Turning A Crisis into Opportunity, E-Learning During COVID-19 Pandemic: A Cross-Sectional Study

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Abstract

Background: The COVID-19 pandemic highlighted the necessity of e-learning, which has been integrated in education worldwide at varying degrees. The University of Jordan has started introducing e-learning in its curriculum. However, the COVID-19 pandemic accelerated the process. This study aims to assess the satisfaction and knowledge attainment of the medical students through distant learning during the COVID-19 pandemic.

Methods: This is a cross-sectional, self-reported, questionnaire-based study that was conducted at the School of Medicine at the University of Jordan in April 2020. The targeted population was the students at the school of medicine throughout the basic and clinical years of study.

Results: 506 of the 1000 student participants are basic science students (BSS) and 494 are clinical science students (CS), 65.5% of all students were either satisfied, or neutral with e-learning. The most popular devices used to connect to the internet are the mobile phone, and the laptop. Streaming (Zoom and Skype) video conference platforms are used by 60% of students.

Conclusion: Transition from traditional in-class teaching to distant learning, whether full or blended, is an inevitable step. It is not a lockdown redemption plan instead a step that needs commitment from the teaching institutions, the teachers, and the students.

Introduction

On March 11, 2020, the Director-General of the World Health Organization publicly declared COVID-19 a pandemic. All over the world, countries put in place social distancing and stay-at-home measures to "flatten the curve" and slow the spread of COVID-19 (1). The Hashemite Kingdom of Jordan was one such country, imposing curfews, and border closures early on to protect its citizens and give healthcare workers the time needed to prepare for this pandemic. As such, universities in Jordan as well as in many countries across the world had to cancel or suspend their campus activities and rely exclusively on e-learning to continue student education.

The term e-learning refers to learning by using electronic technology to access educational materials and curriculum outside the walls of a classroom. E-learning has been introduced to almost all specialities and levels of education. It has been estimated that over the next couple of years e-learning will grow 15 folds, accounting for 30% of all educational provision throughout the globe (2). The World Federation for Medical Education global guidelines endorse technology as a key component of best practice medical education (3).

Pedagogy is witnessing shifting in its models from teaching to learning models which emphasizes the outcome rather than the process (4). This is paralleled with the emerging of digital native students who were born and grew up surrounded by internet and technology (5,6). It has been proposed that they are quickly adaptable to and accepting of technology, more than those born before them. Current students fall under that category, and so it may be reasonable to assume that they would benefit from a learning method that is different from traditional education (7,8).

The learning delivery of e-learning provides easy access to information, updating, distribution and standardization of content (4). It gives the ability to revise and control content simply and quickly to meet their learning objectives. Furthermore, it helps in distributing the content to many users simultaneously, anytime and anywhere (9).

However, the autonomy of online education can affect satisfaction levels, engagement and motivation as the learning experience of students become more self-directed, and a loss of a sense of interactivity and community is often experienced (8,10–13).

The COVID-19 pandemic presented a challenge and an opportunity to use and assess e-learning in higher education. As such, this study aims to illustrate students' attitudes and the impact of transitioning towards e-learning methods in the Faculty of Medicine at the University of Jordan (UJ). In line with UJ developmental plans in the last three years toward implementing blended learning in the curricula of its different schools, School of Medicine has spent great efforts to train faculty members of diverse academic and computer-skills levels, to utilize e-learning resources provided by the university effectively. The COVID-19 pandemic and lockdown requirements offered a push to transition from the lagging implementation of blended learning at the School of Medicine, to an exclusively online learning model. The UJ School of Medicine established a contingency plan where a management crisis committee, composed of computer-skilled faculty members and affiliated IT faculty members, provided extensive online training courses to all faculty members, direct supervision of online teaching sessions, and ongoing follow-up and analysis of teachers e-performance and students e-learning compliance, effectiveness, and satisfaction. In this study, we look at student satisfaction, attitudes, and financial burden that may have resulted due to this transition to distance e-learning.

Methodology

This is a cross-sectional, self-reported, questionnaire-based study that was conducted at the School of Medicine at the University of Jordan in April 2020. The targeted population was the students at the school of medicine throughout the basic and clinical years of study. An online

questionnaire was created using Google Forms©. The questionnaire was distributed to students in basic and clinical medical years through University of Jordan e-learning platform and through Facebook and WhatsApp students' groups. The questionnaire included a written consent in its first page. The questionnaire is composed of multiple sections. The first section inquiries about the gender, the level of study and current grade point average (GPA). The 2nd section assesses students' thoughts about the preparedness of their school and their own preparedness for e-learning use. The 3rd section inquires about the devices that the student uses in e-learning. The 4th section inquires about the tools used in e-learning, duration and number of sessions and rating of lecturers' performance in e-learning. The 5th section compares classical teaching with e-learning, and the final section probes the mental health of students in the acute setting of the COVID-19 pandemic manifested as depression or anxiety.

