Predictors for adoption of e-learning among health professional students during the COVID-19 lockdown in a Private University in Uganda

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Research Article

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Posted Date: April 27th, 2022

DOI: https://doi.org/10.21203/rs.3.rs-1544508/v1

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Abstract

Background. Universities have come to terms with the fact that education, as we have traditionally delivered it, cannot be sustained under the current circumstances imposed on us by the Coronavirus diseases 2019 pandemic. Adoption of e-learning is one obvious way to foster continuity of learning. During the lockdown in Uganda, it was not known whether health professional students were willing to adopt e-learning as a way to foster continuity of learning. We therefore adopted a Technology Acceptance Model to determine the predictors for adoption of e-learning using learner and information technology variables.

Methods. A cross-sectional study among 109 health professional student's ≥18 years at Clarke International University was conducted. Adoption of e-learning was measured as self-report. Data were obtained using a smart survey and descriptively summarized. The differences in the study outcome were compared using the chi-square test. The factors that independently influenced adoption of e-learning were determined using binary logistic regression and reported as adjusted odds ratios (aORs) with a 95% confidence interval (CI).

Results: Of the 109 respondents, 71 (65.1%) adopted e-learning. Our data showed low odds of adoption of e-learning among participants in first year (aOR, 0.34: 95%CI, 0.14-0.79), low e-learning expectations (aOR, 0.01: 95%CI, 0.01-0.34), no confidence in using IT devices (aOR, 0.16: 95%CI, 0.00-0.77), no prior experience in e-learning (aOR, 0.11: 95%CI, 0.02-0.68), not considering e-learning flexible (aOR, 0.25:95%CI, 0.08-0.86) and high cost of internet (aOR, 0.13: 95%CI, 0.02-0.84).

Conclusion: We identified predictors of e-learning adoption which include: having completed at least one year of study, high e-learning expectations, and confidence in using IT devices, prior experience in e-learning, considering e-learning to be flexible and internet access. This information can be used by universities to enhance infrastructure and prepare potential e-learners.

Keywords: E-learning adoption, health professional students, Coronavirus diseases 2019 lockdown.

Word count: 286 Abstract; 2,350 main text.

Background

E-learning (electronic learning) has emerged as one of the ways to foster education during the Coronavirus diseases 2019 pandemic. Worldwide, the new paradigm of the learning market has a growth rate of 35.6% (1). E- learning includes; online learning, virtual learning, distance education, m-learning, and learning management systems (2). In the developing world, ministries of education in different countries have recommended or made it mandatory to implement online learning at all school levels in various countries (3). E-learning initiatives are strongly tied to information and communication technologies (ICTs) (4). ICTs provide an advanced e-learning environment to stimulate and enhance teaching and self-directed learning (5).

The Coronavirus diseases 2019 pandemic introduced the need for less human physical contact to prevent spread in what has been christened “social distancing” (6). This underscored the strong need for e-learning and for continued academic operations both of which could be achieved at a distance. In September, 2020, the Uganda National Council of Higher Education (NCHE) established the Emergency Open Distance e-Learning strategies for health professional students to continue learning remotely during the protracted university continuing lockdown. The introduction of e-learning was not intended to replace face-to -face classroom teaching, but to provide new opportunities for continued learning during Coronavirus diseases 2019 lockdown in Uganda (7).

However, the rapid shift to online learning underscored the need to understand health professional students’ adoption of the new learning virtual environment and learning tools. Yet given the scarcity of health professional workers in the control of the ongoing Coronavirus diseases 2019 pandemic, e-learning needed to be adopted in universities to hasten the continuation of health professional training (7).

Accordingly, understanding students’ adoption of e-learning was imperative to enable universities to design effective e-learning programs amidst the rising Coronavirus diseases 2019 pandemic. Adoption of e-learning was proven to be a reliable proxy for the success of any IT-based initiative in the education sector (8). Thus, this prompted the study on adoption of e-learning among health professional students during the Coronavirus diseases 2019 lockdown. The study adopted a Technology Acceptance Model (TAM) to understand whether health professional students who have been introduced to new technology can accept and use it considering constructs of perceived ease of use, perceived usefulness (9) in form of learner and Information Technology (IT) aspects.

Methods

Aim of the study

The study aimed at determining the predictors for adoption of e-learning among health professional students during the Coronavirus diseases 2019 lockdown in a Private University in Uganda.

Study design

The study employed a cross sectional study design where quantitative data were collected from participants electronically. Emails were only sent to students that were health professionals. Data on learner and IT aspects were obtained for the purpose of comparing differences in adoption of e-learning.

Setting and study participants

The study was conducted at Clarke International University (CIU). This is one of the private universities located in Kampala city with a population of nearly 1000 students of which approximately 150 are health professionals. E-learning at CIU progressively became popular during the national Coronavirus diseases 2019 lockdown (10). Before the pandemic, e-learning was only restricted to post graduate students taking Master's in Public Health with a blended approach. Currently e-learning at CIU has been integrated in all university programs both at undergraduate and postgraduate levels.

