E-learning in a pandemic era: Exploring the digital gaps and needs of rural secondary schools and remote communities across 6 Nigerian states.

Gideon Seun Olanrewaju
Chief Executive Director
Aid for Rural Education Access Initiative (AREAi)
Email: lanre@areai4africa.org

Abiodun Yetunde Omotosho
Monitoring, Evaluation, Accountability and Learning Officer
Aid for Rural Education Access Initiative (AREAi)
Email: yetunde@areai4africa.org

Olajide Charles Falajiki
Community Engagement Manager
Aid for Rural Education Access Initiative (AREAi)
Email: olajide@areai4africa.org

Godwin Osama
Senior Programs Officer
Aid for Rural Education Access Initiative (AREAi)
Email: godwin@areai4africa.org

Abstract

The COVID-19 pandemic contributed to a digital economy transition by emphasizing the importance of digital infrastructure while exposing the digital gaps between countries and communities. Inequalities in digital access has impeded educational gains made towards achieving the sustainable development goals. While major studies have been carried out on digital learning there is currently a dearth of knowledge on the digital gaps and needs of students in remote communities in Nigeria. To this end, this study explored the digital gaps and needs of rural secondary schools in remote communities and its implications on e-learning across 6 Nigerian states during the COVID-19 era. The study adopted a concurrent embedded mixed method design approach to collect data from rural secondary schools from 6 Nigerian states. Findings from the study identified lack of ICT strategies and policies in Nigeria, socio-economic status, poor internet connectivity, electricity, and a high poverty level as the major drivers of digital gaps in remote communities.

Keywords: COVID-19; digital gaps; digital needs, e-learning; remote communities

1. Introduction

Globally, access to ICTs and digital literacy which is very vital to knowledge empowerment, information generation and utilization is unequally distributed both in terms of access to digital tools and infrastructure (Ifijeh, Iwu-James, Adebayo 2016). The role of information and communication technologies (ICTs) in information generation, processing and use in the 21st century cannot be over emphasized. Global economy thrives on digital innovation which to a large extent leads to advancement in sustainable development. Thus, sustainable development remains a mirage in any country whose citizens cannot effectively and efficiently deploy the use of ICTs to access and utilize quality information (Ifijeh et al 2016). Although Asia has the highest number of people without access, Africa leads the world in the percentage of the population without connection at 88 percent. The 'digital divide' we face globally does not just signify those who have access to the internet and those who do not, the gap also encompasses a number of other discrepancies, including the quality of digital infrastructure in rural communities, the speed of connectivity in remote areas, and the training and skills required to navigate such technology. The digital divide is a complex and dynamic phenomenon, though despite the extensive studies on the digital divide and its impact by many researchers, developing countries in particular, are still searching for sustainable solutions to reduce the digital gap, more specially between urban and rural areas, to leverage their investments in Information Technology (IT) towards the attainment of greater economic and social benefits and increase global competitiveness (Anwarul & Keita, 2010).

A lack of access to the Internet is a major element of the digital divide. Research consistently identifies ethnicity, income, age and education as significant predictors of access to technology, (France and Lemuria, 2006). While all 54 African nations are said to have internet connectivity (Jensen, 2002), a paltry ten percent of the continent's 1.216 billion citizens has access to online activities even though 70 percent of sub-Saharan Africa's inhabitants are mobile phone subscribers (GSMA, 2017). While 48% of Nigerians had an Internet connection in 2011, only 10% from the above figure are connected in rural areas, (Bell, Reddy & Rainie 2014). The majority of children from poorer socioeconomic backgrounds tend to have limited access to internet connectivity, computers, smartphones, functional ICT skills and active parental support. Undoubtedly, exploring digital gaps most significantly in a pandemic context has gained the interest of field experts and development practitioners.

Although COVID19 is a health crisis, the ripple effect on education was unprecedented. According to UNESCO (2020), the closure of schools as a measure to contain the spread of the virus affected 39,440,016 primary and secondary school learners across Nigeria, this population includes those in internally displaced camps (IDPs). School closures at first led to a perceived proliferation of online learning but study shows that the efforts made by the federal and state government to ensure that learning continues for every child has not fulfilled the set objectives. According to UNICEF, the share of students who cannot be reached by digital and broadcast remote learning policies is the highest in the countries of Sub-Saharan Africa: at least 48 per cent in West and Central Africa and 49 per cent in Eastern and Southern Africa. Unanimously, OECD report stated that although many countries have been using digital pedagogical tools and virtual

exchanges between students and their teachers, and among students, to deliver education as schools closed, vulnerable students might however have little access to such tools and require further attention and support. In Nigeria, the TEP Centre (2020) study revealed that more than 70 per cent 34 million children who were out of school due to nationwide school closure at the peak of COVID19 do not have access to basic digital devices. Similarly, not all teachers have the technical capacity required to facilitate eLearning with competence varying across rural and urban locations.

