

Article

Deciphering Learning Motivation in Open Distance Learning towards Sustainable Medical Education

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Abstract: Open distance learning has become a new norm in medical education since the COVID-19 pandemic. The abrupt shift from conventional medical education to fully virtual learning deserves a reflection on how it affected the learning motivation among medical students. Hence, this study aimed to investigate the effect of open distance learning on their learning motivation during this pandemic period, with suggestions to improve through reflections and recommendations. This qualitative study involved 152 medical students undertaking the Doctor of Medicine program in Universiti Kebangsaan Malaysia, Malaysia, during the COVID-19 pandemic. All data were collected through a validated questionnaire. We found that medical students portrayed intrinsic motivation—mainly self-motivation, self-discipline, and self-adaptation—in open distance learning during the pandemic period. Feedback from medical students also showed that they advocated a better internet connection, innovative teaching, and learning, as well as new appropriate assessment methods and strengthening of the learning management system for a sustainable open distance learning outcome. Hence, medical educators should be creative in making use of open distance learning as an attractive complementary platform in medical education to ensure life-long learning.

Keywords: education; medical; online learning; motivation; COVID-19



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1. Introduction

Open distance learning has emerged to be the new norm since the novel coronavirus disease 2019 (COVID-19) pandemic. Medical education is not spared from this new norm, as the implementation of the nationwide Movement Control Order (MCO) has forced all medical teaching and learning to be conducted fully online. The abrupt transformation from conventional medical education to exclusive open distance learning is challenging [1–6] and the effect on learning motivation among medical students remains unelucidated.

Generally, open distance learning, also known as digital learning, is a way to complement students' learning process by integrating the advancement of technology in assessing, tutoring, and instructing students for educational purposes [7]. It comprises a few components, mainly digital teaching materials, digital tools, digital delivery, and autonomous learning [8]. Other terminologies that are commonly used to represent open distance learning include 'e-learning', 'technology-enhanced learning', 'internet-based training', 'web-based training', 'online learning', 'network learning', and 'distance learning' [7,9]. Students can learn online synchronously and asynchronously without time and location restrictions, with indirect cultivations of autonomous learning ability through open distance learning [10,11].

In fact, open distance learning has been incorporated into Malaysia's medical education through the Learning Management System (LMS) in conjunction with the ministry's initiative, MyHE4.0 (Education 4.0) in the Higher Education Blueprint 2015–2025. A 'blended learning' environment is created that enables virtual communications between students and lecturers, assignment submission, and group discussion [12]. Even though most

medical students are tech-savvy and support the use of open distance learning in medical education due to its interactivity, cost-effectiveness, and convenience [13–15], open distance learning has been a complementary role in medical education. Our conventional medical education setting is mainly involved a physical lecture in the hall and conventional bedside teaching and learning methods with real patients. However, the shift towards fully open distance learning will involve several challenges, including the increasing time constraints and demands faced by educators and students, network issues, availability of infrastructures, and the perception of being distracted while using high-end technologies that will further impede the development of open distance learning in medical education [16–19].

Learning motivation is affected by a few factors including intrapersonal determinants (i.e., age and gender); interpersonal determinants (i.e., academic conditions, cognitive outcomes); affective outcomes (i.e., anxiety and depression); behavioural outcomes (i.e., academic engagement) [20,21]. Parental and teacher support [22,23], as well as positive personality traits such as perseverance, gratitude, and desire for learning [24–26], also have positive correlations with learning motivation.

The effectiveness of open distance learning depends on students' ability to learn independently, initiate discussions with peers and educators, and develop understandings through active engagement with digital resources [27]. This requires sustainability of learning motivation [28]. Previous studies have reported that blended learning in medical education improves learning motivation. However, the impact of the COVID-19 pandemic on open distance learning and learning motivation remains unexplored. The unforeseen stressors of the pandemic may affect learning motivation and the outcome of open distance learning [29].

The recommendations and reflections from medical students are crucial to enhancing the sustainability of medical education. Hence, this study aimed to qualitatively analyse medical students' learning motivation during this COVID-19 period, as well as their points of view on improving open distance learning.

2. Materials and Methods

2.1. Study Design

This study embraced a qualitative approach in collecting both reflection and feedback from undergraduate medical students of Universiti Kebangsaan Malaysia (UKM), Malaysia. A set of validated questionnaires including an information sheet and a consent form were distributed via Google Forms (Supplementary file), from March 2020 to May 2020, two weeks after the initiation of lockdown in Malaysia. A pilot study to validate the questionnaire was carried out among 35 UKM medical students, with Cronbach's alpha, $\alpha = 0.91$. This study was approved by UKM Ethics Committee (UKM PPI/111/8/JEP-2019-702).

2.2. Selection of Respondents and Data

All current UKM students undertaking the course of Doctor of Medicine were eligible to participate in this study. Stratified convenience sampling was used in which the sample was stratified by year of study and each year contributed an equivalent ratio to population. A study by Universiti Putra Malaysia, Malaysia (UPM) [30] with a power of 1.000 was referenced for sample size calculation. Eventually, there were a total of 152 year 1–year 5 UKM undergraduate medical students that participated in this study.

Demographic data and educational background of respondents were collected, including age, year of study, and phase of the study. The phase of the study consisted of year 1 and year 2 representing the preclinical phase, and year 3 to year 5 for the clinical phase. Reflections regarding their learning motivation during the pandemic period, as well as their opinions on future open distance learning improvements, were collated and further divided into different emerging themes.

2.3. Statistical Analysis

Results were recorded using Statistical Package for Social Science (SPSS) Version 27 by the IBM Corporation, New York, United States, and analysed qualitatively based on the aforementioned objectives. The reflections on learning motivation during the pandemic and recommendations to improve open distance learning were coded into respective emerging and main themes. The coding was performed by two independent authors and cross-checked to determine any discrepancies. Should there be any discrepancies in opinions, a third author would address the difference in opinions and reach a consensus together with the two authors.

