

E-learning Self-Perceived Readiness Among Dental Students: A Multi-Institution Study

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ABSTRACT

Objective: This study aimed to evaluate dental students' perceived readiness for e-learning in low and middle-income countries, employing the Online Learning Readiness Scale (OLRS).

Study Design: A cross-sectional study

Place and Duration of Study: This study was conducted at the College of Dentistry, King Faisal University Al-Ahsa, Saudi Arabia, from March and August 2023.

Methods: An electronic survey was conducted among dental students in six countries: Egypt, India, Nigeria, Pakistan, Saudi Arabia, and Sudan. Convenience and snowball sampling techniques were employed to recruit the participants and disseminate the survey links through collaborative networks.

Results: This study included 665 dental students; 59.4% were female and 73.4% were younger students. Most participants (74%) were enrolled in public institutions, with 54.4% categorized as senior students. The highest average score for the agreement was 52.9% in online communication self-efficacy. Saudi Arabia scored highest across all constructs, while Sudan recorded the lowest, primarily due to insufficient institutional support. Notably, computer/internet self-efficacy demonstrated significant correlations with all other constructs, while the motivation for learning correlated significantly with self-directed learning and online communication self-efficacy.

Conclusion: The findings underscored the importance of assessing dental students' perceived readiness for e-learning, which emerges as a crucial factor in ensuring the efficacy of educational processes. While overall readiness was evident among dental students, variations were observed across demographic factors such as age, gender, study level, and institutional type. The disparity in readiness levels highlights the necessity for tailored approaches to support e-learning initiatives, particularly in regions with limited institutional resources.

Key Words: e-Learning, Dental students, readiness, Dental education, online, OLRS

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INTRODUCTION

Online or electronic learning (e-learning) has revolutionised higher education. E-learning is 'an educational method that facilitates learning by applying

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information technology and communication, providing an opportunity for learners to access all the required education programs¹. In practice, e-learning offers many adaptable models or designs, from enhanced or adjunct models to blended e-learning models and fully online models². The effectiveness of e-learning is not a fixed concept but is contingent on certain levels of technical training and motivation among dental students and educators³. Full implementation necessitates measuring students' e-learning readiness, which involves assessing their confidence in using various technologies and computer-mediated devices for online learning, particularly the Internet⁴.

COVID-19 has posed a significant challenge to dental education. It forced institutes to completely overhaul their teaching methods and focus more on online teaching⁵.

Researchers have developed a readiness scale for e-learning Smith et al⁶ found two primary factors that predicted student success: self-management of learning and comfort with e-learning.

Later, Hung, Chou⁷ developed and validated the Online Learning Readiness Scale (OLRS), a multidimensional

instrument for assessing students' readiness. The (OLRS) assesses five domains. Self-directed learning (SDL); Motivation for learning (MFL); Computer/internet self-efficacy (CIS); Learner's control (LC); Online communication self-efficacy (OCS)⁸.

Researchers in education have widely recognized the OLRS, which is often used to measure the online learning readiness of higher education students in various majors in different countries and has been validated in several studies and contexts.^{9,10}

Assessing and reassessing students' self-perceived readiness for e-learning is essential to guide students more effectively and provide a more productive e-learning experience⁷. Therefore, this study aimed to assess dental students' self-perceived readiness for e-learning in multiple institutions in low-income and middle-income countries using the OLRS.

METHODS

Study design and sampling: This cross-sectional survey, conducted between March and August 2023, included dental students from six countries: Egypt, India, Nigeria, Pakistan, Saudi Arabia, and Sudan. Convenience and snowball sampling techniques were used to recruit the participants and distribute the online survey links through the collaborators' contacts, including WhatsApp groups specific to dental students and institutional email lists. The selection of students with representatives from one public and one private institute within the same country ensures a diverse representation of different socioeconomic groups. The dental students who met the criteria of being registered in academic institutes, having studied some sessions online, having internet access, and being able to read and write in English.

Questions and measures:

The data were collected using a structured questionnaire adapted from the ORLS Scale. The first part of the questionnaire included questions about socio-demographic information: age, gender, type of institution, and academic rank. Furthermore, the questionnaire contained additional aspects regarding online learning devices, kind of internet connection, educators' views on internet cost, and time spent online. The students were then divided by their study year into juniors (in years 1–3) and seniors (in years 4–5/6), as well as by their age (17–22 years = young, and >22 years = old), for a comprehensive analysis. The participants' responses were grouped based on their agreement or disagreement with the statements. This was done using a 5-point Likert scale. Specifically, responses of "strongly agree" and "agree" were combined to indicate agreement with the statement, while responses of "strongly disagree" and "disagree" were combined to indicate disagreement. The frequency of responses for each category was then divided into high and low using the mean as the cut-off point.

