



Distant education in Moroccan medical schools following COVID-19 outbreak at the early phase of lockdown: Were the students really engaged?

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ABSTRACT

The Coronavirus pandemic outbreak has induced many urgent adaptation measures in Morocco including medical education that had to abruptly adopt an exclusive distant education approach, without former sufficient preparation. The present study aimed to assess medical students' engagement in their acutely implemented distant learning and to identify factors that could be associated to the students' studying engagement levels. Medical students from 1st to 5th years of medical studies, enrolled in all Moroccan public medical faculties were invited to fill-in an anonymous online questionnaire.

3174 medical students took part in the study, with a mean age of 20.4 +/- 1.8 years old, and 65.4% of them were women. 90% of the participants reported moderate to drastic change of their sleeping habits and 65% suffered depression symptoms. 20.7% of students didn't engage at all in their learning, 26% studied for less than one hour daily, and only 53.3% studied for one hour or more daily. Only 46.4% of the participants had access to multimedia studying resources and only 20.9% were offered online interactive sessions with their teachers. 41.8% of the participants were unsatisfied from their distant learning experience. Lower studying engagement rates were significantly associated with older age, male gender, change of sleeping patterns, depression symptoms, and also with lack of access to multimedia studying resources and poor general satisfaction from the distant learning experience.

Distant Education needs to include more interactive activities and more multimedia studying resources to engage students more efficiently in their self-regulated learning.

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Introduction

The novel coronavirus disease, commonly referred to as COVID-19, has been recognized as a rapidly spreading global pandemic by the WHO on March 11, 2020 [37]. In Morocco, the very first case of COVID-19 was declared on March 1, 2020 [3]. Two weeks later, and with only 37 active declared cases and one COVID-19 related death, The Moroccan Government implemented highly restrictive social distancing measures with the closure of all Educational institutions from primary to higher education on March 16, 2020, and a general Lockdown with home confinement starting from March 20, limiting people's mobility to the strict minimum [26]. This urgent disruption of "in-person" education was rapidly replaced by a distant education approach in order to keep up with the school and university year, using all possible and available means such as e-learning platforms, academic websites and the mobilization of the public and social media vectors [3,27].

Moroccan Medical Education has also suffered the consequences of lockdown and Universities closure. Medical students in Morocco, among others around the world [33], not only stopped undertaken courses in their universities but also interrupted their clinical rotations at university hospitals to avoid being infected or facilitating the transmission of the virus to others. Because medical education in Morocco is still largely based on a classical model with limited access to web-based education and new technologies [14,16], the very abrupt and total conversion to distant education has been a real challenge for both largely non-initiated educators and students.

Distant education can be defined as the process of planned teaching and learning, occurring in different physical places, and requiring the use of technologies to enable the communication between the teachers and the learners [25]. This concept definition highlights the necessity of both sides' engagement in the educational process to be effective. On the one hand, the teachers should provide the proper educational tools through the institutional official channels (website, E-learning platforms, academic emails...etc.), and guide the students in their learning process using the available communication tools. On the other hand, the students are supposed to actively engage in their learning by studying through the curriculum-related educational tools, following their teachers' recommendations. In Moroccan Medical Schools, and because of its hasty implementation given the urgency of the lockdown, the distant education process didn't quite meet the requirements of active communication going both sides between teachers and learners. Indeed, lecture-based medical courses were quickly converted into digitalized resources that were dispatched to students using different communication vectors [5]. Those educational resources were mostly written documents sometimes accompanied with media files (audio, or video). The students were largely instructed to study at home through the given documents and contact their teachers to ask questions if need be. The interactive communication sessions between students and teachers were not systematic and only organized at the teacher's initiative. In this educational approach, the students' engagement in their learning is difficult to assess, given the lack of systematic feedback from students, and seems to be not actively encouraged enough. Hence, the learning disengagement among students is expected to be higher than it was within the classical in-person education.