3. Results

3.1. Demographic Characteristics

Among 152 UKM undergraduate medical students, the mean age was 21.94 ± 1.63 . Preclinical and clinical medical students comprised 38.8% and 61.2% of the total students, respectively (Table 1).

Table 1. Demographic characteristics of respondents ($n = 152$).

Demographic Data		Number of Students, $n(\%)$
Year of Study	1	31 (20.4)
	2	28 (18.4)
	3	27 (17.8)
	4	35 (23.0)
	5	31 (20.4)
Phase of Study	Preclinical	59 (38.8)
	Clinical	93 (61.2)
Total Students		152

3.2. Themes of Learning Motivation (LM) during the COVID-19 Period

The reflections on learning motivation during the pandemic period were collated into 11 emerging themes (Table 2), which were further summarised into 2 main themes—*intrinsic and extrinsic motivations* (Figure 1). Respondents were labelled as 'R'.

Table 2. Main themes of learning motivation.

Quote	Emerging Theme	Main Theme
'I set up a to-do list every day and focus on things I want to study in small sessions.' (R2)	Self-motivation	Intrinsic motivation
'Regardless of whether we're in difficult times, learning is a continuous journey, the one that can only stop you from learning new knowledge is your own self.' (R12)	Self-discipline	
'Very badly. No motivation most of the day' (R29) 'To pass the year and move on.' (R139)	Self-adaptation Feeling indifferent	
'Weekly teaching and lecture motivate me to understand things better.' (R1)	Online teaching	Extrinsic motivation
'My supervisor is the main reason why I am able to cope with this kind of learning method.' (R4)	Lecturer	
'I watch videos to understand better.' (R54)	Open distance learning using different resources	
'Always remind myself about the pro exam.' (R14)	Examination	
'Ask motivation from friends and family.' (R11)	Family	
'By continuously keeping in touch with my friends, making a checklist of the subjects that I need to cover, having a conducive study area, and online group study with friends.' (R31)	Friend	Learning motivation
'Not having a conducive studying environment at home ...' (R43)	Learning motivation	

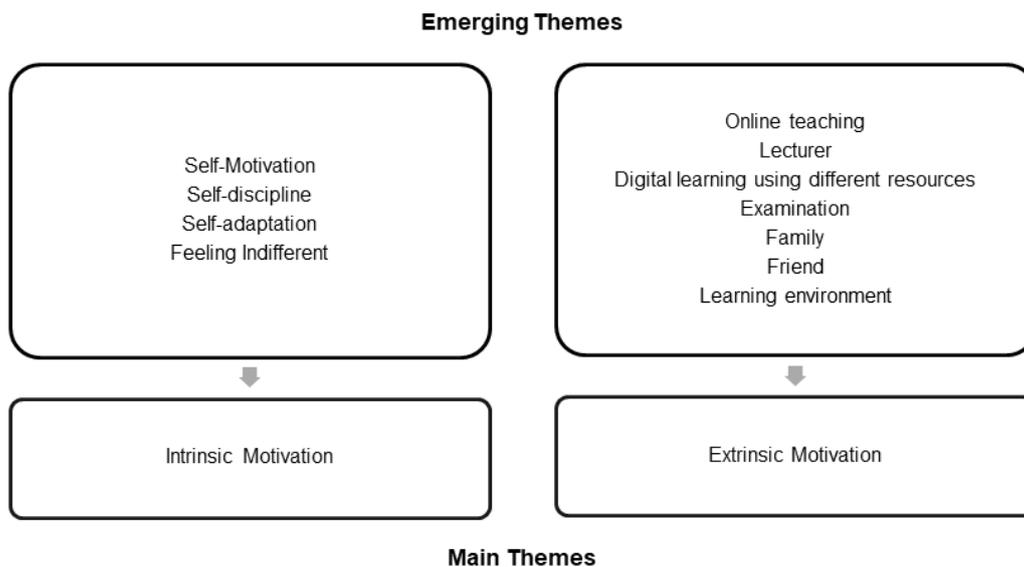


Figure 1. The summary of emerging themes based on the reflection on learning motivation.

3.2.1. Theme LM1: Intrinsic Motivation

Out of 152 responses, 55.9% of students reflected intrinsic motivation in their answers. Of those, 28 responses pointed towards self-motivation during the COVID-19 pandemic. Most of the responses mentioned reminding oneself subconsciously regarding the reason for choosing the medical profession and the necessity of continuous learning.

‘Regardless of whether we’re in difficult times, learning is a continuous journey, the one that can only stop you from learning new knowledge is your own self.’ (R12)

Some medical students also boosted their self-motivation via other sources available while learning at home.

‘Watch vlogs of medical students like Ali Abdal, etc. to make me feel like studying.’ (R59)

‘By watching motivational videos.’ (R64)

Another emerging theme that was categorised under intrinsic learning motivation would be self-discipline. In total, 50 responses portrayed medical students applying the principle of self-discipline as learning motivation.

‘I set up a to-do list every day and focus on things I want to study in small sessions.’ (R2)

‘A lot of self-studies, researching materials, and discussions with lecturers.’ (R45)

‘Study a lot and never forget to rest in between online sessions.’ (R110)

Additionally, there were three responses that mentioned the feeling of indifference despite the transformation.

‘To pass the year and move on.’ (R39)

Shifting from face-to-face learning to open distance learning is an enormous challenge for medical students, especially those clinical students who used to practice clinical skills in hospital settings. This transformation requires one to have the skill of self-adaptation. However, despite various themes of learning motivation, there were four responses pointing towards incapability to adapt due to the lack of both intrinsic and extrinsic motivation. Three out of four responses were from clinical students.

