ORIGINAL RESEARCH

Learners' Determinants of Learning Environment Preferences: Online vs. Blended

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Background	In recent years, the education sector has witnessed a significant shift towards online and blended learning, further accelerated by global events like the COVID-19 pandemic. Understanding what influences learners' preferences for these modes is vital for educational institutions adapting to changing pedagogical needs. This study focuses on exploring the characteristics that shape medical students' choices between online-only and blended learning.
Objectives	This research aims to investigate learner traits impacting their selection of learning environments, specifically emphasizing the preference for online only or blended learning.
Methods	We conducted a cross-sectional survey among medical students at the end of the 2020/2021 academic year's first semester. The survey covered demographics, learning environment preferences, the Scale of University Students' Readiness for E-Learning, and the Motivation and Learning Strategies Scale. We employed statistical analyses, including t-tests, Eta coefficient tests (η) for correlation, and Eta squared tests (η^2) for effect size.
Results	Out of 665 respondents, the majority (63.2 %) favored blended learning. Interestingly, students preferring online-only learning scored significantly higher in e-learning readiness, motivation, and cognitive learning strategies. A strong correlation and substantial effect size linked the preferred environment to e-learning readiness, especially motivation for e-learning ($\eta = 0.834$, $\eta^2 = 0.695$), and overall motivation for learning. However, the influence of cognitive learning strategies showed weaker correlation and a smaller effect size.
Discussion	This study highlights the pivotal role of e-learning readiness, particularly motivation for e-learning and general motivation for learning, in shaping students' preferences for learning environments. In contrast, cognitive learning strategies exert less impact on these preferences. To prepare students for evolving educational landscapes, prioritizing e-learning skills and motivation enhancement is recommended, especially given the potential for future disruptions to traditional learning methods..
Keywords	Learning environment preferences, online versus blended learning, e-learning readiness, motivation for learning, cognitive learning strategies. Journal of Medical Education and Practice. ??:??–??

INTRODUCTION

Since 1990, educational institutions have significantly invested in digital learning technologies, such as virtual classrooms, multimedia software, e-books and learning management systems (LMS) to track student progress[1]. The COVID-19 pandemic led many institutions to adopt either solely online or blended learning formats, recognizing that the latter can improve learning outcomes[2-4]. Online learning's main feature is its lack of a physical classroom, replaced by web technologies enabling learning anytime and anywhere, offering flexibility and cost savings for accessing course materials[2,3]. As the preference for

e-learning grows, especially during the COVID-19 crisis, the challenge is to make online learning effective, relying on the interaction between implementation, context, learner characteristics and technology[4]. Success in online learning demands adjustments in attitudes towards technology use, time management and student interaction skills[5]. Studies indicate that a learner's motivation and learning strategy significantly affect their online engagement[6,7]. Warner, Christie and Choy (1998) first introduced the concept of online learning readiness, focusing on course modality preference, computer communication competence and self-directed learning ability[8]. Hung *et al.* (2010) expanded this to include six key e-learning readiness components[9]. This readiness is crucial for autonomous and active participation in online learning, highlighting the importance of self-regulated learning (SRL) strategies[10]. Nonetheless, in an online learning environment, a student's ability to participate in the learning process autonomously and actively is critical. Since the essence of online learning encourages self-directed learning, online students must be more self-reliant. In comparison to their traditional classroom peers, it is critical that online learners have the capacity to self-generate the ability to monitor, manage and schedule their learning actions (a process known as self-regulated learning). Self-regulated learners (SRL) use different techniques to promote the learning process and they can control their own learning processes[11-13].

These learning strategies are divided into three categories: cognitive, metacognitive and resource management strategies[14]. Cognitive learning strategies employed by SRL include rehearsal, elaboration, organization and critical thinking. Learning by repetition is referred to as rehearsal e.g. a student who repeatedly listens to an online lecture[15]. Elaboration refers to the desire to link current information to existing knowledge to recall new information[16]. The desire to highlight and illustrate key points while learning is related to organization[15]. Critical thinking denotes the student's capability to carefully inspect and scrutinize knowledge[16]. For example, a student rational think about likely possibilities after appraisal of an online learning material.

