

## ORIGINAL ARTICLE

Volume 14 Issue 3 2022

DOI: 10.21315/eimj2022.14.3.8

### ARTICLE INFO

Received: 06-01-2022

Accepted: 22-04-2022

Online: 28-09-2022

# Now You See Me, Now You Don't: Exploring Medical Students' Cognitive, Emotional and Behavioural Engagement with Emergency Remote Learning During the COVID-19 Pandemic

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**To cite this article:** Hong WH, Pallath V, Adams D, Lee YK, Tan KM, Foong CC. Now you see me, now you don't: exploring medical students' cognitive, emotional and behavioural engagement with emergency remote learning during the COVID-19 pandemic. *Education in Medicine Journal*. 2022;14(3):109–122. <https://doi.org/10.21315/eimj2022.14.3.8>

**To link to this article:** <https://doi.org/10.21315/eimj2022.14.3.8>

## ABSTRACT

The COVID-19 pandemic had forced medical students to study at home, transitioning to an emergency remote learning mode of instruction. Its impact on students was unknown and likely to be of concern. Therefore, this study assessed cognitive, emotional and behavioural engagements of medical students during emergency remote learning, and examined its associations with regard to their age, gender, stages of study and ethnic groups. A self-administered questionnaire was distributed to undergraduate medical students at one public medical school in Malaysia. Emergency remote learning was conducted via Microsoft Teams (synchronous) and web resources (asynchronous). The questionnaire consisted of four sections: demographic background, emotional, behavioural, and cognitive engagements with emergency remote learning. Three hundred twenty-nine students ( $n = 329$ ) completed the questionnaire. The three engagement dimension scores were 3.36/4.00 (behaviour – act), 3.16 (cognition – think) and 3.07 (emotion – feel), respectively. There was a significant difference between the engagement dimension scores (paired data), implying that what students feel, think and act on emergency remote learning did not seem to align. Next, engagements of these students were not significantly associated with their age, stages of study, and ethnic groups, but male students had higher dimension mean scores for cognitive and emotional engagements. Emergency remote learning had a considerable impact on student engagements. The study calls for continuing efforts in improving effectiveness and equity in learning engagements among medical students in the post-pandemic era.

**Keywords:** COVID-19, Engagement, Emergency remote learning, Undergraduate, Medical student

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## INTRODUCTION

The COVID-19 pandemic had impacted higher education institutions resulting in the cancellations of lectures and activities in campus to avoid large gatherings (1) in order to reduce the impact of the pandemic (2). The pandemic had forced a shift from traditional (face-to-face) approach to emergency remote learning for students (3). Emergency remote learning is defined as an unplanned and sudden shift from traditional face-to-face learning in a traditional classroom to online education (4). Emergency remote learning requires the use of tools such as a desktop computer, laptop, or tablet with internet access to actuate learning for students. In an emergency remote learning mode of instruction, students and educators remain connected and interact with the course contents virtually while working and studying from their homes. Emergency remote learning requires adaptations by students such as the utilisation of technology, online learning software and tools (5). The efficiency of transitioning to emergency remote learning is dependent on readiness, technology tools and overall student support infrastructure (6). Inadequate conditions can have a negative effect on students' engagement and their learning outcomes (7).

In a study involving 424 universities worldwide, it was reported that 59% of universities were closed and 80% of universities had adopted emergency remote learning (8). Likewise, all higher education institutions in Malaysia had been executing emergency remote learning since March 2020. Students were required to study at home, transitioning to an emergency remote learning mode of instruction (6). Various mitigation efforts such as alternative assessment methods and flexible course plans were implemented to cushion the impact of the pandemic on teaching activities and student learning (9). There are concerns among educators that students are at risk of falling behind in education as they are unable to adapt to emergency remote learning (2). Some studies had found that

teachers struggled and faced challenges in terms of engaging their students online (10–12). Students lacked necessary amenities such as a stable internet connection (13), computer literacy skills (2) and motivation (11). Student engagement could be conceptualised as the demonstrated interaction with peers, learning environment and motivation to learn (14), the influence of which goes beyond knowledge gained, leading to sustained behavioural attributes towards lifelong learning. The effective engagement in learning would be essential for effective learning.