The collected data were analysed via SPSS version 25. One-way ANOVA and univariate analysis t-test with post hoc LSD. An independent-samples t-test were performed to find the relationship between different students' characteristics, surrounding circumstances, and e-learning tools available with the dependent variables in terms of school's preparedness, students' preparedness, the efficacy of e-learning process, and students' mental health status.

Results

A total of 1000 medical students participated in the web-based, self-reported survey. Medical students from year 1 to year 6 (the final year of medical school at the University of Jordan) participated in this survey. Basic science students (BSS) comprise year 1 to 3, while clinical students (CS) comprise year 4 to 6. Of all medical students participating in this study, 506 medical students are from the fundamental science years (50.4% of the total number) and 494 medical students are from the clinical years (49.6 % of the total number). 553 students declared their GPA.

76.3% of the students believe that the electronic devices did not cause any financial burden, whereas 14.4% believe electronic devices cause some, and 9.2% believe they did cause a financial burden. 66.6% of the students believe that the internet connection did not cause any financial, whereas 21.2% believe it causes some burden, and 12.1% believe it did cause a financial burden on them.

Students were asked to rate their school's preparedness for the transition into teaching exclusively through e-learning before the crisis. 45.2% of basic science students think that the school's e-learning infrastructure was well-established and started a long time ago, while only 16.8% of clinical students had the same opinion. 37.6% of basic science students and 40.8% of clinical students believed e-learning in their school was only applied recently before this crisis and it is still evolving. 14% of BSS and 38.9% of CS believe e-learning was only used during this crisis, not before.

When students were asked to rate their satisfaction with the recent transition to e-learning education during COVID-19 outbreak, 48.2% of BSS and 45.4% of CS were neutral, while 21.4% of BSS and 16.8% of CS were satisfied.

Table 2 shows that there is a statistically significant difference in student satisfaction between BSS and CS. 30.8% of BSS was unsatisfied compared to 38.3% of CS ($p<0.012$). Satisfaction was also affected by student preparedness, with 42.9% of non-experienced students being unsatisfied, while only 25.5% of experienced students expressed the same ($p<0.000$). Teacher performance also had an effect on student satisfaction with only 4.8% of students who rated a teacher's performance as unsatisfying, while 12.2% and 39.3% of students satisfied with their e-learning experience rated teacher performance as neutral and satisfying, respectively ($p<0.000$).

Moreover, around 50% of all students recognize the university's E-learning website available for easy access. There was no statistically significant difference in satisfaction level when compared to students' scores on Becks' Anxiety Inventory.

Table 3 assesses clinical knowledge gained throughout the use of e-learning during the COVID-19 lockdown. Of all medical students at the University of Jordan, 63.6% of BSS and 59.5% of CS stated that they gained and understood knowledge the same or better than they did before initiation of exclusive e-learning. Factors affecting knowledge gained were teacher e-learning performance, students experience in using e-learning and the university's e-learning website easy accessibility ($p<0.000$). Of all medical students that took the survey that rated their teacher's performance as dissatisfying, 8.6% stated they gained knowledge better than before the lockdown. In comparison, 20.5% of the neutral teacher's performance and 38.7% of the satisfying teacher performance groups said the same ($p<0.000$).

The most popular devices used to connect to the internet for medical education are the mobile phone and the laptop, with around 1000 students saying they always used these devices, as illustrated in figure 1. The least popular tools were the tablet and the desktop computer. The desktop computer was the least used out of all, with around 1000 students saying they never use it for medical education. We also asked students about their most-used platforms for e-learning, as shown in table 5. Video conference platforms such as Zoom and Skype are used by 60% of students, and YouTube came second, with 56.7%. Moodle was used by 48.5% of students, while Microsoft Teams was the least used platform, with only 24% of students.

Figure 2 shows what the components of the medical school e-learning curriculum were at the time of the COVID-19 pandemic for both clinical rounds and lectures. Students had to stay home during the pandemic. Around 29% of students reported that clinical rounds were either missed, omitted, or not provided at all, while 12% of students had their clinical rounds replaced by online uploaded material. Most students (around 48%) agreed that clinical rounds should be in-site in the future, while 31% stated that they did not know what is the best way to attend clinical rounds would be in the future, as shown in figure 3. Only 15% of students said they would like to see rounds online, either at a specific or open time, while 5% wanted a mixed model including in-site and online components.

The introduction of the computer and the internet has forced both teachers and students to integrate the available technology in medical education. Some changes were passive due to development that affected the world of communication, in addition to the birth of the digital native generation, which cannot separate advanced technology from their daily life. Operational changes were introduced to the field of healthcare, while also affecting the dynamic economics of healthcare education. Since the emergence of the COVID-19 pandemic, all areas of distant communication and learning were accelerated, this change being permanent in many ways.