Yet, such disengagement cannot be only linked to the "distant" aspect of the educational process. Other factors should be taken into consideration especially in the context of a global pandemic. Indeed, medical students were obliged to pursue their education in a general context of home confinement, which is expected to major their already higher rates of psychological distress when compared to the general population. Pursuing a medical career in Morocco or worldwide puts students at higher risk of developing symptoms related to stress, anxiety and depression [1,4,24,34]. Stressors related to COVID-19 and confinement conditions are more likely to worsen emotional distress among medical students [9,10] and negatively interfere with their ability to cope with their distant studies and to actively engage in their learning.

In order to explore how medical students in Morocco were coping with their new distant education conditions, we conducted a National survey aiming to assess students' engagement in their Medical studies from home, during the early phase of the National lockdown. It also aimed to investigate the possible personal and environmental factors, which could be associated to students' disengagement in their active learning.

Methods

Setting and participants

We conducted an online-based national survey targeting undergraduate medical students from 1st to 5th year in each of the seven public medical faculties of the Moroccan Kingdom. We used a Snowball sampling strategy. The anonymous online questionnaire was first spread in social media groups gathering consistent numbers of Moroccan medical students, then participants were asked to pass it on to their colleagues and friends from the same institutions using all possible communication means (emails and social media platforms). In order to control for potential selection bias, a neutral wording was used as an invitation to participate: "This is a national survey aiming to assess the experience of home confinement and e-learning by medical students in Morocco during the COVID-19 pandemic. Thank you for your participation". Data collection took place over 5 days (19–23 April), after 4 weeks of Lockdown and closure of universities.

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Main measures

The online questionnaire comprised questions and scales aiming to explore students' engagement and its possible associated factors. Students' engagement in their distant academic learning during lockdown was assessed through the daily mean study duration. Students were asked to precise the average duration they spent daily in studying their academic medical resources provided by their professors (no studying at all/ less than one hour daily/ 1–3 h daily/ 3–6 h daily/ more than 6 h daily). The potential associated factors to students' engagement were regrouped into 4 domains; 1-demographic and general information (age, sex, level of studies) 2-distant learning aspects (access to Wi-Fi from home, availability of media resources and interactive online sessions and general satisfaction about the distant learning as implemented by the institutions since their closure), 3-COVID-19 and lockdown related aspects (housing conditions, family presence, personal acceptance of the lockdown and general feelings about the pandemic) 4-sleep habits change and Psychological distress assessed through the Hospital Anxiety and Depression Scale (HADS) [38]. HADS is a 14-items self-assessment scale (Cf. Appendix). Each item is scored on a 4-point Likert-type scale (0–3). It is divided into two subscales (Anxiety and Depression) comprising 7 items each, and with a total score resulting from the summation of individual items (0 to 21), a higher score indicating more distress. People scoring 8 or more in one of the subscales are identified as screened positive for anxiety and/or depression symptoms. For the present study, a validated French translation of HADS was used [7], as French is the main language of medical studies in Morocco.

Data analysis

Data were analysed using SPSS 21.0. Descriptive analyses (numbers, means and percentages) were performed to precise the distribution of our data. The main outcome variable was the mean daily duration of studying from home, clustered into two major categories (studying less than one hour daily & studying one hour or more daily). Univariate analysis was run to determine the relationship between each independent variable and the outcome measure. Chi-2 test was used for the qualitative variables and Student *t*-test was used for quantitative variables. A two-tailed $p < 0.05$ was considered statistically significant.

Backward stepwise multiple logistic regression analysis was performed to identify the variables independently associated with the distant learning engagement of students. Odds ratio and 95% confidence intervals were reported to interpret our final model.

Ethical considerations

The present survey was conducted in accordance of the Declaration of Helsinki Provisions regarding research on Humans. All Participants gave their informed consent to participate in the study.

Results

Population description

We gathered 3174 responses from students enrolled in all Moroccan public medical faculties. The participants mean age was 20.4 +/- 1.8 years old, 65.4% of them were women and 42.9% were at preclinical learning stage (first 2 years of medical studies).

