

An Outbreak of Online Learning in the COVID-19 Outbreak in Sub-Saharan Africa: Prospects and Challenges

Michael Agyemang Adarkwah¹

¹ Southwest University

Received: 13 June 2021 Accepted: 4 July 2021 Published: 15 July 2021

Abstract

The COVID-19 outbreak stimulated an outbreak of online learning in many institutions in Sub-Saharan Africa. Educational institutions went beyond fighting the COVID-19 through social distancing norms to tackling Sustainable Development Goal Four (SDG 4) with the adoption of online learning as the new modality for instruction. Online learning has the propensity to ensure learners from all geographical regions have access to education, thereby addressing the inequalities in education. However, the disparities in the access to digital infrastructure had a negative impact on the online instruction in Sub-Saharan Africa. The online learning experience is best described as a 'challenge-ridden online learning' with many teachers suffering from burnout and students lamenting on limited ICT resources, inadequate access to affordable and reliable internet, power outages, and anxiety over academic outcomes. Despite the challenges, the COVID-19 has presented a silver lining to online learning in Sub-Saharan Africa. Aside the attempt to massify online learning, many institutions have come up with novel technological innovations and inventions to bridge the digital divide in the region. The review gives an overview of the challenges, prospects, and practical implications of online learning in Sub-Saharan Africa.

Index terms— online learning, e-learning, distance education, COVID-19, sub-saharan africa

1 Introduction

As at January 2021, the world is still suffering from the unprecedented threat of the COVID-19 pandemic even in the prospect of a potent vaccine (Kwok, et al., 2021; Lovelace, 2020; Mahase, 2020). The novel coronavirus, SARS-CoV-2, also known as the COVID-19 was first identified in Wuhan City of China in the latter part of December 2019 (Chen, et al., 2020; Karasmanak & Tsantopoulos, 2021). Since its declaration as a global pandemic on March 11, 2020 (WHO, 2020b), the COVID-19 crisis has threatened healthy lives, the world economy, and the education sector (Goyal, Daipuria, & Jain, 2020; Pan & Zhang, 2020). The global disruption in education as a result of the COVID-19 pandemic rendered the traditional face-to-face (F2F) learning not only impractical but also unlawful (Meulenbroeks, 2020). In an effort to reduce the spread of the virus and abide by the health protocols from the synchronous F2F learning to synchronous and asynchronous online learning (Aguilera-Hermida, 2020; Azu, Adegboye, & Quadri, 2020; Bacher-Hicks, Goodman, & Mulhern, 2021; Lorusso & Shumskaya, 2020). The sudden closure of schools in 188 countries worldwide impacted over 91% of the student population in the world (UNESCO, 2020). The COVID-19 outbreak has therefore triggered the current online learning outbreak (Wotto, 2020). However, learners have expressed distress in their online learning experience across the globe (Aguilera-Hermida, 2020; Bhagat & Kim, 2020; Meulenbroeks, 2020). Zhong (2020) mentioned that the COVID-19 pandemic has exposed the digital divide in education confronting most countries. The digital divide in Sub-Saharan Africa is a threat to the Sustainable Development Goal Four (SDG 4) and the No Child Left Behind Act (NCLB) (Spanbauer, 2020). Preez & Grange (2020) mentioned that only a third of the population in Africa

43 have access to broadband connectivity. The unique effect of the COVID-19 crisis on the education system in
44 Sub-Saharan Africa is worth writing about (Adarkwah, 2020; Anifowoshe, Aborode, Ayodele, Ireiyayo, & David,
45 2020; Azu, Adegboye, & Quadri, 2020). Over the years, majority of developing countries have become accustomed
46 to F2F mode of learning where students attend lectures in constructed lecture halls (Bans-Akutey, 2020). Online
47 learning is a challenge and not effective in Sub-Saharan Africa as compared to the West (Kizilcec & Halawa,
48 2015). This is because online learning thrives on ICT resources (Adarkwah, 2020) which have not significantly
49 evolved in Sub-Saharan Africa (Ilonga, Ashipala, & Tomas, 2020). The absence of ICT resources has affected the
50 growth of low-income countries in the context of education (Yaw Asabere, Agyiri & Nachanja, 2020). Muftahu
51 (2020) asserted that universities in Africa are still faced with unique challenges such as the provision of ICT
52 gadgets/services (laptops and internet access) to learners who lack ICT resources, resistance to online learning
53 by students and academic staff, and lack of ICT literate skills of users. He added that the COVID-19 crisis has
54 stretch higher education institutions beyond their limits. At the same time, the COVID-19 pandemic can be
55 a catalyst for a positive change in the educational system of schools in Sub-Saharan Africa through innovative
56 ways of instruction and learning (Adarkwah, 2020; Bans-Akutey, 2020; Muftahu, 2020; Yaw Asabere, Agyiri, &
57 Nachanja, 2020). This essay adds to the conversations on the impact of COVID-19 on education. Specifically,
58 it focuses on the prospects and challenges of online learning in Sub-Saharan Africa as a result of the COVID-19
59 crisis to inform policymakers, educators, and researchers on the future of education in Sub-Saharan Africa.

60 2 II.

