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# Preparedness of medical students towards e-learning conducted during COVID-19 lockdown: A cross-sectional descriptive study

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## Abstract:

**BACKGROUND:** COVID-19 lockdown has mandated the medical colleges to start academics using electronic mode. Synchronous e-learning was started by our institute to replicate traditional classes in line with the routine academic schedule. The objective of this study attempted to assess the e-learning readiness of the students of our institute.

**MATERIALS AND METHODS:** A cross-sectional descriptive study was planned using the model proposed by Oketch *et al.* with local modifications. The questionnaire was designed in Google Forms and mailed to respond using Likert scale. The nonparametric data collected from the total 84 respondents were analyzed for validity and reliability of the questionnaire, mean values to know the readiness (mean = 3.4), and one-step multiple regression to know the predictors.

**RESULTS:** The mean eLR (e-learning readiness) as evaluated from attitudinal readiness (Mean<sub>AR</sub> = 3.6), culture readiness (Mean<sub>CR</sub> = 2.3), material and technological readiness (Mean<sub>MTR</sub> = 3.7), and mental health readiness (Mean<sub>MHR</sub> = 2.4) is 3.03 (60.6% with  $n = 84$ ). Multiple regression analysis revealed that all the variables except MHR can significantly predict e-learning readiness linearly ( $P < 0.05$ ).

**CONCLUSION:** The institute is ready for e-learning in terms of AR and MTR (mean values  $>3.4$ ). CR and MHR still need a lot of improvisation to make it acceptable for e-learning. The model could explain 54.9% readiness level with CR as the most important predictor. More than 73% ( $n = 84$ ) of the respondents have acknowledged the present form of online classes to be the best available option in COVID-19 lockdown and most of them are adapted to e-classes in the institute.

## Keywords:

COVID-19 lockdown, e-learning readiness, Likert scale, medical students, questionnaire

## Introduction

The outbreak of COVID-19 pandemic was declared on March 11 by the World Health Organization and a complete lockdown was declared in India from March 24, 2020.<sup>[1,2]</sup> COVID-19, the global pandemic, caused by severe acute respiratory syndrome coronavirus 2 has been potentially disruptive to medical education due to the closure of medical institutes.<sup>[3]</sup> It severely affected the

conventional teaching schedule at medical institutions as students left the campus suddenly for their residential places. Ours being an institute of national importance consisting of students from various states of our country also faced the brunt. This posed a serious challenge to us to start the academic activity and complete the curriculum as per the desired period without effecting their academic tenure of 5½ years. Electronic learning (e-learning)

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methods were implemented by virtual classes through videoconferencing without the physical presence of students to avoid close contact.<sup>[4]</sup> The objective of starting the e-learning was not only to make the teaching material available to students but also to attain the training and teaching hours as desired for the MBBS course. The other objective was to take their attendance into account as it is one of the criteria to make them eligible for the final professional examination.<sup>[5]</sup> The readiness of an organization to adopt e-learning can be defined as mental and physical preparation by the organization itself.<sup>[6]</sup> Hence, e-classes were planned in line with the routine academic schedule on a virtual platform (Zoom incorporation, California, USA).

The study is designed to assess the readiness of e-learning among the medical students of the institute to identify the predictors of e-learning and hence propose a model to assess the readiness of students to e-learning approach.

## Materials and Methods

### Study type

We planned a descriptive cross-sectional study (questionnaire based) at our institute and our students were subject to respond to our questionnaire. The study was approved by the Institutional Ethics Committee of our institute with the IEC no. AIIMS/MG/2020-21/IEC-21.

### Study participants

The respondents of the present study were MBBS students who were part of e-learning classes during the lockdown period. Two batches of undergraduate medical students in the second semester and fourth semester participated in the study. Participation in the study was voluntary and complete anonymity was ensured. Students who were not willing to participate and those students who have not yet participated in the e-learning sessions were excluded from the study. Out of a total of 100 MBBS students in the institute, 84 participated in the study.

