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Perceptions of E-Learning Among Jordanian Medical Students: A Cross-Sectional Analysis

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ABSTRACT

Online learning has emerged as an essential component of education globally, particularly following the COVID-19 pandemic. This study aimed to evaluate medical students' perceptions of online learning, as well as their self-reported readiness and the challenges they faced during the pandemic." A web-based, cross-sectional survey was administered to students enrolled in Pharmacy, Doctor of Pharmacy, Medicine, Nursing, Dentistry, and Veterinary Medicine programs at both public and private universities in Jordan. Data analysis, including descriptive statistics and linear regression, was performed using SPSS, and perception scores were quantified using a 5-point Likert scale." The study included 939 participants, predominantly female (691, 73.6%), with a median age of 22 years (IQR = 2). Just over half were enrolled in private universities (520, 55.6%). More than 50% of students rated their online learning experiences as unsatisfactory or very unsatisfactory (510, 54.3%). A majority favored in-person interactions with instructors and classmates, viewing them as more effective (682, 72.6%). The median perception score across the cohort was 2.4 (IQR = 1.1). Common barriers reported by over 70% of respondents included unstable internet connections, low motivation, and monotony associated with e-learning (723, 77.0%) The findings indicate low levels of satisfaction and perception among students regarding their e-learning experiences during the COVID-19 pandemic. The study also identified key obstacles impeding effective online learning, including poor internet connectivity and reduced motivation, highlighting the necessity for innovative teaching strategies to improve students' engagement and overall experience with digital education.

Keywords: E-learning, Medical, Students, Perception, Jordan, COVID-19

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Introduction

Since the World Health Organization (WHO) declared COVID-19 a global pandemic, numerous aspects of daily life, including education, have been significantly impacted [1–3]. To curb the spread of the virus, governments worldwide implemented measures such as social distancing, self-isolation, and quarantine, which in turn necessitated major transformations in the educational sector. Universities across the globe rapidly transitioned to online learning, employing a variety of digital platforms including Microsoft Teams, Zoom, Moodle, and institutional e-learning systems, thereby presenting new challenges for students [4–6].

Online learning has increasingly become a vital component of modern education. It leverages advanced technologies, such as computers and the internet, to deliver instructional content, engage learners, and facilitate interactive communication between students and instructors [7]. However, in developing countries, the implementation of distance education faces significant obstacles due to limited financial resources, inadequate technical infrastructure, and restricted internet accessibility [8]. Conversely, developed countries benefit from more reliable internet services, higher instructor proficiency with digital tools, and greater experience in online teaching, which makes distance learning more accessible and effective [9, 10].

In Jordan, e-learning initiatives predate the COVID-19 pandemic. Initially, educational materials were made available online while traditional classroom instruction continued. This evolved into blended learning models, combining face-to-face teaching with online components [11]. Despite early adoption, e-learning was not widely implemented across Jordanian universities [12]. The COVID-19 pandemic, however, necessitated a complete shift to online instruction.

Several studies have investigated university students' perceptions and experiences with online learning [13–15]. Reported advantages include improved time management, cost savings, convenience, and accessibility. Conversely, challenges such as technological difficulties, limited student engagement, and variability in instructors' ability to effectively utilize online platforms were also highlighted [13–16].

Medical students, in particular, experienced disruptions in education, clinical practice, career development, and mental well-being due to the pandemic [17–19]. Many reported dissatisfaction and negative perceptions of online learning, primarily because the shift to virtual instruction limited opportunities to acquire essential practical skills [20–22]. In light of these challenges, this study was conducted to evaluate medical students' perceptions of online learning, as well as their preparedness and the barriers they faced during the COVID-19 pandemic.

Materials and Methods

This study collected data on medical students' perceptions of online education at Jordanian universities. A web-based, cross-sectional survey was employed to recruit eligible participants, including students enrolled in Pharmacy, Doctor of Pharmacy, Medicine, Nursing, Dentistry, and Veterinary Medicine programs. Data collection was conducted between July 5 and September 22, 2021, using a combination of online social media campaigns and web-based survey tools to reach potential participants.

An electronic consent form was provided with the survey, and students were required to voluntarily agree before proceeding. Those who consented completed the survey in approximately 15 minutes. Participants were informed that taking part could enhance their understanding of perceptions toward online education. Although responses were collected anonymously, strict measures were implemented to ensure confidentiality and secure handling of all data. Ethical approval for the study was granted by the Institutional Review Board of Applied Science Private University, Jordan (Approval No. 2021-PHA-18).

