ORIGINAL ARTICLE
Volume 14 Issue 2 2022
DOI: 10.21315/eimj2022.14.2.6
ARTICLE INFO
Received: 28-06-2021
Accepted: 08-03-2022
Online: 30-06-2022

The Challenges, Effectiveness and Attitude Towards e-Learning Among Medical Undergraduates in a Private University in Malaysia

Karismajeet Kaur Gill[1], Goh Siak Chieu[1], Suriaprakash R.Sivabalan[1], Yew Ting Wei[1], Gunalan Sekharan[1], Saraswathi Bina Rai[2]

[1]*Faculty of Medicine, AIMST University, Kedah, MALAYSIA*

[2]*Community Medicine, Faculty of Medicine, AIMST University, Kedah, MALAYSIA*

To cite this article: Karismajeet KG, Goh SC, Suriaprakash RS, Yew TW, Gunalan S, Saraswathi BR. The challenges, effectiveness and attitude towards e-learning among medical undergraduates in a private university in Malaysia. Education in Medicine Journal. 2022;14(2):79–92. https://doi.org/10.21315/eimj2022.14.2.6

To link to this article: https://doi.org/10.21315/eimj2022.14.2.6

ABSTRACT

With the onset of the pandemic and the concurrent orders to stay home, many students were forced onto e-learning. This resulted in numerous challenges. While some adapted easily, concerns about the effectiveness of e-learning remain. We carried out a study amongst medical students with the aim to identify the challenges they faced, their perceived effectiveness of e-learning as well as their attitude towards it. A cross-sectional study was conducted using Google Forms. The sample size was 260 based on 95% confidence interval, margin of error 5%, and response distribution 50% on 800 undergraduate medical students. Data was analysed descriptively for demography, challenges and attitudes. The effectiveness of e-learning was scored based on a 5-point Likert scale and analysed. Analysis was by SPSS IBM Statistical Package 25. Overall, mostly Chinese students and females perceived e-learning to be more effective. Challenges were not having a personal study space, a non-conducive environment, large-sized family, technical difficulties and other distractions at home. A major challenge was the technical issues faced by lecturers that often led to extension of class sessions. In terms of attitude, traditional face-to-face classes are still their preferred choice. They are more motivated to study and are more engaged in face-to-face classes. Medical students in this private university prefer traditional face-to-face learning even though most find e-learning just as effective. However, they do face many challenges in e-learning.

Keywords: *e-Learning, Online teaching, Medical students*

CORRESPONDING AUTHOR Saraswathi Bina Rai, Community Medicine Unit, Faculty of Medicine, AIMST University, Batu 3 ½, Jalan Bukit Air Nasi, 08100, Bedong, Kedah, Malaysia

Email: binarai@yahoo.com

INTRODUCTION

The COVID-19 pandemic that swept across the globe in 2020 (1) brought about unprecedented changes in our lives. Social distancing, hand washing and masking became global phenomena overnight (2). Hence, working from home became the new norm and classroom teachings were suspended in many parts of the world. The

traditional model of face-to-face educational didactics, lectures and chalk talks was overnight converted to online classes.

Consequently, throughout Malaysia, online classes for the medical undergraduates commenced in March 2020, following a series of movement control orders (MCO) by the government, whereby all means of gatherings were controlled. With these new norms and the sudden jump start to online lessons, lecturers and students initially struggled to adjust. It was a difficult transition for the educational industry to cope, particularly medical education that relied heavily on clinical and face-to-face teaching.

e-Learning or online learning is a pedagogical approach that aims to be engaging, flexible and learner-centred (3). It essentially refers to instructional environments supported by the internet (4), which utilises electronic tools and media as resources to promote new methods of understanding and improved learning (5). This method has been well studied and though not fully internalised in the country; it has been in use for many years (6). In Malaysia, the Ministry of Higher Education's National Higher Education Strategic Plan launched in 2007 identified e-learning as a Critical Agenda Project (7). In the Malaysia Education Blueprint 2015 to 2025, the plan is to make e-learning an integral component of higher education and lifelong learning, requiring up to 70% of programmes to use blended learning models (8). Blended learning model involves a mixture of conventional and computer-based methods, which has been found to be better or at least equivalent in terms of attitudes, skills, and knowledge as when compared to traditional methods (9–10).