Although it may be feasible for e-learning to replace classroom setting education in some fields completely, medical education is heavily reliant on student-patient interaction, bed-side learning and in-person attendance of surgical procedures and clinical rounds. This could pose a challenge to the integration of e-learning into medical teaching (14). As such, e-learning use is highly variable among medical schools and appears to be more common in basic science courses than in clinical clerkships (4).

Through this study, we tried to look at the University of Jordan's experience in accelerating the transformation into distant learning.

Discussion

Student Satisfaction

Most medical students (69.6% of BSS and 62.2% of CS) reported they felt either satisfied or neutral about their transition into e-learning during the COVID-19 pandemic, as shown in table 3. Similar rates were reported previously (8,15–17).

Teachers' performance, students' experience in using e-learning platforms and websites, and accessibility to websites have shown to have a significant impact on student satisfaction in this study, as shown in table 4. Students' satisfaction is higher when their teachers' performance was satisfying. Teacher performance in e-learning is influenced by multiple factors including time-consuming production of e-learning materials which may interfere with the busy schedules of physicians, the availability of technical support during the implementation of e-learning and the wide range of strategies to facilitate e-learning (18,19). The variability in teacher performance can be addressed by designating permanent staff members exclusively in charge of e-learning which can assist teachers by providing details of the programs used in the creation of e-learning content (19). In addition to providing the appropriate infrastructure for teachers, motivational incentives may be encouraging (19,20).

Other studies have shown that students still value face-to-face teaching over video lectures if possible (21,22). This was attributed to their mere shifting to video lectures without exploring the most suitable e-learning method for the subject being taught. For example, when new technology is incorporated into psychiatry undergraduate teaching, it needs to be carefully considered and evaluated. Students' knowledge and gain may be augmented largely by certain methods over others. Each method can have pros and cons and would affect what the students gain differently (23).

In our study, students who found the e-learning website not easily accessible were more likely to be unsatisfied with the online educational process. Student satisfaction was thoroughly studied, five components were set to be the pillars of online teaching which are effectiveness, accessibility, cost-effectiveness, student satisfaction and faculty satisfaction (24).

To examine the effect of anxiety associated with the COVID-19 pandemic on the teaching process, we asked the students to respond to becks anxiety scale. It showed no effect on their level of satisfaction.

Knowledge attainment

More than half of the students that participated in this study stated they gained the same or even better knowledge than what they did before the lockdown. Teachers' performance and students' experience and accessibility to websites have all affected knowledge attainment.

It does not seem to be a consensus in the literature when comparing e-learning and traditional learning. In a systemic review of 50 studies used for testing knowledge gains, 12 of them found significantly higher gains in the online e-learning intervention groups compared to traditional learning. In contrast, 27 did not detect significant differences or mixed results were found (25). Another study revealed that undergraduate students preferred face-to-face learning over the e-learning teaching method. However, all students agreed that e-learning was good at teaching basic knowledge which required higher levels of thinking (26).

A study about e-learning in palliative care showed that 96% of students used e-learning as a preparation tool for their exams (27). Another survey for evaluating the effectiveness of an online teaching module in the pediatric department showed that e-learning is effective at increasing environmental health knowledge of clinical and non-clinical professionals, assessed by a pre-test and a post-test for the clinical expertise acquired from the online modules (28). Others have shown that educational technologies for respiratory care have an important role and that online learning for baccalaureate and higher degrees in respiratory care is promising. However, it is not easier than traditional learning methods, and it showed to be more expensive. Also, learning in respiratory care should include traditional face-to-face instructions (29).

A study about Video-Based Learning showed that the effectiveness of this tool is augmented by the teachers' consideration to manage and maximize students' engagement (30). This suggests that when dealing with large cohorts that teach students from many courses, the development of more specific e-learning materials is required for engagement levels to be maintained. This could take the form of more targeted and specialized cases and quizzes that are more directed and relevant to sub-groups of students.

Adding e-learning resources and utilizing technology to conventional Anatomy and Physiology were vital in mediating engagement and facilitating deep learning of fundamental concepts, adjusting these materials into career-specific teaching resources (how a particular organ system relates directly to their future profession) will aid learners to succeed in their studies and professions (8).

It is worth mentioning that delivering video lectures on campus does not have the benefit of flexibility and accessibility which are major features of e-lectures (23). Another study showed that students described a lack of control, feeling like passive recipients of e-learning and the feeling of being lost (31).

It is important to emphasize the role of the teacher or mentor in fostering the educational process. The teacher has a major role in explaining the content and highlighting concepts to deepen knowledge. This tends to improve knowledge gain and makes students more confident regarding the usefulness of e-learning (23).

Mobile use in medical education

Electronic devices constitute of mobile phones, tablets, laptops, and desktops. We found that the most used electronic device for e-learning is mobile phones, followed by laptops.

