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Remote learning readiness amidst the COVID-19 pandemic amongst undergraduate medical students

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Abstract

Introduction: The global COVID-19 pandemic had greatly affected the delivery of medical education, where institutions had to convert to remote learning almost immediately. This study aimed to measure undergraduate medical students' readiness and factors associated with readiness for remote learning.

Methods: A cross-sectional quantitative study was conducted amongst undergraduate medical students using the Blended Learning Readiness Engagement Questionnaire, during the pandemic where lessons had to be delivered fully online in 2020.

Results: 329 students participated in the study. Mean scores for remote learning readiness were 3.61/4.00 (technology availability), 3.60 (technology skills), 3.50 (technology usage), 3.35 (computer and internet efficacy), and 3.03 (self-directed learning). Male students appeared more ready for remote learning than females, in the dimensions of self-directed learning and computer and internet efficacy. Students in the pre-clinical years showed a lower level of readiness in the technology availability domain compared to clinical students. The lowest score however was in the self-directed learning dimension regardless of the students' year of studies.

Conclusion: The pandemic had created a paradigm shift in the delivery of the medical program which is likely to remain despite resumption of daily activities post-pandemic. Support for student readiness in transition from instructor-driven learning models to self-directed learning models is crucial and requires attention by institutions of higher learning. Exploring methods to improve self-directed learning and increase availability of technology and conducting sessions to improve computer and internet efficacy can be considered in the early stages of pre-clinical years to ensure equitable access for all students.

Keywords: *Remote Learning, Student's Readiness, Medical Education*

I. INTRODUCTION

The COVID-19 pandemic and global emergency from the end of January 2020 had greatly affected the education sector, with many institutions including undergraduate medical schools converting to remote learning within a short timeframe.

Previous studies have shown that e-learning methods were effective and acceptable among medical undergraduate students (Chen et al., 2020). Studies have also suggested that students may struggle in adapting to a self-directed learning process (Vaughan, 2007), prefer traditional face-to-face lectures and possibly lacking the technological skills and infrastructure for a satisfactory remote learning experience.

It is important to determine the remote learning readiness of undergraduate medical students to facilitate the adaptation of these practices to maximise student competencies. Therefore, the primary objective of this

study was to determine the readiness for remote learning in undergraduate medical students in a South-East Asian university and the secondary objective was to identify factors associated with their remote learning readiness.

II. METHODS

This was a cross-sectional quantitative study to measure medical students' readiness towards remote learning using the BLREQ questionnaire. This study was approved by the Research Ethics Committee (Reference UM.TNC2/UMREC-889) of the university.

In the Covid-19 enforced scenario at that time, the physical face-to-face teaching in our institution was moved to online almost immediately, requiring the students to adapt their learning approaches rapidly to suit the needs of a virtual learning environment.

The duration of the study was one month, from the 19th of June to the 19th of July 2020. Our country implemented a national lockdown (and emergency remote learning) due to COVID-19 on the 18th of March 2020. Thus, data collection occurred in the first few months of the remote learning situation and represented students' experiences and readiness during the early phase of the change.

The students were from all five years of study in the medical undergraduate program. They were contacted via their online educational platform and WhatsApp group chats with details of the study, participant's consent form, link to the online self-administered questionnaire and weekly reminders to encourage participation. Participation was voluntary and consent was obtained from the students. Data were anonymised and not traceable to a particular individual.

This study utilised Section A and B of the BLREQ questionnaire which is a validated questionnaire on the readiness and engagement of students in blended learning (Adams et al., 2018). Although 'Blended Learning' is defined as a combination of e-learning (online) and traditional education (face-to-face) approaches, the BLREQ is appropriate for this study as it primarily measures students' readiness for remote learning. Section A contained basic demographic questions (i.e., age, gender, year of study). Section B had 37 items in five dimensions which addressed various aspects of students' readiness for remote learning. A 4-point Likert-type scale ranging from strongly disagree (1) to strongly agree (4) was provided with only one response allowed per item.

The data was analysed using IBM SPSS version 25. The data was non-normally distributed; hence the Mann-Whitney U test was used to test for significant difference in scores between gender and stages of study.

III. RESULTS

There were 329 complete responses out of 734 invited participants (44.8% response rate). Most respondents were aged between 20 to 24 years old (Mean=21.9; SD=1.8). Approximately 59% were female and 59% were clinical students.

The total dimension and individual item mean scores are reported in Table I with the highest and lowest scores of each dimension annotated. The dimensions of remote learning readiness arranged in descending order of total mean score are Technology Availability (3.61+50), Technology Skills (3.60+.43), Technology Usage (3.50+.44), Computer and Internet Efficacy (3.35+.49), and Self-directed Learning (3.03+.51) (Table 1). Research data of this study are available at https://doi.org/10.6084/m9.figshare.21443100

Analysed by gender, the mean scores of male students were significantly higher than female students in the dimensions of Self-directed Learning; 3.13 vs 2.96 (U=10354.5, z=-3.18, p=.001), and Computer and Internet Efficacy; 3.39 vs 3.32 (U=11332.5, z=-2.02, p=.044). Individual items in which male students scored significantly higher in each dimension were [SDL1], [SDL4], [CIE2] and [CIE3].