Medical schools in Malaysia have always adapted the traditional method of teaching and prior to the COVID-19 pandemic, the traditional method of teaching was similarly routine practice at the AIMST University located in the Northern Peninsular Malaysia. The pandemic was a wake-up call to look towards e-learning. Students and staff were no longer working in the familiarity of the university environment but were now studying and working from their own homes with all the added challenges involved in this new environment. The most common challenges as seen elsewhere and in the region were the unstable internet or the lack of technological support (11–13). Student engagement was also a challenge (14). Various cloud meeting platforms were available to host e-learning sessions: ZOOM, Microsoft Teams, Google Classroom as well as the institution's learning management system (LMS). There are additionally other platforms that some students preferred to use for e-learning (13). Each student is unique, and they come from varied backgrounds and situations. Staff with different levels of competence in handling online classes and competence with technology face their own constraints. The aim of a medical school is to train students to be competent doctors, and hence, educators must ensure that quality education is provided without any disruption. The switch to e-learning may have thwarted some of those objectives. We perceived that among the myriad of challenges that would arise with this sudden transformation, some would struggle to adapt their learning styles, and some might face technological problems, as seen in other countries in the region and elsewhere (15–16). A study in Malaysia on institutions of higher learning has shown that the traditional method of teaching was the preferred choice of learning (17). Therefore, our aim was to investigate the challenges, perceived effectiveness and attitude of students in the AIMST University towards e-learning, which refers to the internet-based approach of teaching and learning (5). Our focus was on the students, whereby we aimed to determine the more effective teaching method for our undergraduate medical students and explored how e-learning could be improved to increase its effectiveness.

METHODS

A cross-sectional study was conducted among the undergraduate medical students at the AIMST University. Consent was obtained from participants via a multi-lingual consent form prior to using a structured pre-validated questionnaire that was distributed using Google Forms. The questions selected were based on students' comments carried out informally via verbal calls and informal survey. After every subgroup of students had completed their Community Medicine posting in the university, an informal survey (in addition to the formal survey) was carried out to assess their response to the method of teaching and the problems faced. This was carried out by the researcher since 2019. We also picked up the comments given by the students during "end of posting" surveys. These were surveys with standardised questions to assess the feedback on the effectiveness of the posting.

Using Raosoft sample size calculator (18), based on the medical undergraduate student population of 800 students, 95% confidence level, margin of error of 5%, and response distribution of 50%, the sample size calculated was 260 individuals. Participants were randomly selected from Year 1 through to Year 5. Students from the other faculties were excluded from this study.

We used SPSS IBM Statistical Package 25 to analyse the data descriptively by frequencies and percentages for demography, effectiveness, challenges and attitudes. Effectiveness covered questions on the level to which the students found e-learning convenient and included effective communication, better understanding, effective delivery of the syllabus, whether it can cater to individual learning needs, its effectiveness in building skills and knowledge, addressing doubts, assignment submissions, cost-effectiveness, effectiveness in grooming professional career, balance between lecture and practical and effectiveness of online quizzes. Each variable was scored from one to five points based on Likert's scale, with one being strongly agree to five being strongly disagree. We computed the 12 variables to obtain an overall score to measure the effectiveness of e-learning. The minimum score was 12, and the maximum score was 60. Since data was normally distributed as determined by the Shapiro-Wilk test for normality, we used the independent *t*-test to assess the perceived effectiveness of e-learning against gender, and one-way ANOVA for the other categorical variables of race, year of study and place of residence, respectively. A value of $p < 0.05$ was considered significant. We used mean as the cut off point for effectiveness.

The university research assessment team scrutinised the content validity of the questionnaire, where the evaluators assessed the items in the questionnaire checklist to ensure that it provided information to meet the problem requirements. This committee then approved the research to be conducted. We first evaluated the questionnaire on five respondents whereby the comments and suggestions by the respondents were used to improve the item questions. We then calculated the reliability of the questionnaire in entirety using Cronbach's alpha for 46 variables. We pilot tested on 30 respondents, and the overall value was found to be 0.735. Cronbach's alpha calculated for 12 variables to measure effectiveness was 0.930.

RESULTS

Demographic Profile of Respondents

There were 274 respondents with an age range of 19 to 26 years old (mean age 21.88 years). The other demographics are explained in Table 1. Respondents were mostly females (58.4%) and mostly Chinese (58.0%). There were only four Malay participants. The respondents were evenly distributed throughout all the years of study except for Year 5 that had the least number of responses.