Study tool

A structured survey, adapted and modified from previous studies [23–25], was developed following established principles of effective survey design. The survey was made available in both Arabic and English using the Google Forms platform. Following its initial draft, a panel of 15 experts in educational technology and socio-behavioral sciences reviewed the questionnaire to evaluate its face and content validity. Efforts were made to ensure that all items were free from medical jargon and complex terminology.

The survey was originally created in English and subsequently translated into Arabic using a forward- and back-translation process by two independent academic translators. To confirm clarity, readability, and overall comprehensibility, a pilot test was conducted with 15 students in both languages, and modifications were applied based on their feedback.

The final questionnaire contained 34 items organized into four sections: sociodemographic information (9 items), students' perceptions of online learning (14 items), perceived obstacles to e-learning (9 items), and experiences with e-learning tools and satisfaction (2 items). The reliability of the perception scale was assessed using Cronbach's alpha, yielding a value of 0.81, indicating high internal consistency. Mean perception scores were calculated on a 5-point Likert scale, where higher scores represented more positive perceptions of e-learning. For positive statements, scores ranged from 1 (strongly disagree) to 5 (strongly agree), whereas for negative statements, scoring was reversed (5: strongly disagree to 1: strongly agree).

Statistical analysis

Data for this study were exported from Google Forms into an Excel spreadsheet and subsequently analyzed using IBM SPSS Statistics (version 22.0, Chicago, Illinois). Continuous variables were summarized using medians and interquartile ranges (IQR), while categorical variables were presented as frequencies and percentages.

Simple linear regression was initially performed to screen independent variables potentially associated with students' perceptions of e-learning. Variables with a P-value < 0.25 in the univariate analysis were included in a

multiple linear regression model. Prior to inclusion, variables were checked for independence, with Pearson correlation coefficients < 0.9 indicating no multicollinearity. Multiple linear regression was then used to identify factors independently influencing students' perceptions of e-learning. Statistical significance was set at a P-value ≤ 0.05.

Results and Discussion

Sociodemographic characteristics of the study participants

A total of 939 students participated in the study and completed the questionnaire. Females constituted approximately three-quarters of the sample (n = 691, 73.6%), and the median age of participants was 22 years (IQR = 2.0). Slightly over half of the students were enrolled in private universities (n = 520, 55.6%). The most frequently reported field of study was the Bachelor of Pharmacy program (n = 664, 70.7%). Most participants lived in urban areas (n = 795, 84.7%), and 25.6% (n = 240) indicated having been previously infected with COVID-19. Students reported a median of 14 hours per week spent online for non-educational activities (IQR = 24.0), compared to 19 hours per week for educational purposes (IQR = 22.0). The detailed demographic characteristics of the participants are summarized in **(Table 1)**.

Table 1. Overview of Demographic Variables Among Respondents (n = 939)

Parameter	Median (IQR)	n (%)
Age (years)	21.0 (2.0)	
Gender		
•Female		691 (73.6)
•Male		248 (26.4)
Major		
•Bachelor of Pharmacy		664 (70.7)
•Doctor of Pharmacy		49 (5.2)
•Medicine		180 (19.2)
•Nursing		29 (3.1)
•Dentistry		17 (1.8)
Years of study		
•First and second year		361 (38.4)
•Third and fourth year		383 (40.8)
•≥Fifth year		195 (20.8)
University		
•Private		520 (55.6)
•Public		419 (44.6)
Residential area		
•Urban		795 (84.7)
•Rural		144 (15.3)
Have you been infected with the corona virus?		
•No		515 (54.8)
•Yes		240 (25.6)
•Unsure		184 (19.6)
The number of hours you spend online per week for non-educational purposes	14.0 (24.0)	
The number of hours you spend online per week for educational purposes	19.0 (22.0)	

IQR: interquartile range.

Students' satisfaction with the current experience in E-learning during the COVID-19 pandemic

Among the 939 participants, students generally expressed low satisfaction with their e-learning experiences during the COVID-19 pandemic **(Figure 1)**. Only 7.0% (n = 66) rated their experience as very satisfactory, while 18.4% (n = 173) considered it satisfactory.