Distant learning implementation and conditions

All participants had to resume their medical learning from home following the closure of their medical faculties as a preventive measure of the virus spread. 9.2% didn't have access to WIFI from their confinement locations, and 23.5% could only use their phones as the main studying tool. Distant learning was implemented in different ways by each medical faculty. 46.4% of students reported receiving lessons with media resources (video and/or audio files explaining lessons), whereas 53.6% had only access to written lessons without media files. Only 20.9% of our participants reported being offered interactive online sessions with their teachers and 41.8% expressed being unsatisfied with the distant learning experience as implemented by their medical school.

Lock-down and pandemic related issues

As shown in Table 1, the majority of our participants were confined at home with their families (93.2%), were comfortably settled (personal space, and no much noise or distraction) (93.4%), and were fully accepting the national lockdown and confinement measures implemented to face the COVID-19 pandemic (97.7%). Only 14% were rather pessimistic about the epidemiological situation in the country and how it might unfold in the near future, when 41.6% were rather optimistic and 44.4% held a neutral opinion.

Table 1

Factors associated to Students' engagement in distant learning, measured as a studying daily duration.

Variables	N (%)	Univariate Analysis				Multivariate Analysis		
		Daily mean duration of studying				Odds Ratio	Confidence Interval	P
Demographic and academic items		Less than 1h N	(%)	1 h or more N	(%)			
Age (means +/- SD)	20.4 +/- 1.8	20.6 +/- 1.9		20.2 +/- 1.7		<0.001	1.1 [1.1 – 1.2]	<0.001
Sex						<0.001		0.017
Women	2077 (65.4)	916	(44.1)	1161	(55.9)	1	–	
Men	1097 (34.6)	564	(51.4)	533	(48.6)	1.2	[1.0 – 1.4]	
Studies Level						0.001		–
Pre-clinical (1st & 2nd years)	1362 (42.9)	291	(41.5)	410	(58.5)	–	–	
Clinical (3rd to 5th years)	1812 (57.1)	1189	(48.1)	1284	(51.9)	–	–	
Environmental items								
Housing conditions						0.006		–
Comfortable enough	2964 (93.4)	1364	(46.0)	1600	(54.0)	–	–	
Nor comfortable at all	210 (6.6)	116	(55.2)	94	(44.8)	–	–	
Family presence						0.064		–
Confined within the family home	2958 (93.2)	1368	(46.2)	1590	(53.8)	–	–	
Confined away from the family	216 (6.8)	112	(51.9)	104	(48.1)	–	–	
Pandemic related items								
General acceptance of the lockdown						0.022		–
Fully accepted	3101 (97.7)	1437	(46.3)	1664	(53.7)	–	–	
Not accepted	73 (2.3)	43	(58.9)	30	(41.1)	–	–	
General feeling about the Pandemic						0.001		–
Rather optimistic	1321 (41.6)	575	(43.5)	746	(56.5)	–	–	
Neutral	1408 (44.4)	665	(47.2)	743	(52.8)	–	–	
Rather pessimistic	445 (14.0)	240	(53.9)	205	(46.1)	–	–	
E-learning Implementation items								
Access to wifi from home						0.276		–
Yes	2883 (90.8)	1339	(46.4)	1544	(53.6)	–	–	
No	291 (9.2)	141	(48.5)	150	(51.5)	–	–	
Main tool used for e-learning						0.001		–
Personal Computer or Tablet	2429 (76.5)	1095	(45.1)	1334	(54.9)	–	–	
Phone	745 (23.5)	385	(51.7)	360	(48.3)	–	–	
Availability of media resources						<0.001		0.021
Yes	1473(46.4)	578	(39.9)	886	(60.1)	1	–	
No	1701(53.6)	893	(52.5)	808	(47.5)	1.2	[1.0 – 1.4]	
Availability of interactive e-learning						0.002		–
Yes	663 (20.9)	276	(41.6)	387	58.4	–	–	
No	2511 (79.1)	1204	(47.9)	1307	52.1	–	–	
General satisfaction of the E-learning						<0.001		<0.001
Very Satisfied	292 (9.2)	81	(27.7)	211	(72.3)	1	–	
Moderately satisfied	1554 (49.0)	617	(39.7)	937	(60.3)	1.6	[1.2 – 2.1]	0.001
Unsatisfied	1328 (41.8)	782	(58.9)	546	(41.1)	3.1	[2.3 – 4.1]	<0.001
Mental health items								
Sleep habits change during lockdown						<0.001		<0.001
No change	318 (10.0)	96	30.2	222	69.8	1	–	
Moderate change	1177 (37.1)	435	37	742	63.0	1.3	[1.0 – 1.7]	0.039
Drastic change	1679 (52.9)	949	56.5	730	43.5	2.4	[2.0 – 3.4]	0.000
Anxiety Symptoms (HADS)						<0.001		–
No	1737 (54.7)	763	43.9	974	56.1	–	–	
Yes	1437 (45.3)	717	49.9	720	50.1	–	–	
Depression Symptoms (HADS)						<0.001		<0.001
No	1111 (35.0)	428	38.5	683	61.5	1	–	
Yes	2063 (65.0)	1052	51.0	1011	49.0	1.4	[1.1 – 1.6]	