### Instrument

The questionnaire for the study is an adaptation of the e-learning readiness model proposed by Oketch *et al.* and other literature.<sup>[7,8]</sup> It is subdivided into segments to evaluate readiness at different levels – attitude, culture, technological, and mental health. For each of the items, students were asked to provide a response on a 5-point Likert scale ranging from “strongly disagree” to “strongly agree” separately. All the items put up in the questionnaire were verified and content validation was done by three experts in medical education. The questionnaire was evaluated with reference to the objectives of the study and was pretested on a small sample of participants and modified accordingly. The

questionnaire was prepared in Google Forms and mailed to students via Google groups. The forms were structured in such a way that only voluntary participants can respond and could be submitted only once. The data were collected over a period of 1 month in June 2020.

### Statistical analysis

The 5-point Likert scale for variables was analyzed as nonparametric data. Reverse coding was done on some of the items of the questionnaire and all were given an item number. A validation test was done on the items to find out how far a measuring instrument can represent real conditions using bivariate Spearman’s correlation analysis. The reliability status of the items in the questionnaire was evaluated by determining Cronbach’s coefficient  $\alpha$ . Frequency distribution was used to describe the means of readiness of the groups as per the Likert scale. The mean level of e-learning readiness was taken as 3.4 as proposed by Aydin and Tasci and adopted by Oketch *et al.*<sup>[7]</sup> One-step multiple regression analysis was applied to determine the predictors of e-learning readiness and to also test the model to determine the same.  $P < 0.05$  is taken as statistically significant. All statistical analyses were performed using the statistical software package SPSS version 21 (Armonk, NY: IBM Corp).

## Results

The questionnaire was responded by 84% of the sample population. The validity and reliability of the test items were determined, as presented in Table 1. In this study, the Spearman’s rank-order correlation at  $n = 84$  was found to be 0.217 with a confidence level of 95%. From the results of validity test, an invalid question item, namely A2, in the attitudinal readiness (AR) section was excluded for further processing. A reliability test was done to look for Cronbach’s coefficient  $\alpha$  and was compared to the value on R table. The value of Cronbach’s coefficient  $\alpha$  was found to be more than  $r$  table and higher than 0.5, as displayed in Table 1. Hence, the items were considered reliable. The mean of AR (Mean<sub>AR</sub>) was found to be 3.63 and that of culture readiness (Mean<sub>CR</sub>) as 2.3 [Table 2]. The overall mean of material and technological readiness (Mean<sub>MTR</sub>) is 3.7 with 90% of the subjects emphasizing that they are now familiar with the technology related to the conduct of e-learning classes after 1 month of attending them [Table 3]. About 64.3% of the subjects agree that attending online classes in the present environment is not a financial burden. At the same time, as displayed in Table 3, the overall mean of MHR for attending online classes (Mean<sub>MHR</sub>) is 2.4. More than 70% of the students expressed that they are tired after attending online classes for 6 h a day.

The Spearman’s bivariate correlation analysis shows [Table 4] that eLR is significantly associated

**Table 1: Result of validity and reliability test of the items**

Online classes - Students responses					
Item	Item number	R count	R table (for n=84)	Cronbachs $\alpha$	Category of validity/reliability
<b>AR</b>					
I was very happy when I heard classes will be conducted via online mode	A1	0.442	0.217	0.607 on deletion of item A2	Valid/reliable
I did not feel unfamiliar or strange after hearing of online classes	A2	0.184	0.217		Not valid/not reliable
If the previous item value is other than 3 then give low values for anxiety or high values for confidence	A3	0.588	0.217		Valid/reliable
My family members were supportive for online classes	A4	0.555	0.217		Valid/reliable
<b>CR</b>					
Online classes are more engaging than a traditional class	B5	0.446	0.217	0.759	Valid/reliable
Online classes are less distracting than traditional classes	B6	0.646	0.217		Valid/reliable
Online classes are more interactive than traditional classes	B7	0.431	0.217		Valid/reliable
It's easy to attend online class and there's no difficulty	B8	0.641	0.217		Valid/reliable
Compared to a traditional class online class are more useful	B9	0.637	0.217		Valid/reliable
<b>MTR</b>					
My background knowledge on information technology with respect to online classes was adequate before the commencement of online classes	C10	0.346	0.217	0.545	Valid/reliable
After a month of online classes, I am very familiar with the technology related to online classes	C11	0.443	0.217		Valid/reliable
The present online classes technologies are user-friendly	C12	0.728	0.217		Valid/reliable
There is no such financial burden to attend online classes	C13	0.493	0.217		Valid/reliable
<b>MHR</b>					
I am not so tired after attending online classes for 6 h per day	D14	0.461	0.217	0.700	Valid/reliable
I do not get sleep disturbances because of attending online classes for 6 h per day	D15	0.615	0.217		Valid/reliable
I do not get much attention related disturbances because of attending online classes	D16	0.689	0.217		Valid/reliable
<b>eLR</b>					
After a month of online classes I feel very much adapted for the process	E17	0.676	0.217	0.584	Valid/reliable
Online classes are the best available option during COVID-19 pandemic	E18	0.648	0.217		Valid/reliable
Online class technology should form a regular part of routine curriculum	E19	0.464	0.217		Valid/reliable
Information technology for online classes in the present form serves the purpose	E20	0.488	0.217		Valid/reliable