Table 1: Demographic profile of respondents

Demographic profile	Number (*N* = 274)	Frequency (%)	Mean
Age (years old)			
19	3	1.1	
20	48	17.5	
21	61	22.3	
22	91	33.2	21.88
23	27	9.9	
24	31	11.3	
25	7	2.6	
26	6	2.2	
Gender			N/A
Male	114	41.6	
Female	160	58.4	
Race			N/A
Malay	4	1.5	
Chinese	159	58.0	
Indian	102	37.2	
Others	9	3.3	
Year of study			N/A
Year 1	66	24.1	
Year 2	58	21.2	
Year 3	54	19.7	
Year 4	69	25.5	
Year 5	27	9.9	
Place of residence			N/A
City/urban	200	73.0	
Suburban	61	22.3	
Rural	13	4.7	
Household income			N/A
RM3,000 and below	74	27.0	
RM3,001–RM6,000	76	27.7	
RM6,001-RM9,000	65	23.7	
RM9,001 and above	59	21.5	
Accessibility to internet			N/A
Yes	271	98.9	
No	3	1.1	
Type of internet connection			N/A
Cell phone network	87	31.8	
DSL	23	8.4	

(continued on next page)

Table 1: *(continued)*

Demographic profile	Number (*N* = 274)	Frequency (%)	Mean
Type of internet connection			N/A
Broadband	30	10.9	
Dial up	2	0.7	
Fibre-optic	93	33.9	
Others	8	2.9	
Do not know	31	11.3	

Note: N/A – Not applicable.

Perceived Effectiveness of e-Learning

Table 2 summarises the responses from students on the perceived effectiveness of e-learning. A high percentage of responses fell into the neutral category. Overall, 132 (48.2%) students found it convenient. A total of 108 (39.4%) students believed that it did not contribute to effective communication, and 102 (37.2%) students stated that it does not allow for better understanding of the syllabus. However, 129 (47.1%) students agreed that it results in lower amount of expenditure in that there was no cost involved in commuting nor for accommodation as they were learning from home.

The score for perceived effectiveness was normally distributed with a mean of 36.73 (SD±9.8), indicating that about half respondents found it effective (Figure 1). Most were neutral.

Table 2: Perceived effectiveness of e-learning

Variables	Strongly disagree *n* (%)	Disagree *n* (%)	Neutral *n* (%)	Agree *n* (%)	Strongly agree *n* (%)
Online learning is convenient	20 (7.3)	36 (13.1)	96 (35.0)	90 (32.8)	32 (11.7)
Online learning contributes to effective communication	31 (11.3)	77 (28.1)	92 (33.6)	51 (18.6)	23 (8.4)
Online learning offers better understanding of the syllabus	30 (10.9)	72 (26.3)	113 (41.2)	44 (16.1)	15 (5.5)
The recorded classes are effective for learning online	15 (5.5)	34 (12.4)	100 (36.5)	83 (30.3)	42 (15.3)
Online learning effectively caters to individual learning needs	26 (9.5)	54 (19.7)	108 (39.4)	64 (23.4)	22 (8.0)
Online learning is effective in building skills and knowledge	31 (11.3)	70 (25.5)	100 (36.5)	57 (20.8)	16 (5.8)
Doubts can be effectively addressed during online learning	23 (8.4)	66 (24.1)	91 (33.2)	68 (24.8)	26 (9.5)
Online platform is a better way of assignment submission	20 (7.3)	21 (7.7)	68 (24.8)	105 (38.3)	60 (21.9)
Online learning incurs a lower amount of expenditure for me	24 (8.8)	23 (8.4)	98 (35.8)	87 (31.8)	42 (15.3)

(continued on next page)

Table 2: *(continued)*

Variables	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
	n (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)
There is a good balance between practical and theoretical experience in online learning	53 (19.3)	87 (31.8)	89 (32.5)	33 (12)	12 (4.4)
Online quizzes make the lesson more interactive	18 (6.6)	31 (11.3)	80 (29.2)	93 (33.9)	52 (19.0)
Online learning is an effective method of grooming my professional career	46 (16.8)	84 (30.7)	90 (32.8)	37 (13.5)	17 (6.2)
Online learning incurs a lower amount of expenditure for me	24 (8.8)	23 (8.4)	98 (35.8)	87 (31.8)	42 (15.3)

