



Readiness for and satisfaction with blended learning among integrated modular-based medical students, Mansoura University, Egypt

Heba Tarek Emara, MSc; Ghada Othman ELkhawaga, MD ; Sherehan Adel Abdel-Salam, MD ,
Nermeen Ahmed Niazy, MD

Public Health and Community Medicine Department, Faculty of Medicine, Mansoura University, Mansoura, Egypt

ABSTRACT

Background: There is a research gap in the quantitative assessment of students' readiness for and satisfaction with blended learning (BL) in Egypt, especially among integrated modular-based medical students at Mansoura University. **Objectives:** To measure students' readiness for and satisfaction with BL and to determine their associated factors. **Method:** This is a cross-sectional study with an analytic component conducted during the academic year 2020-2021 involving 592 medical students enrolled in the integrated education at the Faculty of Medicine, Mansoura University, Egypt. Readiness for and satisfaction with BL were assessed using a valid and reliable scale for students' readiness for BL and satisfaction scale "modified Students' Evaluation of Educational Quality" (SEEQ) scale. **Results:** More than half of the students (52%) were ready for BL, while only 50% were satisfied with BL. The independent predictors for students' readiness are: having fast broadband internet access, the second academic year, and privacy concerns (AOR of 1.927, 1.900, and 0.391, respectively). Moreover, students' readiness for BL is the most important predictor for students' satisfaction (AOR=1.825), followed by living with family or friends (AOR=1.581), then enough family income (AOR=1.460). **Conclusions:** Students' attitude towards BL could be better and needs interventions to improve their optimal use for getting the maximum benefits. There is a crucial need for practical training for students to use the available online resources. The most crucial matter in students' view is that semesters' duration should be increased to give students enough time to study the course materials and contents well.

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INTRODUCTION

Since COVID-19 was declared a global pandemic in early 2020, all governments have taken preventive public health measures to reduce the number of deaths. All over the world, 80% of students did not go to university¹ as higher education institutions canceled their activities, shifted to online courses, or terminated their term early.²

E-learning is considered one of the fastest-developing educational methods due to its increased flexibility regarding how, when, and where learning occurs.³ However, E-learning has some disadvantages, especially in medicine, due to the need for clinical experience. So, a better educational technique than E-learning was developed. It is called blended learning (BL).

Corresponding Author: Heba Tarek Emara, Department of Public Health and Community Medicine, Mansoura University, Egypt. Email: Hebatarek@mans.edu.eg

Blended learning is an educational technique that mixes the advantages of traditional face-to-face learning and E-learning using new communication technologies.⁴ In addition, it improves learning quality using synchronous and asynchronous learning to increase lecturers' and students' interaction.^{5,6} Researchers who studied BL agreed that students' satisfaction is a basis for the implementation of BL to be successful. The satisfaction of students is essential for measuring BL quality.⁷

In the academic year 2018-2019, Mansoura Faculty of Medicine started offering a fully integrated modular-based 5-year medical education, replacing the classic 6-year discipline-based curriculum. Integrated modular-based medical education is a novel teaching method, where basic sciences are integrated with clinical sciences forming modules. A module incorporates several teaching methods facilitating students' active participation.⁸ Until 2021, there were three levels in that new system: first, second, and third. Mansoura university started implementing BL for the new academic year 2020-2021 under the circumstances of preventive measures and social distancing. Thus, the university launched a new version of its website, "MYU," which provides recorded lectures and interactive sessions.^{9,10} There needs to be more research in the quantitative assessment of students' readiness and satisfaction toward BL in Egypt, especially at Mansoura University. Thus, this work aims to measure students' readiness for and satisfaction with BL and to determine their associated factors.

METHOD

This is a cross-sectional study with an analytic component conducted in the Faculty of Medicine, Mansoura University, Mansoura, Egypt, during the academic year 2020-2021. Study participants were medical students enrolled in the integrated modular-based 5-year education. At the time of data collection, there were only three academic years: the first, second, and third.