Other studies have also shown the popularity of mobile device usage among students (32,33). Mobile internet devices (MIDs) are becoming very popular in the modern era, which helps to provide many educational opportunities outside the classroom setting for different learners. Learners using MIDs and an internet connection have a wide range of multimedia learning resources readily available, which are collectively known as mobile learning ‘mLearning’ (34). The apparent benefits of students using mobile devices is context-dependent and could be misleading (35,36). The evidence-based medicine in the field of health professions should magnify the evidences on mobile device technicalities to discover how they would aid in learning and patient care (32,35). Students and healthcare professionals believe that mobile usage saves time, making patients' care more efficient and much easier (32,37,38). A recurrent theme was that students were reluctant to use mobile devices in front of patients to avoid being seen as unprofessional and in front of the staff to avoid misinterpreting the reason of device usage (32,39–42).

Just in time learning

Mobile devices can be an efficient tool of learning whereby the device promoted just-in-time learning in the clinical context, repetition of learning, supplementing rather than replacing learning and making use of wasted time so that learning can be done without setback (43,44). Mobile phone use is the simplest way for students to access information quickly during their clinical placements. It may be beneficial to include mobile phone use in medical education in an official manner and to provide students with instruction on professionalism and communication skills. Thus, maintain a professional image in balance with learning and other duties as future healthcare professional (45).

Financial burden

Jordan is a low to moderate-income country which is under substantial national debt, the gross national income precipitate is estimated around 4300 US$ and the National Debt soaring around 95% from gross domestic product, poverty rate is around 15% (46,47). Our study showed that 9% stated that electronic devices cause students' financial burden and 12 % stated that internet connection did cause them financial burden as well. Which is not high when looking at the country's economic status yet it represents a considerable obstacle when shifting toward e-learning, this was clear in other studies (48).

Platforms

Students recognized streaming applications and YouTube as the most beneficial platforms for learning. Young adults make an extensive use of video in their daily lives (49). The use of level-adapted video-based learning (VBL) is a new and innovative concept that meets the expectations

of both teachers and students besides VBL increased the motivation of the students (30,50). Real time interactive tutorials such as streaming have been found to be more beneficial than links to a pre-recorded video of the tutorial (22,23).

Concerns were aroused due to loss of face-to-face interactions which might lead to loss of collaborative experience, relationship building and presentations in front of the audience, which might affect their competitive abilities in their future carriers (51). Therefore, live online sessions should preserve and encourage interactivity and active enquiry (23).

Although WhatsApp was not highly appreciated, still many have reported it as a beneficial tool which secures the two-way interaction and might improve learner's knowledge as it should be more utilized in the future (34,52,53).

In place of a secure educational tool, it uses a two-way option for all users, allows the monitoring of users' activity and message reading and has end-to-end encryption (14,54). Current evidence strongly suggests that WhatsApp is a suitable resource for their purposes and that further research in this area is not warranted (34,55).

Future platforms

When asked about the platforms they would like to see in the future the majority wanted on-site teaching for rounds and clinical sessions and online sessions for lectures, the answers are consistent with the blended learning which seems to have the merits of both face-to-face and distance learning. Medical students tend to support the use of digital technologies in addition to traditional face-to-face instruction, an approach known as 'blended learning' (4,23).

Limitations

This cross-sectional survey is self-reported, which may cause several limitations and sources of bias. Due to the anonymity of the survey, comparing respondents with non-respondents is not possible. Students living in remote areas may low or no response rate due to the socioeconomic status and difficulties in connecting to the network. Besides that, the survey is somehow long for the respondents, which can create random answers from the students as they lose engagement after spending too much time. Besides, no identification verification is used, which may lead to inaccuracy as the web-based survey can be filled multiple times, can be filled by another person like a family member or a friend, and can be filled by non-medical students who are out of the scope of our study.

Data quality

Our study aims to draw conclusions that would help in the improvement and continuity of e-learning on national and international levels, especially in the current times of the COVID-19 lockdown. The outcome of the research can be utilized by other universities, medical schools, student affairs office and office of technical support to build the most convenient e-learning website and strategies based on students' feedback, to meet the highest standards.

Conclusion

The term e-learning can be recognized as a learning approach that uses electronic technology to access educational materials and curriculum outside the walls of a classroom. E-learning has been introduced to almost all specialities and levels of education. This is a cross-sectional, self-reported, questionnaire-based study that was conducted at the School of Medicine at the University of Jordan in April 2020. The experimental group has been recruited from the school of medicine throughout the basic and clinical years of study.

List Of Abbreviations

ANOVA: Analysis of variance.

BSS: Basic science students.
COVID-19: Coronavirus disease of 2019.

CS: Clinical students.

E-learning: Electronic learning.

GPA: Grade point average.

IT: Information Technology.
LSD: Fishers Least Significant Difference.

MIDs: Mobile internet devices.
mLearning: Mobile learning.

UJ: University of Jordan.

VBL: Video-based learning.

Declarations

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Ethics approval and consent to participate

The study was approved by the Institutional Review Board of the Medical School of the University of Jordan. An informed consent was obtained by each and every student before participation. All methods were performed in accordance with the relevant guidelines and regulations.