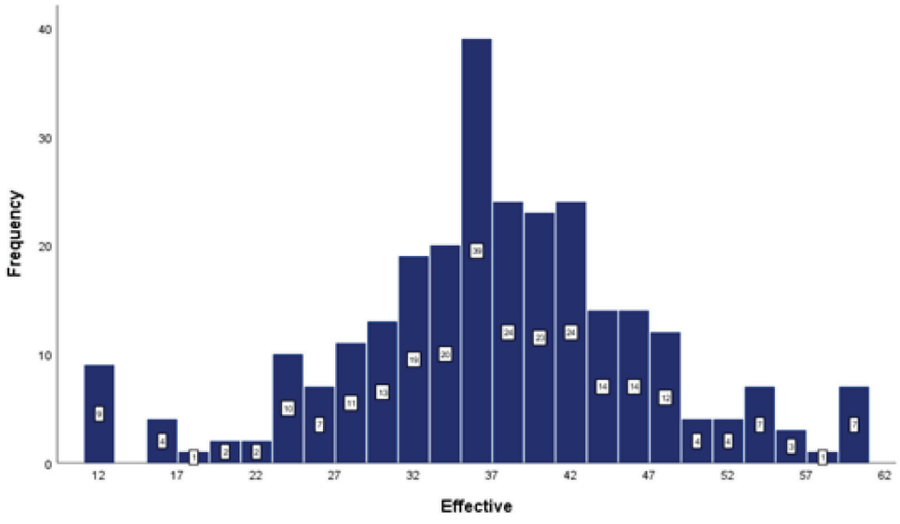

Figure 1: Overall score on perceived effectiveness of e-learning.

Table 3: Comparing perceived effectiveness of e-learning by gender, race, year of study and place of residence

Demographic profile	Mean	df	F	Sig.
Gender				
Male	35.35	272	1.673	0.048*
Female	37.72			
Race				
Malay	36.50			
Chinese	38.09	3	1.926	0.106[i]
Indian	34.86			
Others	30.00			

(continued on next page)

Table 3: *(continued)*

Demographic profile	Mean	df	F	Sig.
Year of study				
Year 1	34.67			
Year 2	39.12			
Year 3	37.69	4	1.844	0.121 [‡]
Year 4	36.36			
Year 5	35.70			
Place of residence				
City/urban	36.74			
Suburban	36.74	2	0.001	0.999 [‡]
Rural	36.62			

Notes: [*]Levenes test $p = 0.197$. Equal variances assumed. Independent *t*-test used. [‡]One-way ANOVA

The perceived effectiveness for males was different from females ($p = 0.048$). Table 3 shows inspection of the two groups indicated that the mean score for female students (37.72) was higher than the score (35.35) for males. Race, year of study, place of residence and household income were not significantly associated with perceived effectiveness of e-learning.

Challenges of e-Learning

The most prominent challenge faced by the students (Figure 2) was the technical issues on the side of the lecturers that often resulted in disruption of classes (85.8%). Despite many of the students (82.1%) having a personal study space, 58.6% of them found it a challenge to have a conducive study environment. There was a problem with completing group work during class (57.3%), completing assignments (40.9%), and having access to textbooks (28.5%). Many of them (52.6%) had to balance household duties and chores along with their studies. A lot of students (61.3%) had issues in time management. Generally, 48.2% of respondents had difficulties in adapting to the sudden transition to online learning. Internet connection was not an issue for many of the respondents themselves. However, 7.3% of them stated that they had either bad or "very bad" connection.

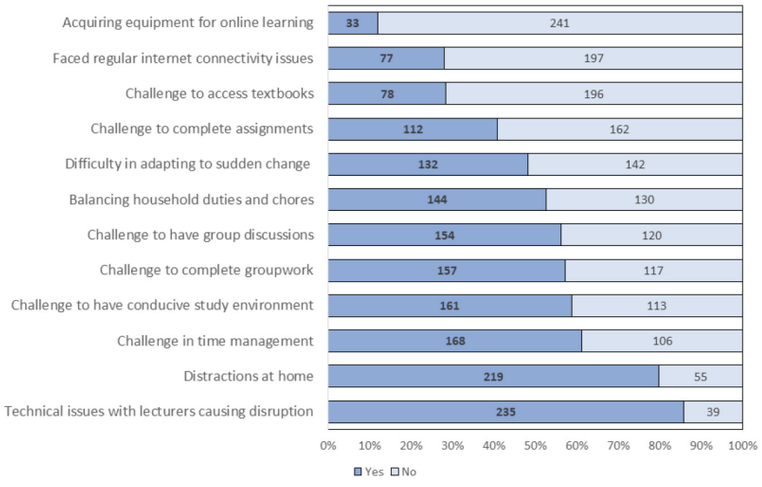

Figure 2: Some of the challenges faced with e-learning.