N= Number; SD= Standard Deviation; HADS= Hospital Anxiety and Depression Scale.

Mental health measures

Most of the survey participants had moderate (37.1%) to drastic (52.9%) changes of sleeping habits with a later sleeping hour and lesser quality of sleep. The HADS scores revealed anxiety and depression symptoms in 45.3% and 65% of our participants respectively.

Students' engagement in their distant medical learning and associated factors

Medical students engaged differently in their distant learning, with an average daily duration of studying that varied from 0 h (20.7%) to over 6 h (2.5%), with 26% of students studying less than one hour daily, 34.3% between 1 and 3 h, and 16.5% studying between 3 and 6 h daily. In order to explore the associated factors to students' engagement, the latter outcome

variable was clustered into 2 main categories: participants with a low engagement, studying less than one hour daily (46.7%), and participants with a higher engagement, with a mean daily duration of studying of at least one hour (53.3%). As detailed in [table 1](#), univariate statistical analysis has revealed that a lower engagement in distant learning was significantly associated with older age ($p < 0.001$), male gender ($p < 0.001$), and higher levels of studies ($p = 0.001$). It was also found significantly associated with uncomfortable housing conditions ($p < 0.001$), a general negative feeling about the pandemic ($p < 0.001$), the presence of anxiety or depression symptoms ($p < 0.001$), and change of sleeping habits ($p < 0.001$). Moreover, availability of media studying resources, interactive sessions with teachers and general satisfaction of students from the distant learning implementation were significantly associated with a higher studying engagement of medical students during the pandemic ($p < 0.001$).

Multivariate logistic regression analysis revealed that, after controlling of confounders, being a man (OR, 1.2; 95% CI, 1.0–1.4; $P = 0.017$) and being older (OR, 1.1; 95% CI, 1.1–1.2; $P < 0.0001$) were associated with lower studying engagement during the pandemic. Non-availability of media resources (OR, 1.2; 95% CI, 1.0–1.4; $P = 0.021$) and students' dissatisfaction with the e-learning implementation (OR, 3.1; 95% CI, 2.3–4.1; $P < 0.0001$) were also associated with lower studying engagement. Moreover, important change of sleeping habits (OR, 2.4; 95% CI, 2.0–3.4; $P < 0.001$) and the presence of depression symptoms on HADS (OR, 1.4; 95% CI, 1.1–1.6; $P < 0.001$) appeared to be independent risk factors of low studying duration of medical students during the home confinement period.

Discussion

This cross-sectional survey included 3174 Medical Students from all Moroccan public medical faculties, covering 23% of all students enrolled in the first 5 years of medical studies, whose total number is approximately around 14,000 students [27]. The age and gender distribution in our sample matches the expected age means (20 years old) and gender distribution of the medical students' population (62% being women) as reported in official statistics by the Ministry of Higher Education in its annual report 2019–2020 [28].