When comparing between stages of study, the mean score of clinical students was significantly higher than pre-clinical students only in the Technology Availability dimension; 3.65 vs 3.55 (U=11376.0, z=-2.13, p=.034) An individual item which clinical students scored significantly higher in Technology Availability dimension was [TA3].

Dimensions and items	Mean	SD
[TS] Technology Skills dimension	**3.60**	**.43**
[TS1] I know the basic functions of a computer/laptop and its peripherals like the printer, speaker, keyboard, mouse etc.**	3.76	.45
[TS2] I know how to save and open documents from a hard disk or other removable storage device.	3.67	.52
[TS3] I know how to open and send email with file attachments.	3.72	.48
[TS4] I know how to log on to Wi-Fi	3.74	.46
[TS5] I know how to navigate web pages (go to next or previous page).	3.68	.50
[TS6] I know how to download files using browsers (e.g., Google Chrome, Internet Explorer, Firefox) and view them.	3.67	.51
[TS7] I know how to access an online library or database.*	3.19	.78
[TS8] I know how to use Word processing software (e.g., Microsoft (MS) Word).	3.62	.53
[TS9] I know how to use Presentation software (e.g., MS PowerPoint).	3.60	.53
[TS10] I know how to use Spreadsheet software (e.g., MS Excel).	3.30	.75
[TS11] I know how to open several applications at the same time and move easily between them.	3.60	.60
[TU] Technology Usage [TU] dimension	**3.50**	**.44**
[TU1] I often use the internet to find information.**	3.86	.37
[TU2] I often use e-mail to communicate.*	2.93	.93
[TU3] I often use office software (e.g., MS Word, PowerPoint, Excel).	3.62	.56
[TU4] I often use social networking sites to share information (e.g., Facebook, Twitter, Instagram, Snapchat).	3.39	.83
[TU5] I often use instant messaging (e.g., WhatsApp, Viber, WeChat, Line, Telegram).	3.72	.54
[TU6] I often use cloud-based file hosting services to store or share documents (e.g., Google Drive, Dropbox, One drive).	3.44	.69
[TU7] I often use learning management systems (e.g., Blackboard, Moodle).	3.28	.69
[TU8] I often use mobile technologies (e.g., Smartphone, Tablet) to communicate.	3.72	.51
[TA] Technology Availability dimension	**3.61**	**.50**
[TA1] I have a computer/laptop with an internet connection.**	3.74	.53
[TA2] I have a computer/laptop with adequate software for learning (e.g., Microsoft (MS) Office).	3.63	.57
[TA3] I have speakers for courses with video presentations.*	3.50	.72
[TA4] I have a computer/laptop and its peripherals like the printer, speaker, keyboard, mouse etc.	3.57	.66
[SDL] Self-directed Learning dimension	**3.03**	**.51**
[SDL1] I am a highly independent learner.	3.12	.69
[SDL2] I am able to learn new technologies.**	3.60	.55
[SDL3] I do not need direct lectures to understand materials.*	2.36	.92
[SDL4] I would describe myself as a self-starter in learning using technology.	3.18	.79

[SDL5] I am not distracted by other online activities when learning online (e.g., Facebook, Gaming, Internet surfing).	2.42	1.04
[SDL6] I can read the online instructional materials on the basis of my needs.	3.49	.58
[CIE] Computer and Internet Efficacy dimension	**3.35**	**.49**
[CIE1] I feel confident in using online tools (e.g., email, internet chat, instant messenger) to communicate effectively with others.	3.48	.65
[CIE2] I feel confident in expressing myself (e.g., emotions and humour) in my university's learning management systems (e.g., Blackboard, Moodle)	2.89	.83
[CIE3] I feel confident in posting questions in online discussions.*	2.87	.82
[CIE4] I feel confident in performing the basic functions of Word processing software (e.g., MS Word).	3.59	.55
[CIE5] I feel confident in performing the basic functions of Presentation software (e.g., MS PowerPoint).	3.48	.62
[CIE6] I feel confident in performing the basic functions of Spread sheet (e.g., MS Excel).	3.26	.78
[CIE7] I feel confident in using web browsers (e.g., Google Chrome, Mozilla Firefox) to find or gather information for online learning.**	3.67	.53
[CIE8] I feel confident in using computer or tablet or mobile phone for online learning.	3.56	.63

Table 1. Dimension and individual item mean scores of student readiness to engage in remote learning

** highest score in the dimension
*lowest score in the dimension

IV. DISCUSSION

This study aimed to identify medical students' readiness for remote learning across five dimensions and to identify factors associated with their readiness during the early months of the COVID-19 online learning transition period. Although there is significant resumption of usual activities post-COVID-19 pandemic, many of the online and self-directed components of learning are likely to remain as the way forward in the medical curriculum. Therefore, we feel that this study still has relevance currently.