The students used multiple devices for e-learning. The most common device used was laptop (240, 49.3%), followed by handphone (155, 31.8%), tablet (71, 14.6%) and desktop (21, 4.3%). However, 208 (75.9%) of them claimed that laptop is the most convenient device to be used during online classes. ZOOM and the university's LMS was the most common online platform, used by 268 (48.2%) and 176 (31.7%) of the students, respectively. The other platforms used were Google Classroom (57, 10.3%) and Microsoft Teams (27, 4.9%). Most of them (226, 82.5%) found ZOOM to be the most convenient.

Attitude Towards e-Learning

Figure 3 shows the students' attitude varied on different aspects, and most of the students (67.2%) claimed that they were sufficiently disciplined to attend online classes, that they were proficient in the use of electronic devices (80.3%), and that it positively affected their willingness to study (55.1%). However, only 31.8% of them admitted to being active during the classes, and 41.6% of them conceded that they are more inclined to miss online classes. Many students felt that switching on the video was unnecessary.

In response to the preferred mode of learning, 210 (76.6%) of the respondents preferred the traditional face-to-face classes and 208 (75.9%) of them felt more motivated to study in this mode. Many of them (212, 77.4%) felt more involved and engaged in traditional face-to-face classes as compared to online classes.

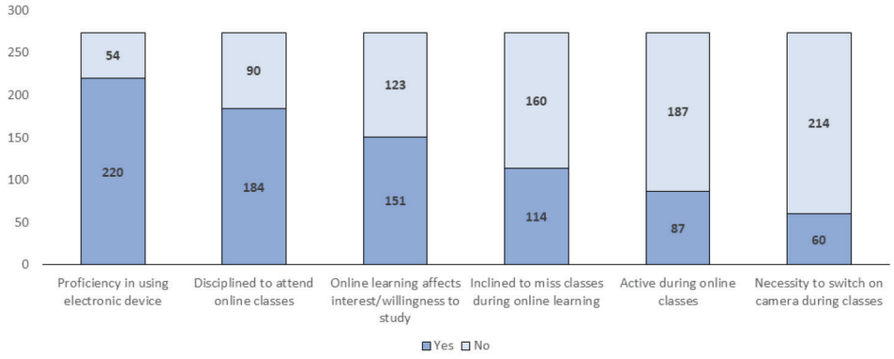

Figure 3: The attitude of students towards online classes.

DISCUSSION

Perceived Effectiveness of e-Learning

Most of the students were neutral about the perceived effectiveness of e-learning, while many students found it convenient. This may be so as they can learn at leisure without having to spend time on the commute to classes. Online classes were highly beneficial during the pandemic as students received education within the safety of their homes. However, the main business of a university is student education, and at a time when the best option is to have online classes, we need to ensure that the students benefit in every way and that their education is not compromised. In terms of communication, the lecturer has limited access to the students as the students may skip the class with the computer monitor on but with the video disabled. Lack of motivation may be a factor when students are studying at their own space. This overall lack of structure is similar to previously published findings (19). One way to overcome this issue is to make the visual mode compulsory.

This may help to improve interaction. In conventional teaching, in-class instruction, body language, facial expressions and the voice of educator are all powerful learning instruments. Nevertheless, when online, there are limitations as only speech will be completely operational.

e-Learning should be made more interesting to capture the interests of the student. It should not just be a PowerPoint presentation delivered through whatever platform chosen to deliver the lesson. We suggest diversity in methods of presentation. Lecturers are recommended to organise their lessons more innovatively so that the students can also participate more effectively.

To effectively deliver the syllabus, clarity of speech by the educator is important for students to fully comprehend the lectures. Virtual learning, however, has limited effectiveness, especially in subjects that requires practical skills. One option is for the lecturer to give high order thinking questions for the students to solve and make the classes more interesting (20). A critical learning space using different strategies and engaging content can make the student more interested in e-learning.

Students' doubts must always be cleared. Students want technological and instructor competence (21), followed by engagement, and these must be provided by the university as well as by the lecturer for effective e-learning. Both methods have their advantages and disadvantages. Both the traditional face-to-face and e-learning methods allow for questions, and as for e-learning, those who are reluctant to ask questions can do it safely from a distance. Although the e-learning method is effective for assignment submission with just a click of a button, it is limited by poor connectivity. e-Learning incurs a lower amount of expenditure. With the convenience of being at home, most students can participate in classes without the need for travel expenses, hostel fees and other associated expenditure. They also need not dress up. Studies have shown mixed findings on cost effectiveness of e-learning (22). However, without the proper equipment some investment is still required, the basics having a computer and good internet connectivity.

