ORIGINAL RESEARCH

Uptake, Barriers, and Determinants of e-Learning Among University Students in Selected Low Income Countries in Sub-Saharan Africa Amidst the COVID-19 Disruption: An Online Survey

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Background: The Coronavirus pandemic has affected educational systems worldwide, leading to the widespread closure of schools in the affected countries with a phased reopening over time. The objective of this study was to determine the uptake, barriers, and determinants of e-learning among university students in Uganda and Nigeria following the COVID-19 disruption in 2020.

Methodology: A total of 240 respondents comprising University students participated in this survey. It was a cross-sectional descriptive study using a self-administered structured online questionnaire using Google documents. Data were analyzed using IBM SPSS v.21 with statistical significance set at $p<0.05$.

Results: The modal age group was 21–25 years at 128 (53.3%) participants, uptake of e-learning was 159 (66.3%). The majority of respondents used a smartphone (98.8%) for the internet, with WhatsApp platform (63.7%) as the most frequently used for e-learning. Barriers to e-learning, as self-reported by respondents, were the cost of internet services (82.1%), internet inaccessibility (68.8%), lack of institutional support (47.1%), and lack of training (40.8%). Determinants of e-learning were age ($p<0.001$) and sex ($p=0.026$).

Conclusion: Two thirds of the university students had ever been taught online before the lockdown. Barriers to e-learning were mainly the cost of internet services and internet inaccessibility. Age and sex of respondents were determinants of e-learning use among University students. It is recommended that students be trained and facilitated by the Universities to adopt e-learning effectively. Governments in sub-Saharan Africa and the relevant sectors in the economy should improve the ICT infrastructure, internet accessibility, and facilitate reduction in the cost of services.

Keywords: e-learning, university students, uptake, barriers, determinants, sub-Saharan Africa

Introduction

The Coronavirus pandemic has affected educational systems worldwide, leading to the widespread closure of schools in the affected countries. As of March 28, 2020, over 1.7 billion learners were out of school due to schools not being in session because of the pandemic. According to UNESCO monitoring, over 100 countries implemented a nationwide closure, impacting nearly 90% of the world's student population.[1,2] School closure does not only affect students, teachers, and families, but has far-reaching economic and societal consequences.[3,4] School closures in response to COVID-19 entailed various social and economic issues, including student debt,[5] digital learning,[6] food insecurity,[7] and homelessness,[8] as well as access to childcare,[9] healthcare,[10] housing,[11] internet,[12] and disability services.[13] Previous outbreaks of infectious diseases have prompted widespread school closure around the world with varying levels of consequences or effects.[14] The pandemic of the COVID-19 coronavirus has no

doubt led to not only the declining economy of countries worldwide, but has also caused travel restrictions and cancellations with prohibition of mass gatherings.

Globally, since 2019, the outbreak of coronavirus has disrupted human activities, compelling individuals to engage in social-distancing. This measure had a direct effect on face-to-face learning and teaching in higher education institutions. Recent studies by UNESCO reveal that an estimate of over 90% of the world's student's population due to the coronavirus pandemic response were forced to stay at home, affecting over 1.5 billion learners across the globe.[1] This necessitated the adoption of e-learning by various institutions worldwide as an alternative method to pedagogy.[1,7]

The e-learning approach to both learning and teaching, which is an intricate information technology (IT) system does not focus only on pedagogical approaches to teaching and learning, but also comprises student's assessment, logistics, feedback, institutional administration, audit, communication, and quality assurance.[16] Kauta et al argue that the rate of online education uptakes in sub-Saharan Africa universities is still very low in spite of the general worldwide trend of the growth of students' enrollment in online courses over the past 15 years.[15,21] However, most of the universities in sub-Saharan Africa prioritized a face-to face mode of teaching and learning.

Against this backdrop, the objective of this study is to determine the uptake, barriers, and determinants of e-learning among University students in Uganda, Nigeria, and Kenya during the COVID-19 disruption in 2020.