We included all continuing health professional students aged ≥18 years at Clarke International University by the time of the lockdown in Uganda (18th March 2020). We excluded the following categories of health professional students: 1) students in their final year of study who were only left with research to complete the program, and 2) students who were enrolled on remote learning before the lockdown. Data was collected over a period of three weeks.

Measurements

Outcome variable

Our outcome variable was adoption of e-learning, measured by self-report on a binary scale. Respondents were asked whether they were satisfied with the decision to continue taking the course online, whether e-learning would satisfy their learning needs and if they would gladly take another program fully via the internet in any institution of higher learning given an

opportunity. Responses were later categorized as a binary outcome (Yes- adopted e-learning and No- did not adopt e-learning).

Independent variables

The independent variables included, learner aspects (age, sex, time management, e-learning expectations) and IT aspects were confidence in using IT and online communication tools, prior experience with e-learning, flexibility of e-learning and internet cost.

We collected quantitative data using a smart survey where emails were distributed using the mailing list feature. This enabled ease of questionnaire distribution and collection of reliable data in real-time**.** Prior to data collection, the questionnaire was pre-tested outside the study area (Kampala International University). Unique identifiers like email and names of participants were removed before data analysis to ensure confidentiality of the collected data.

Data analysis

The analysis was done using Statistical Package for Social Sciences (SPSS) version 20. In the descriptive analysis, frequencies and percentages were summarized. In the bivariate analysis, we conducted the Chi-square test for differences in e-learning adoption as long as all the cell counts were ≥5, else, Fisher's exact test was used. In the multivariate analysis, all variables with probability value (p-value) less than 5% at bivariate analysis and statistically significant variables from the literature particularly age and sex were included in the regression model. Consequently, we computed crude odds ratio (cOR) and adjusted odds ratio (aOR) at multivariate analysis using binary logistic regression. We reported aORs with the corresponding 95% confidence interval (CI). We did not report probability values (p-values) since Confidence Intervals (CIs) are satisfactory for recording the precision of the measure of effect and establishing statistical significance (11). Furthermore, CIs are more enlightening than probability-values (12) and are henceforth preferred in reporting the outcome (13).

Results

A total of 109 continuing health professional students at CIU participated in the study. The study included those who had not completed their courses by the time of the first National Coronavirus diseases 2019 lockdown on the 18th March 2019. Students who had initially applied for the remote learning program before the national lockdown were excluded from the study. Overall, we analyzed 109 participants.

General characteristics of participants

Table 1 describes the participant characteristics. Overall, we studied 109 participants. The highest proportion 65 (59.6%) of respondents were female, 69 (63.3%) were in the 20-29 years age bracket, 63 (57.8%) were in their first year of study, 68 (62.4% were single and 57 (52.3%) were not in the frontline of COVID 19 management.

Table 1: Participant characteristics

Characteristics	Categories	Total (n= 109), No. (%)
Sex	Female	65 (59.6)
	Male	44 (40.4)
Age group (years)	20 – 29	69 (63.3)
	30 – 39	33 (30.2)
	40 and above	7 (6.5)
Year of study	1	63 (57.8)
	2	46 (42.2)
Marital status	In union	41 (37.6)
	Not in union	68 (62.4)
In the frontline of COVID 19 management	Yes	52 (47.7)
	No	57 (52.3)

Differences in adoption of e-learning with learner and IT aspects

The differences in adoption of e-learning with learner aspects and IT aspects are shown in Table 2. Overall 72 (65.1%) adopted e-learning during COVID 19- Lockdown. E-learning adoption was more prevalent among female health professional students (67.7%), participants aged 30-39 years (72.7%), in the first year of study (77.8%), in union/married or cohabiting (75.6%), and in the frontline of COVID 19 management (66.7%). We observed statistically significant differences in e-learning adoption concerning year of study (p= 0.002), time management (p= 0.030), high e-learning expectations (p= 0.001), confidence in using IT devices (p= <0.001), Prior experience in e-learning (p= 0.001), considering e-learning to be flexible (p= 0.006) and affordable internet (p= 0.005).

