



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

By Michael Agyemang Adarkwah

Southwest University

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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.

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I. 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 (WHO, 2020a), many educational institutions migrated

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 have access to broadband connectivity. The unique effect of the COVID-19 crisis on the education system in Sub-Saharan Africa is worth writing about (Adarkwah, 2020; Anifowoshe, Aborode, Ayodele, Iretiayo, & David, 2020; Azu, Adegboye, & Quadri, 2020). Over the years, majority of developing countries have become accustomed to F2F mode of learning where students attend lectures in constructed lecture halls (Bans-Akutey, 2020). Online learning is a challenge and not effective in Sub-Saharan Africa as compared to the West (Kizilcec & Halawa, 2015). This is because online learning thrives on ICT resources (Adarkwah, 2020) which have not significantly evolved in Sub-Saharan Africa (Ilonga, Ashipala, & Tomas, 2020). The absence of ICT resources has affected the growth of low-income countries in the context of education (Yaw Asabere, Agyiri & Nachanja, 2020). Muftahu (2020) asserted that universities in Africa are still faced with unique challenges such as the provision of ICT gadgets/services (laptops and internet access) to learners who lack ICT resources, resistance to online learning by students and academic staff, and lack of ICT literate skills of users. He added that the COVID-19 crisis has stretch higher education institutions beyond their limits. At the same time, the COVID-19 pandemic can be a catalyst for a positive change in the educational system of schools in Sub-Saharan Africa through

*Author: PhD(c), Southwest University, China.
e-mail: adarkwahmichael1@gmail.com*

innovative ways of instruction and learning (Adarkwah, 2020; Bans-Akutey, 2020; Muftahu, 2020; Yaw Asabere, Agyiri, & Nachanja, 2020). This essay adds to the conversations on the impact of COVID-19 on education. Specifically, it focuses on the prospects and challenges of online learning in Sub-Saharan Africa as a result of the COVID-19 crisis to inform policymakers, educators, and researchers on the future of education in Sub-Saharan Africa.

II. HISTORY OF ONLINE LEARNING

Wong (2020) defines online learning as a form of education that occurs on the internet whether synchronously or asynchronously. Scholars conceptualize online learning to mean e-learning/online teaching/blended learning/remote learning/distance education (Adarkwah, 2020; Aguilera-Hermida, 2020). Online learning is not a new approach to instruction (De Freitas, Morgan, & Gibson, 2015). Paul & Jefferson (2019) reports that the earliest distance education program begun in the mid-1800s by the University of London. In 1873, the "Society to Encourage Home Studies" was established in Boston, Massachusetts as the first official correspondence school in the United States of America. The World Wide Web (WWW) was unveiled in 1991, and the University of Phoenix became one of the pioneers in online education (Kentnor, 2015). Early online mode of instruction started by 1994 and was followed up with content and learning management systems including WebCT, Blackboard, and Moodle. However, De Freitas et al. (2015) reports that these virtual learning environment were not pedagogically driven tools but served as depositories for digital content. The earliest learning environment that was totally different from the traditional F2F modality of instruction was Fathom.com which was first initiated in 2000 and led by Columbia University. Yet, it was faced with technical issues such as broadband connectivity and instructors lacked the motivation for pedagogical

change. Hence, its establishment as a learning tool worldwide was hindered. MIT Open Course Ware programme emerged around the same time in 1999 to provide web-based education to students. Online learning gained it impetus in 2002 when 50 courses were published online by the MIT, and was followed by the UNESCO's initiative of "open educational resources" to provide universal education for all humanity. The MIT published 2150 courses by 2012 and recorded a visit of 127 million. Since then online learning has been recognized as a mainstream and not a trend.