The second part of the questionnaire evaluated dental students' perceived readiness for e-learning using the 18-item (five domains) OLRS (7). Three questions measured 'computer/internet self-efficacy' (CIS): 'I feel confident in performing the basic functions of Microsoft Office programs (MS Word, MS Excel, and MS PowerPoint)'; 'I feel confident in my knowledge and skills of how to manage software (apps) for online learning'; 'I feel confident in using the internet (e.g. Google) to find or gather information for online learning.' A sum variable CIS had Cronbach's α 0.80.

Five questions measured self-directed learning (SDL): 'I carry out my own study in the online learning setting'; 'I seek assistance when facing learning problems in the online learning setting'; 'I manage time well in the online learning setting'; 'I set up my learning goals in online learning'; 'I have higher expectations for my learning performance due to online learning'. A sum variable SDL with a Cronbach's α 0.73.

Three questions measured Learner's control (LC): 'I can direct my own online learning progress'; 'I am not distracted by other online activities when learning online (instant messages, internet browsing)'; 'I repeated the online instructional materials based on my needs'. A sum variable LC with a Cronbach's α 0.61.

Four questions measured 'motivation for learning' (MFL): 'I am open to new ideas in the online learning'; 'I have the motivation to learn in the online setting'; 'I improve from my mistake in the online setting'; 'I like to share my ideas with others in the online learning'. A sum variable MFL scored Cronbach's α 0.83.

Three questions measured online communication self-efficacy (OCS): 'I feel confident in using online tools (email, discussion) to communicate with others effectively'; 'I feel confident in expressing myself (emotions and humour) through text in the online learning'; 'I feel confident in posting questions in online discussions'. A sum variable OCS with Cronbach's α 0.81.

Data analysis: The data collected were organised, categorised, tabulated, and analysed using Statistical Package for Social Science (SPSS, 21). The data were presented as descriptive statistics, and the t-test and One-way analysis of variance (ANOVA) were used with a significance threshold of $p \leq 0.05$ and a confidence interval of 95%.

RESULTS

In this study, 665 dental students from six countries participated. Among them, 59.4% were female and 73.4% were younger students. Approximately 74% of the participants were from public institutes, and 54.4% were senior students. The highest percentage of participants came from Sudan (32.3%), followed by Nigeria (20%), while the fewest participants (9.9%) were from Egypt.

Table No.1: Distribution of frequencies and percentages (%) of individual questions of the OLRs constructs.

Question	Disagree	Neutral	Agree
Computer/Internet Self-efficacy (CIS)			
CIS1	86 (13)	217 (32.7)	360 (53.2)
CIS1	78 (11.8)	202 (30.5)	383 (57.8)
CSI3	35 (5.3)	113 (17.0)	516 (77.7)
Self-Directed Learning (SDL)			
SDL1	55 (8.4)	211 (32.0)	393 (59.7)
SDL2	102(15.5)	196 (29.8)	360 (75.7)
SDL3	244(36.9)	206 (31.2)	211 (32)
SDL4	202(30.4)	241 (36.5)	219 (33.1)
SDL5	259(39.4)	200 (30.4)	198 (30.2)
Learners' control (LC)			
LC1	162(24.6)	241 (36.6)	256 (38.9)
LC2	258(54.1)	164 (24.8)	140 (21.2)
LC3	69 (10.5)	234 (35.4)	358 (54.2)
Motivation For Learning (MFL)			
MFL1	110(16.6)	171 (25.9)	380 (57.4)
MFL2	182(27.6)	202 (30.6)	276 (41.8)
MFL3	111(16.9)	228 (34.5)	321 (48.7)
MFL4	169 (25)	225 (34.1)	270 (40.9)
Online Communication Self-efficacy (OCS)			
OCS1	137(20.8)	178 (26.9)	346 (52.4)
OCS2	197(29.9)	199 (30.2)	263 (39.9)
OCS3	170(25.7)	223 (33.7)	268 (40.5)

The OCS construct had the highest agreement level at 52.9%, closely followed by the SDL construct at 52.8%. In contrast, the LC construct had the lowest agreement level at 42.6% (Figure 1).

An analysis of the individual questions for each construct revealed that the highest percentage of student responses were in the 'agree' category, except for questions SDL3, SDL5, and LC2. (Table 1).