The institution in this study is a publicly funded medical school in Malaysia with a faculty of medicine within a public university. The faculty had also subscribed to online teaching and learning resources to support learning activities in addition to converting the existing lessons online. This also mitigated the challenging times when many healthcare workers who are also medical teachers were not available as they had to be on the frontline during the outbreak. Many students in the public universities were from bottom 40% (B40) household income group implying they were from lower income families [Note: the government categorises household incomes into top 20%, middle 40% and bottom 40%] (15). During the pandemic, these students might not have personal computers or laptops at home or had financial difficulties in subscribing to internet data plans, for them to adopt emergency remote learning (16–17). In addition, some areas in Malaysia did not have internet coverage due to inadequate infrastructures (16).

Despite several past studies exploring impacts of the COVID-19 pandemic on medical students, their measures were not analysed in terms of cognitive, emotional and behavioural engagements (18–22). Fredricks et al. (23) described students' engagement as an intricate process which is easily affected by contextual features. Cognitive engagement concerns students' mental processes. It involved students' knowledge and skills in learning.

Behavioural engagement is the degree to which students show positive actions towards the academic subject matter and their social circle, and lastly emotional engagement is the students' feelings towards their teachers, institutions and fellow friends (24). Hence, engagement includes what students' plan to do (behavioural), think (cognitive), and feel (emotional). Fisher and colleagues (25) positioned students' engagement as a multidimensional construct affected by many factors such as students' motivation and satisfaction (24, 26). Positive engagement of students is an essential component to the successful transition towards an emergency remote learning mode of instruction in higher education institutions (10–11, 27).

Understanding of students' cognitive, emotional and behavioural engagements offer specific interventions in improving their learning, leading to attainment of learning outcomes (27). However, there is little empirical research focusing on undergraduate medical students' engagement in emergency remote learning experiences in Malaysia (28–29). This study aimed to investigate undergraduate medical students' cognitive, emotional and behavioural engagements with emergency remote learning, and examined associations with their age, gender, stages of study and ethnic groups in Malaysia. The following research questions guided the study:

- a. What are undergraduate medical students' levels of cognitive, emotional and behavioural engagement with emergency remote learning?
- b. Are there any significant differences in undergraduate medical students' cognitive, emotional, and behavioural engagements with emergency remote learning based on their gender, stages of study and ethnic groups?
- c. Is there a significant relationship between undergraduate medical

students' cognitive, emotional, and behavioural engagements and their age?

## METHODS

This was a cross-sectional quantitative study measuring undergraduate medical students' engagement with emergency remote learning adapting the Blended Learning Readiness Engagement Questionnaire (BLREQ) (27). The university research ethics board approved this study with the reference number of UM.TNC2/UMREC-889. The questionnaire consisted of two sections: demographic characteristics of the students, and the students' engagement with the emergency remote learning activities. The students' engagement section (a total of 16 items) was further divided into the domains of behavioural (7 items), cognitive (4 items) and emotional (5 items) engagement.

Our country implemented a national response to the COVID-19 pandemic from the 18th of March 2020 which included a "stay at home" order, restriction of economic activities and emergency remote learning in the educational sector. Emergency remote learning at the authors' institution started in April, and this study measured the medical students' response two to three months (June to July) after the sudden transition. This timeframe is sufficient for impacts on students to be identified; a Malaysian study which was conducted from April to May 2020 reported that university students started experiencing anxiety after emergency remote learning was implemented (30).

In between June and July 2020 when the study was conducted, knowledge-based subjects were taught to preclinical (Years 1 and 2) students via synchronous and asynchronous learning sessions. Previous live lectures at lecture halls were instantly replaced with narrated PowerPoint presentations (asynchronous), and live question and answer sessions (synchronous) were organised using Microsoft Teams.

Previous physical problem-based learning sessions were replaced with virtual problem-based learning sessions (synchronous) using Microsoft Teams. Previous lab practical sessions and clinical teaching sessions were replaced with videos and various educational websites that included Lecturio, BMJ Open and the New England Journal of Medicine. For clinical students (Years 3, 4 and 5), the clinical curriculum continued but physical attachments to the teaching hospital were disabled as the hospital was designated as a COVID-19 hospital, and they were replaced with virtual attachments. During the virtual attachments, lecturers or students taught/learnt clinical topics and discussed patient cases using Microsoft Teams. Similarly, previous lectures were replaced with narrated PowerPoint presentations (asynchronous). In summary, knowledge-based subjects in the preclinical years were maintained, and clinical skills related subjects in clinical years were reduced or were replaced with virtual attachments.