Sample size calculation was based on the mean total score of medical students' satisfaction with blended learning recorded from a previous study (54.99 ± 7.978).¹¹ MedCalc program version 18 was used, applying one sample t-test with α error of 0.05, power of 99%, and absolute precision of 5%. The calculated sample size (157) was multiplied by two to

compensate for the design effect of the cluster sampling technique employed. After adding 20% to compensate for attrition, the estimated sample size was finally a total of 378 students at least.

Medical students in the three levels were recruited using a stratified cluster sampling method. The total sample was selected from the three levels, with each level considered a stratum with proportional allocation according to the number of students in each level. Within each stratum, several sections (clusters) were randomly selected. All students in the selected clusters were chosen. Six hundred students received the questionnaires; however, 592 completed them. Thus, response rate was 98%.

Data collection tool: Students completed a structured self-administered English questionnaire to collect information about three sections. The first section was about the students' socio-demographic characteristics and particular habits such as age, sex, accommodation, academic year, family income, exercise, and smoking. The second section was students' readiness and factors of learning aspects that influence their readiness for blended learning (18 questions), derived from a study by Tang and Chaw.¹² The third section was a satisfaction scale, which was a modified Students' Evaluation of Educational Quality (SEEQ) scale (15 questions), derived from a previous study¹¹ as a short version of the original SEEQ, which Centra firstly developed in 1993.¹³ Finally, an open-ended question about their recommendations to improve the learning process was added.

The readiness and The SEEQ scales are valid and reliable tools that use a 5-point Likert scale. An external pilot study was conducted on 28 students to test the validity, clarity, and feasibility of students' readiness and modified SEEQ questionnaires. Only two questions appeared unclear, biased, and not understood by all students in the SEEQ questionnaire, so they were modified. "I was bored in class" was changed to "I was excited in class" The class challenged my medical knowledge" and was changed to "The class enhanced my medical knowledge". Each item of the student's readiness and SEEQ questionnaires had five possible responses with the following coding: 1= strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree except for the first three questions of the readiness scale regarding the attitude of students towards classroom learning where coding was reversed. A readiness score and a

Table (1): Association between students' demographic characteristics and both readiness and satisfaction for blended learning (n=592)

	Ready n (%)	COR (95% CI)	Satisfied n (%)	COR (95% CI)
Overall	308 (52.0)		296 (50.0)	
Academic year:				
First year	112 (48.7)	1.09 (0.87-1.35)	117 (50.9)	1.07 (0.87-1.32)
Second year	126 (61.2) *	1.36 (1.11-1.67)	105 (51.0)	1.08 (0.87-1.33)
Third year	70 (44.9) *	r (1)	74 (47.4)	r (1)
Sex:				
Female	152 (47.2) *	r (1)	155 (48.1)	r (1)
Male	156 (57.8) *	1.53 (1.11-2.12)	141 (52.2)	1.18 (0.85-1.63)
Family income:				
Not enough	78 (46.2)	r (1)	70 (41.4) *	r (1)
Enough	230 (54.4)	1.39 (0.97-1.99)	226 (53.4) *	1.622 (1.13-2.33)
Smoking:				
Non-smoker	293 (51.2) *	r (1)	286 (50.0)	r (1)
Smoker	15 (75.0) *	2.86 (1.03-7.96)	10 (50.0)	1 (0.41-2.44)
Accommodation:				
Alone	61 (57.0)	r (1)	43 (40.2) *	r (1)
with family/ friends	247 (50.9)	0.78 (0.51-1.19)	253 (52.2) *	1.62 (1.06-2.48)
Exercise per week:				
Never or one time	231 (50.5)	r (1)	221 (48.4)	r (1)
Two times or more	77 (57.0)	1.30 (0.88-1.91)	75 (55.6)	1.34 (0.91-1.96)

* Categories with a significant difference at a P value less than or equal to 0.05. COR=crude odds ratio; CI=confidence interval; r=reference category.

satisfaction scores were obtained by calculating the total of the student's responses to the 18 questions of readiness and the 15 questions of satisfaction. For the quantitative analysis, the median was taken as an arbitrary cutoff point (54 for the readiness score and 45.5 for the satisfaction score). So, if the total of the individual's response was equal to or more than the median, it was considered ready or satisfied. Thus, the individual response scores ranged between 18 and 90 for the readiness score and between 15 and 75 for the satisfaction score.