Consent for publication

Not applicable.

Availability of data and materials

The questionnaire and the datasets used and analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

Conception of the idea: A.B-H., R.A-T., H.H., and Y.H. Collection of data: A.B-H., H.H., Y.H. Data analysis and interpretation: A.B-H., R.A-T., M.A., A.S., M.A-A. Literature review: all authors. Drafting the manuscript: A.B-H., Y.H., H.H., A.J. Critical review and final approval: all authors. Accountability: all authors.

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Tables

Table 1: Statistical analysis of basic science and clinical medical students' GPA.

Mean	3.3488
Median	3.4000
Mode	3.00
Std. Deviation	0.48128
Range	2.00
Minimum	2.00
Maximum	4.00

Table 2: The relationship between the levels of student satisfaction and each of: gender, academic level, GPA, student preparedness, teacher e-learning performance and Beck Anxiety Inventory result.

		Student Satisfaction (All)			Total	P-value
		Unsatisfied	Neutral	Satisfied		
Gender	Male	148 (38.0%)	170 (43.7%)	71 (18.3%)	389 (100.0%)	0.394
	Female	197 (32.2%)	294 (48.1%)	120 (19.6%)	611 (100.0%)	
Total		345 (34.5%)	464 (46.4%)	191 (19.1%)	1000 (100.0%)	
Academic Level	Basic	156 (30.8%)	245 (48.4%)	105 (20.8%)	506 (100.0%)	0.012
	Clinical	189 (38.3%)	219 (44.3%)	86 (17.4%)	494 (100.0%)	
Total		345 (34.5%)	464 (46.4%)	191 (19.1%)	1000 (100.0%)	
GPA Level	C	29 (42.6%)	27 (39.7%)	12 (17.6%)	68 (100.0%)	0.501
	B	109 (32.6%)	162 (48.5%)	63 (18.9%)	334 (100.0%)	
	A	54 (35.8%)	66 (43.7%)	31 (20.5%)	151 (100.0%)	
Total		192 (34.7%)	255 (46.1%)	106 (19.2%)	553 (100.0%)	
Student Preparedness Level	Non experienced	222 (42.9%)	237 (45.8%)	58 (11.2%)	517 (100.0%)	0.000
	Experienced	123 (25.5%)	227 (47.0%)	133 (27.5%)	483 (100.0%)	
Total		345 (34.5%)	464 (46.4%)	191 (19.1%)	1000 (100.0%)	
Teacher e-learning performance	Unsatisfying	144 (68.6%)	56 (26.7%)	10 (4.8%)	210 (100.0%)	0.000
	Neutral	148 (31.0%)	271 (56.8%)	58 (12.2%)	477 (100.0%)	
	Satisfying	53 (16.9%)	137 (43.8%)	123 (39.3%)	313 (100.0%)	
Total		345 (34.5%)	464 (46.4%)	191 (19.1%)	1000 (100.0%)	
Beck Anxiety Inventory	Low	253 (33.2%)	351 (46.0%)	159 (20.8%)	763 (100.0%)	0.455
	Moderate	55 (34.8%)	79 (50.0%)	24 (15.2%)	158 (100.0%)	
	Severe	37 (46.8%)	34 (43.0%)	8 (10.1%)	79 (100.0%)	
Total		345 (34.5%)	464 (46.4%)	191 (19.1%)	1000 (100.0%)	
UJ e-Learning website is easily accessible	Strongly disagree	42 (58.3%)	25 (34.7%)	5 (6.9%)	72 (100.0%)	0.000
	Disagree	93 (42.9%)	93 (42.9%)	31 (14.3%)	217 (100.0%)	
	Neither agree nor disagree	75 (29.8%)	128 (50.8%)	49 (19.4%)	252 (100.0%)	
	Agree	122 (30.8%)	193 (48.7%)	81 (20.5%)	396 (100.0%)	
	Strongly agree	13 (21.0%)	24 (38.7%)	25 (40.3%)	62 (100.0%)	
Total		345 (34.5%)	464 (46.4%)	191 (19.1%)	999 (100.0%)	

Table 3: The relationship between level of attainment of medical knowledge for all medical students and each of: gender, academic level, GPA, teacher e-learning performance and Beck Anxiety Inventory result.