In light of the above, this study is therefore set to explore the digital gaps and needs of rural secondary schools and remote communities across 6 Nigerian states using the New psychological model of e-adoption within the context of the digital divide framework. The study seeks to answer certain research questions as discussed below.

1.1 Research questions

1. What were the causes of digital gaps in rural secondary schools and remote communities across 6 Nigerian states?
2. What are the digital needs of rural secondary schools and remote communities across 6 Nigerian states?
3. What was the effect of digital gaps on e-learning in rural secondary school and remote communities across 6 Nigerian states during the Covid19 pandemic?

This study is divided into five sections. Section one above describes the background, study rationale and research questions. Section two addresses the review of the literature on digital gaps and the theoretical framework situated within Bourdieu's theory of social and cultural re production. Section three discusses the data and methods employed in this study, section four covers the findings, and section five talked about the conclusion and recommendation

2. Literature Review

According to Rozina (2002), modern achievements in the field of computer and communication technologies have offered tremendous opportunities for learning by electronic means. Additionally, with ongoing innovation in the adoption of new multimedia technologies and the internet, learning is seen as a means to improve efficiency, accessibility and quality of learning by facilitating access to resources and services as well as remote exchanges and collaboration.

Hedge and Haywood (2004) defined eLearning as an innovative approach for delivering electronically mediated well-designed, learner centred and interactive learning environments to anyone, any place, any time by utilizing the internet and digital technologies in line with instructional design principles. Parks (2013) posits that the word "e" should refer to "everything, everyone, engaging and easy" in addition to electronic. Modern societies especially, the developed nations use e-learning to extend educational advantages to communities that were erstwhile excluded from it due to the triple problem of time, distance and cost.

E-learning has become a new paradigm for bridging the educational gap within and across societies. Although, the concept of e-learning is considered to be very attractive as a new learning paradigm with positive effect on the development of education in developing countries. Amongst the many positive effects are that it is less expensive to deliver, self-paced, provides consistent content, faster and works anywhere and anytime for the learning. E-learning can improve retention, provide immediate feed-back and allows learners to customize learning materials to meet their individual needs. However, despite the benefits of e-learning not much effort has been taken for its full implementation in Nigeria (Nwegbu, 2011). E-learning when fully implemented in Nigeria educational system will change the concept of digital divide to digital opportunities.

The Term "digital divide" emerged in the 21st century due to innovations in information and communication technology. It is used to define inequality in access to and use of telecommunication infrastructure by citizens to solve personal and societal problems. OECD (2001) defined it as the gap between individuals, households, businesses and geographical areas at different socio-economic levels with regard to their opportunities to access information and communication technology and to their use of the internet for a variety of purposes. These unequal access to ICT is determined by social and physical barriers, from never having seen a computer to absence of electricity infrastructure and cost of internet connectivity. Drori (2010) observed that the causes of the global digital divide depend on income or wealth differential, the complex array of economic, political and socio-cultural matters. Globally, many countries which incidentally are geographically located in Europe, North America and parts of Asia are highly industrialized with an edge in modern Science and Technology, stable governments, have more access to the internet than the countries of the South much of which are poor, emerging democracies and have not shown much improvement on most fronts of development (Ogunsola & Okusaga, 2006). At the national level, the digital divide follows the lines of gender, wealth, education, race, minority designation whereas between countries, it follows the lines of national wealth, literacy and democracy. Though efforts are being made to address the problem of digital divide, it still exists and it particularly affects older people, those with lower levels of education, those with lower income and those who live in geographically remote areas where infrastructure coverage is low. attempt to solve the problem of the digital divide, been the second phase of the World Summit on the Information Society (WSIS) organized by the United Nations Summit in Tunisia as an attempt to solve the problem of the digital divide

The implications of the digital divide are not limited to whether or not individuals have or do not have access to technology. As the 21st century unfolds, having access and being able to use the new technologies also mean being an integral part of society (Shelly, 2006). People with limited access will be out paced by those who are ahead in the ability to select and process information. This was buttressed by Wong (2009) who stated that digital exclusion has become a new form of social exclusion.