61 3 History of Online Learning

62 Wong (2020) defines online learning as a form of education that occurs on the internet whether synchronously
63 or asynchronously. Scholars conceptualize online learning to mean e-learning/online teaching/blended learn-
64 ing/remote learning/distance education (Adarkwah, 2020; Aguilera-Hermida, 2020). Online learning is not a
65 new approach to instruction (De Freitas, Morgan, & Gibson, 2015). Paul & Jefferson (2019) reports that the
66 earliest distance education program begun in the mid-1800s by the University of London. In 1873, the "Society to
67 Encourage Home Studies" was established in Boston, Massachusetts as the first official correspondence school in
68 the United States of America. The World Wide Web (WWW) was unveiled in 1991, and the University of Phoenix
69 became one of the pioneers in online education (Kentnor, 2015). Early online mode of instruction started by 1994
70 and was followed up with content and learning management systems including WebCT, Blackboard, and Moodle.
71 However, De Freitas et al. (2015) reports that these virtual learning environment were not pedagogically driven
72 tools but served as depositories for digital content. The earliest learning environment that was totally different
73 from the traditional F2F modality of instruction was Fathom.com which was first initiated in 2000 and led
74 by Columbia University. Yet, it was faced with technical issues such as broadband connectivity and instructors
75 lacked the motivation for pedagogical change. Hence, its establishment as a learning tool worldwide was hindered.
76 MIT Open Course Ware programme emerged around the same time in 1999 to provide web-based education to
77 students. Online learning gained it impetus in 2002 when 50 courses were published online by the MIT, and
78 was followed by the UNESCO's initiative of "open educational resources" to provide universal education for all
79 humanity. The MIT published 2150 courses by 2012 and recorded a visit of 127 million. Since then online
80 learning has been recognized as a mainstream and not a trend.

81 In Sub-Saharan Africa, the World Bank in its quest to advance cyber education established the first online
82 university in 1996 (Kotouaa, Ilkan, & Kilic, 2015). The university had its headquarters in Kenya but was
83 established in Ethiopia together with six other African Uganda. This online university operated from the
84 University of Kenyatta. The mode of delivery was through satellite broadcast in the form of videos, MPEG
85 4, and email conversations between lecturers and students. The principal objective of this online university was
86 to enhance the quality of education in Africa. The university targeted secondary school leavers and the working
87 class who could not enter university because of limited spaces. Initially, the courses that were taught were
88 business, science, and engineering. Since its inception, a lot of courses have been added. The only fully online
89 universities in Sub-Saharan Africa are African Virtual University (AVU), Kenyatta Digital School of Virtual
90 Learning, and University of Rwanda e-learning platform.

91 However, Sub-Saharan Africa faced insurmountable challenges ensuring massification of online learning and is
92 unable to achieve participation rates like in Europe and in North America (Trines, 2018). Despite the technological
93 barriers, current trends suggest there is an improvement in the massification of online learning in Sub-Saharan
94 Africa. Online Learning in Sub-Saharan Africa During COVID-19 Pre-pandemic instruction in most educational
95 institutions required both teachers and students to be physically present in a classroom for the purposes of
96 teaching, examinations, thesis defense, and seminars in Sub-Saharan Africa. Oyediran et al.

97 (2020) acknowledged that there is a pervasive crisis in the teaching and learning development systems in
98 Sub-Saharan Africa and this problem was compounded by the COVID-19 pandemic. The closure of schools as
99 a result of the COVID-19 crisis revealed how educational institutions adapt to meet the needs of students and
100 education staff (Muftahu, 2020). Most educational institutions in Africa joined the league of developed countries
101 by migrating to the online modality of instruction to ensure lifelong education (Adarkwah, 2020; Agormedah,
102 Henaku, Ayite, & Ansah, 2020). Thus, the COVID-19 stimulated the appetite of most African institutions for
103 coming up with educational innovations to counteract the disruption in education (Mukute, Francis, Burt, &

104 Ben, 2020). Diverse delivery of instruction were adopted including web-based learning, e-learning platforms, CD-
105 ROMS, television, radio, emails, and SMS services (Azu, Adegboye, & Quadri, 2020; Mulenga & Marbán, 2020;
106 Tadesse & Muluye, 2020). According to Tadesse & Muluye (2020), only 11% of countries in Sub-Saharan African
107 provided solely online learning mode of instruction while 23% of countries provided a blend of broadcast and
108 online learning. Also, since the transition to the online modality was emergent, most institutions couldn't provide
109 training to their teachers and students were not adequately oriented (Adarkwah, 2020; Tadesse & Muluye, 2020).
110 In some countries, instruction was delivered using social media applications like Facebook, Skype, WhatsApp,
111 and Wechat (Sintema E. J., 2020; Tadesse & Muluye, 2020). However, Gangwar & Bassett (2020) in their
112 report published by the World Bank suggests that the sudden transition from F2F to online exposed the digital
113 divide in tertiary institutions in Sub-Saharan Africa. In most African countries, learners from rich socioeconomic
114 households had more access to quality online learning experience than their counterparts from poor households
115 due to limited resources (Adarkwah, 2020; Azu, Adegboye, & Quadri, 2020). Thus, the digital divide resulted in
116 inequality in the access of online learning platforms. For Example, in Ethiopia, over 80% of the student population
117 is estimated to live in the rural areas with limited access making it difficult for such students to access radio and
118 television contents (Tadesse & Muluye, 2020). The same authors revealed that about 56 million of students in
119 Sub-Saharan Africa do not have access to mobile networks. Ethiopia and other Sub-Saharan African countries
120 (Mali, Niger, Senegal, Ghana, Nigeria, Malawi, Zambia, Uganda, Kenya etc.) have partnered with National
121 Research and Education Networks (NRENs) to promote internet connectivity in the region but this goal is yet to
122 be realized (see Fig. 2). Also, since e-learning is focused mainly in higher education, school children became the
123 most vulnerable in adopting the sudden shift to the online mode of instruction (Sintema E. J., 2020). Parents
124 and caregivers therefore had a unique duty to help school children to study online at home (Abdullahi, Sirajo,
125 Saidu, & Bello, 2020). Students with parents who had no formal education or background in online learning
126 had to navigate their own path to study. In some countries, such as Ghana, some educational institutions tried
127 to bridge the inequality in access to elearning platforms by the provision of data bundle incentives to students
128 but this was not enough (Adarkwah, 2020). Tadesse & Muluye (2020) reported that some schools also provided
129 textbooks, study guides, radios and other equipment to students coming from poor homes. Some insitutions also
130 considered setting up virtual laboratories for students who needed to do experiments where feasible (Gangwar &
131 Bassett, 2020). Electronic libraries also made it possible for some schools to engage their students in academic
132 work during the lockdown (Ladan, Haruna, & Madu, 2020). Schools in Sub-Saharan Africa are more vulnerable
133 as a result of the COVID-19 pandemic (Muftahu, 2020). Most educational institutions are comfortable with the
134 traditional onsite instruction and are not accustomed to the online modality of instruction (Bans-Akutey, 2020).
135 Some higher education and colleges are also now in the process of transforming and improving and the COVID-
136 19 crisis has threatened this vision (Muftahu, 2020). The emergence of online learning seemed to be the only
137 solution for schools but its emergent adoption has resulted in myriads of challenges (Abdullahi, Sirajo, Saidu,
138 & Bello, 2020; Aboagye, 2020; Adarkwah, 2020; Bhagat & Kim, 2020; Mukute, Francis, Burt, & Ben, 2020).
139 For example, in Ghana the National Union of Ghana Students (NUGS) referred to the online instruction as a
140 "challenge-ridden online learning" (Adarkwah, 2020). The exceptional challenges emanating from the COVID-19
141 pandemic involves all stakeholders in education (administrators, teachers, students, parents) who are required
142 to do unexpected things relating to online instruction if education will continue (Agormedah, Henaku, Ayite,
143 & Ansah, 2020). According to the authors, educators are not adequately prepared to teach with technology,
144 let alone to use technology for remote teaching. Some of the recurring challenges pertinent to all Sub-Saharan
145 African countries and identified in literature during the COVID-19 pandemic are discussed below;