Medical students from all five years of the undergraduate programme were invited to participate in this study. The students were contacted through the university's online educational platform with details of the study, participants' consent form and the link to the online self-administered questionnaire. Students were also contacted once a week from the second week onwards via their WhatsApp student groups with the same information. Participation in the study was voluntary and the students provided informed consent. Data were anonymised prior to analysis and were not traceable to an individual.

The data were analysed using IBM SPSS version 25.0. First, descriptive analysis was performed for each item in the three dimensions (behavioural, cognitive and emotional engagements). Next, the mean for each dimension was calculated, and one-way repeated measures Analysis of variance (ANOVA) was used to determine whether three-dimensional means were different among the participants. Meanwhile, correlations between dimensional means

and ages were examined using Pearson's analyses. Lastly, independent *t*-tests (or ANOVA test, respectively) were used to compare the dimensional means between different gender, stages of study and ethnic groups.

## RESULTS

Three hundred twenty-nine students ( $n = 329$ ) completed the questionnaire. The response rate was sufficient for a population of 734 students, based on 95% confidence level and 5% margin of error (minimum sample size required = 253). Approximately 60% of the respondents were female ( $n = 196$ ) and clinical ( $n = 195$ ) students. Most of the students were aged between 19 and 24 years old. More than half (54.7%) of the respondents were Chinese, 29.1% were Malay and 10.9% were Indian (Table 1).

**Table 1:** Demographic background of the respondents ( $n = 329$ )

Demographics	<i>n</i> (%)
Gender	
Male	133 (40.4)
Female	196 (59.6)
Ethnicity	
Malay	98 (29.1)
Chinese	180 (54.7)
Indian	36 (10.9)
Indigenous/Sabah/Sarawak	10 (3.0)
Others	5 (1.5)
Years of studies	
Preclinical (Years 1–2)	134 (40.7)
Clinical (Years 3–5)	195 (59.3)
Age	
19	11 (3.3)
20	66 (20.1)
21	52 (15.8)
22	59 (27.1)
23	54 (16.4)
24	50 (15.2)
≥ 25	7 (2.1)

Overall, on a scale of 1 to 4, the dimensional mean scores for students' engagement in online learning were 3.36 (behavioural), 3.16 (cognitive) and 3.07 (emotional), respectively. Table 2 reports the mean scores for dimensions and individual items. Regarding behavioural engagement, the item "I do my assignments and submit it on time online" was ranked highest (mean = 3.53), while "I participate actively in online activities" was ranked lowest (mean = 2.96).

In terms of cognitive engagement, the item "I'm able to do my best to complete online tasks" was ranked highest (mean = 3.31), while "I'm able to discuss assignments with my classmates using my university's learning management system" was ranked lowest (mean = 2.98). Meanwhile, for emotional engagement, the item "I feel my lecturers show interest in my views during online discussion" was ranked highest (mean = 3.34), while "I feel my classes are more interesting when performing tasks online with my classmates" was ranked lowest (mean = 2.69).

In analysis of dimensional mean differences between participants, the one-way repeated measures ANOVA reported a significant dimension effect, Wilks' Lambda = 0.60,  $F(2, 327) = 108.83$ ,  $p = 0.00$ ,  $\eta^2 = 0.40$ . Bonferroni's comparison indicated that each pairwise difference was significant at  $p = 0.00$ . The results imply that students'

engagements in each dimension were significantly different. In other words, what students feel (emotion), think (cognition) and act (behaviour) about online learning did not align.