In Sub-Saharan Africa, the World Bank in its quest to advance cyber education established the first online university in 1996 (Kotouaa, Ilkan, & Kilic, 2015). The university had its headquarters in Kenya but was established in Ethiopia together with six other African countries including Kenya, Ghana, Zimbabwe, and Uganda. This online university operated from the University of Kenyatta. The mode of delivery was through satellite broadcast in the form of videos, MPEG 4, and email conversations between lecturers and students. The principal objective of this online university was to enhance the quality of education in Africa. The university targeted secondary school leavers and the working class who could not enter university because of limited spaces. Initially, the courses that were taught were business, science, and engineering. Since its inception, a lot of courses have been added. The only fully online universities in Sub-Saharan Africa are African Virtual University (AVU), Kenyatta Digital School of Virtual Learning, and University of Rwanda e-learning platform. However, Sub-Saharan Africa faced insurmountable challenges ensuring massification of online learning and is unable to achieve participation rates like in Europe and in North America (Trines, 2018). Despite the technological barriers, current trends suggest there is an improvement in the massification of online learning in Sub-Saharan Africa.

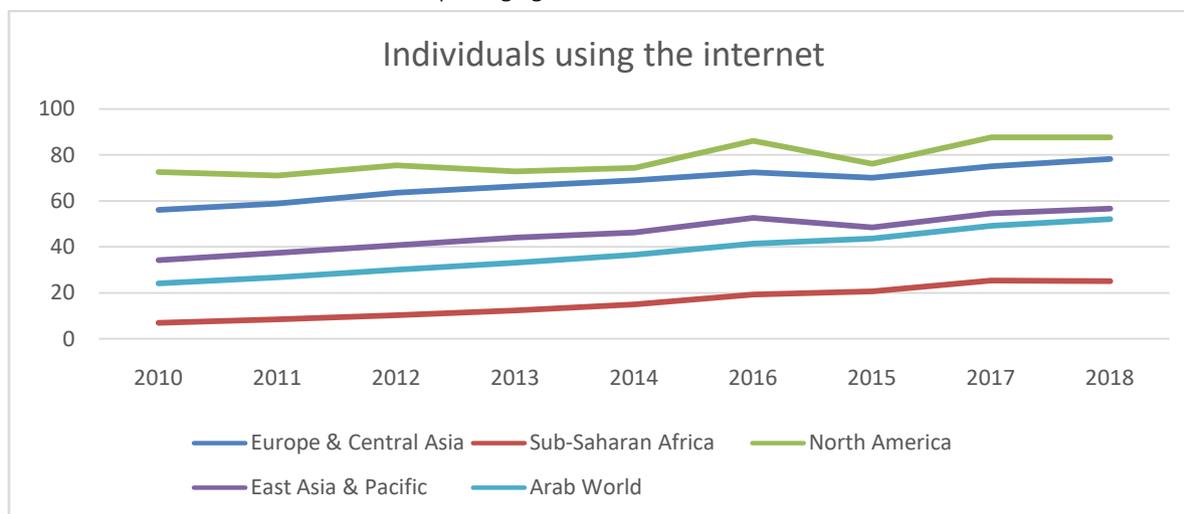


Figure 1: Individuals using the internet in Sub-Saharan Africa, Source: World Bank