146 ICT infrastructure/tools: In his qualitative study, Adarkwah (2020) revealed that one of the main barriers
147 to tertiary students engaged in online learning in Ghana was limited ICT resources/facilities. Nigeria also
148 experienced the challenge of procuring ICT hardware to power online instruction in the country (Oyediran et al.,
149 2020). The authors mentioned that ICT facilities in schools are ill-equipped to foster e-learning. There was no
150 supply of ICT tools such as computers or phones for schools to foster online learning in Kenya (Ngari & Ndung'u,
151 2020).Mabeya (2020) added that the lack of supportive structure in Kenya served as a hindrance to children in
152 the access of online content. Students in poor homes also lacked digital tools for accessing study materials and
153 the online instruction in Ethiopia (Mengistie, 2020).

154 4 Lack of Funding:

155 The negative impact of the COVID-19 on the economy of most African countries affected the supply of funds to
156 many institutions (Muftahu, 2020). Limited funding can hinder institutions from hosting online instruction since
157 money would be needed to purchase and maintain ICT gadgets (Adarkwah, 2020). Some institutions were forced
158 to seek for alternative funding because of limited financial support from the government in Ethiopia (Tamrat,
159 2020). The lack of financial capacity of some schools has hindered their successful transition from traditional
160 onsite instruction to online instruction (Azu, Adegboye, & Quadri, 2020).

161 Internet Access: In Ghana, teachers and students lacked access to digital devices and high-speed broadband
162 (Aboagye, 2020; Adarkwah, 2020; Agormedah, Henaku, Ayite, & Ansah, 2020). Students in Nigeria also
163 complained about insufficient data bundle to access their online classes (Abdullahi, Sirajo, Saidu, & Bello,
164 2020). The implementation of online learning in Ethiopia became a hurdle because of the high cost of internet
165 (Mengistie, 2020). Belay (2020) reported large inequalities in the access of radio and TV services meant for

7 PRACTICAL IMPLICATIONS

166 digital instruction and also internet for webbased learning. Electricity Supply: Rural students are often faced
167 with power outages and limited supply of electricity (Adarkwah, 2020). Students who use mobile devices and
168 computers often experience a flat battery, and hence, are not able to complete the online instruction (Abdullahi,
169 Sirajo, Saidu, & Bello, 2020). It was found in Zambia that electricity load shading had a negative impact on the
170 academic outcomes of students (Sintema & Singogo, 2021). In the case of Zambia, the authors revealed that every
171 household do not get access to electricity for at least eight hours daily which means that students sometimes are
172 unable to access instruction delivered on national televisions described the supply of power in Nigeria as barbaric,
173 worrisome, erratic, and embarrassing serving as a hindrance to the e-learning implementation.

174 5 Acceptance and Adoption:

175 The unfamiliarity of the online instruction to some faculty staff and students makes them develop a negative
176 attitudes towards the acceptance and adoption of the online learning (Adarkwah, 2020). Some of these academics
177 and students perceive the online delivery as too difficult and are therefore not ready to embrace this drastic change
178 (Muftahu, 2020). Supervision: Muftahu (2020) reports that some higher education institutions are faced with
179 some managerial issues such as supervision of the online learning. According to Oyediran et al. (2020), there
180 are less ICT experts to supervise e-learning platforms and instruction in Nigeria. Also, less training support are
181 provided for users. In Kenya, there was minimal supervision for learners by teachers (Ngari & Ndung'u, 2020).
182 Parents were not able to properly supervised their children on the online instruction (Mabeaya, 2020).