According to Broadbent, 2017 Self-regulation strategies used in blended and online learning environments differed depending on the context. As a result, it appears critical to comprehend SLR strategies and assess the relationship between these strategies and learning environment preferences[17]. On the other hand, motivation for learning improves learning success. It influences learning rate, knowledge retention and the willingness to remember. Evidence suggests that the more motivated a group of students is, the more successful their learning will be[18]. Motivation consists of three main components called value.

Motivation consists of three main components called value, expectation and affective components, which include various sub-components such as task value, test anxiety and self-efficacy[19]. Task value refers to the presumed utility, significance, usefulness and relevance of a taught task. Self-efficacy refers to learner's confidence in his or her own abilities or capacity to complete to a task. Test anxiety is a negative psychological response that occurs before or during a test and includes over-arousal, stress and physical symptoms as well as a concern and fear of failure[19].

Therefore, learners' characteristics and competences are sought to affect their preference for the learning environment. However, students' preference on the learning environment and the factors that deemed important to affect their preference are infrequently studied[3]. In this regard, this study aimed to examine the correlation between learners' characteristics; in terms of e-learning readiness, motivation for learning and cognitive learning strategies and their preferences for the mode of the learning environment; online only versus blended learning.

METHODS

Participants

Study design and participants

This cross-sectional quantitative study was conducted at the end of the first semester of the academic year 2020/2021. Undergraduate medical students of the six years of the faculty of Medicine, Menoufia University were invited to participate in this study to examine their individual characteristics that affect their preferences for the learning environments; online versus blended, for theoretical learning only. Theoretical learning (knowledge only), was the subject of investigation in the current study, whereas clinical skills training is being conducted as face-to-face in the campus and its preferences for delivery was not targeted in the study. Participants of the current study have experienced the two types of the learning environments: exclusively online at the second semester of the preceding academic year 2019/2020 during the COVID-19 lockdown and blended learning during the first semester of the academic year 2020/2021.

An exhaustive sample of 6012 undergraduate students at Menoufia medical school was invited to participate in the current study. These learners were identified on the Learning Management System (LMS) of the school during Fall 2020 and winter 2020. Among these invitation emails, only 5009 emails were successfully sent out. A sample size of 361 or more measurements/surveys were needed to have a confidence level of 95 % that the real value is within ± 5 % of the measured/surveyed value[20]. However, 665 completed surveys were returned, with the response rate at 13.2 %.

Data collection method

A questionnaire was used for data collection. It consisted of three parts as following:

Part one: Developed by the researchers and explores students' demographics and their preference of either learning environment.

Part two: To assess students readiness for online learning using a valid reliable tool which is the' 'Scale of University Students' Readiness for E-Learning'[20]. It consists of 33 items that reveal six student competencies for e-learning learning: computer self-efficacy, internet self-efficacy, online communication self-efficacy, self-directed learning, learner control and motivation for e-learning. It is a 5-point Likert type scale used to collect data on students' views on their readiness for e-learning and the 33 items of the scale are all positive statements, with scores range from one point for strongly disagree and five points for strongly agree. The reliability and validity of the scale were examined. The reliability coefficient was re-calculated in the study and the Cronbach alpha value was found to be greater than 0.70. Therefore, the scale allowed for reliable results.

Part three: To assess the motivation and learning strategies using "Motivation and Learning Strategies Scale (MSLQ)" developed by Pintrich, 1991[14]. The MSLQ is scored on a 7-point likert scale with scores ranging from one point for not at all true of me to seven for very true of me. It entails two main dimensions: the motivation for learning dimension and the dimension of cognitive learning strategies. The sub-components of task value, self-efficacy and test anxiety constitute the dimension of motivation for learning, whereas the sub-components of rehearsal, organization and elaboration create the dimension of cognitive learning strategies. We used three item questions to examine each subcomponent of the two dimensions.

Validity and reliability of the MSLQ was tested and the Cronbach alpha coefficients calculated for this study revealed acceptable values for different sub-components.