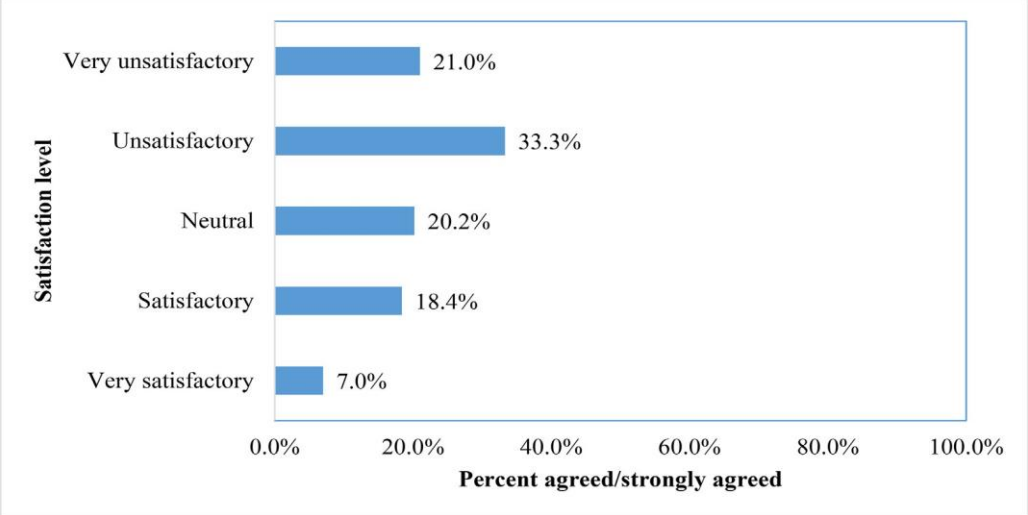

Figure 1. Satisfaction Ratings of Students Regarding E-Learning During the Pandemic (n = 939)

Students' perception towards E-learning experience during the COVID-19 pandemic

Students exhibited generally low perceptions of their e-learning experiences **(Table 2)**. Only 24.7% (n = 232) agreed or strongly agreed that online learning contributes to achieving their future goals, and just 16.2% (n = 152) expressed a preference for e-learning to become the standard mode of instruction. Similarly, only 16.8% (n = 157) felt that studying courses online enhanced their ability to memorize and master the material. Approximately one-third of students believed that their universities provided high-quality online education (n = 321, 34.2%) and adequate technical support for e-learning (n = 313, 33.3%). The overall mean perception score was 2.4 (IQR = 1.1), reflecting a generally unfavorable perception.

Table 2. Assessment of Student Perceptions Toward Online Learning During the Pandemic (n = 939)

Statement	Agree/Strongly Agree, n (%)	Neutral, n (%)	Disagree/Strongly Disagree, n (%)
E-learning supports my future goals (e.g., further studies, travel)	232 (24.7)	201 (21.4)	506 (53.9)
My university provides a high-quality online learning experience	321 (34.2)	279 (29.7)	339 (36.1)
I would like e-learning to become the standard mode of instruction	152 (16.2)	135 (14.4)	652 (69.4)
I feel comfortable communicating with instructors and peers online	221 (23.5)	178 (19.0)	540 (57.5)
Online courses help me memorize and master content more effectively	157 (16.8)	159 (16.9)	623 (66.3)
E-learning helps me organize study time and complete academic tasks better than face-to-face learning	254 (27.1)	167 (17.8)	518 (55.2)
I have adequate computer skills to manage online courses and assignments	477 (50.8)	204 (21.7)	258 (27.4)
I can ask questions and receive responses from instructors quickly online	265 (28.2)	292 (29.4)	406 (43.2)
I prefer face-to-face communication because it is more effective	682 (72.6)	122 (13.0)	135 (14.4)
I can collaborate effectively in group work during online courses	259 (27.6)	264 (28.1)	416 (44.3)
All my courses can be taken online without difficulty	192 (20.4)	139 (14.8)	608 (64.7)
My university provides sufficient technical support for e-learning	313 (33.3)	290 (30.9)	336 (35.8)
E-learning increases students' educational workload	487 (51.9)	160 (17.0)	292 (31.1)
E-learning encourages better idea generation compared to classroom learning	164 (17.5)	205 (21.8)	570 (60.7)

Students' perceptions towards the obstacles surrounding the E-learning

The study also explored challenges faced by students during e-learning, assessed through nine statements **(Table 3)**. The most frequently reported difficulty was unstable internet access (n = 755, 80.4%). Other prominent barriers

included feelings of boredom while engaging with online courses (n = 731, 77.8%), distractions or unsuitable conditions at home (n = 729, 77.6%), and a general lack of motivation to participate in e-learning (n = 723, 77.0%).