‘Very badly. No motivation most of the day.’ (R30)

‘Difficult.’ (R55)

3.2.2. Theme LM2: Extrinsic Motivation

The learning environment was the extrinsic factor that cause the inability to adapt, as indicated by one student with the following statement:

'...Not having a conducive studying environment at home and also a lot of reading materials have been left at the college . . . ' (R43)

As online classes had become the bread-and-butter routine of everyday life, there were students ($n = 10$) who said that online learning motivated them to understand the lessons better.

'Weekly teaching and lecture motivate me to understand things better.' (R1)

Among the students whose learning motivation was extrinsic, six of them thought that lecturers can be a source of learning motivation.

'My supervisor is the main reason why I am able to cope with this kind of learning method.' (R4)

Different sources of open distance learning which were found online such as research articles, e-books, educational videos, etc. were considered students' extrinsic motivation because these sources were very informative and easily accessible.

'I watch videos to understand better.' (R54)

Cancellations or delays of examinations over the COVID-19 pandemic did not demotivate the students; in contrast, upcoming delayed examinations had become a learning motivation for 18 students, especially those who were in the final year.

'Counting days for professional exams.' (R7)

A total of 32 students reflected that family ($n = 6$) and friends ($n = 26$) acted as strong support for them to study at home during COVID-19.

'Ask for motivation from friends and family.' (R11)

'My friends and I have discussions frequently regarding questions we encounter during our teachings . . . ' (R26)

3.3. Reflections on Methods (RM) to Improve Open Distance Learning

Recommendations on open distance learning improvement were collated (Table 3), consisting of a total of 18 emerging themes, which were further summarised into 5 main themes (Figure 2).

Table 3. Main themes of open distance learning improvement.

Quote	Emerging Theme	Main Theme
<i>'Improve the Wi-Fi connection and online course platforms.'</i> (R2)	Improve Wi-Fi connection	Better internet connection
<i>'Provide free internet to those who are in need, give lectures in more fun and challenging ways, e.g., playing games, Kahoot.'</i> (R52)	Free internet	
<i>'Pre-record the video so it can be played many times.'</i> (R1)	Pre-record videos/lectures	Different teaching and learning methods
<i>'Students should participate actively in discussion and share their ideas more with the classroom.'</i> (R12)	Make it more interactive (involve lecturers and students—discussion)	
<i>'Having online lectures every day for at least one hour to sustain the knowledge.'</i> (R90)	More online teaching	
<i>'Be more creative and graphical.'</i> (R18)	More graphical explanation	
<i>'Upload examination videos that are verified and agreed by all the lecturers as a standard.'</i> (R10)	Videos on theory/clinical part	Simulation software
<i>'Can involve real patients in learning history taking.'</i> (R64)	Video conferencing with patients	
<i>'Case-based scenario, virtual ward rounds'</i> (R114)	Virtual ward round	
<i>'Tele-viva sessions and use of simulation software instead of lectures'</i> (R6)	Simulation software	

Table 3. Cont.

Quote	Emerging Theme	Main Theme
<i>'We need virtual reality; it will make it a lot more fun but then again not realistic at all.'</i> (R51)	Virtual reality	
<i>'Hope University expands and adds more resources to online medical courses (subscribe to them, e.g., UpToDate).'</i> (R116)	Learning apps (UpToDate)	
<i>'Provide free eBooks or any study materials that reliable/easy to understand.'</i> (R79)	Free eBooks	
<i>'Prepare more questions along with the lecture slides so that can stimulate thinking other than just simply listening to lecture.'</i> (R15)	Quizzes/Question banks/Kahoot	
<i>'Develop more systematic systems in conducting online courses including various forms of teaching and learning methods.'</i> (R13)	Improve and standardise online course platforms	Strengthening of LMS platform
<i>'Tele-viva sessions and use of simulation software instead of lectures.'</i> (R6)	Tele-viva sessions	Assessment
<i>'Improve the assessment system. Instead of sticking to the same weightage for final semester exams, maybe the management team can adjust the weightage and methods of evaluation if either exams or teaching and learning sessions are held online.'</i> (R39)	Different weightage, methods	
<i>'I prefer the traditional way of learning rather than online as history taking and physical examination cannot be trained via digital learning.'</i> (R33)	Human Interaction	The traditional method of learning