Adherence to ethical recommendations

An institutional review board approval, IRB 3/2021FAML9-3, was obtained from the Biomedical Research and Ethics committee of Menoufia Faculty of Medicine. The authors declare adherence to ethical recommendations throughout the work. Participants' information was kept confidential and will not be breached.

Data analysis

Data were analyzed using IBM advanced SPSS statistical package version 26. Quantitative variables were presented as mean and standard deviation (SD), while qualitative variables were presented as numbers and percentages. Independent t-test was used to compare the means of e-learning readiness, motivation for learning and cognitive learning strategies for students who preferred online only and those who preferred blended learning. Eta coefficient test (η) was used to assess the correlation between the preferred learning environment (categorical, dependent variable) and the students' characteristics (numerical, independent variables). Correlation was interpreted as follows: < 0.2 is negligible, 0.2 to 0.39 is weak, $\geq$ 0.4 to < 0.7 is medium and $\geq$ 0.7 is strong. 22 Eta Squared test ($\eta2$) was used to assess the effect size (degree of variance) of students' characteristics on the preferences for learning environment. Effect size was interpreted as 0.01 to 0.059 for small effect, 0.06 to 0.138 for medium effect and $\geq$ 0.14 for large effect. 22, 23The level of significance for all statistical tests was set at $p < 0.05$.

RESULTS

A total of 665 students responded to the survey. Of these, 414 (62.3 %) were females, 237 (35.6 %) were year two students, while 186 (28.0 %) were year three students and 126 (18.9 %) were year four students. As regard academic achievement in the last year, among the total responders, 236 (35.4 %) achieved grade A, 165 (24.8 %) achieved grade B+, while 105 (15.8 %) were grade C. As regard daily hours spent on computer use, most responders; 312 (46.9 %) spend more than four hours, while 132 (19.9 %) spend 2 to 3 hours and 109 (16.4 %) spend 1 to 2 hours daily. Similarly, most responders; 269 (40.5 %), indicated that they spend more than four hours daily on social media, while almost equal percentages of students [118 (17.7 %), 105 (15.8 %) and 131 (19.7 %)] spend 1 to 2, 2 to 3 and 3 to 4 hours respectively. Notably, almost two thirds of the students; 420 (63.2 %), indicated blended learning as their preferred mode of learning delivery, compared to 245 (36.8 %) students who preferred the online learning. Table 1.

Table 2 shows comparison of the student who preferred online learning to students who preferred blended learning as regard readiness for e-leaning, motivation for learning and cognitive learning strategies. There were significantly higher means for all components of readiness for e-learning among students who preferred online learning compared to students who preferred blended learning ($p = 0.000$).

Regarding motivation for learning, students who preferred online learning had significantly higher means

of task value ($p = 0.015$) and self-efficacy ($p = 0.012$). However, there was no significant difference between both groups as regard test anxiety ($p = 0.055$).

For cognitive learning strategies, students who preferred online learning has significantly higher means for critical thinking ($p = 0.000$), rehearsal ($p = 0.01$) and elaboration ($p = 0.000$) whereas, there was no significant difference between both groups as regard organization.

Table 3 shows the correlation between the preferred learning environment and students' characteristics and the effect size of these characteristics on the learning environment preferences. There was strong correlation between the preferred learning environment with all components of the students' readiness for e-learning ($\eta > 0.7$), with the highest correlation with of motivation towards e-learning ($\eta = 0.834$). Strong correlation was also demonstrated with students' motivation for learning, whereas the correlation was weak with the cognitive learning strategies.

The effect size of students readiness for e.learning on students' preference for learning environment, was large ($\eta2 > 0.14$), with the largest effect size demonstrated for motivation for e.learning ($\eta2 = 0.695$). Large effect size was also noted for students' motivation for learning whereas the effect size of cognitive learning strategies was small ($\eta2 < 0.06$).