Validation of the tool: Face and content validity were done by three experts. Pilot study was done as mentioned earlier in the methods section (An external pilot study was conducted on 28 students to test the validity, clarity, and feasibility of students' readiness and modified SEEQ questionnaires). Cronbach's alpha coefficients of internal consistency for the two parts were computed during the pilot study: 0.952 for students' readiness and factors of learning aspects and 0.927 for the SEEQ questionnaires. The full scale was

found to have high internal consistency, with an alpha coefficient of 0.960.

Statistical analysis: The collected data were coded, processed, and analyzed through SPSS (Statistical Package for Social Sciences Inc., version 25). A descriptive analysis of the collected data was performed using frequencies and percentages for qualitative variables and mean \pm standard deviation for quantitative variables. The Chi-Square test was used to test the significance of categorical data. Crude odds ratio and their 95% Confidence Interval were calculated. Significant variables in univariate analysis were entered into a logistic regression model using forward Wald analysis. Adjusted Odds Ratio and their 95% Confidence Interval were calculated to find the predictors for student readiness and satisfaction towards blended learning. All tests done were 2-tailed with P-value < 0.05 considered statistically significant.

RESULTS

This study involved 592 medical students, as shown in Table 1. There was nearly equal sex distribution with

Table (2): Association between students' responses and their readiness and satisfaction for BL (n=592)

	Ready n (%)	COR (95% CI)	Satisfied n (%)	COR (95% CI)
Overall	308 (52.0)		296 (50.0)	
Commitment to preventive measures during the pandemic:				
No	50 (44.6)	r (1)	49 (43.8)	r (1)
Yes	258 (53.8)	1.44 (0.95-2.18)	247 (51.5)	1.36 (0.90-2.06)
Type of technology used in BL:				
Smart phone	177 (48.5) *	r (1)	178(48.8)	r (1)
Tablet or laptop	131 (57.7) *	1.45 (1.04-2.02)	118 (52.0)	1.14 (0.82-1.58)
Broadband Internet connection:				
Slow (r)	152 (44.6) *	r (1)	166 (48.7)	r (1)
Fast	156 (62.2) *	2.04 (1.46-2.85)	130(51.8)	1.13 (0.82-1.57)
What is the most important factor affecting BL?				
Duration of semester:				
No (r)	168 (54.5)	r (1)	156 (50.6)	r (1)
Yes	140 (49.4)	0.81 (0.59-1.12)	140 (49.3)	0.95 (0.69-1.31)
Privacy concerns:				
No (r)	293 (53.7) *	r (1)	270 (49.5)	r (1)
Yes	15 (32.6) *	0.421 (0.22-0.79)	26 (56.5)	1.33 (0.73-2.44)
Readiness for BL:				
Unready (r)	-		120 (42.3) *	r (1)
Ready	-		176 (57.1) *	1.82 (1.32-2.53)

COR=crude odds ratio; CI= confidence interval; r=reference category; Bl= blended learning. * Categories with significant difference at P value less than or equal to 0.05.

a slightly higher proportion of females than males (54.4% vs. 45.6%, respectively). Their mean age was 19.5 years, with a standard deviation of 1.1 years. The distribution of students over academic years was higher among the first year (38.9%), followed by the second year (34.8%), then the third year (26.4%). Total family income was enough among 71.5% of students. Only 3.4% of students were smokers. About 18% of students lived alone, while the rest lived with their families or friends. More than three fourth of students never exercised or only exercised one time (for 30 minutes) per week (Table 1).