Methodology
Study Area
Researchers in this study are based in Uganda. However, online questionnaires were distributed primarily via the WhatsApp platform to students in various Universities in Uganda, Nigeria, and Kenya.

Study Design
A cross-sectional descriptive survey was done.

Study Population
Students for this survey comprised undergraduate and postgraduate students drawn from Universities in Uganda (Islamic University in Uganda, Kampala International University, Cavendish University, and Victoria University), Nigeria (Delta State University, Ahmadu Bello University, and University of Abuja), and Kenya (Mount Kenya University) through respective student WhatsApp chat groups.

Study Duration
The study took place within 2 months (April–May, 2020).

Sampling Technique
Respondents were recruited for the survey using a snowball sampling approach. First, a list of WhatsApp groups comprising students of the health sciences from universities in Uganda, Nigeria, and Kenya were selected by the researchers. Then, the online questionnaire was shared to these WhatsApp groups and participants in the respective groups were encouraged to share with other WhatsApp groups comprising their University students. The Google document link was formally closed 4 weeks after it was opened for the survey.

Sample Size Determination
Two hundred and forty students participated in this online survey.

Data Collection
Data was collected over a 4-week period using a self-administered structured online questionnaire created using Google documents with sections for demographic characteristics, knowledge of e-learning, attitude towards e-learning, and

practice of e-learning by the students. Practice of e-learning was determined by two questions "have you ever been taught using e-learning modalities?" and "have you been taught using e-learning modalities in the last 1 month?"

Data Analysis

Data was retrieved as filled in real time on google documents, transferred to Microsoft excel spreadsheets, and analyzed using the IBM SPSS version 21 statistical software. Descriptive analysis was done in counts, frequencies, and proportions with the use of statements, tables, and figures. Inferential statistics was done using the chi-square test of association and logistic regression analysis for predictors of practice of e-learning by students. Statistical significance was set at $p<0.05$.

Ethical Consideration

Ethical approval for this study was obtained from the Research and Ethics Committee of the Islamic University in Uganda. Permission was sought from participants in order to fill the questionnaire. Questionnaires were submitted anonymously with no distinct identifiers. It is assumed that only individuals that consented to the study filled in the online questionnaire.

Results

Table 1 shows the demographic characteristics of respondents. The modal age group was 21–25 years (128; 53.3%), the higher proportion of respondents were male (156; 65.0%), with the highest proportion of students in the survey being Bachelor students (187; 77.9%).

Table 2 shows the perception of university students towards e-learning. The majority of the respondents (177; 77.3%) agreed that students need to be trained before they undergo any e-learning activity. The majority of the respondents (68.0%) agreed that there are more opportunities to create own knowledge in e-learning. Most respondents (154; 64.2%) agreed that e-learning assures schedule flexibility. Most of the respondents (61.7%) agreed to finding information actively in the e-learning environment. About half of the respondents (55.9%) agreed that an e-learning environment improves thinking skills. About half of the respondents (124; 51.4%) agreed that e-learning reduces students' educational cost. Less than half of the respondents (47.1%) agreed to having freedom of expression during the e-learning classes. Less than half of the respondents (43.4%) agreed that the e-learning environment enhances problem-solving skills. Less than half of the respondents (42.9%) agreed that there is effective communication between the instructor and the students with the help of e-learning.