The present survey revealed low students' engagement in their distant medical learning, urgently implemented because of the COVID-19 outbreak, with 20.7% of students not studying at all for the whole four weeks following lockdown, and 26% studying less than one hour daily. One of the possible explanations to this general low studying engagement could be the absence of visibility regarding final examinations dates. At the time of the study (4 weeks following lockdown), it was not possible to predict if the finals were going to take place at the end of the year or be postponed to later on. However, the time to run the survey, set at exactly 4 weeks of the national lockdown was motivated by two main reasons; 1-it was long enough to assess the potential impact of the home confinement, which was already longer than previously described in similar epidemic conditions [9], 2-the lack of visibility regarding the ease of the lockdown by the Moroccan authorities. The general lockdown was first announced to last for one month and its prolongation to another 6 weeks was only decided after the study was launched.

Most participants were female, comfortably confined in their family homes, reporting full acceptance and neutral or positive feelings about the pandemic outcomes. Our study revealed that male and older students were significantly less engaged in their distant learning which might be explained by the lower self-discipline and more academic procrastination behavior usually observed within male students [12,31]. Even if the personal acceptance of lockdown measures and the overall positive feeling about the pandemic outcome appeared to be significantly associated with higher studying engagement rates in the univariate analysis ($P = 0.0022$ and $P = 0.001$ respectively), they weren't identified as real independent associated factors to the daily mean study duration in the logistic regression final model. These results imply that negative feelings about the lockdown measures or the pandemic outcomes weren't strong enough stressors to directly impact students' engagement in their medical learning.

Depression symptoms were found in 65% of our participants which is a high rate compared to the Moroccan general population where the latest known prevalence of depression was found to be around 26.5% [29], and to the Moroccan medical students population where suicidal ideas prevalence was found to be 31% in a recent national survey [4]. Depression and anxiety symptoms' high rates can be related to both the pandemic stressors and the confinement measures, which are known to interfere with the mental state of individuals [9,10].

One could argue that the high prevalence of anxiety and depression among our participants might be explained by a selection bias. As the survey was based on voluntary participation, persons being more psychologically affected might be keener to participate. However, this potential bias was partially controlled by including a large number of participants, and by using a neutral wording for the participation invitation as mentioned in the methods section.

These psychological factors make it harder for students and workers to be vigorous and dedicated to their work [20] and are directly associated with lower academic performances among medical students [19,32]. On the other hand, lower personal achievement (being less engaged in one's studies for example), due to multiple factors like the unsuitability of the working environment or other distractors might also affect the mood causing or reinforcing depression symptoms [23], and putting the students into a difficult-to-break vicious circle.

In the present study, only depression (not anxiety) was found to be an independent factor associated to lower studying engagement ($P < 0.001$). However, we only measured engagement through the actual mean daily duration students spent studying, without investigating the quality or efficiency of the learning process. Hence, it is possible that anxious students spent more time studying but with less learning efficiency [36]. Changes in sleeping habits, mainly related to being confined

at home for a long period, were also identified as an independent factor of lower engagement in distant learning ($P < 0.001$). Students who had a complete reverse of their sleeping pattern (staying up very late and sleeping through the day) had the least studying engagement rates. This could be explained by the possible lesser quality of day sleeping [17], possibly affecting their studying motivation [30].