Table 2: Bivariate analysis of differences in e-learning adoption with learner and IT aspects

	Total	E-learning adoption		p-value
	Overall n = 109	**No (34.9%) n= (38)**	**Yes (65.1%) n=(71)**	
Sex				
Female	65 (59.6)	21 (32.3)	44 (67.7)	0.496
Male	44 (40.4)	17 (38.6)	27 (61.4)	
Age				
20-29 years	69 (63.3)	26 (37.7)	43 (62.3)	1.868
30-39 years	33 (30.3)	9 (27.3)	24 (72.7)	
40 and above	7 (6.4)	3 (42.9)	4 (57.1)	
Year of study				
One	63 (57.8)	14 (22.2)	49 (77.8)	0.002
Two	46 (42.2)	24 (52.2)	22 (47.8)	
Marital status				
In union	41 (37.6)	10 (24.4)	31 (75.6)	0.054
Not in union	68 (62.4)	28 (41.2)	39 (58.8)	
In COVID 19 management frontline				
No	52 (47.7)	19 (36.5)	33 (63.5)	0.807
Yes	57 (52.3)	19 (33.3)	38 (66.7)	
I manage time well				
No	37 (29.4)	18 (48.6)	19 (51.4)	0.030
Yes	72 (70.6)	20 (27.8)	52 (72.2)	
High expectations in e-learning				
No	9 (8.3)	8 (89.0)	1 (11.0)	0.001
Yes	100 (91.7)	30 (30.0)	70 (70.0)	
I feel confident using IT devices				
No	32 (29.4)	19 (59.4)	12 (40.6)	<0.001
Yes	77 (70.6)	19 (24.4)	59 (75.6)	
Prior experience in e-learning				
No	30 (27.5)	18 (60.0)	12(40.0)	0.001
Yes	79 (72.5)	20 (25.3)	59 (74.7)	
I consider e-learning to be flexible				
No	31(28.4)	17 (54.8)	14 (45.2)	0.006
Yes	78 (71.6)	21 (26.9)	57 (73.1)	
Affordable internet				
No	73 (67.0)	32 (43.8)	41 (56.2)	0.005
Yes	36 (33.0)	6 (16.7)	30 (83.3)	

Factors associated with adoption of e-learning at the unadjusted and adjusted analysis

Table 3 shows low odds of adoption of e-learning among participants in their first year of study (aOR, 0.34: 95%CI, 0.14-0.79), low e-learning expectations (aOR, 0.01: 95%CI, 0.01-0.34), no confidence in using IT devices (aOR, 0.16: 95%CI, 0.00-0.77), prior use of e-learning tools (aOR, 0.11: 95%CI, 0.02-0.68), not considering e-learning flexible (aOR, 0.25:95%CI, 0.08-0.86) high cost of internet (aOR, 0.13: 95%CI, 0.02-0.84).

Table 3: Factors associated with adoption of e-learning at unadjusted and adjusted analysis

Variable	**Binary Logistic Regression**			
	Unadjusted analysis		**Adjusted analysis**	
	OR	**95%CI**	**aOR**	**95%CI**
Sex				
Male	0.71	0.32-1.59	0.998	0.27-3.75
Female	1		1	
Year of study				
One	0.37	0.17-0.84	0.34	0.14-0.79*
Two	1		1	
I manage time well				
No	0.41	0.18-0.93	0.62	0.16-2.47
Yes	1		1	
I have high expectations in e- learning				
No	0.05	0.01-0.45	0.01	0.01-0.34*
Yes	1		1	
I feel confident using IT devices				
No	0.20	0.08-0.50	0.16	0.00-0.77*
Yes	1			
Prior experience in e-learning				
No	0.23	0.09-0.55	0.11	0.02-0.68*
Yes	1		1	
Consider e-learning to be flexible				
No	0.30	0.13-0.72	0.25	0.08-0.86*
Yes	1		1	
Affordable internet				
No	0.26	0.10-0.69	0.13	0.02-0.84*
Yes	1		1	

Note: Significance codes at 5% level: p<0.001***, p<0.01**, p<0.05*.

Discussion

This study focused on the predictors for adoption of e-learning as a way to foster continuity in learning during the lockdown at Clarke International University in Uganda. The data show that 65.1% of the continuing health professional students adopted e-learning. This finding is consistent with a recent finding in Ghana (14) where university students had a positive attitude towards e-learning during the lockdown. However, the rate of e-learning adoption in the current study was twice higher than in a recent study conducted at a university in Nigeria (32.5%) and five times higher in Uganda (14.4%) (15). The discrepancy could be attributed to the fact that the previous studies were conducted in Public Universities with high volume of students compared to the current study setting which is a private university with relatively low numbers of students that are health professionals. Our results suggest that universities' transition from face to face teaching to e-learning during the lockdown was not smooth as evident in a recent study (16). Accordingly, Universities in Uganda must develop strategies to ensure that all students continue to learn during the lockdown and beyond any unprecedented time.

Our study shows that, health professional students in their first year of study are less likely to adopt e-learning compared to those in second year. Though no study has directly linked e-learning adoption to year of study, a previous study (17) revealed that IT adoption in universities is incremental. This could probably imply that first year health professional students have not adequately utilized IT in education, so adopting any IT- based initiative such as e-learning would be slow paced compared to students in a higher year of study.