Table 1 Socio-Demographic Characteristics of Respondents (n=240)

Variable	Frequency	Percent
Age (in years)		
<20	34	14.2
21–25	128	53.3
26–30	50	20.8
31–35	13	5.4
≥36	15	6.3
Sex		
Male	156	65.0
Female	84	35.0
Student Status		
PhD	3	1.3
Masters	17	7.1
Bachelor	187	77.9
Diploma and Certificate	33	13.8

Table 2 Perception of University Students Towards e-Learning

|	Disagree		Neutral		Agree	
	n	(%)	n	(%)	n	(%)
1.E-learning assures schedule flexibility	31	(12.9)	55	(22.9)	154	(64.2)
2.E-learning reduces students' educational cost	60	(25.0)	56	(23.3)	124	(51.7)
3.Students need to be trained before they undergo any e-learning activity	30	(12.6)	33	(10.1)	177	(77.3)
4.There is effective communication between the instructor and the students with the help of e-learning	92	(38.3)	45	(18.8)	103	(42.9)
5.Finding information actively in the e-learning environment	33	(13.8)	59	(24.6)	144	(61.7)
6.The e-learning environment improves thinking skills	51	(21.3)	55	(22.8)	134	(55.9)
7.The e-learning environment enhances problem-solving skills	62	(25.9)	74	(30.7)	104	(43.4)
8.There are more opportunities to create own knowledge in the e-learning environment	26	(10.8)	51	(21.2)	163	(68.0)
9.Having freedom of expression during the e-learning classes	73	(30.4)	54	(22.5)	113	(47.1)

Figure 1 is a bar chart describing the expectation of respondents on what they consider e-learning as namely interactive sessions online (78.8%), receiving teaching materials via e-mail (65.4%), using internet search engines (58.8%), and receiving pre-recorded materials online (47.1%).

Figure 2 is a bar chart showing the self-reported barriers to e-learning by respondents. The majority of respondents (165; 82.1%) saw the cost of the internet as a barrier to e-learning; this was followed by internet inaccessibility (68.8%), lack of institutional support (47.1%), and lack of training (40.8%).

Table 3 shows the ICT and e-learning characteristics of respondents. With regard to frequency of internet use, the majority of the respondents used the internet daily (200; 83.3%). The majority of respondents used a smartphone (98.8%) to access the internet, followed by a laptop (30.0%). The highest proportion of respondents used WhatsApp (63.7%), followed by Zoom (45.6%), then e-mail (42.1%) as an e-learning platform.

Less than half of the respondents (42.5%) had been trained on the use of e-learning, two thirds of the respondents (66.3%) had been taught online, while a little above half of the respondents (53.3%) had been taught within the month preceding the survey.