The readiness of the medical students in terms of AR and CR for e-learning is represented in Table 2. The overall Mean<sub>AR</sub> is 3.63. Similarly, the overall Mean<sub>CR</sub> was evaluated to be 2.26 and 73.8% of the students in the study are of the opinion that online classes are more distracting than traditional classes. AR=Attitudinal readiness, CR=Culture readiness, MTR=Material and technological readiness, MHR=Mental health readiness, eLR=Inferential e-learning readiness, Mean<sub>AR</sub>=Mean of AR, Mean<sub>CR</sub>=Mean of CR

with AR, CR, MTR, and MHR ( $P < 0.05$ ). The multiple linear regression model as illustrated in Table 5 signifies that the model can significantly predict the predictors of e-learning readiness ( $P < 0.05$ ). The variables can explain 54.9% of the e-learning readiness. All the variables as mentioned individually can significantly predict e-learning readiness linearly ( $P < 0.05$ ) except MHR.  $\beta$  coefficient values as mentioned for the variables help to identify and rank the predictors as per their importance.

## Discussion

The era of COVID-19 has presented challenges to the continuing of medical education in the traditional format.

Hence, e-learning should be refined and evolved to replace or supplement traditional education. Our study looks into the e-learning readiness of the institute by focussing on some key areas as proposed by Oketch *et al.* The model was selected as the model fits into the developing countries with the limitations around.

In our study, 80% of the target population responded to our questionnaire and hence considered as a representative of the study population.<sup>[9]</sup> Students and their families were ready in terms of attitude to attend e-learning classes as reflected (MeanAR >3.4). The ease to attend classes scored low (Mean <3.4) which might be due to network constraints. There has been a significant

**Table 2: Readiness in terms of attitude and culture for e-learning amongst medical students**

Item	Mean±SD	Strongly disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly agree (%)	Yes/No (%)
<b>AR</b>							
A1	3.7±0.92	2.4	8.3	26.2	47.6	15.5	63.1/10.7
A3	3.0±0.91	2.4	31.0	38.1	23.8	4.8	28.6/33.3
A4	4.2±0.86	0.0	3.6	17.9	32.1	46.4	78.6/3.6
Overall mean=3.63							
<b>CR</b>							
B5	2.0±1.20	44.0	28.6	15.5	4.8	7.1	11.9/72.6
B6	2.0±1.07	39.3	34.5	17.9	3.6	4.8	8.3/73.8
B7	2.3±1.13	26.2	37.5	23.8	8.3	6.0	14.3/61.9
B8	3.0±1.04	6.0	32.1	28.6	27.4	6.0	33.3/38.1
B9	2.0±1.08	45.2	21.4	25.0	6.0	2.4	8.3/66.7
Overall mean=2.26							

AR=Attitudinal readiness, CR=Culture readiness, SD=Standard deviation

**Table 3: Readiness in terms of material and technological knowledge and mental health for e-learning amongst medical students**