The current study revealed a low likelihood to adopt e-learning among health professional students with low e-learning expectations. This could be due to the low anticipation of what e-learning can contribute towards continuity of learning especially during such unprecedented times of coronavirus diseases 2019. This finding is consistent with (18) where adoption of e-learning was found to be dependent on student expectations. Additionally (19) argues that e-learning does not, *in itself*, result in improved educational outcomes, probably students were concerned about the teaching methodology and assessment hence hesitant to adopt e-learning.

Our finding that students with low confidence in using IT devices are less likely to adopt e-learning is not surprising. This is because e-learning is largely premised on IT. This argument is supported by (20) who found that one of the challenges of implementing e-learning in medical education was

issues related to IT information technology. This implies that IT improvement is an integral part to introducing e-learning in any academic institution.

Our data show that students with no prior e-learning experience are less likely to adopt e-learning. This can be explained by the fact that having prior e-learning experience exposes students to some level of online skills and a level of online system competency. This finding is consistent with a study in Saudi Arabia (21) where dental students' readiness to adopt e-learning was due to acceptable levels of online system competency. It is important to note that acceptability to adopt technology depends largely on prior use or recommendations from previous users (22). Therefore, it is imperative for universities in Uganda to adopt a blended learning for students in preparation for any unforeseen event such as Coronavirus diseases 2019.

We found that students who never considered e-learning a flexible way to study were less likely to adopt e-learning. This could be potentially attributed to the fact that these students had enrolled for the traditional face- to- face learning, therefore it would be impossible for them to envision the flexibility of an online education system they had never experienced. Though previous studies (23) have demonstrated flexibility as an additional fascinating feature of e-learning; emphasizing that a student can plan their time for completion of courses available virtually.

Our study revealed that participants who found the cost of the internet unaffordable were less likely to adopt e-learning during the lockdown. This finding was also not surprising based on the fact that the majority of e-learning is enabled by access to the internet. This finding is consistent with a previous study (24) where unreliable internet potentially affected student adoption of e-learning. This clearly implies that access to the internet is a necessary factor for students' successful adoption of e-learning. Though students in high-income countries had the ability to transition from traditional face- to- face education to e-learning during the Coronavirus diseases 2019 pandemic, students in low- and middle-income countries like Uganda, where access to the internet is not free, might struggle to fully adopt online education. This argument is also supported by another study (25). Therefore, it is imperative for universities to advocate for internet policy reforms to accelerate adoption to e-learning during the Coronavirus diseases 2019 pandemic and even beyond.

This study also confirms the applicability of TAM where students who have been introduced to new technology can accept and use it based on perceived easiness to use and flexibility.

Study strengths and limitations

Our study has strengths and limitations. Regarding the strength, to the best of our knowledge this study is among the first few studies that were conducted on adoption of e-learning among health professional students during lockdown in a private university in Uganda. The limitation is that the study setting has relatively low numbers of students, especially those that are health professionals. So the small sample size makes the findings limited to private universities.

Conclusions

Our study shows that predictors of e-learning adoption are year of study, high e-learning expectations, confidence in using IT devices, prior experience of e-learning, considering e-learning to be a flexible way to study and affordable internet. Our findings suggest a need to prepare students intending to engage in online learning on costs related to internet activity and internet bundles and offer ICT training to all potential e-learners for easy adoption.

List of abbreviations

aORs: Adjusted odds ratios

CI: Confidence Interval

CIU: Clarke International University

cORs: Crude odds ratios

E-learning: Electronic learning

ICTs: Information Communication Technologies

IT: Information Technology

NCHE: National Council for Higher Education

TAM: Technology Acceptance Model

SPSS: Statistical Package for the Social Sciences

Declarations

Consent for publications

Not applicable (Since no identity revealing information has been included in this study).

Ethics approval and consent to participate

Our study was reviewed and approved by the Clarke International University Research Ethics Committee (Reference No: CLARKE-2021-123) and the participants provided informed consent. I confirm that all methods performed were in accordance with relevant guidelines and regulations.

Data availability

The dataset for the current study is available and can be provided by the corresponding author upon reasonable request.

Conflicts of interest

All authors declare that there is no conflict of interest regarding the publication of this article.

Funding statement

Research reported in this publication was supported in part by the Fogarty International Center of the National Institutes of Health under Award Number 1R25TW011213. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

Author contributions

AK: Study conception and design. AK and FWG: Acquisition of data. AK: Analysis and interpretation of data. AK, FWG, HM and LR: Drafting of manuscript. AK, FWG and RCN: Critical revision. AK, FWG, HM, LR and RCN: Final approval of manuscript.

Acknowledgments

We thank Health Professional Education Partnership Initiative (HEPI) for the funding. We are indebted to Clarke International University Research Ethics Committee for the review and approval of the study protocol and the health professional students that participated in the study.

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