Table 3. Students' Views on Challenges and Barriers in E-Learning (n = 939)

Reported Challenge	Students Agree/Strongly Agree, n (%)	Neutral, n (%)	Disagree/Strongly Disagree, n (%)
Lack of motivation to participate in online courses	723 (77.0)	100 (10.6)	116 (12.4)
Insufficient guidance or unclear instructions	648 (69.0)	168 (17.9)	123 (13.1)
Difficulties navigating or using digital learning tools	433 (46.1)	230 (24.5)	276 (29.4)
Expenses related to e-learning equipment (computers, headphones, etc.)	629 (67.0)	163 (14.7)	147 (15.7)
Internet subscription or connectivity costs	619 (65.9)	181 (19.3)	139 (14.8)
Distractions or unsuitable conditions at home	729 (77.6)	118 (12.6)	92 (9.8)
Poor or unreliable internet connection	755 (80.4)	100 (10.6)	84 (8.9)
E-learning is time-consuming	674 (71.8)	135 (14.4)	130 (13.8)
Online courses are monotonous or unengaging	731 (77.8)	95 (10.1)	113 (12.0)

Students' experience with E-learning tools

The survey explored which digital platforms students predominantly used for online learning **(Figure 2)**. Microsoft Teams emerged as the platform most frequently accessed, with 851 students (90.6%) using it. YouTube was the next most popular tool (744, 79.2%), followed by Telegram (520, 55.4%). In contrast, Google Classroom was the least utilized platform, reported by only 144 students (15.3%).

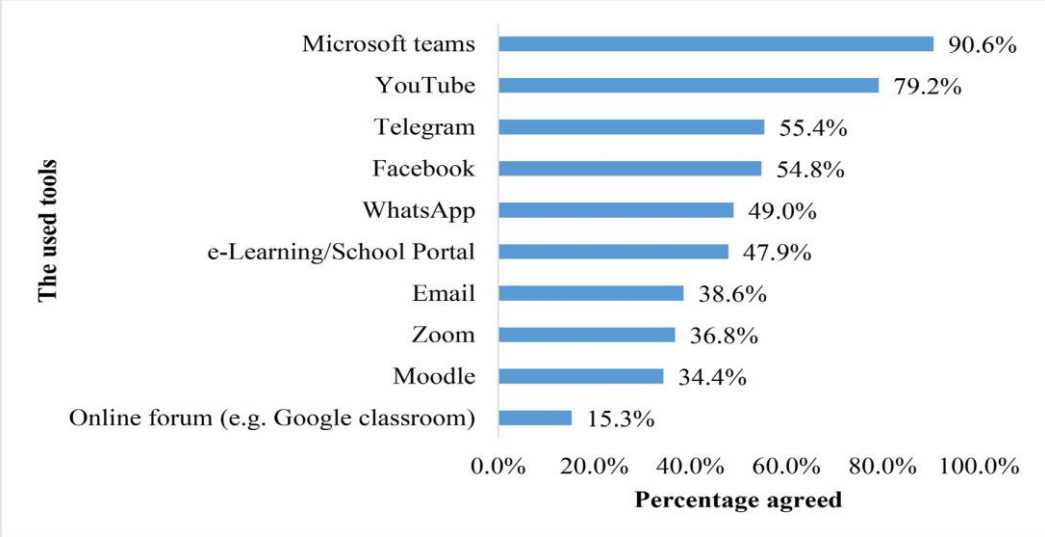

Figure 2. Students' experience with E-learning tools (n = 939).

Assessment of factors affecting students' perception of E-learning

Finally, univariate and multivariate linear regression analyses were conducted to identify factors influencing students' perceptions of e-learning **(Table 4)**. The analyses revealed that older students, male participants, and those enrolled in private universities demonstrated significantly more positive perceptions of e-learning compared to their counterparts ($P \leq 0.05$).

Table 4. Determinants of Students' Perceptions Toward E-Learning (n = 939)

Parameter	Perception score			
	Beta	P-value[b]	Beta	P-value[c]
Age (years)	0.202	<0.001[a]	0.139	<0.001[d]
Gender				
•Female	Reference			
•Male	0.143	<0.001[a]	0.100	0.001[d]

Years of study				
•First and second year		Reference		
•Third and fourth year	0.069	0.035[a]	0.026	0.419
•≥Fifth year	0.099	0.002[a]	0.039	0.320
University				
•Public		Reference		
•Private	0.146	<0.001[a]	0.102	0.003[d]
Residential area				
•Urban		Reference		
•Rural	-0.046	0.160[a]	0.018	0.592
Have you been infected with the corona virus?				
•No/unsure		Reference		
•Yes	-0.032	0.326	—	—
The number of hours you spend online per week for non-educational purposes	-0.064	0.023[a]	-0.063	0.288
The number of hours you spend online per week for educational purposes	-0.053	0.107[a]	0.004	0.941

a Eligible for entry in multiple linear regression
b Using simple linear regression
c Using multiple linear regression
d Significant at 0.05 significance level.