183 6 Nigeria

184 Problems with teacher delivery method, poor teacher-student communication, electricity shortage, insufficient
185 data bundle, lack of understanding, difficulty in solving math-related questions, difficulty in submitting
186 assignment, poor technological infrastructure, ICT illiteracy, lack of funding, high cost of ICT accessories,
187 inadequate resource personnel, difficulty in conceptualizing e-learning.. Zambia Inadequate preparation of parents
188 to respond to children's academic needs, problems with electricity, difficulty in procuring curriculum materials,
189 limited access to e-learning facilities.

190 V. Prospects of Online Learning in sub-Saharan Africa Post COVID-19 Necessity is forcing changes in many
191 educational institutions in Sub-Saharan Africa. The COVID-19 crisis has served as a catalyst in the massification
192 of online learning in Africa which has being a challenge. Adedoyin & Soykan (2020) mentioned that the online
193 learning has given educators a clear roadmap to engage other stakeholders in education to produce a novel market
194 for the delivery of instruction. They added that the more the COVID-19 persists, the greater the probability of
195 worldwide acceptance of online learning as the mode of teaching and learning. Additionally, institutions across
196 the globe have went beyond fighting the COVID-19 pandemic to tackling the SDGs with education inclusive
197 (Pan & Zhang, 2020). Thus, if carefully implemented and managed, online instruction can grant learners from
198 all geographical regions access to education (Adarkwah, 2020). In the age of COVID-19, many faculty staff and
199 students are showing less resistance to the adoption of online learning in some African countries (Mulenga &
200 Marbán, 2020). This will foster the digital competence of users and will subsequently aid in e-learning acceptance
201 and adoption in the future. There is no doubt that the COVID-19 crisis have resulted in technological and
202 academic innovations (Adedoyin & Soykan, 2020). For example, the crisis resulted in technological inventions
203 and innovations in such higher education institutions in Africa such as Valley View University (VUU), Ghana
204 (Murugesan & Chidambaram, 2020). While majority of institutions adopted already established applications
205 such as Google Classroom and Zoom, VUU established their own server called the "Big Blue Button" for the
206 online instruction. The server application enabled students to access educational contents without a cost to
207 them in terms of data bundle while at the same time keeping a storage of all live videos and study materials for
208 the perusal of students. The success that attended their online learning experience attracted national attention
209 such as being invited on a national television station (TV3) to recount how they were able to provide "non-stop
210 learning" to their students at a cheaper rate. The University of Ghana was also able to swiftly transition to
211 online learning with the introduction of the Sakai Learning Management System platform (Gangwar & Bassett,
212 2020). Telkom Kenya also launched a customized a dependable mobile phone for staff and students of University
213 of Nairobi to ensure education continues despite the COVID-19 pandemic (Gangwar & Bassett, 2020). Moreover,
214 the pandemic present an opportunity for libraries in African that operates on only the traditional mode of delivery
215 of books to go digital/online with the provision of electronic books like in developed countries (Ifijeh & Yusuf,
216 2020). Schools VI.

217 7 Practical Implications

218 The online instruction during the COVID-19 pandemic has unveiled the digital divide in most Sub-Saharan
219 countries. Although all learners are faced with the challenges associated with online learning, the review indicate
220 that the situation of children from poor households is worse (Adarkwah, 2020; Azu, Adegboye, & Quadri, 2020;
221 Ngeywo, Maizs, & Egesa, 2020). This inequality in education is a threat to the SDG 4 and NCLB Act which
222 has its goal to ensure lifelong education for all by also addressing gender gaps (Adarkwah, 2020). Policymakers
223 in education and governments in Sub-Saharan Africa should partner with international bodies like UNESCO in
224 addressing the digital divide which serves as a barrier to e-learning. Also, it was found that female students suffer

225 from more stress as a result of household chores and are unable to concentrate during digital/online instruction.
 226 It is advocated that school leaders, especially teachers ensure adequate supervision of the online instruction to
 227 involve all students irrespective of gender It behoves on parents too to liaise with their children’s schools to
 228 ensure smooth delivery of the online courses. School institutions should partner with the government to supply
 229 ICT tools/devices to both staff and learners since online learning depends on ICT tools. Adarkwah (2020)
 230 recommended schools to establish e-learning centers which charge a minimum fee to generate funds solely for the
 231 functioning of learning management systems (LMS) and other issues related to online learning. The additional
 232 pressures on teachers and students as a result of the COVID-19 (Pan & Zhang, 2020) serves as an indicator
 233 for educators to address issues related to psychological health. Not addressing the aforementioned issues can
 234 widen the gender, poverty, education and ICT literacy in Sub-Saharan Africa. This is the time for Sub-Saharan
 235 Africa to catapult its vision for a "knowledge and technology-driven" society to boost its economy. Gangwar
 236 & Bassett (2020) recommends that the weak NRENs in Sub-Saharan Africa should be strengthened to promote
 237 internet access by liaising with telecommunication companies in the region such as MTN, Vodaphone, and Orange
 238 (see Fig. 2). Overall, educators, curriculum experts, researchers, governments, parents, and students should all
 239 work in unison to transform the education system to keep at par with other advanced countries across the globe
 240 (Tadesse & Muluye, 2020).