		Attainment of **theoretical** medical knowledge (among all basic and clinical students)				Total	P-value
		I experience difficulty in understanding	I gain and understand less	I gain and understand the same	I gain and understand better		
Gender	Male	32 (8.2%)	125 (32.1%)	138 (35.5%)	94 (24.2%)	389 (100.0%)	0.478
	Female	34 (5.6%)	193 (31.6%)	241 (39.4%)	143 (23.4%)	611 (100.0%)	
Total		66 (6.6%)	318 (31.8%)	379 (37.9%)	237 (23.7%)	1000 (100.0%)	
Academic Level	Basic	35 (6.9%)	149 (29.4%)	202 (39.9%)	120 (23.7%)	506 (100.0%)	0.281
	Clinical	31 (6.3%)	169 (34.2%)	177 (35.8%)	117 (23.7%)	494 (100.0%)	
Total		66 (6.6%)	318 (31.8%)	379 (37.9%)	237 (23.7%)	1000 (100.0%)	
GPA Level	C	5 (7.4%)	28 (41.2%)	20 (29.4%)	15 (22.1%)	68 (100.0%)	0.398
	B	20 (6.0%)	108 (32.3%)	118 (35.3%)	88 (26.3%)	334 (100.0%)	
	A	10 (6.6%)	44 (29.1%)	66 (43.7%)	31 (20.5%)	151 (100.0%)	
Total		35 (6.3%)	180 (32.5%)	204 (36.9%)	134 (24.2%)	553 (100.0%)	
Teacher e-learning performance	Unsatisfying	45 (21.4%)	102 (48.6%)	45 (21.4%)	18 (8.6%)	210 (100.0%)	0.000
	Neutral	19 (4.0%)	162 (34.0%)	198 (41.5%)	98 (20.5%)	477 (100.0%)	
	Satisfying	2 (0.6%)	54 (17.3%)	136 (43.5%)	121 (38.7%)	313 (100.0%)	
Total		66 (6.6%)	318 (31.8%)	379 (37.9%)	237 (23.7%)	1000 (100.0%)	
UJ e-Learning website is easily accessible	Strongly disagree	18 (25.0%)	19 (26.4%)	21 (29.2%)	14 (19.4%)	72 (100.0%)	0.001
	Disagree	14 (6.5%)	76 (35.0%)	81 (37.3%)	46 (21.2%)	217 (100.0%)	
	Neither agree nor disagree	21 (8.3%)	77 (30.6%)	96 (38.1%)	58 (23.0%)	252 (100.0%)	
	Agree	12 (3.0%)	130 (32.8%)	163 (41.2%)	91 (23.0%)	396 (100.0%)	
	Strongly agree	1 (1.6%)	16 (25.8%)	17 (27.4%)	28 (45.2%)	62 (100.0%)	
Total		66 (6.6%)	318 (31.8%)	378 (37.8%)	237 (23.7%)	999 (100.0%)	

Table 4: The relationship between level of attainment of medical knowledge for clinical students and each of: gender, academic level, GPA, teacher e-learning performance and Beck Anxiety Inventory result.

		Attainment of **clinical** medical knowledge (among clinical students only)				Total	P-value
		I experience difficulty in understanding	I gain and understand less	I gain and understand the same	I gain and understand better		
Gender	Male	63 (29.2%)	98 (45.4%)	40 (18.5%)	15 (6.9%)	216 (100.0%)	0.295
	Female	68 (24.5%)	159 (57.2%)	35 (12.6%)	16 (5.8%)	278 (100.0%)	
Total		131 (26.5%)	257 (52.0%)	75 (15.2%)	31 (6.3%)	494 (100.0%)	
GPA Level	C	10 (22.7%)	26 (59.1%)	5 (11.4%)	3 (6.8%)	44 (100.0%)	0.504
	B	51 (24.5%)	111 (53.4%)	37 (17.8%)	9 (4.3%)	208 (100.0%)	
	A	13 (30.2%)	22 (51.2%)	6 (14.0%)	2 (4.7%)	43 (100.0%)	
Total		74 (25.1%)	159 (53.9%)	48 (16.3%)	14 (4.7%)	295 (100.0%)	
Teacher e-Learning performance	Unsatisfying	43 (47.8%)	41 (45.6%)	5 (5.6%)	1 (1.1%)	90 (100.0%)	0.000
	Neutral	68 (29.3%)	119 (51.3%)	32 (13.8%)	13 (5.6%)	232 (100.0%)	
	Satisfying	20 (11.6%)	97 (56.4%)	38 (22.1%)	17 (9.9%)	172 (100.0%)	
Total		131 (26.5%)	257 (52.0%)	75 (15.2%)	31 (6.3%)	494 (100.0%)	
Student's Experience	Non experienced	91 (29.8%)	155 (50.8%)	43 (14.1%)	16 (5.2%)	305 (100.0%)	0.192
	Experienced	40 (21.2%)	102 (54.0%)	32 (16.9%)	15 (7.9%)	189 (100.0%)	
Total		131 (26.5%)	257 (52.0%)	75 (15.2%)	31 (6.3%)	494 (100.0%)	
UJ e-Learning website is easily accessible	Strongly disagree	11 (42.3%)	10 (38.5%)	4 (15.4%)	1 (3.8%)	26 (100.0%)	0.094
	Disagree	28 (33.7%)	47 (56.6%)	5 (6.0%)	3 (3.6%)	83 (100.0%)	
	Neither agree nor disagree	34 (31.2%)	43 (39.4%)	22 (20.2%)	10 (9.2%)	109 (100.0%)	
	Agree	54 (23.5%)	126 (54.8%)	38 (16.5%)	12 (5.2%)	230 (100.0%)	
	Strongly agree	4 (8.9%)	30 (66.7%)	6 (13.3%)	5 (11.1%)	45 (100.0%)	
Total		131 (26.6%)	256 (51.9%)	75 (15.2%)	31 (6.3%)	493 (100.0%)	

Table 5: The most common platforms used in e-learning in this study.