Hence, and in order to improve students' engagement in their distant educational experience and consequently its effectiveness, some urgent measures need to be undertaken to support students and provide them with the appropriate strategies to cope with the psychological stressors negatively interfering with their learning behavior. These psychological stressors already impeded by the nature of the studies field and requirements are certainly enhanced by the current extraordinary pandemic related aspects and preventive measures, such as home confinement [18]. Some of these measures could be for example, the implementation and reinforcement of the medical schools' psychological support teams, through sharing guidelines about how to cope with the home confinement, with their students. A green line, with psychological hearing, orientation and urgent assistance could also be offered to those facing acute distress, especially regarding depression symptoms. Also, specific recommendations regarding sleep habits need to be adapted from the recent guidelines as those developed by the European CBT-I Academy [2] to students' personal conditions on a local or national approach, with the participation of sleep disorders experts. All these recommendations need to be urgently implemented or at least prepared, especially that this pandemic is still far from being controlled and with the country facing a highly probable and imminent return to the general lockdown, after it was progressively eased, given the recent recrudescence of the COVID-19 related death rates and seriously critical cases.

Besides psychological factors, our study revealed other significant risk factors to low studying engagement, which are related to the distant learning itself. Regression analysis showed that the low general satisfaction of students about their distant learning was significantly associated with a lower studying engagement ($P < 0.001$). This might be explained with the type of the digitalized learning resources that were offered to students. Each faculty adopted its own distant learning strategy with different kinds of tools and resources. More than half (53.6%) of our surveyed students representing each of the seven public medical schools, only had access to written lessons without media files (audio/video files with the teachers' explanations), and only 20.9% of them were offered interactive online sessions with their teachers, which can be a limiting factor to self-regulated studying motivation and engagement. Indeed, receiving a unique mode of instructional delivery is limiting for the students, especially in a distant learning setting. Preferred learning ways and methods can change from a person to another, and multiplying curriculum delivery methods helps meeting learners' needs [8]. It has been established that the availability and the quality of media studying resources and student-teacher interactivity influence students learning engagement and effectiveness [21,22].

Consequently, it is obviously not enough to provide students with written downloadable studying materials and expect them to engage and learn effectively without an attractive learning experience, nor real interaction, guidance or supervision from their instructors. Moroccan medical schools had to cope with this pandemic spread prevention measures, with the least teaching-time loss by implementing distant education. However, the way it was implemented didn't optimally meet students' needs of support and guidance to be able to face this drastic change in their learning behavior, going from an exclusive off-line and very traditional educational setting to an exclusive distant type of learning. This resulted in a low engagement of students in their distant learning, questioning and challenging the real point of implementing a way of education if almost half of the students weren't sufficiently motivated to engage in it. Less than a year before the COVID-19 outbreak, Moroccan medical students were already loudly voicing their dissatisfaction with the medical education system through the largest and longest national protestation movement, boycotting courses and trainings for nearly six months [15]. And one of their major concerns was the need for the modernization of the teaching and learning methods with a larger implementation of new educative technologies and approaches like simulation, serious gaming and e-learning activities. Moroccan medical students are very receptive and eager to engage in active learning and distant learning initiatives when they are implemented in their curriculum [6,14]. However, these activities need to meet the general requirements of attractiveness and usefulness, to be engaging for the learners, and optimally associate both distant and face-to-face teaching & learning approaches to be more efficient [11,13,35].

The COVID-19 pandemic has brought up a real opportunity for Moroccan medical faculties to modernize their teaching approaches by adopting more active and distant education tools. To achieve this goal, many measures have to be taken. First of all, all medical schools need to lead an urgent collaborative work to develop and validate a national digitalized medical education curriculum with shared educational resources, that can be made available to students of all public medical schools. Instead of making the huge and very time-consuming effort to create good quality online teaching resources of the whole module, one professor of a discipline would only do one part of the collaborative work involving all the professors of the same discipline throughout the country. This strategy appears to be the best way to achieve a high-quality result, while saving a lot of time and money. However, to be effectively implemented it requires good communication between faculty members on a national scale, which is easier to achieve within the disciplines where a national college of professors is already existent and functional. But those are still very rare. The second very important and urgent measure is to provide medical professors with appropriate training, to create and implement adequate e-learning resources, and to effectively embrace this newly implemented distant education approach. When this current "connected" generation of students is very accustomed to new technologies, an important number of faculty members are still uncomfortable with the digitalized teaching methods and even when willing to engage in it, are lacking the appropriate skills. Hence, training the teachers

is a necessary step that should be planned and effectively implemented by real trainers and facilitators, to guide teachers through their first steps in this completely new pedagogical practice. Also, no change can be led without regular assessment that should take into account all stakeholders and users' experience (professors and students), and perspectives on the effectiveness of the educational process. The present study aimed to participate in this evaluation effort of the very first national experience of distant education implementation in Moroccan medical schools, but further studies are still needed to come up with more useful conclusions and recommendations.