Item	Mean±SD	Strongly disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly agree (%)	Yes/No (%)
<b>MTR</b>							
C10	3.4±1.19	6.0	20.2	22.6	31.0	20.2	51.2/26.2
C11	4.3±0.63	0.0	0.0	9.5	52.4	38.1	90.5/0
C12	3.1±1.11	10.7	20.2	23.8	40.5	4.8	45.2/31.0
C13	4.0±1.14	0.0	15.5	20.2	17.9	46.4	64.3/15.5
Overall mean=3.7							
<b>MHR</b>							
D14	2.1±0.95	26.2	44.0	21.4	6.0	2.4	8.3/70.2
D15	2.7±1.17	11.9	41.7	22.6	13.1	10.7	23.8/53.6
D16	2.5±1.14	17.9	40.5	21.4	13.1	7.1	20.2/58.3
Overall mean=2.4							
<b>eLR</b>							
E17	3.7±1.01	3.6	9.5	20.2	46.4	20.2	66.7/13.1
E18	3.9±0.90	1.2	7.1	17.9	48.8	25.0	73.8/8.3
E19	2.3±1.24	35.7	19.0	27.4	11.9	6.0	17.9/54.8
E20	3.5±1.01	3.6	13.1	22.6	46.4	14.3	60.7/16.7
Overall mean=3.35							

MTR=Material and technological readiness, MHR=Mental health readiness, eLR=Inferential e-learning readiness, SD=Standard deviation

improvement in MTR (MeanMTR >3.4) after 1 month of attending e-classes and students were found to be technologically self-sufficient for the same. E-learning has been accepted as the best available option to continue the academics in COVID-19 lockdown (mean >3.4).

The results in Table 2 highlight that the students are ready in terms of attitude to attend e-learning classes as reflected by Mean<sub>AR</sub> of 3.63 (3.63 ± 0.90) which is >3.4, the expected e-learning readiness level (Eelr). Most of the respondents (70%) agreed that their family members were supportive of the idea to attend classes via online mode. The finding is in line with a study by Muganda in 2006 on university staff in Nairobi where they found that the academic staff from the university have a positive attitude toward e-learning and were ready to attend (MeanAR = 3.4).<sup>[10]</sup> The table also shows that the students consider the traditional mode of teaching to be more superior to e-learning in terms of interaction,

concentration, and involvement (MeanCR = 2.3 which is <3.4, Eerl). The students are not yet at ease to attend online classes (mean 3.0 ± 1.04 which is <3.4). This might be because of network issues and taking time to get adapted to the new system of e-education.

Mohammed 2018 also found that 41% of the university students in their study consider the lack of face-to-face interaction in e-learning to be a hindrance.<sup>[11]</sup> However, our study shows that around 62% of the students have felt the same. This might be because of the difference in the teaching methodology in the two studies. In addition, the present study deals with synchronous e-learning strategy only which is not the case in the other studies. Moreover, the students are availing the e-learning education from different parts of the country which has larger dynamics as compared to their availability in the campus which has a better support system. Various interactive small group e-learning



**Table 4: Association between e-learning readiness variables (attitudinal readiness, culture readiness, material and technological readiness, mental health readiness) and inferential e-learning readiness**

Variables	$\rho$	$P$
AR	0.593	<0.05
CR	0.545	<0.05
MTR	0.596	<0.05
MHR	0.530	<0.05

AR=Attitudinal readiness, CR=Culture readiness, MTR=Material and technological readiness, MHR=Mental health readiness

**Table 5: Predictors of e-learning readiness among medical students**

Variables	$B$	SE	95.0% CI for $B$		$\beta$	$P$
			Lower Bound	Upper bound		
Constant	0.594	0.310	-0.024	1.212		<0.05
AR	0.246	0.110	0.027	0.466	0.237	<0.05
CR	0.299	0.088	0.125	0.473	0.338	<0.05
MTR	0.263	0.107	0.050	0.477	0.255	<0.05
MHR	0.091	0.079	-0.067	0.249	0.113	0.254
Model	$R$	$R^2$	Adjusted $R^2$	$F$	$P$	Durbin Watson
-	0.755	0.570	0.549	26.12	<0.05	2.12

CI=Confidence interval, AR=Attitudinal readiness, CR=Culture readiness, MTR=Material and technological readiness, MHR=Mental health readiness, SE=Standard error

sessions or flipped e-class can be arranged every week to clarify the doubts and improve this part of e-learning readiness index. Creation of a social interaction group like WhatsApp can help to improve the involvement of students for e-learning sessions. However, the suggestive modules to improve e-learning readiness were not part of this study and need further deliberations.