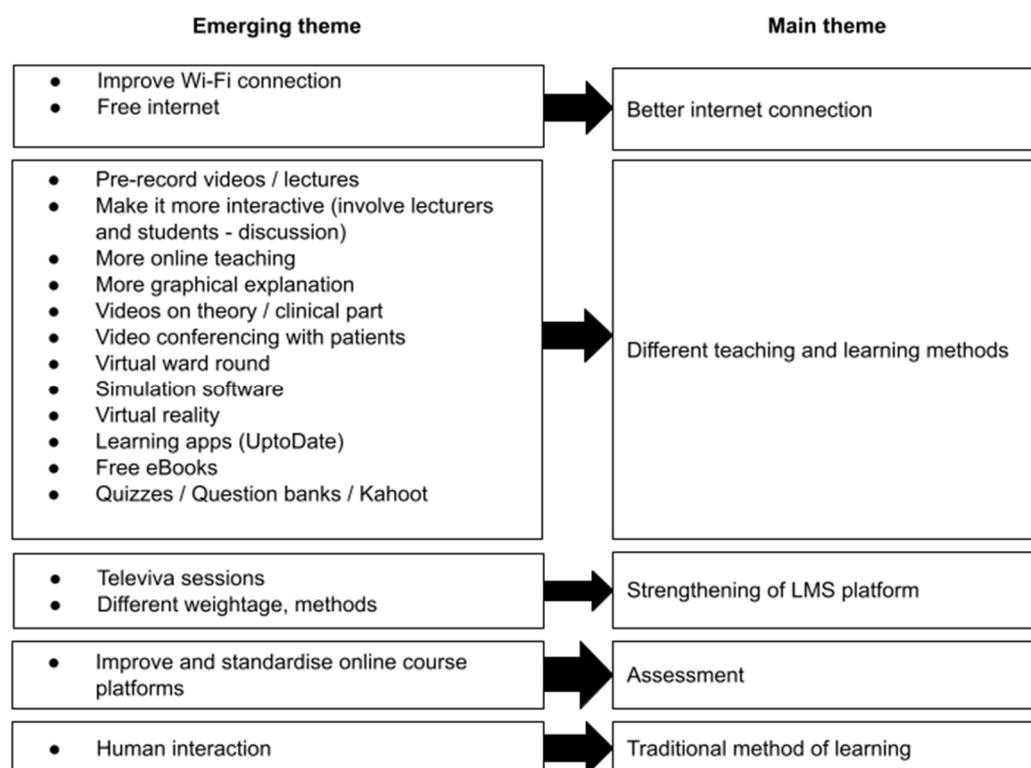


Figure 2. The summary of emerging themes based on the feedback on open distance learning improvement.

3.3.1. Theme RM1: Better Internet Connection

Online learning is dependent on internet access, and without a stable internet connection, the learning process would be interrupted since most of the materials and resources were available online. In this theme, there were two groups of responses which included improvement of Wi-Fi connection (16 responses) and free internet access (2 responses).

'Improve the Wi-Fi connection and online course platforms.' (R2)

'Provide free internet to those who need it, give lectures in more fun and challenging ways, e.g., playing games, Kahoot.' (R52)

3.3.2. Theme RM2: Different Teaching and Learning Methods

Twelve different approaches used in medical learning were collated from the responses under the main theme of different learning methods. Due to occasionally unstable internet connections, some students were unable to access synchronised online classes; therefore, there were nine students who suggested that lectures and educational videos be pre-recorded before the class or recorded during the class as a reference for those students.

'Record teaching video for practical besides concept lecture because it is better than online discussion. Sometimes the line does not cooperate, I can't get the full content of the discussion...' (R32)

There were students ($n = 27$) who deemed e-learning as a more interactive way of learning and involved intercommunication between both lecturers and students instead of plain lecturing.

'More group discussions and problem-based learning than mass lecture.' (R46)

While all medical students were staying at home under the Movement Control Order, three students mentioned that online teaching should be delivered more frequently, and one of them gave the following example:

'Having an online lecture every day at least for one hour to sustain the knowledge.' (R90)

To enhance the understanding of certain topics, especially lessons involving anatomy and physiology, there were two comments about the preparation of more graphical explanations; for instance, lecturers may incorporate more mind maps or diagrams when delivering lectures.

'More exciting and easier to understand by using more pictures along with the explanation.' (R144)

For the substitution of physical examination, 22 responses suggested that it can be learned through demonstration via video, and an explanation of each step should be recorded simultaneously.

'Upload examination videos that are verified and agreed by all the lecturers ...' (R10)

Students also suggested that history taking can be carried out through video conferencing with patients whose condition was stable to be interviewed.

'Can involve real patients in learning history taking.' (R64)

There was one response that suggested virtual ward rounds to replace the routine ward round performed in a hospital setting.

'... virtual ward rounds.' (R114)

Learning via simulation software was also mentioned by 23 students.

'Can improve session like 'DxR Clinician' so students can improve (on) their clinical reasoning skills.' (R14)

Three responses suggested virtual reality replacing clinical exposure learning for medical students.

'We need virtual reality; it will make it a lot more fun but then again not realistic at all.' (R51)

Two students hoped that the faculty can subscribe to more learning applications during this COVID-19 period.

'... subscribe to UpToDate.' (R21)

For students who used to borrow medical books from the library or left their study materials at their accommodation in the faculty, there was one suggestion about free e-books which can be accessed online.

'... provide free eBooks or any study materials that are reliable/easy to understand ...' (R79)

To consolidate one's knowledge and explore their own understanding of certain topics, there were 16 responses that mentioned quizzes, question banks, or Kahoot.

'...provide practice questions/clinical scenarios as homework, to be discussed further online.' (R21)

3.3.3. Theme RM3: Strengthening of LMS Platform

Learning Management System (LMS) is another crucial component in the transformations of medical education via open distance learning. An ideal LMS will provide a standardised platform for all students to access e-learning content systematically and interact with each other, while lecturers can track the progression of students. Some medical students recommended that UKM's LMS, UKMFolio™ should be improved, as shown in the following statements:

'...my suggestion is that our university should prepare a dedicated website for online learning where all the syllabus is structured.' (R66)

'Standardising the way, the instructions are given such as displaying the submission date and time in a column where all students and lecturers can see clearly.' (R74)

'(LMS) a stable platform where students and lecturers can communicate well because it's more like one-way communication now and taking longer than usual.' (R82)

3.3.4. Theme RM4: Assessment

A small proportion of students ($n = 2$) suggested that the assessment method should be modified to be in line with the modifications upon implementation of open distance learning.

'Improve the assessment system. Instead of sticking to the same weightage for final semester exams, maybe the management team can adjust the weightage and methods of evaluation if either exams or teaching and learning sessions are held online.' (R39)

3.3.5. Theme RM5: Traditional Method of Learning

A total of four students insisted on having traditional methods of learning, as they believed that clinical components especially cannot be replaced with open distance learning. Three out of these four students were clinical students. Two of them even proposed that they were willing to postpone the current semester and graduation until they were allowed to enter the hospital and resume the usual way of learning from patients.