Analysis of association between demographic variables and the three dimensions reported no significant associations for age, gender, stage of studies and ethnic groups. There was no significant correlation between ages of the students and dimension scores for cognitive engagement ( $r = 0.18$ ,  $p = 0.739$ ), emotional engagement ( $r = 0.18$ ,  $p = 0.745$ ) and behavioural engagement ( $r = -0.037$ ,  $p = 0.508$ ). There was no significant difference in the dimension mean scores for behavioural, cognitive, and emotional engagements between preclinical and clinical students ( $p > 0.05$  for all engagements); similarly, the difference in the three engagements were not significant between Malay, Chinese and Indian students ( $p > 0.05$  for all engagements). On the other hand, gender had a significant association with two dimensions. Male students had higher dimension mean scores for cognitive and emotional engagements, as compared to female students ( $p < 0.05$ ); there was no gender difference in behavioural engagement ( $p > 0.05$ ). Table 3 reports the mean scores of engagement dimensions by demographic variables.

**Table 2:** Descriptive analyses for dimensions and items of engagement domains

Dimensions	Scores	SD
Cognitive engagement	3.16	0.58
Emotional engagement	3.07	0.59
Behavioural engagement	3.36	0.48
Cognitive engagement items		
I'm able to do my best to complete online tasks	3.31	0.63
I'm able to discuss assignments with my classmates using my university's learning management systems (e.g., Blackboard, Moodle)	2.98	0.88
I prepare myself by reading materials online before attending classes	3.17	0.70
I spend enough time and effort to learn online	3.16	0.77

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**Table 2:** (Continued)

Dimensions	Scores	SD
Emotional engagement items		
I'm able to motivate myself to learn when performing online tasks	3.03	0.78
I give importance to studying together with my classmates in a group online	2.93	0.85
I feel my classmates respect my thoughts and views during online discussion	3.33	0.60
I feel my classes are more interesting when performing tasks online with my classmates	2.69	0.98
I feel my lecturers show interest in my views during online discussion	3.34	0.59
Behavioural engagement items		
I participate actively in online activities	2.96	0.81
I behave fairly to all my classmates when performing tasks online	3.37	0.57
I listen carefully to my lecturers in class on the required task to perform online	3.33	0.65
I do my assignments and submit them on time online	3.53	0.55
I carefully read other students' views during online discussion	3.35	0.65
I try to do my best in online group work	3.51	0.56
I share information with my classmates during online discussion	3.45	0.57

**Table 3:** Student engagement in online learning according to gender, stages of study and ethnicity

Variables	Mean $\pm$ SD (95% CI for mean: lower bound–upper bound)	p-value
Behavioural engagement		
Male ( $n = 133$ )	3.39 $\pm$ 0.52 (3.30–3.47)	0.316
Female ( $n = 196$ )	3.33 $\pm$ 0.44 (3.27–3.39)	
Preclinical ( $n = 134$ )	3.39 $\pm$ 0.46 (3.31–3.46)	0.343
Clinical ( $n = 195$ )	3.34 $\pm$ 0.49 (3.27–3.41)	
Malay ( $n = 98$ )	3.35 $\pm$ 0.45 (3.26–3.44)	0.897
Chinese ( $n = 180$ )	3.35 $\pm$ 0.47 (3.38–3.42)	
Indian ( $n = 36$ )	3.39 $\pm$ 0.58 (3.19–3.59)	
Cognitive engagement		
Male ( $n = 133$ )	3.25 $\pm$ 0.59 (3.15–3.35)	0.012
Female ( $n = 196$ )	3.08 $\pm$ 0.56 (3.01–3.17)	
Preclinical ( $n = 134$ )	3.12 $\pm$ 0.60 (3.02–3.22)	0.356
Clinical ( $n = 195$ )	3.18 $\pm$ 0.56 (3.10–3.26)	
Malay ( $n = 98$ )	3.07 $\pm$ 0.53 (2.97–3.18)	0.235
Chinese ( $n = 180$ )	3.20 $\pm$ 0.58 (3.11–3.28)	
Indian ( $n = 36$ )	3.16 $\pm$ 0.63 (2.95–3.37)	

(Continued on next page)

**Table 3:** (Continued)

Variables	Mean±SD (95% CI for mean: lower bound–upper bound)	p-value
Emotional engagement		
Male (n = 133)	3.16 ± 0.63 (3.05–3.27)	0.013
Female (n = 196)	3.00 ± 0.55 (2.92–3.07)	
Preclinical (n = 134)	3.07 ± 0.62 (2.96–3.17)	0.957
Clinical (n = 195)	3.06 ± 0.57 (2.98–3.14)	
Malay (n = 98)	3.06 ± 0.54 (2.96–3.17)	0.947
Chinese (n = 180)	3.07 ± 0.60 (2.98–3.16)	
Indian (n = 36)	3.03 ± 0.68 (2.80–3.26)	