Online quizzes make lessons more interactive and were found to be more beneficial (23). With applications like Kahoot, students not only earn points for correct answers but will get a better understanding as to where they stand among their classmates. e-Learning is not an effective way of grooming student's professional career as the practical aspect is compromised. Medical students need to practice on patients, and this cannot be substituted with just teaching online. We found that females and Chinese perceived the effectiveness of online classes to be significantly better than the rest. Female students in this cohort probably focussed better. Findings on gender have been mixed. Some studies have shown that patterns of retention were similar irrespective of gender (24). In other studies, females have been found to have stronger self-regulation leading to positive online learning outcome (25). They have also been found to be more persistent and committed (26).

Challenges of e-Learning

Time management is a common problem with e-learning (27–28). At home, the students are not bound by the university's schedule as some classes are recorded and made accessible to the students via their LMS. In some situations, study time is affected by household chores. Due to the MCO, all family members are home. In addition, there are other family distractions (29), especially from siblings, phones, games and television. These may make the environment noisy and inconducive to learning. Having younger siblings at home who are unable to go to school due to the pandemic adds to the challenges. A good level of planning and prioritisation is needed. Those without a personal study

space find it challenging. They lack the supportive environment needed to interact and discuss with the lecturers or their friends and to carry out groupwork.

Not having easy access to physical textbooks does not put students at a disadvantage as seen in studies (30). The web is a rich source of information, and the student needs guidance on where to look. Despite this, some students in this study found it a challenge to complete assignments and meet deadlines due to lack of references. Textbooks are the main source of reference in some medical universities with reading directly from textbooks being the choice of reference (31–32). The university library here has yet to digitalise its books to make it accessible online. We recommend that in this age of technology, the university considers digitisation of the key books in the library to make them more accessible to the students.

Malaysia overall has good broadband and mobile phone penetration rates (33). The internet speed can play a significant role in how effectively one engages in class and subsequently the learning experience. However, band width does slow down and some areas do not have good coverage due to which some students face connectivity issues. It is essential to take into consideration the connectivity issues from the lecturer where majority of the respondents have faced disruption during class. It has long been known that for online learning to be successful, there must be smooth interaction between the learner, the teacher and technology (34). Equity and accessibility to technology have been a problem with online teaching (35).

The university should have a help desk that students can refer to when they face any difficulties. Lecturers need to have a backup plan to deal with disruptions. Students at home should invest in their own internet, and likewise, all lecturers should invest in a good network.

Attitude Towards e-Learning

As mentioned earlier, the traditional face-to-face classes are the preferred mode of learning in this study. The university environment is defined by its facilities, classrooms, libraries, students-lecturer relationship and disciplinary policies that enables a quality learning experience. Despite their preferences, many of the students claimed that they have the discipline to attend online classes. However, the freedom that online classes afford, inclines them to miss classes, and this affects their interests and willingness to study. Prior to the COVID-19 pandemic, home was a place to rest, relax and interact with the family, but now, home was also the classroom where other family members may be carrying out tasks in the confines of the home. In addition, every response the student makes is audible to his family, especially in the smaller homes where space is a challenge. This situation forces them to be more disciplined. Ultimately, as seen elsewhere, students will learn to adapt (36) and appreciate the flexibility it affords (37).

Like other studies, (38) laptop and phone are the devices that were frequently used during online classes, with the laptop being most convenient device. Phones are handy and can easily be used anywhere. The main drawback is probably the small screen size. ZOOM was the preferred learning platform. It is user-friendly and can be accessed anywhere and even via handphones. Most of the students were proficient in using electronic devices and had all the necessary equipment; this facilitated their learning process. However, a few students did not have proper equipment and internet connectivity, which affected their learning experience.

Switching on the camera was not a popular option. This requires a larger bandwidth with associated higher cost. Some may not want their home conditions to be viewed. One option is to use a virtual background to preserve privacy, but this affects bandwidth. In addition, there may be other siblings

having online classes, or parents working from home and the bandwidth needs to be shared. We recommend that during online classes, where possible, the students activate their video to actively engage, using a virtual background to maintain privacy. Lecturers should be sensitive to the student's environment, understanding that this may not always be possible; in such cases, we recommend that they engage the student during class by calling out to them for feedback.

Here, students feel more involved and engaged in traditional face-to-face classes. In line with this, some are passive during online classes. Passive could mean that they are shy, do not want their family members to hear what they are saying, or do not want to turn on the sound as the background noise may be high. Nevertheless, the unconfrontational nature of online learning might encourage the introverted students to engage more within their comfort levels (39–40).