'I prefer traditional ways of learning rather than online as history taking and physical examination cannot be trained via digital learning.' (R7)

'Nothing, no online classes ever can beat the actual learning method by seeing patients. Postpone the semester.' (R130)

4. Discussion

Generally, it is believed that open distance learning cannot replace the conventional teaching and learning methods in medicine [31–34], as the nature of the medical degree involves substantial hands-on skills that open distance learning lacks. Open distance learning has been playing a complementary role in medical education thus far [31]. Indeed, the unanticipated full implementation of open distance learning upon the introduction of the Movement Restriction Order (MCO) in Malaysia has left all faculty members unprepared, and the actual outcome is yet to be observed. Open distance learning has been implemented in medical schools worldwide during the COVID-19 pandemic [2,35–38]. Various innovative teaching and learning methods have been introduced such as virtual clerkships, simulation software, and digital clinical placements [39–44]. However, one of the main concerns is internet connection issues such as poor coverage, low speed, and network congestion [16]. This has been the main challenge faced by undergraduate students throughout their studies [45–48]. In fact, our preliminary data found that 40% of

medical students had a poor internet connection (<5 Mbps). Feedback from the medical students also showed that internet connection must be improved, and free internet should be provided to achieve effective open distance learning.

We believe that this medical education transformation has caused certain changes and impacts on learning styles among medical students. Multimodal has been the preferred style of learning among medical students, especially among universities that use integrated curricula [49–53]. Hence, with the implementation of open distance learning, there are adaptations from lecturers and medical students, as they are required to make use of the available resources in digital platforms to gain the utmost knowledge and skills for practical clinical components that were initially obtained through clinical clerkships at the hospital. As such, clinical students would be more impacted, as they have missed the most crucial part of learning directly from patients. Indeed, there were several responses from clinical students stating that they had a tough time adapting to open distance learning. They hoped that they could be provided with more interactive forms of digital learning, simulation software, videos regarding the topics to be learned, and recordings of lectures. These strategies make up the multimodal style of learning, including aural and visual, and can partially replace the kinaesthetic style since students do not have any direct experience with patients via clerkships in hospitals during the pandemic period. In fact, medical students have positive views towards the use of simulation-based learning [54–57] and virtual reality [40,58–60], as they provide hands-on practice and improve learning competency with clinical reasoning skills especially when there is limited availability of patients in hospitals. Hence, the development of simulation labs should be encouraged in medical institutions to allow medical students to gain medical-procedural experience with more intensive training workshops provided for lecturers so that it could be used as an additional tool for medical teaching and learning.

Our results found that medical students portrayed intrinsic motivation, mainly self-motivation, and self-discipline, in coping with this tough time. For instance, some of them motivate themselves to learn continuously by recalling the actual intention of medical pursuit, while some create an organised study plan with daily learning objectives to ensure that they learn something every day. This is reasonable, as medical students are known to have high intrinsic motivation, compared with undergraduate students of other courses [61,62]. High motivation has been one of the vital components during selections or interviews for the course of medicine [63,64]. Thus, medical students with pre-existing high intrinsic motivation will make use of all available digital resources for their study despite the challenges they faced during the pandemic.

Hence, it can be concluded that most of the medical students' learning motivations are not impacted by the pandemic. As open distance learning has been part of the blended learning in UKM medical curricula, medical students generally adapted well during the pandemic. However, the challenges that they face from full digitalisation of open distance learning mainly emerged from extrinsic factors, especially the learning environment. As suggested by medical students, stable internet connection, more variety of online learning platforms such as UpToDate and full-text journals that are accessible without any time and place restrictions, and ideal LMS platforms to access all learning materials while encouraging discussions between lecturers and students via online assessments such as quizzes and viva sessions are required if the university were to embark on the sustainable open distance learning experience. Based on these recommendations, students with high intrinsic motivation can improve their lifelong learning skills through open distance learning.

This study was conducted with a few potential limitations. Further quantitative synthesis to determine the impact of potential confounders such as age, gender, the phase of the study, and household income on learning motivation among medical students was not carried out due to the lack of relevant data. Since only UKM medical students were involved in this study, the representativeness and generalisability of the findings to other medical faculties are limited. Additionally, there was a likelihood of respondents giving socially desirable responses, as they may answer the questionnaire positively based on

what they perceived to be expected of them since our study used self-reported data. Further longitudinal studies with mixed methods are recommended to explore the impact of open distance learning on learning motivation among medical students. Constant feedback, reflections, and evaluations from medical students on the implementation of open distance learning are required to improve medical education.

5. Conclusions

The majority of medical students portrayed intrinsic motivation in their studies during the current pandemic period. Better internet connection, innovative ways of teaching and learning, new assessment methods, and strengthening of LMS is recommended for optimal outcome of open distance learning. Open distance learning should be improvised based on students' needs and recommendations to be an additional driving factor to further increase learning motivation, especially during this pandemic period, when face-to-face teaching and learning methods are limited.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/su14084497/s1>, Supplementary file: The survey tool used in this study.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