241 8 VII. Conclusion and Recommendation

242 The COVID-19 pandemic affected all aspects of lives but can be an impetus for digitalization of education in
 243 Sub-Saharan Africa. The review suggests that the COVID-19 crisis has served as a stimulus for most educators
 244 in the region to embrace online learning as the mode of instruction. In the pre-pandemic period, only a few
 245 universities had online learning platforms and distance education centers. However, the COVID-19 crisis spurred
 246 even pre-tertiary institutions to adopt digital technologies and/or online learning to ensure the educational
 247 careers of learners are not jeopardized. Despite the fact that online learning is set to grow at a high speed in
 248 this pandemic era, the huge disparities in the access of internet and technological tools has negatively impacted
 249 the online instruction. Most educational institutions are still not adequately equipped to implement and ensure
 250 the sustainability of the online learning. Although Sub-Saharan Africa is one of the largest regions in the
 251 world, World Bank report indicates that access to internet or technology is a great challenge; only 25% of the
 252 population has access to internet and only 0.44% have access to a fixed broadband (Gangwar & Bassett, 2020).
 253 Since online learning thrives on ICT tools and reliable internet access, it is recommended that policymakers
 254 and educators ensure equitable distribution of ICT gadgets and resources to all schools. Partnering with other
 255 donor/international bodies can help schools get adequate funds to sustain the e-learning in Africa. ICT integration
 256 can be a way of increasing the self-efficacy and digital literacy of staff and students for e-learning acceptance
 257 and adoption. Findings from the review also suggest that there are opportunities for schools to come up with
 258 novel inventions and innovations to massify online learning in Sub-Saharan Africa. A clear example is the shift
 259 from traditional libraries to electronic libraries and the development of reliable and affordable elearning platforms
 260 in Ghana and Kenya. Since many countries across the world with Sub-Saharan African countries inclusive are
 261 experiencing a second wave of the COVID-19, online learning may be the "new normal" and "legally" accepted
 262 way of instruction. Sub-Saharan Africa has to brace itself for the sudden shift to digital technologies in education.
 263 The author recommend that future researches should conduct a similar research on Sub-Saharan African countries
 with focus on stakeholder/organizational experiences in online ¹

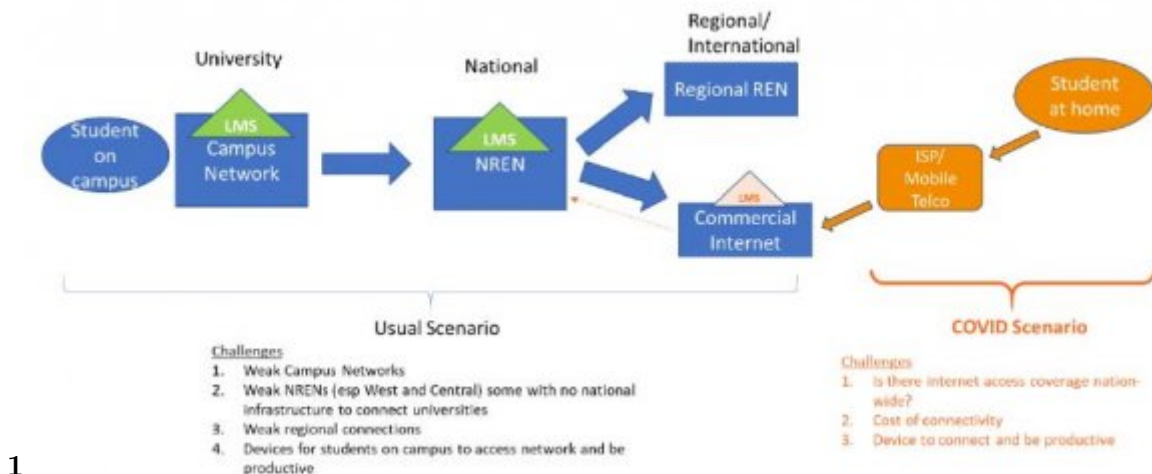


Figure 1: Figure 1 :

1

Source: World Bank

[Note: learning experience of some selected Sub-Saharan African Countries Country Mode of Instruction Côte D'Ivoire ? Usage of radio, television, and SMS services to deliver instruction Ethiopia ? Radio lessons for primary students, and digital technology for secondary and tertiary students Ghana ? Broadcasting teaching content e-learning systems ? Radio and Television services for instruction Kenya ? Publication of "guidance for teaching and learning" to 15 million students ? Partnership with Kenya Broadcasting Corporation ? Uploading instruction on YouTube ? Sharing of Electronic textbooks Liberia ? Initiating "Rising-On-Air" program that delivers instruction using radio services and SMS. ? Availability of teaching content on Orange Campus Africa which partners with Khan Academy (Wikibooks, Wiktionary, and Wikipedia were also made available) Libya ? "Compulsory lessons" for middle and secondary schoolchildren via television stations. Madagascar ? Instruction via Radio and TV Channels ? Hosting educative programs on "RTA Official" YouTube Channel ? Usage of "recruitment" drive to hire more designers to produce educative content for students ? Sharing Radio Programs on WeTransfer platform Mauritius ? Television programs for primary students ? E-learning platforms for secondary level students ? Zoom and Microsoft Teams Platforms for tertiary students. Rwanda ? Instruction via Radio, TV, and CD-ROM. ? YouTube Channel called REB e-learning ? Web-based learning via REB online learning sites Sierra Leone ? "Rising on Air" initiative to deliver lessons by SMS and radio Somalia ? "Google Education" for online learning. South Africa ? Web-based learning with multimedia sources such as audio, videos, or interactive workbooks South Sudan ? "Distance learning" programs via radio, television, and SMS. Tanzania ? Instruction via radio and television channels Uganda ? Via radio services (97% had access) ? Publication of Education Sector response and study materials online. Zimbabwe ? Usage of digital platforms such as partnering with a private firm, "Higher Life Foundation to distribute learning content", but with limited access due to internet connectivity.]