Table 1: Demographic characteristics of participants and their preferred learning environment (n = 665):

Variable		N (%)
Gender	Male	251 (37.7)
	Female	414 (62.3)
Year level	Year 1	186 (28.0)
	Year 2	237 (35.6)
	Year 3	58 (8.7)
	Year 4	126 (18.9)
	Year 5	38 (5.7)
	Year 6	20 (3.0)
GPA (last year)	A+	79 (12)
	A	236 (35.4)
	B+	165 (24.8)
	B	70 (10.5)
	C+	10 (1.5)
	C	105 (15.8)
Daily use of computer (hours)	< 1	44 (6.4)
	1 -2	109 (16.4)
	2 -3	132 (19.9)
	3 -4	68 (10.2)
	> 4	312 (46.9)
Daily use of social media (hours)	< 1	42 (6.3)
	1 -2	118 (17.7)
	2 -3	105 (15.8)
	3 -4	131 (19.7)
	> 4	269 (40.5)
Preferred learning environment	Online	245 (36.8)
	Blended	420 (63.2)

Table 2: Comparison of the students' preferred learning environment as regard readiness for e-leaning, motivation for learning and cognitive learning strategies (independent t-test) (n = 665):

Variable		Minimum	Maximum	Online (n = 245)	Blended (n = 420)	95 % C.I.	P-value
				Mean ±SD			
Readiness for e-learning	Computer self-efficacy	5	25	20.17±5.09	15.41±5.36	3.927-5.59	0.000
	Internet self- efficacy	7	20	18.42±2.75	15.5±4.03	2.401-3.437	0.000
	Communication self-efficacy	7	25	21.65±4.12	17.41±5.11	3.524-4.948	0.000
	Self-directed learning	8	40	33.77±6.16	28.2±6.77	4.529-6.598	0.000
	Learner control	4	20	17.2±3.35	13.24±3.9	3.389-4.515	0.000
	Motivation towards e-learning	8	35	30.49±5.55	20.43±7.45	9.064-11.06	0.000
Motivation for learning	Task value	3	21	14.8±4.72	15.68±4.09	-1.592-0.169	0.015
	Self-efficacy	3	21	15.18±4.55	14.3±3.94	0.198-1.568	7
	Test anxiety	3	21	15.16±4.96	14.43±4.63	-.0149-1.487	0.055
Cognitive learning strategies	Critical thinking	4	21	15.78±3.85	14.52±3.72	0.665-1.857	0.000
	Organization	3	21	16±4.11	15.5±3.88	-0.12-1.132	0.114
	Rehearsal	4	21	16.36±3.84	15.58±3.77	0.186-1.386	0.010
	Elaboration	3	21	16.26±3.86	15.17±3.72	0.486-1.679	0.000

Table 3: Correlation and effect size of students' characteristics and the preferred online only learning environment (n = 665):

	Students' characteristics					
	Readiness for e-learning					
	Computer self-efficacy	Internet self-efficacy	Communication self-efficacy	Self-directed learning	Learner control	Motivation towards e-learning
Preferred learning environment	* η = 0.766, **η2 = 0.586	η = 0.736, η2 = 0.541	η = 0.646, η2 = 0.417	η = 0.768, η2 = 0.589	η = 0.757, η2 = 0.573	η = 0.834, η2 = 0.695
	Motivation for learning					
	Task value	Self-efficacy	Test anxiety			
	η = 0.727, η2 = 0.528	η = 0.756, η2 = 0.571	η = 0.668, η2 = 0.459			
	Cognitive learning strategies					
	Critical thinking	Organization	Rehearsal	Elaboration		
	η = 0.224, η2 = 0.054	η = 0.222, η2 = 0.049	η = 0.242, η2 = 0.058	η = 0.239, η2 = 0.057		

∗η = Eta Coefficient test. ∗∗η2 = Eta Squared test.

DISCUSSION

This study was aimed to examine undergraduate students' characteristics that affect their preferences for the mode of theoretical (knowledge) learning environment, online only versus blended learning. Students' readiness for e-learning, motivation for learning and cognitive learning strategies were the domains of students' characteristics for investigation with sub-components under each of these domains.

Most students of the current study (63.2 %) preferred the blended mode of learning. Blended learning is favored due to considerations such as versatility, responsiveness to students and learning resources and the chances to have face-to-face learning sessions together with timely feedback providing[24].