Table 4 depicts the demographic characteristics and uptake of e-learning by respondents. There was an association between the age of respondents and being taught online (*p*<0.001). Proportionally, more of the respondents aged 16–20 years (82.4%) reported being taught online. With regard to sex and e-learning, proportionally more females (63.1%)
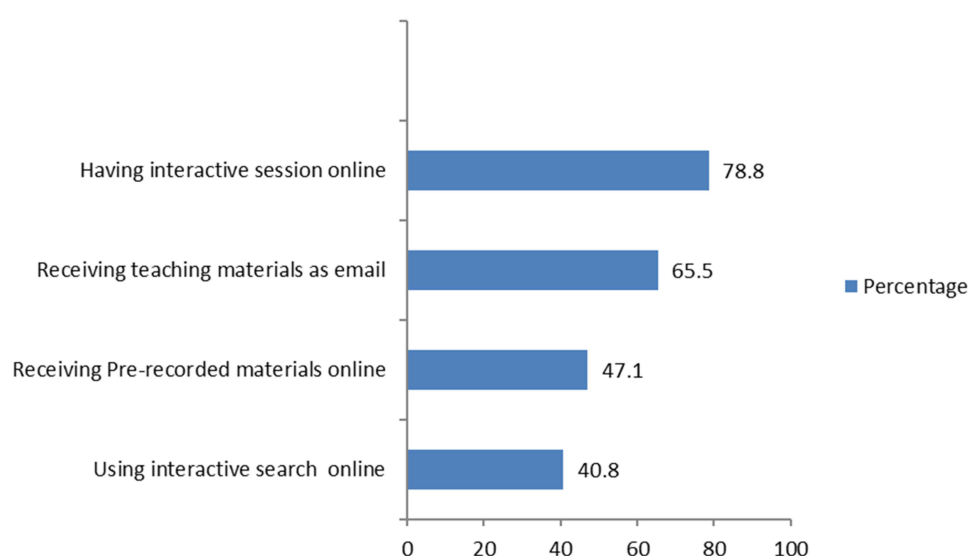
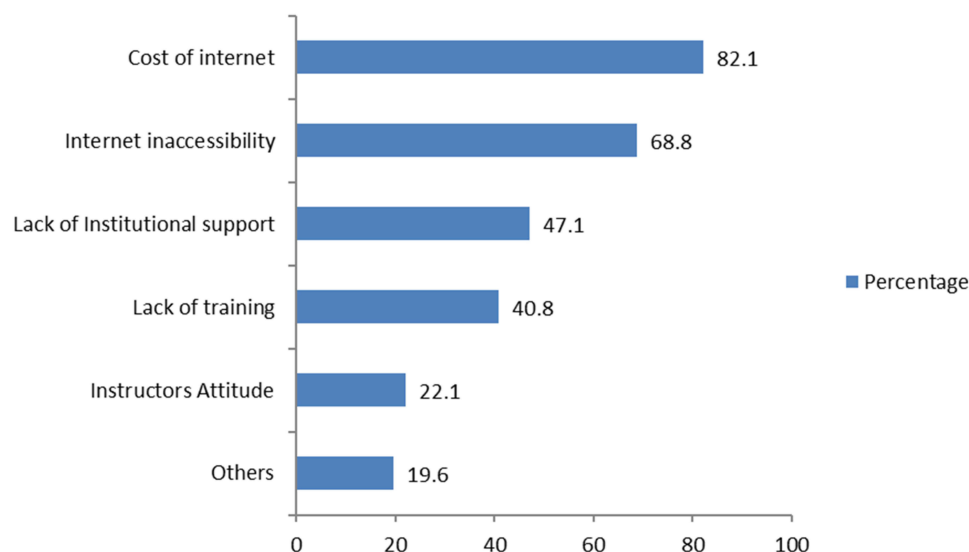**Figure 1** Expectations of students on what is considered e-learning.

Figure 2 Self-reported barriers to e-learning.

reported being taught online, and this was statistically significant (p=0.026). However, there was no association between student status and being taught online (p=0.217), even though, proportionally, more Master's students (76.5%) reported being taught online.

Table 3 ICT and e-Learning Characteristics of Respondents (n=240)

Variable	Frequency	Percent
Frequency of internet use		
Daily	200	83.3
Weekly	30	12.5
Monthly	10	4.2
Device frequently used for accessing the internet*		
Smart phone	237	98.8
Laptop	72	30.0
Tablet/i-Pad	34	14.2
Desktop	19	7.9
E-learning platforms frequently used*		
WhatsApp	153	63.7
Zoom	110	45.6
E-mail	101	42.1
Google class	74	30.8
Skype	27	11.3
Others	45	18.7
Ever had training on e-learning		
Yes	102	42.5
No	138	57.5
Ever been taught online		
No	81	33.7
Taught online in the last month		
Yes	128	53.3
No	112	46.7

Note: *Multiple response.

Table 4 Demographic Characteristics of the Respondents and Uptake of e-Learning by Respondents

Variable	Not Ever Been Taught Online		χ^2	p-value
	No (n=112)	Yes (n=128)		
	Frequency (%)	Frequency (%)		
Age group (years)				
16–20	6 (17.6)	28 (82.4)	21.770	**<0.001**
21–25	61 (47.7)	67 (52.3)		
26–30	34 (68.0)	16 (32.0)		
31–35	6 (46.2)	7 (53.8)		
36 and above	5 (33.3)	10 (66.7)		
Sex				
Female	31 (36.9)	53 (63.1)	4.948	**0.026**
Male	81 (51.9)	75 (48.1)		
Student Status				
Diploma/Certificate	17 (51.5)	16 (48.5)	Fisher's	0.217
Degree	90 (48.1)	97 (51.9)	Exact	
Masters	4 (23.5)	13 (76.5)		
PHD	1 (33.3)	2 (66.7)		

Note: Statistically significant at p<0.05.