It was found that older male students scored significantly higher than their male peers in all OLRs constructs. Additionally, public college students scored considerably higher than their counterparts in CIS, MFL, and OCS. Furthermore, senior students scored significantly higher than their peers in CIS and MFL (Tables 3).

In addition, pairwise comparison between the countries and the OLRs scores. Saudi Arabia scored higher than all countries in all constructs, followed by Nigeria and India, except CIS, where Pakistan scored higher than India. Sudan scored lower than all countries in all constructs (Table 2).

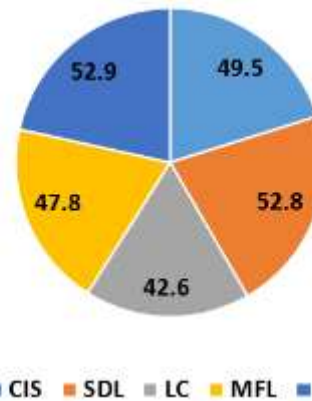


Figure No.1: Distribution of percentages of OLRs constructs.

Table No.2: The mean (±SD) of OLRs constructs by gender, age group, type of college, study level, and country.

Variable	CIS	SDL	LC	MFL	OCS
Gender					
Male	11.48 ±2.20	17.05 ±3.20	9.80 ±2.17	14.00 ±3.10	10.52 ±2.55
Female	10.78 ±2.18	14.97 ±3.35	8.71 ±2.16	12.48 ±3.22	8.92 ±2.60
Age group					
Young	10.92 ±2.20	15.45 ±3.38	8.97 ±2.18	12.82 ±3.32	9.32 ±2.69
Old	11.45 ±2.21	16.81 3.44	9.67 ±2.27	13.88 ±2.96	17.7 ±2.59
Type of college					
Private	10.66 ±2.06	15.47 ±3.17	9.09 ±2.03	12.58 ±3.20	9.22 ±2.44
Public	11.20 ±2.25	15.93 ±3.53	9.18 ±2.29	13.28 ±3.26	9.69 ±2.77
Study level					
Junior	10.83 ±2.18	15.62 ±3.56	9.09 ±2.20	12.70 ±3.37	9.45 ±2.71
Senior	11.25 ±2.22	15.97 ±3.33	9.21 ±2.25	13.43 ±3.13	9.67 ±2.68
Country					
Egypt	10.56 ±1.70	15.73 ±3.07	9.15 ±1.96	13.50 ±2.51	9.44 ±2.47
India	10.89 ±1.68	16.41 ±2.27	9.42 ±1.69	13.54 ±2.57	9.87 ±1.84
Nigeria	11.83 ±1.93	17.00 ±3.40	9.24 ±2.12	14.15 ±2.73	11.00 ±2.12
Pakistan	11.20 ±2.25	15.71 ±3.40	8.72 ±2.27	12.63 ±3.21	9.42 ±2.46
Saudi Arabia	12.18 ±2.21	17.89 ±2.64	10.50 ±2.04	14.96 ±2.67	11.51 ±2.13
Sudan	10.35 ±2.38	14.17 ±3.50	8.71 ±2.41	11.68 ±3.60	7.98 ±2.70

Table No.3: Independent sample t test of the OLRs constructs by gender, age, type of college, and study level

Independent Variable	Construct	Mean Difference S. E.	95% C.I.
Gender	CIS	0.701 (0.173)	0.36 / 1.04**
	SDL	2.081 (0.260)	1.57 2.59**
	LC	1.090 (0.171)	0.75 / 1.43**
	MFL	1.519 (0.251)	1.03 / 2.01**
	OCS	1.597 (0.204)	1.19 /1.99**
Age group	CIS	-0.532 (0.193)	-0.91 / -0.15**
	SDL	-1.357 (0.298)	-1.94 / -0.77**
	LC	-0.695 (0.194)	-1.08 / -0.315**
	MFL	-1.060 (0.283)	-1.62 / -0.50**
	OCS	-0.956 (0.234)	-1.41 / -0.49**
Type of college	CIS	-0.544 (0.195)	-0.09 / -0.16**
	SDL	-0.457 (0.304)	-1.05 / 0.14
	LC	-0.094 (0.197)	-0.48 / 0.29
	MFL	-0.0702 (0.287)	-1.27 / -0.14**
	OCS	-0.473 (0.238)	-0.94 / -0.01*
Study level	CIS	-0.422 (0.172)	-0.76 / -0.09**
	SDL	-0.352 (0.268)	-0.88 / 0.17
	LC	-0.118 (0.174)	-0.46 / 0.22
	MFL	-0.0731 (0.252)	-1.23 / -0.24**
	OCS	-0.222 (0.210)	-0.63 / 0.19

* p≤0.05; **p≤0.01

Table No.4: Spearman’s correlation coefficient showing the correlation between the OLRs constructs.