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References

1. Alsoufi, A.; Alsuyihili, A.; Msherghi, A.; Elhadi, A.; Atiyah, H.; Ashini, A.; Ashwieb, A.; Ghula, M.; Ben Hasan, H.; Abudabuos, S.; et al. Impact of the COVID-19 pandemic on medical education: Medical students' knowledge, attitudes, and practices regarding electronic learning. *PLoS ONE* **2020**, *15*, e0242905. [[CrossRef](#)] [[PubMed](#)]
2. Stoehr, F.; Müller, L.; Brady, A.; Trilla, A.; Mähringer-Kunz, A.; Hahn, F.; Düber, C.; Becker, N.; Wörns, M.A.; Chapiro, J.; et al. How COVID-19 kick-started online learning in medical education-The DigiMed study. *PLoS ONE* **2021**, *16*, e0257394. [[CrossRef](#)] [[PubMed](#)]
3. Lucey, C.R.; Johnston, S.C. The Transformational Effects of COVID-19 on Medical Education. *JAMA* **2020**, *324*, 1033–1034. [[CrossRef](#)] [[PubMed](#)]
4. Rose, S. Medical Student Education in the Time of COVID-19. *JAMA* **2020**, *323*, 2131–2132. [[CrossRef](#)]
5. Ahmed, H.; Allaf, M.; Elghazaly, H. COVID-19 and medical education. *Lancet Infect. Dis.* **2020**, *20*, 777–778. [[CrossRef](#)]
6. Khalil, R.; Mansour, A.E.; Fadda, W.A.; Almisnid, K.; Aldamegh, M.; Al-Nafeesah, A.; Alkhalifah, A.; Al-Wutayd, O. 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*, 285. [[CrossRef](#)]
7. Wheeler, S. E-Learning and Digital Learning. In *Encyclopedia of the Sciences of Learning*; Seel, N.M., Ed.; Springer US: Boston, MA, USA, 2012; pp. 1109–1111.
8. Keane, T. Leading with technology: 21st century skills = 3Rs + 4Cs. *Aust. Educ. Lead.* **2012**, *34*, 44.

9. Lin, M.-H.; Chen, H.-C.; Liu, K.-S. A study of the effects of digital learning on learning motivation and learning outcome. *Eurasia J. Math. Sci. Technol. Educ.* **2017**, *13*, 3553–3564. [[CrossRef](#)]
10. Fabriz, S.; Mendzheritskaya, J.; Stehle, S. Impact of Synchronous and Asynchronous Settings of Online Teaching and Learning in Higher Education on Students' Learning Experience during COVID-19. *Front. Psychol.* **2021**, *12*, 733554. [[CrossRef](#)]
11. Singh, C.K.S.; Madzlan, N.A.; Ong, E.T.; Gopal, R.; Muhammad, M.M.; Shukor, S.S.; Mostafa, N.A.; Singh, T.S.M.; Maniam, M. Using Synchronous vs. Asynchronous Methods during the COVID-19 Pandemic in Malaysia: Preservice and In-Service Teachers' Perspectives. In *E-Learning and Digital Education in the Twenty-First Century-Challenges and Prospects*; IntechOpen: London, UK, 2021.
12. Adams, D.; Sumintono, B.; Mohamed, A.; Noor, N.S.M. E-learning readiness among students of diverse backgrounds in a leading Malaysian higher education institution. *Malays. J. Learn. Instr.* **2018**, *15*, 227–256. [[CrossRef](#)]
13. Mahajan, M.V.; Kalpana, R. A study of students' perception about e-learning. *Indian J. Clin. Anat. Physiol.* **2018**, *5*, 501–507.
14. Scott, K.; Morris, A.; Marais, B. Medical student use of digital learning resources. *Clin. Teach.* **2018**, *15*, 29–33. [[CrossRef](#)]
15. 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*, e042378. [[CrossRef](#)] [[PubMed](#)]
16. O'Doherty, D.; Dromey, M.; Lougheed, J.; Hannigan, A.; Last, J.; McGrath, D. Barriers and solutions to online learning in medical education—An integrative review. *BMC Med. Educ.* **2018**, *18*, 130. [[CrossRef](#)]
17. Papapanou, M.; Routsis, E.; Tsamakias, K.; Fotis, L.; Marinou, G.; Lidoriki, I.; Karamanou, M.; Papaioannou, T.G.; Tsiptsios, D.; Smyrnis, N.; et al. Medical education challenges and innovations during COVID-19 pandemic. *Postgrad. Med. J.* **2021**. [[CrossRef](#)] [[PubMed](#)]
18. Ibrahim, N.K.; Al Raddadi, R.; AlDarmasi, M.; Al Ghamdi, A.; Gaddoury, M.; AlBar, H.M.; Ramadan, I.K. Medical students' acceptance and perceptions of e-learning during the Covid-19 closure time in King Abdulaziz University, Jeddah. *J. Infect. Public Health* **2021**, *14*, 17–23. [[CrossRef](#)]