## DISCUSSION

In this study, medical students' engagement in the various dimensions in terms of what students feel (emotion), think (cognition) and act (behaviour) on online learning did not seem to align. Educational researchers have argued that these types of engagement are not necessarily connected, and it means that a student can be engaged by clicking through their learning management system and reviewing the material (behavioural engagement) but might not be deeply engaging with it (cognitive engagement) (31). This trait is also evident in a study conducted by Ranganathan and colleagues (32) where the transition from pedagogical to andragogical model of instructions may pose a challenge for undergraduate students. In terms of behavioural engagement, it was evident in this study that students appeared to be able to perform or complete tasks which were assigned to them on an individual basis. However, elements of discussions and teamwork seemed to be a greater challenge for students. Students seemed to be trying to assimilate to learning online as they may not have had any prolonged virtual sessions before this, as medical schools had always followed the traditional mode of delivery of teaching (33). This is consistent with findings of other studies where students find difficulty in engaging with faculty and classmates in several online courses (2, 10, 34–37).

In this study, lower emotional engagement revealed that students found themselves less interested in performing online tasks with their peers. As student engagement is a sophisticated scenario involving physical and psychological constructs (23, 38), future intervention may consider promoting emotional engagement for emergency remote learning. Autonomy-supportive lecturers enable students to enjoy their classes (39). Referring to the lowest rated item in the emotional engagement domain – “I feel my classes are more interesting when performing tasks online with my classmates”, therefore students may be empowered to form their group with chosen members or be given the freedom to choose from a list of tasks. While there are drawbacks for emergency remote learning, emergency remote learning is unavoidable and hence, students' engagement in this mode of delivery is crucial to ensure an effective overall teaching and learning experience.

The essence of online education is to provide sustained opportunities for the continuous development of students' cognitive level, and to acquire effective learning, students need to participate actively in learning. However, due to the lack of communication between teachers and students, the performance of students who participate in online education may become unsatisfactory, and their persistence

and efficiency become poor (10, 40). In the context of the COVID-19 pandemic, the transition to online education was sudden and so it was termed as emergency remote learning, representing an emergency transition in instructional delivery (41). It is stated to be not a transition, but a temporary shift of instructional delivery to an online mode due to a critical context, and in this study setting it was the pandemic of COVID-19. Such an emergency crisis management approach probably will have an impact on the effectiveness of instructional delivery. In the study context the student learning experience through emergency remote learning might have been perceived as a temporary shift, which then lasted for a significant time. The student satisfaction in emergency remote learning was shown to be neutral in a study conducted by Ho et al. (42), and students were shown to prefer face-to-face learning. These results indicated that the engagement in learning during emergency remote learning could be transitional and only for the purpose of continuing learning and not even as a complementary mode of learning. This could mean that students will engage in learning, as in behavioural engagement could be seen, but at the same time emotional and cognitive engagement, which results in long term meaningful learning might not be manifested in such a context. This was the case in this study too, where learners' behavioural engagement was higher compared to cognitive and emotional engagement.

Ho et al. (42) also demonstrated that technology related factors or perceived digital competency including familiarity with technology or accessibility were not predictors of student satisfaction during emergency remote learning. So even with the existence of the digital divide, the technological factors were not shown to lead to decreased satisfaction. It could also be considered that technological factors were not affecting engagement. Next, Bolliger and Martin (43) used Moore's three interaction categories (44) to analyse the

best perceived online student engagement strategies. These included learner-learner, learner-instructor and learner-content interactions. Among these, they found that learner-instructor interactions were most valued by the learners. Also in the current study, the items related to instructor related interactions were found to be ranked highest in behavioural, emotional and cognitive engagements. "I do my assignments and submit them on time online", "I'm able to do my best to complete online tasks" and "I feel my lecturers show interest in my views during online discussion" were ranked highest in each of the engagement categories.