Discussion

The lockdown necessitated by the COVID-19 pandemic for a period kept the vast majority of students in primary, secondary, and tertiary institutions indoors and unable to attend school conventionally. This distorted several academic school calendars, except for those institutions that had already mainstreamed online teaching and learning into their curriculum. Such institutions had minimal disruption of academic activities during the lockdown, unlike several universities in sub-Saharan Africa that were adversely affected. For most Universities in sub-Saharan Africa the lockdown was especially problematic.

This online survey was carried out at the peak of the COVID-19 lockdown in most countries across the globe between April and May 2020. The present study highlights the uptake, barriers, and determinants of the adoption of e-learning among University students drawn online, especially from Uganda, Kenya, and Nigeria.

e-Learning is learning utilizing electronic technologies to access educational curriculum outside of a traditional classroom. It refers to a course, program, or degree delivered completely online.

If one wishes to improve the quality of the student experience online, addressing student perceptions about what the e-learning experience involves and how it can be useful for learning is essential.[17] The majority of the respondents agreed that students needed special training regarding the adoption of e-learning. A critical observation by the students was the need for deliberate training on e-learning for them by their host institution. Luis Borges Gouveia in his seminal piece "Emergent Skills in Higher Education: The Quest for Emotion and Virtual University" highlighted individual skills necessary for society to include the *ability to perform*, *work capacity*, flexibility, being a *self-learner*, *reporting: creative*, *collaborative*, *information* sharing, *representing information*, and *information proactivity*.[18] Focused training will enhance these skills among students in higher institutions.

Respondents were also of the opinion that e-learning provides opportunities for students to create their own learning. This attitude helps foster a student-centered approach to teaching and learning that are necessary in training them to be global citizens. The acceptance of schedule flexibility that e-learning assures, as acknowledged by these students, provides an opportunity in subsequent modification in curriculum design and implementation in various universities.

With regards to the understanding among university students of what e-learning is, having lectures online and receiving teaching materials were the modalities students majorly considered as e-learning. There was, however, a notable deficit seen in the students' understanding of what e-learning entailed as they had a very narrow view by

asserting that the two main ways of being taught was having lectures online and being sent informational materials by email. It is thus necessary to educate these students on the broad scope of e-learning and introduce them to the further concept of blended learning, student's assessment, logistics, feedback, institutional administration, audit, communication, and quality assurance achievable using such innovate technologies.[16] The fact that e-learning could either be synchronous or asynchronous should also be discussed. Platforms that enhance e-learning such as Zoom, Moodle, Google classroom, Microsoft Teams, etc., should be effectively used by these students and their teachers. As observed in this survey, University students already have ICT characteristics that favor a high uptake of e-learning, such as ownership of internet enabled smartphones and a high frequency of internet use. The present study shows that the platforms used by these students, in order of reducing frequency, were WhatsApp, Zoom, and e-mail, respectively.

Barriers to e-learning highlighted in this survey included cost of internet services, internet accessibility, lack of institutional support, and lack of training. The leading barriers were all factors external to the student. Therefore, for e-learning to succeed in a university, there is the need to improve ICT infrastructure in the institution. Ellis et al[17] noted four underlying factors, namely e-teaching, design, workload, and interactivity, as important aspects in research into the most meaningful aspects of e-learning when it is used to support students in a predominantly face-to-face experience.

Education researchers have signposted four levels of literacy, namely *basic literacy* (to read and write and to use the language), *technological literacy* (to use and take advantage of IC.T, in particular the computer) *information literacy* (how to use information systematically and develop critical use of information), and *communication literacy* (necessary skills related to human communication and leadership).[19] E-learning enhances all four.