Most beneficial tool	%
Moodle	48.5
WhatsApp	28.2
Facebook	29.1
Microsoft Teams	24.0
Zoom/Skype	60
YouTube	56.7

Figures

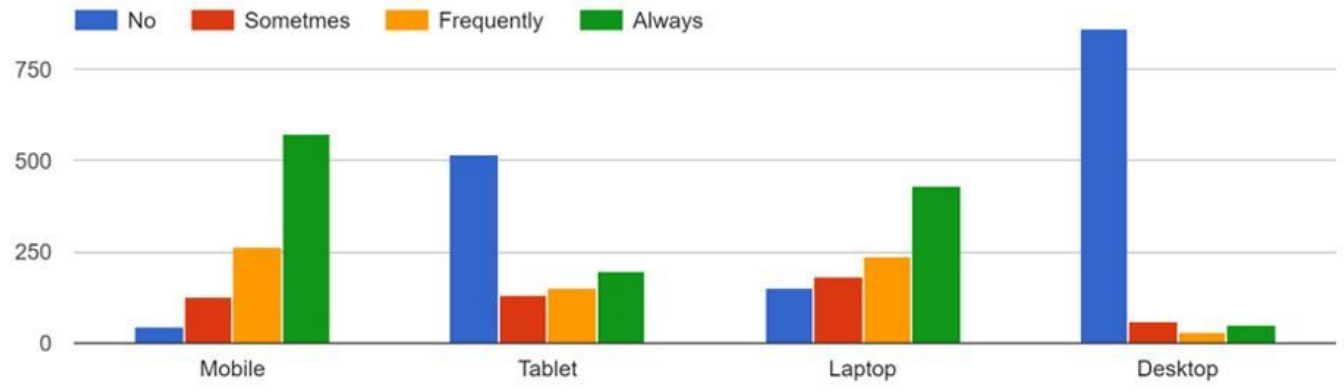

Figure 1

Bar chart of the most common devices used to connect to the internet.