The educator's efforts may help students overcome engagement issues. An engineering education framework for active student engagement in synchronous and asynchronous learning sessions could be referred to and adapted to suit medical education (45). One-way didactic lectures could be replaced by online interactive lectures and small group discussions (45). Recordings of the synchronous learning sessions would enable students to replay and learn at their own paces (46). Meanwhile, medical schools should conduct workshops for students to initiate and develop self-regulated learning (47). Educators should encourage students to take full responsibilities for their learning progress at home and inculcate self-discipline and motivation (48).

With the acceptance that the pandemic is here to stay, and COVID-19 is now regarded as endemic in many countries, medical education sees a potential paradigm shift. Medical training might not return to the normal teaching mode prior to the COVID-19 pandemic but is likely to transform into a new norm (49). Medical schools will need to undertake curriculum revisions, new adaptations to teaching and learning approaches, and assessment methods with a foresight to assimilate it for the future learners. There also needs to be an emphasis on students' directed learning (heutagogy), peer learning, cybergogy and



implementation of integrated assessments to ensure smooth transition and engagement of students (50). However, technology is here to assist in the delivery of teaching and learning with shared resources and lesser preparation time, but not to take over in entirety. Medical teachers while optimising the potentials of online learning and the use of technology, humanistic approaches such as communication skills, empathy and the patient-doctor relationship must be maintained.

Equality in emergency remote learning is essential to ensure equal education opportunities for learners regardless of their background. In this study, age, stages of study and ethnicity did not significantly influence student engagements, but male students were more cognitively and emotionally engaged than female students. Despite information and communications technology being historically perceived as a stereotypically masculine domain, findings of this study contrast an Indian study where female medical students had higher motivation to engage in virtual classes during the COVID-19 pandemic (51). Meanwhile, studies conducted among secondary school students reported that girls had higher learning engagement during the pandemic (52–53). In a non-emergency remote learning context, female students also had higher behavioural intention and use of online education platforms (54). However, literature on gender difference in emergency remote learning engagement during the COVID-19 pandemic is inconclusive. A study on Ghana university students concluded that male and female students had similar online education experiences during the pandemic, and in some specific areas, males demonstrated more positive ratings than females (55). Next, in non-emergency remote learning, a study in Netherlands reported that ethnicity affected social learning experiences and self-regulatory focus of medical students (56). Findings of this study were contradictory

where no significant difference was found in terms of engagement. Malaysia is a multi-ethnic society with distinct cultural practices and beliefs. Future studies should continue to investigate equity of medical education in emergency remote learning context and intervene if necessary to ensure equity.

### Limitations of the Study

This study only represented the student engagement with emergency remote learning at one public medical school in Malaysia. Future investigations conducted at more Malaysian medical schools could generalise findings of this study. With stronger evidence, the findings may be proposed to policy makers or educators to develop interventions to aid medical students with low engagement levels. Next, the study reported self-assessed engagements which could lead to biased responses from respondents who may choose what were perceived as favourable answers. The possible concern was addressed by informing anonymity to the respondents to create a non-threatening atmosphere. To triangulate self-assessment, future investigation may consider interviewing medical educators for their observations on student engagement during synchronous and asynchronous sessions.

Findings of the study were confined to student engagement during the period of emergency remote learning from June to July 2020. First, this study was unable to exclude possible confounding factors which might affect the findings such as individual differences in learning styles and time taken to adapt to new learning strategies. Second, student engagements may have changed later as there was a growing number of programmes to train lecturers and students in utilising education technologies, stronger support from the government (free smart devices and data internet plans) and student adaption to online education.

## CONCLUSION

Emergency remote learning was important during the pandemic to sustain medical training, but it had impacts on student engagements. In this study, students were least engaged emotionally, and there was a misalignment between their behavioural, cognitive and emotional engagements. Also, male students were more cognitively and emotionally engaged than female students. The study calls for continuing efforts in improving effectiveness and equity in learning engagements among medical students in the post-pandemic era.

## ACKNOWLEDGEMENTS

The authors would like to thank the students for participating in the study.

## ETHICAL APPROVAL

The study was approved by the Universiti Malaya Research Ethics Committee (UMREC) [UM.TNC2/UMREC - 889].

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