19. Singh, A.; Min, A.K.K. Digital lectures for learning gross anatomy: A study of their efficacy. *Korean J. Med. Educ.* **2017**, *29*, 27–32. [[CrossRef](#)] [[PubMed](#)]
20. Orsini, C.; Binnie, V.I.; Wilson, S.L. Determinants and outcomes of motivation in health professions education: A systematic review based on self-determination theory. *J. Educ. Eval. Health Prof.* **2016**, *13*, 19. [[CrossRef](#)] [[PubMed](#)]
21. Deci, E.L.; Ryan, R.M. Facilitating optimal motivation and psychological well-being across life's domains. *Can. Psychol.* **2008**, *49*, 14. [[CrossRef](#)]
22. Tanaka, M.; Watanabe, Y. Academic and family conditions associated with intrinsic academic motivation in Japanese medical students: A pilot study. *Health Educ. J.* **2011**, *71*, 358–364. [[CrossRef](#)]
23. Kong, S.C.; Wang, Y.Q. The influence of parental support and perceived usefulness on students' learning motivation and flow experience in visual programming: Investigation from a parent perspective. *Br. J. Educ. Technol.* **2021**, *52*, 1749–1770. [[CrossRef](#)]
24. Wagner, L.; Ruch, W. Good character at school: Positive classroom behavior mediates the link between character strengths and school achievement. *Front. Psychol.* **2015**, *6*, 610. [[CrossRef](#)] [[PubMed](#)]
25. Hazrati-Viari, A.; Rad, A.T.; Torabi, S.S. The effect of personality traits on academic performance: The mediating role of academic motivation. *Procedia-Soc. Behav. Sci.* **2012**, *32*, 367–371. [[CrossRef](#)]
26. Nauzeer, S.; Jaunky, V.C. A Meta-Analysis of the Combined Effects of Motivation, Learning and Personality Traits on Academic Performance. *Pedagog. Res.* **2021**, *6*, em0097. [[CrossRef](#)]
27. Hartnett, M. The Importance of Motivation in Online Learning. In *Motivation in Online Education*; Hartnett, M., Ed.; Springer: Singapore, 2016; pp. 5–32.
28. Chiu, T.K.; Hew, T.K. Factors influencing peer learning and performance in MOOC asynchronous online discussion forum. *Australas. J. Educ. Technol.* **2018**, *34*, 16–28. [[CrossRef](#)]
29. Chiu, T.K.F.; Lin, T.-J.; Lonka, K. Motivating Online Learning: The Challenges of COVID-19 and Beyond. *Asia-Pac. Educ. Res.* **2021**, *30*, 187–190. [[CrossRef](#)]
30. Chan, Y.; Norlizah, C. Students' motivation towards science learning and students' science achievement. *Int. J. Acad. Res. Progress. Educ. Dev.* **2017**, *6*, 174–189.
31. Ghanizadeh, A.; Mosallaei, S.; Dorche, M.S.; Sahraian, A.; Yazdanshenas, P. Attitude and Use of E-Learning, education by medical students in Shiraz, Iran. *Intern. Med. Med. Investig. J.* **2018**, *3*, 108–111. [[CrossRef](#)]
32. Totlis, T.; Tishukov, M.; Piagkou, M.; Kostares, M.; Natsis, K. Online educational methods vs. traditional teaching of anatomy during the COVID-19 pandemic. *Anat. Cell Biol.* **2021**, *54*, 332–339. [[CrossRef](#)]
33. Olmes, G.L.; Zimmermann, J.S.M.; Stotz, L.; Takacs, F.Z.; Hamza, A.; Radosa, M.P.; Findelee, S.; Solomayer, E.-F.; Radosa, J.C. Students' attitudes toward digital learning during the COVID-19 pandemic: A survey conducted following an online course in gynecology and obstetrics. *Arch. Gynecol. Obstet.* **2021**, *304*, 957–963. [[CrossRef](#)]
34. Xin, L.J.; Hathim, A.A.A.; Yi, N.J.; Reiko, A.; Shareela, I.N.A. Digital learning in medical education: Comparing experiences of Malaysian and Japanese students. *BMC Med. Educ.* **2021**, *21*, 418. [[CrossRef](#)]
35. Al-Balas, M.; Al-Balas, H.I.; Jaber, H.M.; Obeidat, K.; Al-Balas, H.; Aborajoo, E.A.; Al-Taher, R.; Al-Balas, B. Distance learning in clinical medical education amid COVID-19 pandemic in Jordan: Current situation, challenges, and perspectives. *BMC Med. Educ.* **2020**, *20*, 341. [[CrossRef](#)]