It is important to point out that the present survey was conducted at a very early stage of lockdown and after only 4 weeks of the implementation of the E-learning strategy for medical studies, which highlights the necessity to put its findings into their timely context. The psychological distress that was observed among medical students and their low engagement in their e-learning activities could be related to the unexpected and dramatic change of their life and studying habits as imposed by the lockdown measures. Hence, the whole situation might have been improved significantly which can only be ascertained through further studies.

Limitations

The present study has some limitations. The lack of access to students' coordinates made it difficult to do a random sampling, or to reach all the students enrolled in the medical faculties to invite them to take part in the study, which makes it difficult to generalize the study results. However, the sample size was large enough (3174) to draw impactful conclusions. Also, the study only assessed the first four weeks of students' engagement in their distant learning without a longitudinal follow up. Thus, students' behavior and perception of the whole experience including final examinations is worth a further investigation.

Conclusion

In this survey study, Moroccan medical students undergoing a total and abrupt shift to exclusive distant learning, following the disruption of in-present higher education as a preventive measure of the Coronavirus spread, reported low engagement in their distant learning during the first four weeks of its implementation. Besides personal factors, this low studying engagement was significantly associated to the lack of multimedia use in the teaching tools, and to the poor students' satisfaction with the distant learning experience as a whole. Hence, more efforts should be done to improve the e-learning experience for students, with the combination of a richer set of learning approaches and a special attention to the students engaging activities such as interaction with their educators. In order to achieve this ambitious goal, more money and energy should be invested to be able to implement a strong, attractive and effective blended learning approach.

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The authors report no conflict of interest. The authors alone are responsible for the content and writing of the article.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix

Hospital Anxiety and Depression Scale (HADS)

Tick the box beside the reply that is closest to how you have been feeling in the past week.

D	A	D	A
	I feel tense or 'wound up':		I feel as if I am slowed down:
	Most of the time	3	Nearly all the time
	A lot of the time	2	Very often
	From time to time, occasionally	1	Sometimes
	Not at all 0	0	Not at all
	I still enjoy the things I used to enjoy:		I get a sort of frightened feeling like 'butterflies' in the stomach:
0	Definitely as much		Not at all
1	Not quite so much		Occasionally
2	Only a little		Quite Often
3	Hardly at all		Very Often
	I get a sort of frightened feeling as if something awful is about to happen:		
	I have lost interest in my appearance:		
	Very definitely and quite badly	3	Definitely
	Yes, but not too badly	2	I don't take as much care as I should
	A little, but it doesn't worry me	1	I may not take quite as much care
	Not at all 0	0	I take just as much care as ever
	I can laugh and see the funny side of things:		I feel restless as I have to be on the move:
0	As much as I always could		Very much indeed
1	Not quite so much now		Quite a lot
2	Definitely not so much now		Not very much
3	Not at all		Not at all
	Worrying thoughts go through my mind:		I look forward with enjoyment to things:
	A great deal of the time	0	As much as I ever did
	A lot of the time	1	Rather less than I used to
	From time to time, but not too often	2	Definitely less than I used to
	Only occasionally	3	Hardly at all
	I feel cheerful:		I get sudden feelings of panic:
3	Not at all		Very often indeed
2	Not often		Quite often
1	Sometimes		Not very often
0	Most of the time		Not at all
	I can sit at ease and feel relaxed:		I can enjoy a good book or radio or TV program:
	Definitely 0	0	Often
	Usually 1	1	Sometimes
	Not Often 2	2	Not often
	Not at all 3	3	Very seldom

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