Two-thirds of the respondents (66.3%) had ever been taught online while a little above half of the respondents (53.3%) had been taught within the month preceding the survey. This survey occurred at the peak of the COVID-19 lockdown across the globe (April and May 2020) and is a veritable source of data on how students were engaged academically during this period of lockdown. It reinforces the need by respective Universities to improve facilitation and coverage of e-learning modalities to their students since the University management remains the prime drivers of the implementation of such a policy.

This study showed an association between age, sex of respondents, and uptake of e-learning. This was similar to the findings by Alipio among 880 students in the Philippines[20] who in addition included socioeconomic status and living area as other significant factors influencing adoption of e-learning during the COVID-19 disruption.

With regards to determinants of use of e-learning, this study found that being younger and being female was associated with higher use of e-learning modalities. The younger students would most likely be willing to explore and try out innovative new technologies in ICT when compared with the older students at the higher education level. Proportionally, more of the younger and paradoxically the older students were involved with e-learning compared to the other age groups. The younger students are at an advantage of adapting to the internet enabled life style because of the manner in which the social media and internet modalities have become pervasive. This could explain their familiarity with these ICT and e-learning modalities. In the older students, however, it might result from the curricular demand of engaging in distant learning programs which they might be involved with as undergraduate or postgraduate students. This becomes imperative, especially if they are already employed or in entrepreneurship, in which case the typical Monday to Friday brick and mortar arrangement of a regular University classroom might be inappropriate for them, thus e-learning improves the opportunity for student involvement at higher education. It is interesting to note in this study that, relative to the males, proportionally more females were more likely to adapt to e-learning. This might speak to their more avid use of social media. However, there was no such association seen between the student status and their uptake of e-learning.

Limitations to this study include the fact that participants with a poor practice of e-learning might have been reluctant to fill in the questionnaire, while those with good practice might likewise have been eager to fill in the online questionnaire (respondents individual bias towards the subject of research). Mainly, the respondents recruited in this survey were from the health science faculties in their respective universities, reflecting the faculty of most of the survey investigators. Thus, the initial WhatsApp groups where the questionnaire was sent comprised mainly students of the health sciences, thereby limiting the disciplinary diversity of students recruited in this study. Also, due to our sampling method (snowball sampling) researchers were only aware of the universities of the initial respondents from the primary

WhatsApp groups to which survey instruments were shared and could not ascertain the ultimate scope of spread of the online questionnaire to students in other universities in sub-Saharan Africa. Ultimately, it was difficult to accurately establish the denominator from which the respondents in this study were derived. Although the sample size for this survey limits the generalizability of its findings, the researchers acknowledge that this study will give relevant insight on the subject of e-learning in the target population with its implication for educational policy and programming in the respective countries.

Conclusion

While two thirds of the university students had ever been taught online, just about half of them reported being taught online within the month preceding this survey. Barriers to e-learning among university students included the cost of internet services, internet accessibility, lack of institutional support, and lack of training. The majority of respondents accessed the internet through their smartphones, with WhatsApp being the predominant e-learning platform among University students. Age (being younger) and sex (being female) of respondents was associated with the adoption of e-learning by University students.

Recommendations

University students should be trained on e-learning and facilitated by their respective Institutions in order to live the internet enabled academic lifestyle that they are willing to adopt, as present evidence on students' perception shows. In view of the opportunity for innovation that the COVID-19 pandemic has provided, Universities in sub-Saharan Africa should keenly adopt e-learning modalities and train their lecturers to do the same in order to improve educational opportunities, in scale and coverage, to their students. Governments in respective countries and the relevant sectors in the economy should improve ICT infrastructure, improve internet accessibility, and facilitate reduction in the cost of services, knowing its implication for the educational sector, human capacity development, and national productivity.

Disclosure

The authors report no conflicts of interest in relation to this work.