The mean total readiness score was 53.5 with a standard deviation of 11.9 and with median (Q1-Q3) of 54 (45-62). After recoding students' readiness using the median as a cutoff point, 52% (n=308) were ready for BL. Moreover, the mean total satisfaction score was 45.7 with a standard deviation of 12.6 and with median (Q1-Q3) of 45.5 (40-55). After recoding students' satisfaction using the median as a cutoff point, 50.0% (n=296) of students were satisfied with BL.

The second academic year was significantly associated with a higher readiness percentage than the first and

third years (61.2% vs. 48.7% and 44.9%, respectively), with a significant difference between the second and third years (p=0.002) with a crude odds ratio (COR) of 1.363 for the second year. Furthermore, males and smokers were associated with higher student readiness percentages (57.8% vs. 47.2%, p=0.010 and 75% vs. 51.2%, p=0.036, respectively) with a crude odds ratio (COR) of 1.530 and 2.857, respectively. Furthermore, enough family income and living with family or friends were associated with higher student satisfaction (53.4% vs. 41.4%, p=0.008 and 52.2% vs. 40.2%, p=0.025, respectively) with COR of 1.622 and 1.623 respectively (Table 1).

“Using tablets or laptops”, and fast broadband internet connection were associated with higher students' readiness (57.7% vs. 48.5%, p=0.029 and 62.2% vs. 44.6%, p=<0.001; respectively) with COR of 1.499 and 2.042, respectively. However, privacy concerns were associated with lower student readiness (32.6% vs. 53.7%. p=0.006) with a COR of 0.418. Furthermore, being ready for BL was associated with higher student satisfaction (57.1% vs. 42.3%, p<0.001) with a COR of 1.822 (Table 2).

Table (3): Logistic regression of significant predictors for students' readiness for blended learning

Predictors for students' readiness for BL			Predictors for students' satisfaction towards BL		
β	P	AOR (95% CI)	β	P	AOR (95% CI)
Academic year:			Family income		
First year	0.18	0.402	1.20 (0.78-1.84)	Not enough (r)	0.38 0.046 1
Second year	0.64	0.004	1.90 (1.23-2.95)	Enough	1.46 (1.01-2.12)
Third year (r)		1			
Broadband Internet connection			Accommodation		
Slow (r)		1	Alone (r)		1
Fast	0.66	<0.001	1.93 (1.35-2.74)	with family/ friends	0.46 0.04 1.58 (1.02-2.45)
Privacy concerns			Readiness for BL		
No (r)	-	1	Unready (r)		1
Yes	0.94	0.006	0.39 (0.20-0.76)	Ready	0.60 <0.001 1.825 (1.31-2.54)
Constant		-0.636	Constant		-0.960
Model χ^2		41.860, p<0.001	Model χ^2		23.162, p<0.001
Overall Percent predicted		62.2%	Overall Percent predicted		57.8%

P=P-value; AOR=Adjusted odds ratio; CI= confidence interval; r=reference category; Bl= blended learning.

Having fast broadband internet access is the most important predictor for students' readiness (AOR=1.927), followed by the second academic year (AOR=1.900), then privacy concerns (AOR=0.391). Moreover, students' readiness for BL is the most important predictor for students' satisfaction (AOR=1.825), followed by living with family or friends (AOR=1.581), then enough family income (AOR=1.460) (Table 3).

Regarding students' suggestions to improve the learning process, the most frequent suggestion was a long semester duration (56 students), followed by more face-to-face learning (34 students). The least frequent suggestions were providing more practical sessions, more online formative exams, and providing a hard copy of a department book with a frequency of fewer than ten students for each (Figure 1).