Teaching assistants can be employed to assist with online support and ensure educators comprehend each class goals and structure their teaching activities accordingly. They can also provide feedback and address questions. We also recommend that lecturers use quizzes as a self-check mechanism. Lecturers need to vary their teaching methods to make the classes interesting. Teaching and learning are a two-way process that are interrelated. Lecturers need to be alert and able to identify and pay special attention to students who are lagging in the e-learning process. These can encourage all students to finish the reading needed, enabling students and the educators to assess their understanding of the topics.

CONCLUSION

Most students in this medical faculty perceive that online learning is just as effective as traditional face-to-face learning but preferred the latter as they found themselves more motivated to study and more engaged in that method. There was a significant difference between the genders where Chinese and females perceived it to be more effective. The challenges that they faced included not having a personal study space, non-conducive environment, large family members, technical difficulties and facing other distractions at home. The technical issues faced by lecturers were a major challenge to many. Most of the students used a laptop for online classes, preferred the ZOOM platform and had the discipline to attend online classes.

ETHICAL APPROVAL

The Faculty of Medicine Research and Human and Animal Ethics Committee (FOMRHAEC) of the AIMST University provided ethical approval to conduct this research with the reference number: FOM/SSM/2020/21.

REFERENCES

1. Priyadarshini I, Mohanty P, Kumar R, Son LH, Chau HTM, Nhu V-H, et al. Analysis of outbreak and global impacts of the COVID-19. Healthcare. 2020; 8(2):148.

2. Laskowski-Jones L. COVID-19 and changing social norms. Nursing. 2020;50(5):6.

3. Kaur N, Dwivedi D, Arora J, Gandhi A. Study of the effectiveness of e-learning to conventional teaching in medical undergraduates amid COVID-19 pandemic. Natl J Physiol Pharm Pharmacol 2020;10(07):563–7.

4. Bakia M, Shear L, Toyama L, Lasseter A. US: US Department of Education Office of Educational Technology; 2012 [cited 12 Jan 2021]. Understanding the implications of online learning for educational productivity. Available from: https://tech.ed.gov/files/2013/10/implications-onlinelearning.pdf

5. Sangrà A, Vlachopoulos D, Cabrera N. Building an inclusive definition of e-learning: an approach to the conceptual framework. International Review of Research in Open and Distance Learning. 2012;13(2):145–59.

6. Garrison DR, Anderson T. e-Learning in the 21st century: a framework for research and practice. London: Routledge/Falmer; 2003.

7. Ministry of Higher Education Malaysia. National Higher Education Action Plan 2007–2010. Triggering higher education transformation. Putrajaya: Ministry of Higher Education Malaysia; 27 August 2007.

8. Ministry of Education Malaysia. Executive summary. Malaysia's education blueprint 2015–2025 (higher education). Putrajaya: Ministry of Education Malaysia; 2015.

9. Rasmussen K, Belisario JM, Wark PA, Molina JA, Loong SL, Cotic Z. Offline e-learning for undergraduates in health professions: a systematic review of the impact on knowledge, skills, attitudes and satisfaction. J Glob Health. 2014;4(1):010405.

10. Kyaw BM, Posadzki P, Dunleavy G, Semwal M, Divakar U, Hervatis V, Tudor Car L. Offline digital education for medical students: systematic review and meta-analysis by the digital health education collaboration. J Med Internet Res. 2019;21(3):e13165.

11. Leary J, Berge ZL. Trends and challenges of eLearning in national and international agricultural development. Int J Educ Dev Using Inf Commun Technol. 2006;2(2):51–9.

12. Almaiah MA, Al-Khasawneh A, Althunibat A. Exploring the critical challenges and factors influencing the e-learning system usage during COVID-19 pandemic. Education and Information Technologies. 2020;25:5261–80.

13. Mahyoob M. Challenges of e-learning during the COVID-19 pandemic experienced by EFL learners. Arab World English Journal. 2020;11(4):351–62.

14. Mahmud AA, Suain Bon R. Teaching undergraduate psychiatry during the COVID-19 pandemic: challenges and learning experiences. Malaysian Journal Psychiatry. 2021;30(2): Online early.

15. Toquero CM. Challenges and opportunities for higher education amid the COVID-19 pandemic: the Philippine context. Pedagogical Research. 2020;5(4):em0063.

16. Almarzooq ZI, Lopes M, Kochar. 2020. Virtual learning during the COVID-19 pandemic: a disruptive technology in graduate medical education. J Am Coll Cardiol. 75(20);2635–8.

17. Selvanathan M, Hussin NAM, Azazi NAN. Students learning experiences during COVID-19: work from home period in Malaysian higher learning institutions. Teaching Public Administration. 2020;December(online first).