Construct	SDL	LC	MFL	OCS
CIS	0.434**	0.354**	0.422**	0.441**
SDL		0.638**	0.646**	0.590**
LC			0.546**	0.441**
MFL				0.646**

* p≤0.05; **p≤0.01

Correlation analysis between the different constructs showed that the primary skills variables, CIS and OCS, significantly correlated with all four other constructs (p≤0.01). The strongest correlations were between MFL with SDL and OCS (p≤0.01), as well as SDL with LC (p≤0.01), followed by SDL with OCS and MFL with LC, while the weakest correlations were between SDL with CIS, MFL with CIS, and OCS with CIS, OCS with LC, and LC with CIS (Table 4).

DISCUSSION

The self-perceived readiness of dental students for e-learning is a crucial aspect of the educational process, particularly given the widespread adoption of e-learning as a supplementary tool by academic institutions worldwide. However, it is essential to recognize that e-learning in clinical dental education poses significant challenges in developing practical skills¹¹. This study assessed the self-perceived readiness of dental students for e-learning across multiple institutes. Multiple previous studies^{3,12-14} have shown a predominance of female students over male students in

dentistry. This contrasts with the study among Saudi students, which had an equal gender distribution¹⁵. This might be explained by the relatively recent introduction of female students in Saudi Arabia compared to the other countries included in the study.

According to the study's findings, more than half of the participants reported confidence in their OCS, which aligns with previous studies from Saudi Arabia, Pakistani, and South Africa^{12,13,15-17}. This consistent alignment with existing research suggests that the majority of the students were already able to communicate well using online platforms, hence their perception of better readiness for e-learning regardless of the location of their institution. This might be because today's students are millennial learners who prefer the integration of innovative teaching modalities¹⁵.

Older male students, those attending public colleges, and senior students scored higher in OLRs constructs than their counterparts. This finding contrasts with a previous study that found no differences between these groups¹⁶ but aligns with the results of Hattar's study³. Additionally, there were significant differences among Pakistani students, with senior students scoring higher than junior students¹². Among Nigerian students, males and senior students had higher overall scores than their female and junior counterparts. In Vietnamese students, online communication skills were notably more vital in males¹⁴.

In this study, the countries' economic income levels were found to affect the students' self-perceived readiness for e-learning. For instance, with its

substantial institutional support, Saudi Arabia scored significantly higher in all constructs than other countries, except for Nigeria, where no statistical difference was observed in the MFL, CIS, and OCS constructs¹⁵.

Furthermore, the early implementation of e-learning in Nigerian higher educational institutes, even before the COVID-19 crisis, compared to other low and middle-income countries¹⁸, may explain the higher MFL, CIS, and OCS construct scores. Conversely, Sudan scored significantly lower in all the constructs than other countries involved in this study, except for Egypt and Pakistan^{12,19}. This could be explained by the country's inability to implement e-learning in its higher educational institutes due to its lower financial support for higher educational institutes.

The study found a strong correlation between SDL as a primary outcome and the MFL, LC, CIS, and OCS; these results are similar to those reported by Nguyen and Tran¹⁴.

MFL is another important factor for e-learning, and this was derived from CIS, SDL, and LC, the latter being essential in strengthening these constructs. This was also found among Pakistani students¹². Furthermore, some studies have confirmed that e-learning affects students' motivation^{20,21}. This study's findings are limited to dental students' opinions in six countries. The limitation of the sample size, study design, and self-reporting questionnaire implies inevitable biases, including selection bias and information and social desirability, limiting the generalizability of reporting information.

Overall, the study provides information on dental students' e-readiness based on reliable and valid tools. It also gives better insight into dental students' e-readiness and helps us understand how best to support them in the transition to e-learning.

In general, dental students are positive about e-learning. In addition, this research can help dental educators create quality materials that improve e-learning. On the other hand, to tackle the constraints of e-learning and offer better methods to generate a suitable e-learning atmosphere.

CONCLUSION

The findings highlight the significance of assessing dental students' perceived readiness for e-learning, a key determinant of educational success. While a general readiness was observed among students, notable differences emerged across various demographic factors. This variability in readiness underscores the need for targeted approaches to support e-learning, particularly in resource-constrained regions, to bridge the gap and ensure effective learning outcomes.

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