III. ONLINE LEARNING IN SUB-SAHARAN AFRICA DURING COVID-19

Pre-pandemic instruction in most educational institutions required both teachers and students to be physically present in a classroom for the purposes of teaching, examinations, thesis defense, and seminars in Sub-Saharan Africa. Oyediran et al. (2020) acknowledged that there is a pervasive crisis in the teaching and learning development systems in Sub-Saharan Africa and this problem was compounded by the COVID-19 pandemic. The closure of schools as a result of the COVID-19 crisis revealed how educational institutions adapt to meet the needs of students and education staff (Muftahu, 2020). Most educational institutions in Africa joined the league of developed countries by migrating to the online modality of instruction to ensure lifelong education (Adarkwah, 2020; Agormedah, Henaku, Ayite, & Ansah, 2020). Thus, the COVID-19 stimulated the appetite of most African institutions for coming up with educational innovations to counteract the disruption in education (Mukute, Francis, Burt, & Ben, 2020). Diverse delivery of instruction were adopted including web-based learning, e-learning platforms, CD-ROMS, television, radio, emails, and SMS services (Azu, Adegboye, & Quadri, 2020; Mulenga & Marbán, 2020; Tadesse & Muluye, 2020). According to Tadesse & Muluye (2020), only 11% of countries in Sub-Saharan Africa provided solely online learning mode of instruction while 23% of countries provided a blend of broadcast and online learning. Also, since the transition to the online modality was emergent, most institutions couldn't provide training to their teachers and students were not adequately oriented (Adarkwah, 2020; Tadesse & Muluye, 2020). In some countries, instruction was delivered using social media applications like Facebook, Skype, WhatsApp, and Wechat (Sintema E. J., 2020; Tadesse & Muluye, 2020). However, Gangwar & Bassett (2020) in their report published by the World Bank suggests that the sudden transition from F2F to online exposed the digital divide in tertiary institutions in Sub-Saharan Africa. In most African countries, learners from rich socioeconomic households had more access to quality online learning experience than their counterparts from poor households due to limited resources (Adarkwah, 2020; Azu, Adegboye, & Quadri, 2020). Thus, the digital divide resulted in inequality in the access of online learning platforms. For Example, in Ethiopia, over 80% of the student population is estimated to live in the rural areas with limited access making it difficult for such students to access radio and television contents (Tadesse & Muluye, 2020). The same authors revealed that about 56 million of students in Sub-Saharan Africa do not have access to mobile networks. Ethiopia and other Sub-Saharan African countries (Mali, Niger, Senegal, Ghana, Nigeria, Malawi, Zambia, Uganda,

Kenya etc.) have partnered with National Research and Education Networks (NRENs) to promote internet connectivity in the region but this goal is yet to be realized (see Fig. 2). Also, since e-learning is focused mainly in higher education, school children became the most vulnerable in adopting the sudden shift to the online mode of instruction (Sintema E. J., 2020). Parents and caregivers therefore had a unique duty to help school children to study online at home (Abdullahi, Sirajo, Saidu, & Bello, 2020). Students with parents who had no formal education or background in online learning had to navigate their own path to study. In some countries, such as Ghana, some educational institutions tried to bridge the inequality in access to e-learning platforms by the provision of data bundle incentives to students but this was not enough (Adarkwah, 2020). Tadesse & Muluye (2020) reported that some schools also provided textbooks, study guides, radios and other equipment to students coming from poor homes. Some institutions also considered setting up virtual laboratories for students who needed to do experiments where feasible (Gangwar & Bassett, 2020). Electronic libraries also made it possible for some schools to engage their students in academic work during the lockdown (Ladan, Haruna, & Madu, 2020).