All mean scores of the subscales Technology Availability (TA), Technology Skills (TS), Technology Usage (TU), Computer and Internet Efficacy (CIE) and Self-directed Learning (SDL), were above 3 on a scale of 1 to 4. The mean scores in our study were much higher and have less deviation than Adams et al's study conducted in a similar setting before the COVID-19 pandemic, in which the five dimensions scored lower than 3.00, with SDL scoring the lowest mean in the other study at 1.25+1.55 (Adams et al., 2018). Adams et al's study also did not show much difference when comparing between medicine, social science, science and engineering students (Adams et al., 2018), indicating that readiness for online learning was much lower overall pre-COVID-19.

Despite the increase compared to Adams et al's study, SDL still scored the lowest in our study out of the five dimensions. An implication of this is that universities need to help learners transition from facilitator/ instructor-driven learning models to self-directed learning models. This can be done by making training in 'learning to learn' (L2L) an essential component of student support. In our setting, this training should address items which scored lowest in SDL as these indicate areas of struggle for students; [SDL3] and [SDL5]. It is also possible that some facilitators are not aware of what SDL is, therefore facilitators can also benefit from training for SDL methods.

Our study demonstrated significantly higher readiness for remote learning among male students in comparison to female students in the domains of SDL and CIE. While some studies indicate no gender differences in e-Learning readiness, other studies also report gender differences such as males having more positive attitudes toward online learning; males being more ready for online learning (Adams et al., 2018) and males using more learning strategies and having better technical skills than females (Alghamdi et al., 2020). In the CIE domain, males scored higher in the items [CIE2] and [CIE3] which are both related to communication through a virtual platform. This resulted in males scoring higher in the CIE domain in general. The gender disparity in remote learning readiness needs to be addressed as

female students are increasingly the majority (and therefore primary stakeholders) in medical schools worldwide.

The mean score of clinical students was significantly higher than pre-clinical students only in the Technology Availability domain with clinical students reporting better hardware and infrastructure access compared to pre-clinical students. It is likely that as the learners progress through a course, they become more aware of the technological requirements of the course and invest in better devices and internet access. It is also possible that the students' socioeconomic status at the beginning of their course may not have been good, for example if they were awaiting scholarships to be processed, which subsequently became available later in their course of study. This may have then enabled the students to purchase better hardware and infrastructure further on in their course, during the clinical years. However, this financial aspect was not included our study. It is still worth considering future programs early in the course, where there could be subsidies for students to purchase necessary technological equipment for their studies.

A. Limitations and Recommendations

One limitation of this study was that it looked at remote learning in general and did not look at clinical elements such as using online simulated patients for history taking classes, or procedural skills videos. The study also only looked at student perspectives, and not faculty perspectives to get a complete picture of the online learning experiences. Future studies should explore student readiness for clinical online learning as this would be a struggle for students even if the transition was under normal circumstances (Vaughan, 2007). The perspectives of faculty members on readiness to move towards online learning also need to be explored. The strength of this study was that it used a previously validated questionnaire which allowed some comparison on students' remote learning readiness with pre-COVID-19 studies.

V. CONCLUSION

In conclusion, the study explored medical undergraduates' remote learning readiness in a public medical school in Malaysia during the COVID-19 pandemic. In general, students were found to be ready for remote learning. However, the lowest scores were for the domain of self-directed learning and computer and internet efficacy. Based on our findings, we feel that support for student readiness in transition from instructor-driven learning models to self-directed learning models is crucial and requires attention by institutions of higher learning. Exploring methods to improve self-directed learning and increase availability of technology and conducting sessions to improve computer and internet efficacy can be considered in the early stages of pre-clinical years to ensure equitable access for all students. There should also be efforts to train the educators to develop online learning activities which incorporate the socio-relational aspects of learning into the remote learning experience.

Notes on Contributors

Kit Mun, Tan is the first author and person who initiated the study, contributed to the design of the study, data collection and analysis, writing and approval of the final version of the manuscript.

Chan Choong, Foong contributed to the design of study, data collection and analysis, writing and approval of the final version of the manuscript.

Donnie, Adams is the creator of the original Blended Learning Readiness Questionnaire (BLREQ) and contributed to the design of the study, data collection and analysis, writing and approval of the final version of the manuscript.

Wei Han, Hong contributed to the design of the study, data collection and analysis, writing and approval of the final version of the manuscript.

Yew Kong, Lee contributed to the design of the study, data collection and analysis, writing and approval of the final version of the manuscript.

Vinod, Pallath is the corresponding author and contributed to the design of the study, data collection and analysis, writing and approval of the final version of the manuscript.

Ethical Approval

This study received ethical approval from the Universiti Malaya Ethics Review Committee with the approval number of UM.TNC2/UMREC-889.

Data Availability

Research data of this study are available at https://doi.org/10.6084/m9.figshare.21443100.

Readers may access the anonymised data freely with the above URL. Kindly contact the authors for permission if you wish to use the data for a subsequent study or collaboration.

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Declaration of Interest

All the authors do not have a conflict of interest to declare.

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