 11 (2) (2006) 137–160.

[48] S. Sukendro, A. Habibi, K. Khaeruddin, B. Indrayana, S. Syahruddin, F.A. Makadada, H. Hakim, Using an extended Technology Acceptance Model to understand students' use of e-learning during Covid-19: Indonesian sport science education context, Heliyon 6 (11) (2020), e05410.

[49] A. Alshwaier, A. Youssef, A. Emam, A new trend for e-learning in KSA using educational clouds, Advanced Computing 3 (1) (2012) 81. Retrieved April 1, 2021, from, https://airccse.org/journal/acij/papers/0112acij07.pdf.

[50] B. Celik, H. Uzunboylu, High school students' attitudes towards distance education: comparative study, Proced. Soc. Behav. Sci. 197 (2015) 292–297.

[51] U.K. Halder, A study on distance learners' attitude towards distance education, Indian Streams Res. J. 2 (7) (2012) 1–4.

[52] A. Stanković, B. Petrović, Z. Milošević, Attitudes and knowledge of medical students about distance learning, Acta Fac. Med. Naissensis 32 (3) (2015) 199–207.

[53] D.J. Haughey, Ethical relationships between instructor, learner and institution, Open Learn.: J. Open Dist. e-Learning 22 (2) (2007) 139–147.

[54] L.Y. Muilenburg, Z.L. Berge, Student barriers to online learning: a factor analytic study, Dist. Educ. 26 (1) (2005) 29–48.