References

1. UNESCO. COVID-19 educational disruption and response; 2020.
2. Murphy MPA. COVID-19 and emergencye-learning: consequences of the securitization of higher education for post-pandemic pedagogy. *Contemp Secur Policy.* 2020;41(3):492–505. doi:10.1080/13523260.2020.1761749
3. Owusu-Fordjour C, Koomson CK, Hanson D. The impact of COVID-19 on learning. *Eur J Educ Stud.* 2020;7(3):88–101. doi:10.5281/zenodo.3753586
4. Gonzalez T, de la Rubia MA, Hincz KP, et al. Influence of COVID-19 confinement in students' performance in higher education. *arXiv.* 2020:1–25. doi:10.35542/osf.io/9zuac
5. Jamerson K, Josh M, Joshua B. *Student-Loan Debt Relief Offers Support To An Economy Battered By Coronavirus.* Wall Street Journal; 2020:99–106.
6. Karp P, McGowan M. Clear as mud: schools ask for e-learning help as coronavirus policy confusion persists. *The Guardian.* 2020;1:261–307.
7. Cecco L. Schools race to feed students amid coronavirus closures; 2020. Available from: https://www.npr.org/. Accessed June 1, 2022.
8. Ngumbi E. *Coronavirus Closings: Are Colleges Helping Their Foreign, Homeless and Poor Students?* USA Today; 2020:11–14.
9. Belinda L. *Coronavirus Forces Families to Make Painful Childcare Decisions.* Time; 2020:88–93.
10. Feuer W. *WHO Officials Warn Health Systems are 'Collapsing' Under Coronavirus: 'This Isn't Just a Bad Flu Season.* CNBC; 2020:3–23.
11. Barrett S. *Coronavirus on Campus: College Students Scramble to Solve Food Insecurity And Housing Challenges.* CNBC; 2020.
12. Jordan C. *Coronavirus Outbreak Shining an Even Brighter Light on Internetdisparities in Rural America.* The Hill; 2020.
13. Alex W. National public radio news. Retrieved from national public radionews website; 2020. Available from: https://www.npr.org/sections/coronavirus-live-updates. Accessed June 1, 2022.
14. Simon M. CNN. Retrieved from CNN web site; 2020. Available from: https://fox40.com/news/coronavirus/. Accessed June 1, 2022.
15. Kotouaa S, Ilkana M, Kilicb H. The growing of online education in Sub Saharan Africa: case Study Ghana. *Procedia.* 2015;191:2406–2411. doi:10.1016/j.sbspro.2015.04.670
16. Baig QA, Jaffar S, Zaidi A, Alam BF. Perceptions of dental faculty and students of E-learning and its application in a public sector Dental College in Karachi, Pakistan; 2019:1319–1324.
17. Ellis RA, Ginns P, Piggott L. E-learning in higher education: some key aspects and their relationship to approaches to study. *High Educ Res Dev.* 2009;28(3):303–318. doi:10.1080/07294360902839909

18. Gouveia L. Emergent skills in higher education: the quest for emotion and virtual university. In: Preston D, Nguyen T, editors. *Virtuality and Education. A Reader*. Oxford, United Kingdom: Inter-Disciplinary Press. Publishing Creative Research. e-book. ISBN: 1-904710-10-7; 2004:14–18.

19. Preston DS. Contemporary issues in education. Vol 22; 2005. Available from: http://repositorio.unan.edu.ni/2986/1/5624.pdf. Accessed June 1, 2022.

20. Alipio M. Education during Covid-19 era: are learners in a less-economically developed country ready for E-Learning? *SSRN Electron J*. 2020. doi:10.2139/ssrn.3586311

21. Watson J, Pape L, Murin A, Gemin B, Vashaw L. *Keeping Pace with K-12 Digital Learning: An Annual Review of Policy and Practice*. Durango, CO: Evergreen Education Group; 2014.