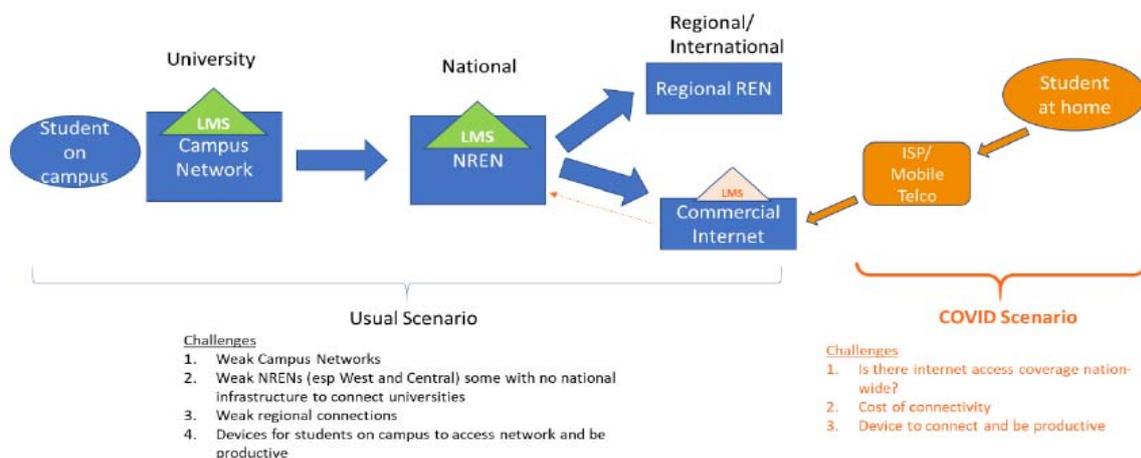


Figure 2: Connectivity in Sub-Saharan Africa using NRENs, Source; Alex Twinomugisha, World Bank Senior Education Specialist

Table 1: Online learning experience of some selected Sub-Saharan African Countries

| Country | Mode of Instruction |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Côte D'Ivoire | <ul style="list-style-type: none"> ▪ Usage of radio, television, and SMS services to deliver instruction |
| Ethiopia | <ul style="list-style-type: none"> ▪ Radio lessons for primary students, and digital technology for secondary and tertiary students |
| Ghana | <ul style="list-style-type: none"> ▪ Broadcasting teaching content e-learning systems ▪ Radio and Television services for instruction |
| Kenya | <ul style="list-style-type: none"> ▪ 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 | <ul style="list-style-type: none"> ▪ 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 | <ul style="list-style-type: none"> ▪ "Compulsory lessons" for middle and secondary schoolchildren via television stations. |
| Madagascar | <ul style="list-style-type: none"> ▪ 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 |
| Mauritius | <ul style="list-style-type: none"> ▪ Sharing Radio Programs on WeTransfer platform ▪ Television programs for primary students ▪ E-learning platforms for secondary level students ▪ Zoom and Microsoft Teams Platforms for tertiary students. |
| Rwanda | <ul style="list-style-type: none"> ▪ Instruction via Radio, TV, and CD-ROM. ▪ YouTube Channel called REB e-learning ▪ Web-based learning via REB online learning sites |
| Sierra Leone | <ul style="list-style-type: none"> ▪ "Rising on Air" initiative to deliver lessons by SMS and radio |
| Somalia | <ul style="list-style-type: none"> ▪ "Google Education" for online learning. |
| South Africa | <ul style="list-style-type: none"> ▪ Web-based learning with multimedia sources such as audio, videos, or interactive workbooks |
| South Sudan | <ul style="list-style-type: none"> ▪ "Distance learning" programs via radio, television, and SMS. |
| Tanzania | <ul style="list-style-type: none"> ▪ Instruction via radio and television channels |
| Uganda | <ul style="list-style-type: none"> ▪ Via radio services (97% had access) ▪ Publication of Education Sector response and study materials online. |
| Zimbabwe | <ul style="list-style-type: none"> ▪ 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. |

Source: World Bank

IV. CHALLENGES OF ONLINE LEARNING IN SUB-SAHARAN AFRICA DURING COVID-19

Schools in Sub-Saharan Africa are more vulnerable as a result of the COVID-19 pandemic (Muftahu, 2020). Most educational institutions are comfortable with the traditional onsite instruction and are not accustomed to the online modality of instruction (Bans-Akutey, 2020). Some higher education and colleges are also now in the process of transforming and improving and the COVID-19 crisis has threatened this vision (Muftahu, 2020). The emergence of online learning seemed to be the only solution for schools but its emergent adoption has resulted in myriads of challenges (Abdullahi, Sirajo, Saidu, & Bello, 2020; Aboagye, 2020; Adarkwah, 2020; Bhagat & Kim, 2020; Mukute, Francis, Burt, & Ben, 2020). For example, in Ghana the National Union of Ghana Students (NUGS) referred to the online instruction as a "challenge-ridden online learning" (Adarkwah, 2020). The exceptional challenges emanating from the COVID-19 pandemic involves all stakeholders in education (administrators, teachers, students, parents) who are required to do unexpected things relating to online instruction if education will continue (Agormedah, Henaku, Ayite, & Ansah, 2020). According to the authors, educators are not adequately prepared to teach with technology, let alone to use technology for remote teaching. Some of the recurring challenges pertinent to all Sub-Saharan African countries and identified in literature during the COVID-19 pandemic are discussed below;