Current study demonstrated that students with higher e-learning readiness, learner control, motivation towards e-learning and higher motivation in terms of high task value and self-efficacy and higher cognitive learning strategies preferred online only mode of learning. Online learning is frequently seen as a challenging environment with higher level of difficulty and workload that necessitates high learners' motivation towards e-learning, high task value, self-efficacy and learner control[25]. Moreover, Online

learning environment renders students with a feeling of loneliness and isolation[26,27]. In contrast, students can get support more easily in bended compared to online only learning[25].

The current study demonstrated strong correlation between the preferred mode of learning and all components of e-learning readiness. The highest correlation was with students' motivation towards e-learning. Moreover, the effect size of e-learning readiness on the preference for learning environment was large. Similar findings were demonstrated by earlier studies[3,28]. Lee *et al*, 2017 stated that students are motivated towards e-learning because it represents a new way to learn[28].

Consistent with our findings, Keskin S and Yurdugül H, 2020 demonstrated a strong correlation between the preferred learning environment and the motivation for learning subcomponents, high task value and self-efficacy[3]. Motivation is seen as a mental impulse that drives and directs the attitudes and behavior of a learner[27]. Therefore, online learners' interaction profiles differ according to their learning motivation[6]. In other words, different levels of motivation affect the patterns of interaction in the online learning environment. Lee YG, *et al* 2017 in their study revealed that the face-to-face dissatisfiers play a major role in shaping students' preferences for class delivery style, with online classes being the most preferred[28]. Students, for example, tend to learn online rather than in a face-to-face class because they do not see the value in engaging with the teacher or other students. Additionally, students enjoy online courses because they gain more response from the educator in this mode of learning[28]. Moreover, the Learning Management System (LMS) adopted by the setting of the current study, comparable to learning systems operated currently by many educational institutions all around the world, deliver collaborative and interactive classes that permit learners to be engaged more efficiently and provides an environment for learners with different levels of motivation for learning. That could provide an explanation of the difference between the findings of our study and the results of previous studies that were performed on e-learning materials mounted to the internet for access by learners without interaction with educators e.g., pre-taped videos and presentations. In this regard, it appears that mastering the skills of readiness for e-learning together with the motivation towards e-learning constitute the base foundation for online only learning and declines the need for blended learning.

As regards correlation with cognitive learning strategies, the current study revealed weak correlation with learning environment preferences and small effect size.

These findings are consistent with those demonstrated by Keskin S and Yurdugül H, 2020 in their study[3]. They concluded that the preference for learning environment is independent of the cognitive learning strategies. In contrast, Brown and Liedholm, 2004 demonstrated strong correlation with the cognitive learning strategies[29]. Possible explanation of the present study findings could rely upon the facts that recent online learning environment offers interactive learning encounters and access to a diverse learning materials such as texts, videos and formative assessments through which learners can apply their individual learning strategies. Hence, learner's cognitive learning strategies have poor impact on the learners' choice for the learning environment.

Therefore, as demonstrated by the present study, e-learning readiness and motivation towards e-learning are the most determining factors affecting preference for mode of learning environment.

Study strengths and limitations

This study primary strength is filling the gap regarding the factors affecting students' preferences for the mode of learning environment. Its sample size is significantly more substantial than most of the studies evaluating learning mode, precisely the one related to students' characteristics. However, there are few limitations to the study. A self-report questionnaire was used to obtain the data, hence, allows for self-reporting bias with over- or underreporting which may have exaggerated or flattened the correlations between learners' characteristics and learning mode. Also, the study was conducted in a single institution which limits its generalizability. Therefore, replicating this study in a more controlled setting and including multi-institutions is recommended for future research.

CONCLUSION

This study concludes that the most determining factors affecting students' preferences of learning environment is e-learning readiness specially motivation for e-learning and students' motivation for learning, whereas, cognitive learning strategies have little impact on the preferences for learning environment. It recommends empowering students' e-learning skills and motivation for e-learning for preparedness for the imminent learning fluctuations.

CONFLICTS OF INTEREST
There are no conflicts of interest.

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