This study aimed to evaluate medical students' perceptions and preparedness for the rapid shift to online learning across public and private universities in Jordan due to the COVID-19 pandemic. It also sought to identify the barriers and challenges associated with this transition. The findings revealed widespread dissatisfaction among students with their e-learning experiences.

Overall, participants expressed negative perceptions of online learning, favoring traditional face-to-face instruction for its interactive opportunities with peers and instructors. These findings align with prior studies conducted in both developing and developed countries [16, 20, 26–28]. For instance, Al Balas *et al*. reported that students considered distance education a significant barrier to acquiring essential clinical skills [16]. Similarly, Alrashhed *et al*. highlighted that virtual interprofessional education (IPE) experiences could enhance student engagement and

interactions with both peers and mentors, emphasizing the need for a variety of teaching approaches such as asynchronous discussions, synchronized sessions, and case-based assignments [29].

Other Jordanian studies focusing solely on medical students reported that 75% of participants were dissatisfied with online learning [22]. Students in these studies suggested blending online methods with conventional teaching to improve learning outcomes [9, 22]. Comparable trends were observed in the United States, where undergraduate students found the shift from in-person lectures to remote learning less engaging and enjoyable [30].

The negative perceptions observed can be attributed, in part, to the emergency response to the COVID-19 pandemic. The sudden transition to online platforms created unprecedented challenges, and universities had limited time to implement structured and pedagogically sound online teaching frameworks [26, 31, 32]. Furthermore, e-learning is inherently technology-dependent, requiring robust internet infrastructure and collaboration with telecommunication providers [31]. As a developing country, Jordan faces challenges such as inadequate IT infrastructure, limited financial resources, and insufficient technical support, all of which can hinder effective online learning [9, 33–36]. This study found that poor internet connectivity was a major obstacle, compounded by socioeconomic disparities that limit students' access to reliable broadband, affecting both their engagement and attitudes toward online learning [31, 37]. Consistent with this, students from private universities, who generally have higher socioeconomic status, reported significantly more positive perceptions of e-learning.

Telecommunication limitations during the pandemic also negatively impacted students' experiences. Network overloads and slow internet speeds disrupted attendance, examinations, and assignment submissions, contributing to feelings of frustration and helplessness [21, 22]. Home-related challenges were another significant factor. Qualitative research among Jordanian nursing students found that female students with children struggled to balance household responsibilities with academic obligations, often citing insufficient partner support [21, 38].

Literature also links distance learning with negative mental health outcomes, including stress, burnout, and feelings of helplessness [21, 39, 40]. Additionally, boredom and low motivation were commonly reported, likely stemming from monotonous, lecture-heavy teaching approaches that limited student engagement and visual stimulation, sometimes resulting in absenteeism [41]. Video conferencing has been suggested as a means to increase interaction and engagement, potentially mitigating these challenges [41, 42].

The findings underscore the importance of adopting innovative teaching strategies to overcome barriers to effective online learning [32]. This may involve providing faculty development programs on online pedagogies to improve lecture quality and delivery [41]. Training for both students and instructors on the use of online learning tools, particularly synchronous platforms such as Zoom or Microsoft Teams, may enhance engagement and familiarity [16, 30, 43, 44]. Additionally, universities could consider adopting advanced information technologies, improving digital services, and subsidizing internet costs for students and faculty to facilitate equitable access to online education [31, 44–46].

Limitations

Several limitations should be acknowledged in this study. First, the survey was distributed online, primarily via social media platforms such as Facebook, which may have excluded students who are less active online or have limited internet access, potentially introducing participation bias. Second, because the survey was administered electronically, the total number of students who received the survey is unknown, preventing calculation of an accurate response rate. Third, the reliance on self-reported data may have introduced recall bias. Additionally, collecting data through an online survey rather than face-to-face interactions may raise concerns regarding the reliability and authenticity of the responses; however, given the constraints imposed by the COVID-19 pandemic, this method was the most feasible. Fourth, the survey did not include questions specifically addressing online learning in medicine or pharmacology, which should be considered in future research. Finally, the non-random sampling approach, using a snowball recruitment technique, may have introduced selection bias. Despite these limitations, this study provides valuable baseline data on e-learning experiences among Jordanian students, which can inform future educational strategies and stimulate further research in this area.

Conclusion

This study revealed that medical students experienced low satisfaction and negative perceptions of e-learning during the COVID-19 pandemic. It provided insights into students' preparedness for the rapid shift to online education and identified key challenges, including poor internet connectivity and lack of motivation. The findings underscore the need to adopt innovative teaching strategies and pedagogical approaches to improve the quality of online learning and enhance students' educational experiences.

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Ethics Statement: None

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