36. Amir, L.R.; Tanti, I.; Maharani, D.A.; Wimardhani, Y.S.; Julia, V.; Sulijaya, B.; Puspitawati, R. Student perspective of classroom and distance learning during COVID-19 pandemic in the undergraduate dental study program Universitas Indonesia. *BMC Med. Educ.* **2020**, *20*, 392. [[CrossRef](#)] [[PubMed](#)]
37. Ahmady, S.; Kallestrup, P.; Sadoughi, M.M.; Katibeh, M.; Kalantarion, M.; Amini, M.; Khajeali, N. Distance learning strategies in medical education during COVID-19: A systematic review. *J. Educ. Health Promot.* **2021**, *10*, 421. [[CrossRef](#)]
38. Armstrong-Mensah, E.; Ramsey-White, K.; Yankey, B.; Self-Brown, S. COVID-19 and Distance Learning: Effects on Georgia State University School of Public Health Students. *Front. Public Health* **2020**, *8*, 576227. [[CrossRef](#)]
39. Chandra, S.; Laotepitaks, C.; Mingioni, N.; Papanagnou, D. Zooming-out COVID-19: Virtual clinical experiences in an emergency medicine clerkship. *Med. Educ.* **2020**, *54*, 1182–1183. [[CrossRef](#)]
40. De Ponti, R.; Marazzato, J.; Maresca, A.M.; Rovera, F.; Carcano, G.; Ferrario, M.M. Pre-graduation medical training including virtual reality during COVID-19 pandemic: A report on students' perception. *BMC Med. Educ.* **2020**, *20*, 332. [[CrossRef](#)]
41. Torres, A.; Domańska-Głonek, E.; Dzikowski, W.; Korulczyk, J.; Torres, K. Transition to online is possible: Solution for simulation-based teaching during the COVID-19 pandemic. *Med. Educ.* **2020**, *54*, 858–859. [[CrossRef](#)]
42. Sam, A.H.; Millar, K.R.; Lupton, M.G.F. Digital Clinical Placement for Medical Students in Response to COVID-19. *Acad. Med.* **2020**, *95*, 1126. [[CrossRef](#)]
43. Iguacel, I.; Abecia, B.; Bernal, J.L.; Martínez-Jarreta, B. Changing Attitudes towards Occupational Medicine with Blended Learning Methods Is Possible among Medical Students in Spain: A Longitudinal Study. *Int. J. Environ. Res. Public Health* **2022**, *19*, 878. [[CrossRef](#)]
44. Nijakowski, K.; Lehmann, A.; Zdrojewski, J.; Nowak, M.; Surdacka, A. The Effectiveness of the Blended Learning in Conservative Dentistry with Endodontics on the Basis of the Survey among 4th-Year Students during the COVID-19 Pandemic. *Int. J. Environ. Res. Public Health* **2021**, *18*, 4555. [[CrossRef](#)] [[PubMed](#)]
45. Ming, T.S.; Mahmud, N.; Abd Razak, N. The use of wireless technology in UKM: Challenges faced and its impact on English language learning. *3L Lang. Linguist. Lit.* **2012**, *18*, 129–143.
46. Rajab, M.H.; Gazal, A.M.; Alkattan, K. Challenges to Online Medical Education during the COVID-19 Pandemic. *Cureus* **2020**, *12*, e8966. [[CrossRef](#)] [[PubMed](#)]
47. Farooq, F.; Rathore, F.A.; Mansoor, S.N. Challenges of Online Medical Education in Pakistan during COVID-19 Pandemic. *J. Coll. Phys. Surg. Pak.* **2020**, *30*, 67–69. [[CrossRef](#)]
48. Su, B.; Zhang, T.; Yan, L.; Huang, C.; Cheng, X.; Cai, C.; Cui, D. Online Medical Teaching in China during the COVID-19 Pandemic: Tools, Modalities, and Challenges. *Front. Public Health* **2021**, *9*, 797694. [[CrossRef](#)]
49. Nuzhat, A.; Salem, R.O.; Quadri, M.S.; Al-Hamdan, N. Learning style preferences of medical students: A single-institute experience from Saudi Arabia. *Int. J. Med. Educ.* **2011**, *2*, 70–73. [[CrossRef](#)]
50. Moro, C.; Smith, J.; Stromberga, Z. Multimodal Learning in Health Sciences and Medicine: Merging Technologies to Enhance Student Learning and Communication. *Adv. Exp. Med. Biol.* **2019**, *1205*, 71–78. [[CrossRef](#)]
51. Samarakoon, L.; Fernando, T.; Rodrigo, C.; Rajapakse, S. Learning styles and approaches to learning among medical undergraduates and postgraduates. *BMC Med. Educ.* **2013**, *13*, 42. [[CrossRef](#)]
52. Bokhari, N.M.; Zafar, M. Learning styles and approaches among medical education participants. *J. Educ. Health Promot.* **2019**, *8*, 181.
53. Karim, M.R.; Asaduzzaman, A.; Talukder, M.H.K.; Alam, K.K.; Haque, F.; Khan, S.J. Learning style preferences among undergraduate medical students: An experience from different medical colleges of Bangladesh. *Bangladesh J. Med. Educ.* **2019**, *10*, 26–30. [[CrossRef](#)]
54. Joseph, N.; Nelliyanil, M.; Jindal, S.; Utkarsha; Abraham, A.E.; Alok, Y.; Srivastava, N.; Lankeshwar, S. Perception of Simulation-based Learning among Medical Students in South India. *Ann. Med. Health Sci. Res.* **2015**, *5*, 247–252. [[CrossRef](#)] [[PubMed](#)]
55. Philippon, A.-L.; Truchot, J.; De Suremain, N.; Renaud, M.-C.; Petit, A.; Baron, G.-L.; Freund, Y. Medical students' perception of simulation-based assessment in emergency and paediatric medicine: A focus group study. *BMC Med. Educ.* **2021**, *21*, 586. [[CrossRef](#)] [[PubMed](#)]
56. Piryani, R.M.; Piryani, S.; Shrestha, U.; Acharya, A.; Kanskar, S.; Shahi, M.; Kayastha, J.; Chaulagain, A.; Agarwal, J.P.; Bajracharya, S.R. Simulation-based education workshop: Perceptions of participants. *Adv. Med. Educ. Pract.* **2019**, *10*, 547. [[CrossRef](#)] [[PubMed](#)]
57. Turatsinze, S.; Willson, A.; Sessions, H.; Cartledge, P.T. Medical student satisfaction and confidence in simulation-based learning in Rwanda—Pre and post-simulation survey research. *Afr. J. Emerg. Med.* **2020**, *10*, 84–89. [[CrossRef](#)]
58. Sattar, M.U.; Palaniappan, S.; Lokman, A.; Hassan, A.; Shah, N.; Riaz, Z. Effects of Virtual Reality training on medical students' learning motivation and competency. *Pak. J. Med. Sci.* **2019**, *35*, 852–857. [[CrossRef](#)]
59. Kolla, S.; Elgawly, M.; Gaughan, J.P.; Goldman, E. Medical Student Perception of a Virtual Reality Training Module for Anatomy Education. *Med. Sci. Educ.* **2020**, *30*, 1201–1210. [[CrossRef](#)]
60. Parsons, D.; MacCallum, K. Current perspectives on augmented reality in medical education: Applications, affordances and limitations. *Adv. Med. Educ. Pract.* **2021**, *12*, 77. [[CrossRef](#)]
61. Campos-Sánchez, A.; López-Núñez, J.A.; Carriel, V.; Martín-Piedra, M.; Sola, T.; Alaminos, M. Motivational component profiles in university students learning histology: A comparative study between genders and different health science curricula. *BMC Med. Educ.* **2014**, *14*, 46. [[CrossRef](#)]

62. Wu, H.; Li, S.; Zheng, J.; Guo, J. Medical students' motivation and academic performance: The mediating roles of self-efficacy and learning engagement. *Med. Educ. Online* **2020**, *25*, 1742964. [[CrossRef](#)]
63. Kusurkar, R.A.; Croiset, G. Autonomy support for autonomous motivation in medical education. *Med. Educ. Online* **2015**, *20*, 27951. [[CrossRef](#)]
64. Wouters, A.; Croiset, G.; Galindo-Garre, F.; Kusurkar, R.A. Motivation of medical students: Selection by motivation or motivation by selection. *BMC Med. Educ.* **2016**, *16*, 37. [[CrossRef](#)] [[PubMed](#)]