The results in Table 3 show that there has been a significant improvement (around 40%) in the familiarity with the technology related to e-learning after 1 month of attendance. This indicates that the technology being used for e-learning is user-friendly. Since the Mean<sub>MTR</sub> is 3.7 (3.7 ± 1.01) which is > Eerl of 3.4, it can be assumed that the students are technologically sound for e-learning. Some of the institute policies like only single type of platform should be used for e-learning, inclusion of digital technology in the day-to-day academic activity even in traditional academics might have helped to improve the score. Moreover, nowadays, availability of mobile-accessible Internet and technology development has reduced the technological barriers as compared to old times. However, some studies have found nonreadiness of students in this section due to nonavailability of laptops and computer tools which is not the limiting factor in our case.<sup>[11]</sup> Furthermore, the highest readiness level in this section is observed with respect to the financial burden (4.0 as mean readiness level-C13) which indicates most of the respondents

believe that it was not financially taxing to attend e-learning activities. This finding is consistent with many other studies which believed that all e-learning courses were less expensive than traditional education and hence are cost-effective.<sup>[12,13]</sup>

This study has an additional component of mental health readiness (MHR) as one of its e-learning readiness indicators. This has been added keeping in mind the synchronous e-learning activity for a period of 6 h with hardly 1 h lunch break in between. Seventy percent of the respondents are very tired after attending the classes. Most of them face sleep disturbances and attention-related problems. Consequently, the students are not ready to enter the e-learning stage of medical academics (Mean<sub>MHR</sub> = 2.4, which is < Eerl of 3.4). The e-learning readiness assessment is a continuous stage of assessment and is not a one-time phenomenon. Hence, it acts as a self-monitoring guide reflecting the areas to be taken care of and remove the bottlenecks accordingly. MHR component is an important and neglected area in e-learning assessment tool as none of the studies have included it. However, in the present scenario of COVID-19 pandemic, the increase in dependence on e-learning activity has necessitated the addition of such parameters for the effective assessment of e-learning readiness.

The mean eLR as evaluated from AR, CR, MTR, and MHR is 3.03 (60.6%) which indicates that the deficiencies are to be taken care of to secure readiness (mean value of 3.4 or 68% readiness). Taking a cue from Aydin and Tasci model, the scores are interpreted as the readiness of our institute to e-learning in terms of AR (MeanAR = 3.6) and MTR (MeanMTR = 3.7). CR (MeanCR = 2.3) and MHR (MeanMHR = 2.4) still need a lot of improvisation to make it acceptable for e-learning.

The e-learning readiness indicators are correlated significantly with inferential e-learning readiness (Ier) ( $P < 0.05$ ) [Table 4]. The study proposed a multiple linear regression model to verify the predictors of e-learning readiness scale ( $P < 0.05$ ). As shown in Table 5, it highlights that 1 unit of increase in CR increases the eLR by 0.299 units signifying CR as the most important predictor of e-learning. Similarly, 1 unit increase in MTR will lead to 0.263 units of increase in eLR. However, some studies have shown MTR as the most important predictor of e-learning readiness.<sup>[14]</sup> The difference might be due to the limited number of questions in the section. Although MHR is correlated significantly [Table 4], it is not a significant linear predictor as per the regression analysis ( $P > 0.05$ ). The section needs an adequate number of questions with a clear workup for the respondents. The model could however explain 54.9% of readiness for e-learning in the study population.

## Conclusion

Students of our institute are not completely prepared for the online classes (mean eLR = 3.03 which is less than 3.4). But the study helps us to understand our strengths and weaknesses while preparing the students for the e-learning. In spite of our preparedness in terms of technology and positive attitude, we need to address the problems of mental health readiness and cultural readiness to make e-learning acceptable to students in future.

### Limitation

The study has been conducted on the students of a single medical institute, and hence, it is difficult to generalize.

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### Conflicts of interest

There are no conflicts of interest.

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