Figure 2: Table 1 :

Articles	Countries	Challenges
(Belay, 2020) (Mengistie, 2020) (Tamrat, 2020)	Ethiopia	
(Aboagye, 2020) (Adarkwah, 2020) (Agormedah, Henaku, Ayite, & Ansah, 2020) (Owusu-Fordjour, Koomson, & Hanson, 2020)	Ghana	High cost of delivery, glitches in with e-learning platform, lack of study materials and ICT tools, less prior knowledge of users, low access to electricity and internet, anxiety over academic outcomes.
(Ngeywo, Maizs, & Egesa, 2020) (Mabeya, 2020) (Ngari & Ndung'u, 2020)	Kenya	Lack of preparedness, inconsistency in syllabus coverage, less supervision by teachers, limited access of online instruction by students, disparity of content offered from one program to another, lack of learner assessment, and lack of support for parents/guardians and teachers of students, limited access to internet and technological resources, low parental supervision, perception that online instruction is time-consuming.
(Abdullahi, Saidu, & Bello, Sirajo,	Nigeria	

Figure 3: Table 2 :

- 264 [Chen et al.] , J Chen , X Wang , S Zhang , B Lin , X Wu , Y Wang .
- 265 [Paul and Jefferson ()] ‘A comparative analysis of student performance in an online vs. face-to-face environmental
266 science course from’. J Paul , F Jefferson . 10.3389/fcomp.2019.00007. *Frontiers in Computer Science* 2019.
267 2009 to 2016. 1 (7) p. .
- 268 [Goyal et al. ()] ‘An alternative structure of delivering management education in India’. J K Goyal , P Daipuria
269 , S Jain . 10.1177/0047239520958612. *Journal of Educational Technology Systems* 2020. p. .
- 270 [Kizilcec and Halawa ()] ‘Attrition and achievement gaps in online learning’. R F Kizilcec , S Halawa . [https://](https://rene.kizilcec.com/wp-content/uploads/2013/02/kizilcec2015attrition.pdf)
271 rene.kizilcec.com/wp-content/uploads/2013/02/kizilcec2015attrition.pdf *Proceedings of*
272 *the Second (2015) ACM Conference on Learning@ Scale*, (the Second (2015) ACM Conference on Learning@
273 Scale) 2015. ACM. p. .
- 274 [Ilonga et al. ()] ‘Challenges experienced by students studying through open and distance learning at a higher
275 education institution in Namibia: Implications for strategic planning’. A Ilonga , D O Ashipala , N Tomas .
276 10.5430/ijhe.v9n4p116. *International Journal of Higher Education* 2020. 9 (4) p. .
- 277 [Bans-Akutey ()] ‘Change management amid pandemic -A case Of tertiary educators In Ghana’. A Bans-Akutey
278 . *Global Scientific Journal* 2020. 8 (8) p. .
- 279 [Xie ()] ‘Characteristics of acute pulmonary embolism in patients with COVID-19 associated pneumonia from the
280 city of Wuhan’. Y Xie . 10.1177/1076029620936772. *Clinical and Applied Thrombosis* 2020. 26 p. . (Hemostasis)
- 281 [Aguilera-Hermida ()] ‘College students’ use and acceptance of emergency online learning due to COVID-19’.
282 P A Aguilera-Hermida . 10.1016/j.ijedro.2020.100011. *International Journal of Educational Research Open*
283 2020.
- 284 [Whoa ()] *Coronavirus disease (COVID-19) advice for the public*, Whoa . [https://www.who.int/](https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public)
285 [emergencies/diseases/novel-coronavirus-2019/advice-for-public](https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public) 2020.
- 286 [Ifijeh and Yusuf ()] ‘Covid -19 pandemic and the future of Nigeria’s university system: The quest for libraries’
287 relevance’. G Ifijeh , F Yusuf . 10.1016/j.acalib.2020.102226. *The Journal of Academic Librarianship* 2020. p.
288 46.
- 289 [Adedoyin and Soykan ()] *Covid-19 pandemic and online learning: the challenges and opportunities. Interactive*
290 *Learning Environments*, O B Adedoyin , E Soykan . 10.1080/10494820.2020.1813180. 2020.
- 291 [Ladan et al. ()] ‘COVID-19 pandemic and social media news in Nigeria: The role of libraries and library
292 associations in information dissemination’. A Ladan , B Haruna , A U Madu . *International Journal of*
293 *Innovation and Research in Educational Sciences* 2020. 7 (2) p. .
- 294 [Belay ()] ‘COVID-19, distance learning and educational Inequality in rural Ethiopia’. D G Belay .
295 10.29333/pr/9133. *Pedagogical Research* 2020. 5 (4) p. .
- 296 [Mahase ()] ‘Covid-19: Pfizer and BioNTech submit vaccine for US authorisation’. E Mahase .
297 10.1136/bmj.m4552. *BMJ* 2020. 371 p. 4552.
- 298 [Whob ()] ‘detail/30-01-2020-statement-on-the-second-meetin g-of-the-international-health-regulations’. Whob .
299 [https://www.who.int/news-room/](https://www.who.int/news-room/Statement-on-the-Second-Meeting-of-the-International-Health-Regulations) *Statement on the Second Meeting of the International Health*
300 *Regulations*, 2020. July 15. 2005. 2019. 2005. (Emergency Committee Regarding the Outbreak of Novel
301 Coronavirus. emergency-committee-regarding-the-outbreak-of-novel-coronavirus-(2019-ncov)
- 302 [Ngari and Ndung’u ()] ‘Disaster management preparedness in the education sector in Kenya -A case of the
303 COVID-19 pandemic. Editon Cons’. S M Ngari , S W Ndung’u . 10.51317/ecjempl.v1i1.192. *J. Educ. Manag.*
304 *Leadership* 2020. 1 (1) p. .
- 305 [Kentnor ()] *Distance education and the evolution of online learning in the United States. Curriculum and*
306 *Teaching Dialogue*, H Kentnor . 2015. 17 p. .
- 307 [Mabeya ()] ‘Distance learning during COVID-19 crisis: Primary and secondary school parents experiences in’.
308 M T Mabeya . doi:10.37 284/eajes.2.1.249. *East African Journal of Education Studies* 2020. 2 (1) p. .
- 309 [Distance learning solutions UNESCO (2020)] ‘Distance learning solutions’. [https://en.unesco.org/](https://en.unesco.org/covid19/educationresponse/solutions)
310 [covid19/educationresponse/solutions](https://en.unesco.org/covid19/educationresponse/solutions) *UNESCO* 2020. May 12.
- 311 [Sintema ()] ‘E-Learning and smart revision portal for Zambian primary and Secondary School Learners: A
312 digitalized virtual classroom in the COVID-19 era and beyond’. E J Sintema . 10.29333/aquademia/8253.
313 *Aquademia* 2020. 4 (2) p. .
- 314 [Trines (2018)] *Educating the Masses: The Rise of online education in Sub-Saharan Africa and South Asia*, S
315 Trines . 2018. August 14.
- 316 [Mukute et al. ()] ‘Education in times of COVID-19: Looking for silver linings in southern Africa’s educational
317 responses’. M Mukute , B Francis , J Burt , D Ben . 10.4314/sajee.v36i1.7. *Southern African Journal of*
318 *Environmental Education* 2020. 36 p. .