DISCUSSION

The current study showed that 52% of students were ready for BL. On the other hand, Siregar et al.¹⁴ reported that 73% of their students in Indonesia were ready for blended learning use in the learning process. In another study done in a leading Malaysian private higher education institution by Adams et al.¹⁵, it was found that generally, students (69%) were ready for blended learning; however, after further analysis, most were only moderately ready. Such low readiness is unexpected, especially since students

nowadays have the proper technology, both hardware and the knowledge, to deal with it, especially during the COVID-19 pandemic and the urgency to decrease physical contact. However, this can be due to the sudden emergence of this pandemic, with no previous warnings to alert universities to be ready for the transition to online learning.

When assessing predictors of students' readiness towards BL, the second academic year and having fast internet broadband had higher readiness percentages, while privacy concerns had lower readiness.

This can make sense regarding the second academic year (61% of students were ready) as the study only involved the first three academic years, as mentioned before. The first academic year students are naïve and need time to accommodate this new system (only 49% were ready). At the same time, the third academic year students (45% were ready) were the first to face this new system with no older academic years to learn from their experience. Similarly, Sriwichai¹⁶ reported in a study conducted at the University of Phayao in Thailand that some first-year students -for which BL was first applied- found access to the online platform to be complex. He rationalized this by not being familiar with learning through online platforms. This was consistent with Kenney and Newcombe¹⁷ to help students get familiar with tools for online learning by providing technical and learning support for students, as many students might face blended learning for the

The current finding supports some recommendation. Providing governmental fast broadband internet access for both lecturers and students. Mandatory practical training for students to use ultimately the available online resources. Students should be ensured that there is no threat to their privacy by securing the network and using safe videoconferencing applications. Recent technological methods and funnier applications other than PowerPoint should be used for course delivery. More videoconferencing interactive sessions are required. Semesters' duration should be increased

To the authors' knowledge, this is the first study to assess students' readiness and satisfaction toward BL using standardized tools. The current study can pave the way for a large-scale national study and provide the basis for national programs for improving the implementation of BL in the learning process, especially with the help of students' suggestions for improvement. Nevertheless, we acknowledge few limitations. This study is cross-sectional with no control group, so cause-and-effect relationships cannot be determined. We had to use an arbitrary cutoff point for readiness and satisfaction to use logistic regression as we could not find any reference for a validated cutoff point. In addition, only three academic years were involved in the study, as the integrated system was initiated only three years before the study began.

CONCLUSION

Blended learning has many advantages that make it a perfect strategy for learning. However, students' attitudes towards it could be better and need interventions to improve their optimal use for getting the maximum benefits. Providing governmental fast broadband internet access is crucial for both lecturers and students, with the need for practical training for students to use ultimately the available online resources that should be mandatory, not elective. Moreover, universities should ensure students that there is no threat to their privacy by securing the network and using safe videoconferencing applications. Recent technological methods and funnier applications other than PowerPoint can be used for course delivery to increase students' attention. Videoconferencing interactive sessions could be used as an alternative to recorded lectures to increase interaction and communication

between students and lecturers. Finally, the most crucial matter in students' view is that semesters' duration should be increased to give students enough time to study the course materials and contents well.

Ethical Approval

The study obtained all required approvals from the Institutional Research Board of Mansoura Faculty of Medicine (MFM-IRB), (Code number: MS.21.01.1341). Approval was obtained from the authority of Faculty of Medicine. Consent was obtained from the students who were assured of their anonymity and the confidentiality of their responses.

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Conflict of Interest

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

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Author Contributions

Heba Tarek Emara: Choosing research idea, literature search, protocol writing, statistical analysis, manuscript writing, manuscript preparation for publishing, manuscript submission and correspondence; Ghada Othman ELkhawaga: Choosing research idea, sharing in protocol writing, manuscript writing and critical review; Sherehan Adel Abdel-Salam: Choosing research idea, sharing in protocol writing, manuscript writing and critical review; Nermeen Ahmed Niazy: Choosing research idea, sharing in manuscript writing, language editing and critical review. All authors reviewed and approved the final version of the manuscript.

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