18. Raosoft [Internet]. US: Raosoft Inc.; c.2014 [cited 18 Aug 2020]. Sample size calculator. Available at: http://www.raosoft.com/samplesize.html

19. Rahiem MDH. Indonesian university students' likes and dislikes about emergency remote learning during the COVID-19 pandemic. Asian Journal of University Education. 2021;17(1):1–18.

20. Kwangmuang P, Jarutkamolpong S, Sangboonraung W, Daungtod S. The development of learning innovation to enhance higher order thinking skills for students in Thailand Junior High Schools. Heliyon. 2021;(7)6:e07309.

21. Van Wart et al. Integrating students' perspectives about online learning: a hierarchy of factors. Int J Educ Technol High Educ. 2020;17(1):1–22.

22. Jung I, Rha I. Effectiveness and cost-effectiveness of online education: a review of the literature. Educational Technology. 2000;40(4):57–60.

23. Shukla T, Dosaya D, Nirban VS, Vavilala MP. Factors extraction of effective teaching-learning in online and conventional classrooms. Int J Inf Educ Technol. 2020;10(6):422–7.

24. James S, Swan K, Daston C. Retention, progression and the taking of online courses. Journal of Asynchronous Learning Network. 2016;20(2):75–96.

25. Alghamdi A, Karpinski AC, Lepp A., Barkley J. Online and face-to-face classroom multitasking and academic performance: moderated mediation with self-efficacy for self-regulated learning and gender. Computers in Human Behavior. 2020;102;214–22.

26. Richardson JT, Woodley A. Another look at the role of age, gender and subject as predictors of academic attainment in higher education. Studies in Higher Education. 2003;28(4):475–93.

27. Kearns LR. Student assessment in online learning: challenges and effective practices. J Online Learn Teach. 2012;8(3):198–208.

28. Rajab MH, Gazal AM, Alkattan K. Challenges to online medical education during the COVID-19 pandemic. Cureus. 2020;12(7):e8966.

29. Dost S, Hossain A, Shehab M, Abdelwahed A, Al-Nusair L. Perceptions of medical students towards online teaching during the COVID-19 pandemic: a national cross-sectional survey of 2721 UK medical students. BMJ Open. 2020;10(11):e042378.

30. Alshahrani S, Ahmed E, Ward R. The influence of online resources on student–lecturer relationship in higher education: a comparison study. Journal of Computers in Education. 2017;4:87–106.

31. Folb BL, Wessel CB, Czechowski LJ. Clinical and academic use of electronic and print books: the health sciences library system e-book study at the University of Pittsburgh. J Med Libr Assoc. 2011;99(3):218–28.

32. Anuj Singhal, Prashant Jambunathan, Manish Manrai, Shikha Awasth and Arshi Sashindran. e-learning in medicine: are we ready to replace text books? Journal of Research in Medical Education & Ethics. 2019;9(3):212–5.

33. MCMC. MCMC 2Q 2020 facts and figures. 2020 [cited 12 Jan 2021]. Available at: https://www.mcmc.gov.my/skmmgovmy/media/General/pdf/2Q-2020-C-M.pdf

34. Fabry DL. Designing online and on-ground courses to ensure comparability and consistency in meeting learning outcomes. Q Rev Distance Educ. 2009;10(3);253–61.

35. Mbuva JM. Examining the effectiveness of online educational technological. J High Educ Theory Pract. 2015;15(2):113–27.

36. Khalil R, Mansour AE, Fadda WA, Almisnid K, Aldamegh M, Al-Nafeesah A, et al. The sudden transition to synchronized online learning during the COVID-19 pandemic in Saudi Arabia: a qualitative study exploring medical students' perspectives. BMC Med Educ. 2020;20:85.

37. Al-Balas M, Al-Balas HI, Jaber HM, Obeidat K, Al-Balas H, Aborajooh EA, et al. Distance learning in clinical medical education amid COVID-19 pandemic in Jordan: current situation, challenges, and perspectives. BMC Med Educ. 2020;20(1):341.

38. Gamage KAA, Perera E. Undergraduate students' device preferences in the transition to online learning. Social Sciences. 2021;10(8):288.

39. Nuning Wahyu Astuti. "I feel less judged, so I speak more" introverted students' response on online learning platforms in speaking class. Journal of English Language Teaching and Learning. 2021;2(2):51–6.

40. Oesch T. Using e-learning to engage introverts. Training industry. 16 February 2017 [cited 12 Jan 2021]. Available at: https://trainingindustry.com/articles/e-learning/using-e-learning-to-engage-introverts/