8 VII. CONCLUSION AND RECOMMENDATION

- 319 [Sintema and Singogo ()] ‘Educational preparedness of the home environment: A technological perspective
320 amidst coronavirus (COVID-19) outbreak’. E J Sintema , D Singogo . 10.30935/ijpdll/9290. *International*
321 *Journal of Pedagogical Development and Lifelong Learning* 2021. 2 (1) p. .
- 322 [Tamrat ()] ‘Enduring the impacts of COVID-19: Experiences of the private higher education sector in Ethiopia’.
323 W Tamrat . 10.1080/03075079.2020.1859690. *Studies in Higher Education* 2020. 46 (1) p. .
- 324 [Pan and Zhang ()] ‘From fighting COVID-19 pandemic to tackling sustainable development goals: An opportu-
325 nity for responsible information systems research’. S L Pan , S Zhang . doi: 10.1016/j. ijinfomgt.2020.102196.
326 *International Journal of Information Management* 2020. p. 55.
- 327 [Bhagat and Kim ()] ‘Higher education amidst COVID-19: Challenges and silver lining’. S Bhagat , D J Kim .
328 10.1080/10580530.2020.1824040. *Information Systems Management* 2020. 37 (4) p. .
- 329 [Muftahu ()] ‘Higher education and Covid-19 pandemic: Matters arising and the challenges of sustaining
330 academic programs in developing African universities’. M Muftahu . 10.24331/ijere.776470. *International*
331 *Journal of Educational Research Review* 2020. 5 (4) p. .
- 332 [Adarkwah ()] ‘I’m not against online teaching, but what about us’. M A Adarkwah . 10.1007/s10639-020-10331-z.
333 *ICT in Ghana post Covid-19. Education and Information Technologies*, 2020. p. .
- 334 [Anifowoshe et al. ()] *Impact of COVID-19 on education in Sub-Saharan Africa*, O Anifowoshe , A T Aborode ,
335 T I Ayodele , A R Ireaiyo , O O David . 10.20944/preprints202007.0027.v1. 2020. (Preprint.)
- 336 [Mengistie ()] ‘Impact of covid-19 on the Ethiopian education system’. T A Mengistie . 10.15354/sief.20.or011.
337 *Sci Insig Edu Front* 2020. 6 (1) p. .
- 338 [Karasmanak and Tsantopoulos ()] ‘Impacts of social distancing during COVID-19 pandemic on the daily life of
339 forestry students’. E Karasmanak , G Tsantopoulos . 10.1016/j.childyouth.2020.105781. *Children and Youth*
340 *Services Review* 2021. p. 120.
- 341 [Yaw Asabere et al. ()] ‘Improving education delivery in a technical university in Ghana through mobile learning
342 technology’. N Yaw Asabere , J Agyiri , A Nachanja . 10.4018/IJICTRAME.2020070103. *International Journal*
343 *of ICT Research in Africa and the Middle East* 2020. 9 (2) p. .
- 344 [Bacher-Hicks et al. ()] ‘Inequality in household adaptation to schooling shocks: Covid-induced online learning
345 engagement in real time’. A Bacher-Hicks , J Goodman , C Mulhern . 10.1016/j.jpubeo.2020.104345. *Journal*
346 *of Public Economics* 2021. p. 193.
- 347 [Kwok et al. ()] ‘Influenza vaccine uptake, COVID-19 vaccination intention and vaccine hesitancy among nurses:
348 A survey’. K O Kwok , K.-K Li , W I Wei , A Tang , S Y Wong , S S Lee . doi:10.1016/ j.ijnurstu.2020.103854.
349 *International Journal of Nursing Studies* 2021. p. 114.
- 350 [Ngeywo et al. ()] ‘Managing the finance of home based learning and teaching in Kenya amid Covid-19:
351 Perception and challenges’. J Ngeywo , E K Maizs , M K Egesa . *International Journal of Recent Research in*
352 *Social Sciences and Humanities* 2020. p. .
- 353 [Lorusso and Shumskaya ()] ‘Online laboratory exercise on computational biology: Phylogenetic analyses and
354 protein modeling based on SARS-CoV-2 data during COVID-19 remote instruction’. N S Lorusso , M
355 Shumskaya . 10.1002/bmb.21438. *Biochemistry and Molecular Biology* 2020. 48 (5) p. .
- 356 [Agormedah et al. ()] ‘Online Learning in higher education during COVID-19 pandemic: A case of Ghana’. E K
357 Agormedah , E A Henaku , D K Ayite , E A Ansah . *Journal of Educational Technology & Online Learning*
358 2020. 3 (3) p. .
- 359 [Mulenga and Marbán ()] ‘Prospective teachers’ online learning mathematics activities in the age of COVID-19:
360 A cluster analysis approach’. E M Mulenga , J M Marbán . 29333/ejmste/8345 *Science and Technology*
361 *Education* 2020. 16 (9) p. . (EURASIA Journal of Mathematics)
- 362 [Oyediran et al. ()] *Prospects and limitations of e-learning application in private tertiary institutions amidst*
363 *COVID-19 lockdown in Nigeria*, W O Oyediran , A M Omoare , M A Owoyemi , A O Adejobi , R B Fasasi .
364 10.1016/j.heliyon.2020.e05457. 2020. p. 6.
- 365 [Secondary Data Analysis Journal of Educational Technology Systems] ‘Secondary Data Analysis’. doi:10.11
366 77/0047239520940624. *Journal of Educational Technology Systems* 49 (2) p. .
- 367 [Abdullahi et al. ()] ‘Stay-at-home order and challenges of online learning’. U Abdullahi , M Sirajo , Y Saidu ,
368 U Bello . 10.9790/7388-1004061017. *IOSR Journal of Research & Method in Education* 2020. 10 (4) p. .
- 369 [Murugesan and Chidambaram ()] ‘Success of online teaching and learning in higher education-covid 19 pan-
370 demic: A case study Valley View University’. S Murugesan , N Chidambaram . *Ghana. International Journal*
371 *of Applied Engineering Research* 2020. 15 (7) p. .
- 372 [Meulenbroeks ()] ‘Suddenly fully online: A case study of a blended university course moving online during the
373 Covid-19 pandemic’. R Meulenbroeks . 10.1016/j.heliyon.2020.e05728. *Heliyon* 2020. (12) p. 6.