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

Lack of Funding: The negative impact of the COVID-19 on the economy of most African countries affected the supply of funds to many institutions (Muftahu, 2020). Limited funding can hinder institutions from hosting online instruction since money would be needed to purchase and maintain ICT gadgets (Adarkwah, 2020). Some institutions were forced to seek for alternative funding because of limited financial support from the government in Ethiopia (Tamrat, 2020). The lack of

financial capacity of some schools has hindered their successful transition from traditional onsite instruction to online instruction (Azu, Adegbeye, & Quadri, 2020).

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

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

Acceptance and Adoption: The unfamiliarity of the online instruction to some faculty staff and students makes them develop a negative attitudes towards the acceptance and adoption of the online learning (Adarkwah, 2020). Some of these academics and students perceive the online delivery as too difficult and are therefore not ready to embrace this drastic change (Muftahu, 2020).

Supervision: Muftahu (2020) reports that some higher education institutions are faced with some managerial issues such as supervision of the online learning. According to Oyediran et al. (2020), there are less ICT experts to supervise e-learning platforms and instruction in Nigeria. Also, less training support are provided for users. In Kenya, there was minimal supervision for learners by teachers (Ngari & Ndung'u, 2020). Parents were not able to properly supervised their children on the online instruction (Mabeya, 2020).

Table 2: Overview of studies on the challenges of online learning in some selected Sub-Saharan African countries

| Articles | Country | Challenges |
|-----------------------------------------------------------------------------------------------------------------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (Belay, 2020) (Mengistie, 2020) (Tamrat, 2020) | Ethiopia | Expensive and limited internet, Lack of ICT gadgets and facilities, Students' parents lack ICT literacy, Inadequate access to reading materials, lack of concentration of female students engaged in house chores, poor school-parent relation, little preparation of students and teachers, negative attitudes towards the adoption of e-learning, lack of funding for institution, especially private higher education. |
| (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, Sirajo, Saidu, & Bello, 2020) (Ifijeh & Yusuf, 2020) (Oyediran, Omoare, Owoyemi, Adejobi, & Fasasi, 2020) | Nigeria | Problems with teacher delivery method, poor teacher-student communication, electricity shortage, insufficient data bundle, lack of understanding, difficulty in solving math-related questions, difficulty in submitting assignment, poor technological infrastructure, ICT illiteracy, lack of funding, high cost of ICT accessories, inadequate resource personnel, difficulty in conceptualizing e-learning. |
| (Sintema & Singogo, 2021) (Sintema E. J., 2020) | Zambia | Inadequate preparation of parents to respond to children's academic needs, problems with electricity, difficulty in procuring curriculum materials, limited access to e-learning facilities. |

V. PROSPECTS OF ONLINE LEARNING IN SUB-SAHARAN AFRICA POST COVID-19

Necessity is forcing changes in many educational institutions in Sub-Saharan Africa. The COVID-19 crisis has served as a catalyst in the massification of online learning in Africa which has being a challenge. Adedoyin & Soykan (2020) mentioned that the online learning has given educators a clear roadmap to engage other stakeholders in education to produce a novel market for the delivery of instruction. They added that the more the COVID-19 persists, the greater the probability of worldwide acceptance of online learning as the mode of teaching and learning. Additionally, institutions across the globe have went beyond fighting the COVID-19 pandemic to tackling the SDGs with education inclusive (Pan & Zhang, 2020). Thus, if carefully implemented and managed, online instruction can grant learners from all geographical regions access to education (Adarkwah, 2020). In the age of COVID-19, many faculty staff and students are showing less resistance to the adoption of online learning in some African countries (Mulenga & Marbán, 2020). This will