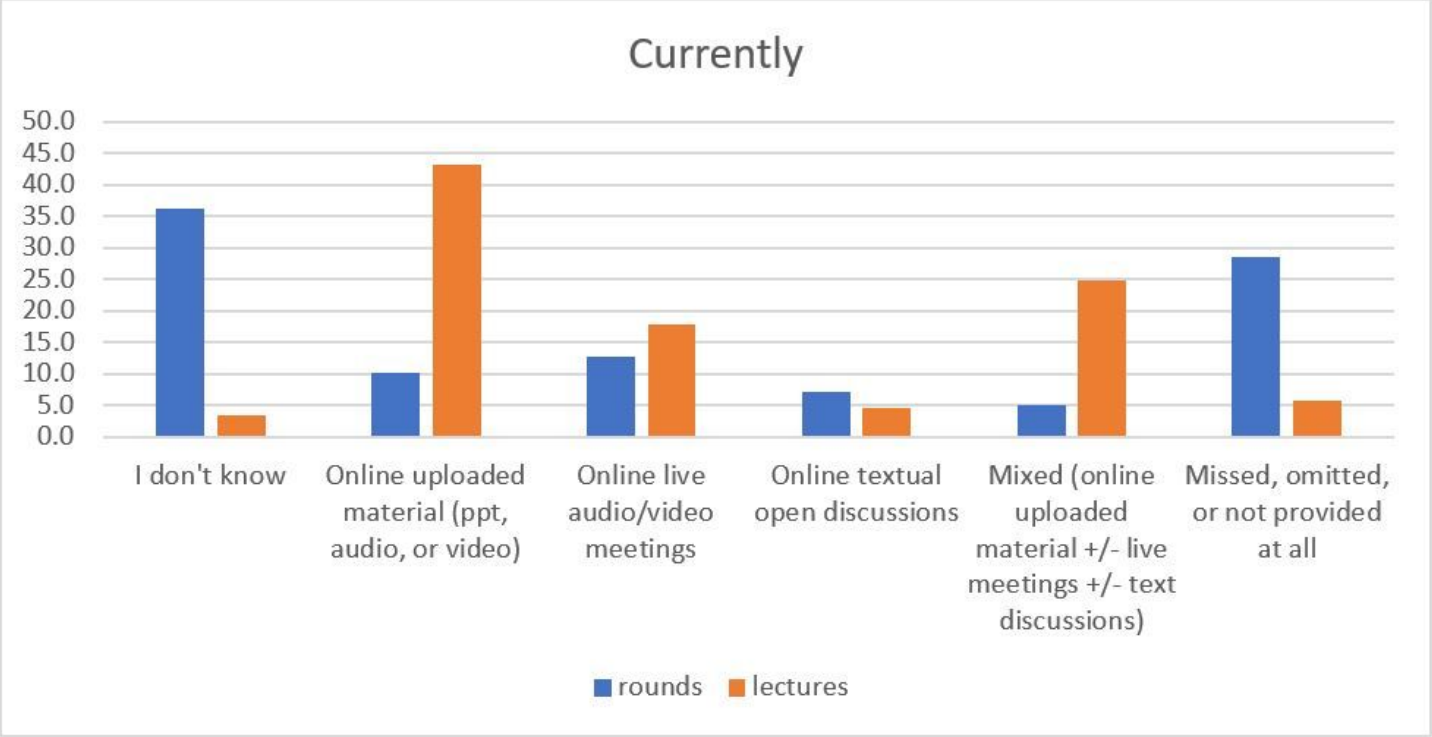

Figure 2

E-learning methods used currently for clinical rounds and lectures.

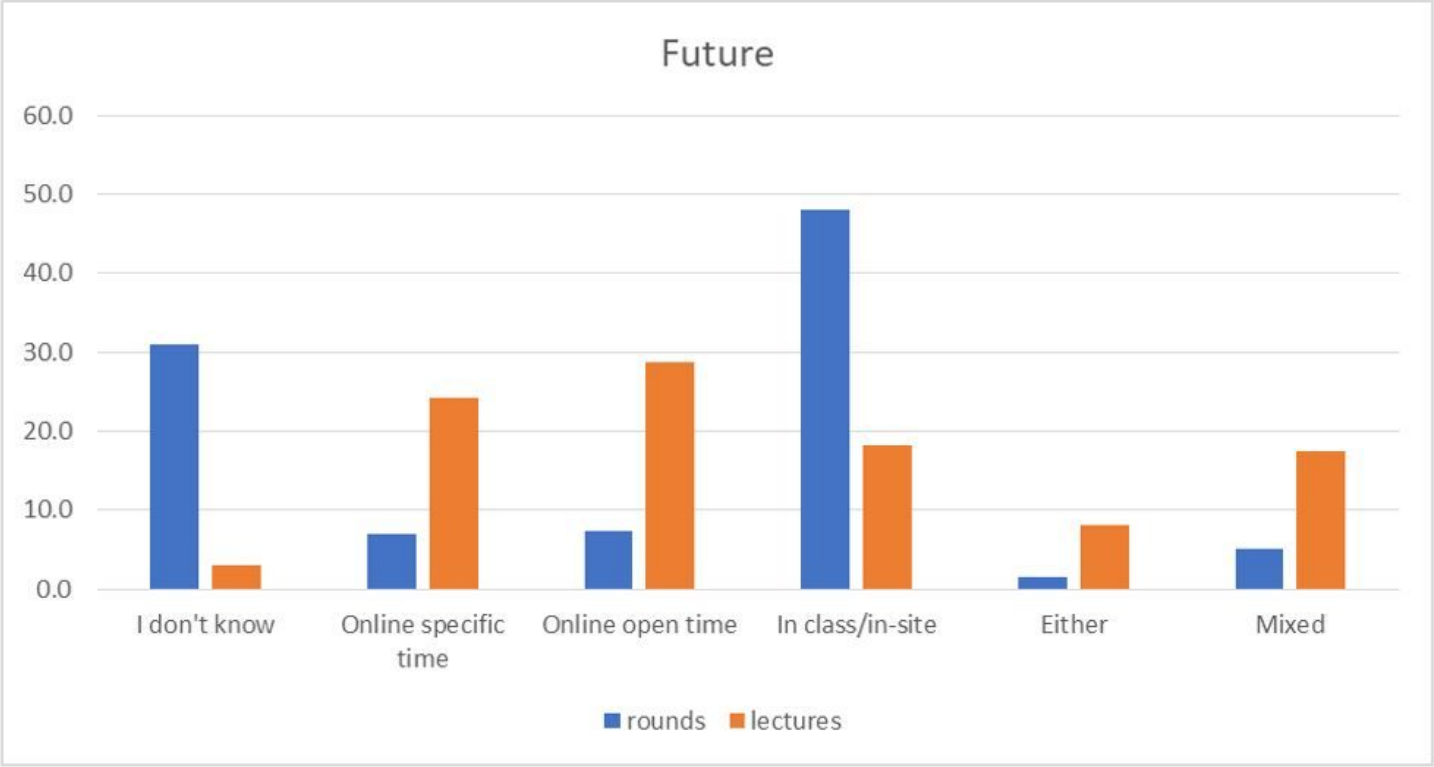

Figure 3

E-learning methods students would like to see being used in the future.