-
- 374 [Gangwar and Bassett ()] *Tertiary education in Sub-Saharan Africa*, M Gangwar , R M Bassett . [http://](http://pubdocs.worldbank.org/en/109901592405885723/One-Africa-TE-and-Covid-06162020.pdf)
375 pubdocs.worldbank.org/en/109901592405885723/One-Africa-TE-and-Covid-06162020.pdf
376 2020.
- 377 [Zhong (2020)] *The Coronavirus Exposes Education's Digital Divide*, R Zhong . [https://www.nytimes.com/](https://www.nytimes.com/2020/03/17/technology/china-schools-coronavirus.html)
378 [2020/03/17/technology/china-schools-coronavirus.html](https://www.nytimes.com/2020/03/17/technology/china-schools-coronavirus.html) 2020. March 18.
- 379 [Preez and Grange ()] 'The COVID-19 pandemic, online teaching/learning, the digital divide, and epistemolog-
380 ical access'. P D Preez , L Grange . 10.29086/978-0-9869936-1-9/2020/AASBS01. *AASBS* 2020. 1 p. .
- 381 [Spanbauer ()] *The Digital Divide in Sub-Saharan Africa. 19th Annual Celebration of Undergraduate Research*
382 *and Creative Activity*, T Spanbauer . https://digitalcommons.hope.edu/curca_19/10 2020. 2020.
383 (p. Paper 10)
- 384 [Wotto ()] *The Future High Education Distance Learning in Canada, the United States, and France: Insights*
385 *From Before*, M Wotto . COVID-19. 2020.
- 386 [Kotouaa et al. ()] 'The growing of online education in Sub Saharan Africa: Case study Ghana'. S Kotouaa , M
387 Ilkan , H Kilic . 10.1016/j.sbspro.2015.04.670. *Procedia -Social and Behavioral Sciences* 2015. 191 p. .
- 388 [Owusu-Fordjour et al. ()] 'The impact of covid-19 on learning: The perspectives of the Ghanaian student'. C
389 Owusu-Fordjour , C K Koomson , D Hanson . 10.5281/zenodo.3753586. *European Journal of Education*
390 *Studies* 2020. 7 (3) p. .
- 391 [Tadesse and Muluye ()] 'The impact of COVID-19 pandemic on education system in developing countries: A
392 review'. S Tadesse , W Muluye . 10.4236/jss.2020.810011. *Open Journal of Social Sciences* 2020. 8 p. .
- 393 [Aboagye ()] 'Transitioning from face-to-face to online Instruction in the COVID-19'. E Aboagye . doi:10.37256/
394 ser.212021545. *Social Education Research* 2020. 2 (1) p. .
- 395 [Azu et al. ()] 'Who gets to learn in a pandemic? Exploring the digital divide in remote learning during
396 the COVID-19 pandemic in Nigeria'. O B Azu , O Adegboye , H Quadri . 10.1016/j.ijedro.2020.100022.
397 *International Journal of Educational Research Open* 2020.
- 398 [Lovelace (2020)] *WHO warns coronavirus vaccine alone won't end pandemic: 'We cannot*
399 *go back to the way things were*, B J Lovelace . [https://www.cNBC.com/2020/08/21/](https://www.cNBC.com/2020/08/21/who-warns-a-coronavirus-vaccine-alone-will-not-end-pandemic.html)
400 [who-warns-a-coronavirus-vaccine-alone-will-not-end-pandemic.html](https://www.cNBC.com/2020/08/21/who-warns-a-coronavirus-vaccine-alone-will-not-end-pandemic.html) 2020. August 21.
- 401 [De Freitas et al. ()] 'Will MOOCs transform learning and teaching in higher education? Engagement and course
402 retention in online learning provision'. S De Freitas , J Morgan , D Gibson . doi:10. 1111/bjet.12268. *British*
403 *Journal of Educational Technology* 2015. 46 (3) p. .