foster the digital competence of users and will subsequently aid in e-learning acceptance and adoption in the future. There is no doubt that the COVID-19 crisis have resulted in technological and academic innovations (Adedoyin & Soykan, 2020). For example, the crisis resulted in technological inventions and innovations in such higher education institutions in Africa such as Valley View University (VVU), Ghana (Murugesan & Chidambaram, 2020). While majority of institutions adopted already established applications such as Google Classroom and Zoom, VVU established their own server called the "Big Blue Button" for the online instruction. The server application enabled students to access educational contents without a cost to them in terms of data bundle while at the same time keeping a storage of all live videos and study materials for the perusal of students. The success that attended their online learning experience attracted national attention such as being invited on a national television station (TV3) to recount how they were able to provide "non-stop learning" to their students at a cheaper rate. The University of Ghana was also able to swiftly transition to online learning with the introduction of the

Sakai Learning Management System platform (Gangwar & Bassett, 2020). Telkom Kenya also launched a customized a dependable mobile phone for staff and students of University of Nairobi to ensure education continues despite the COVID-19 pandemic (Gangwar & Bassett, 2020). Moreover, the pandemic present an opportunity for libraries in African that operates on only the traditional mode of delivery of books to go digital/online with the provision of electronic books like in developed countries (Ifijeh & Yusuf, 2020). Schools and internet service providers have the opportunity to provide socio-economic interventions such as the construction of more ICT facilities with free/subsidized internet data bundle for staff and students.

VI. PRACTICAL IMPLICATIONS

The online instruction during the COVID-19 pandemic has unveiled the digital divide in most Sub-Saharan countries. Although all learners are faced with the challenges associated with online learning, the review indicate that the situation of children from poor households is worse (Adarkwah, 2020; Azu, Adegboye, & Quadri, 2020; Ngeyo, Maizs, & Egesa, 2020). This inequality in education is a threat to the SDG 4 and NCLB Act which has its goal to ensure lifelong education for all by also addressing gender gaps (Adarkwah, 2020). Policymakers in education and governments in Sub-Saharan Africa should partner with international bodies like UNESCO in addressing the digital divide which serves as a barrier to e-learning. Also, it was found that female students suffer from more stress as a result of household chores and are unable to concentrate during digital/online instruction. It is advocated that school leaders, especially teachers ensure adequate supervision of the online instruction to involve all students irrespective of gender It behoves on parents too to liaise with their children's schools to ensure smooth delivery of the online courses. School institutions should partner with the government to supply ICT tools/devices to both staff and learners since online learning depends on ICT tools. Adarkwah (2020) recommended schools to establish e-learning centers which charge a minimum fee to generate funds solely for the functioning of learning management systems (LMS) and other issues related to online learning. The additional pressures on teachers and students as a result of the COVID-19 (Pan & Zhang, 2020) serves as an indicator for educators to address issues related to psychological health. Not addressing the aforementioned issues can widen the gender, poverty, education and ICT literacy in Sub-Saharan Africa. This is the time for Sub-Saharan Africa to catapult its vision for a "knowledge and technology-driven" society to boost its economy. Gangwar & Bassett (2020) recommends that the weak NRENs in Sub-Saharan Africa should be strengthened to promote internet access by liaising with

telecommunication companies in the region such as MTN, Vodaphone, and Orange (see Fig. 2). Overall, educators, curriculum experts, researchers, governments, parents, and students should all work in unison to transform the education system to keep at par with other advanced countries across the globe (Tadesse & Muluye, 2020).

VII. CONCLUSION AND RECOMMENDATION

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

learning and support it with a large scale empirical evidence.

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