2.1 Digital divide and E-learning in Nigeria

Following the outbreak of the COVID-19 pandemic, educational systems transitioned into new methods of learning aided by the internet but children in rural and underserved communities in Nigeria were mainly

left out of this digital transition Amorighoye (2020). Research from the TEP Centre (2020) shows a sizable proportion (28%) of teachers reported that their students were not actively learning during the pandemic as a result of inaccessibility of digital tools for learning.

According to the International Telecommunication Union, internet penetration in Nigeria stands at 42%, implying that more than half of the population are not connected to the Internet, and even fewer if the consideration of multiple devices used by Nigerians is factored in. On the other hand, mobile adoption in Nigeria shows great potential which can also be harnessed for learning (International Telecommunication Union (ITU), 2019b). In Nigeria, the majority of the population with internet access are from richer socioeconomic and urban households who can afford private school education, thereby giving their children a learning advantage over their public-school counterparts (Obiakor & Adeniran, 2020). Children from poorer socioeconomic backgrounds tend to have limited access to internet connectivity, computers, mobile phones, functional ICT skills and active parental support. Moreover, they dwell in rural areas where local languages are dominant and could limit the uptake of ICT-learning. The inequity in access to ICT-based learning has the adverse effect of further intensifying the existing disparities in learning outcomes along socioeconomic and geographic (urban-rural) lines (United Nations, 2020; Rubagiza, Were and Sutherland, 2011; Furuholt, and Kristiansen, 2007). Studies from other African countries confirm these existing divides. In South Africa, students in private or high-fee paying institutions were more proficient in the use of ICT in their learning than their counterparts in public institutions (Gudmundsdottir, 2010). A study by EdQual on the use of ICTs in Rwandan schools, showed how ICT policy initiatives could tend to exclude those in rural areas. Urban schools had more computers, internet, electricity supply and ICT equipment (Rubagiza, Were and Sutherland, 2011). Chair and De Lannoy's (2018) study of Nigeria, Tanzania and Rwanda showed that young people, especially in rural areas, were deprived of internet resources due to low-level of education, low income and lack of digital skills.

As the pandemic led to school closure and forced many children across the world and in Nigeria to learn at home, it is important to understand if children in remote communities accessed learning remotely. This study explored the digital gaps and needs of rural secondary schools in remote communities and its implications on e-learning across 6 Nigerian states during the COVID 19 era.

3. Research Methodology

3.1 Study design

The study adopted a concurrent embedded mixed method design. This is a type of design, were quantitative and qualitative data are analysed at the same time because the quantitative data alone would not be sufficient to answer the research question (Creswell, 2011).

3.2 Study site

This study was conducted in Government-owned secondary schools in 24 communities across the 6 Geopolitical zones in Nigeria

3.3 Data

The Data for this study was obtained from a Foreign Commonwealth and Development Office funded survey conducted by the Aid for Rural Education Access initiative between January 2021- February 2021. The survey sampled 90 respondents from 24 communities in the 6 geopolitical zones of Nigeria. The study used both closed and open-ended questions, to elicit information from students. Informed consent was gotten from each student, and for participants below 18, an assent was gotten before proceeding with the interview.

3.3.1 Sample size determination

3.3.2 Qualitative data

A total of 20 eligible respondents who consent to voluntarily participate in the study were interviewed for the study. As saturation was attained with these numbers (i.e where no new themes emerged).

3.3.3 Quantitative data

A purposive sampling technique was adopted to select a total of 70 participants from 24 rural communities.

3.4 Method for Data Collection

3.4.1 Qualitative data collection

Qualitative data were collected using an in-depth interview guide. All interviews were conducted in English language, the interviews were semi-structured in accordance with the topic guide and included open-ended questions as well as "probe" questions. The IDI guide was used to elicit information on the effect of digital gaps on e-learning in rural secondary schools during the Covid19 pandemic.

3.4.2 Quantitative data collection

A validated, semi-structured self-administered questionnaire was used for data collection. It comprised three sections which were section A: Sociodemographic of respondents, section B: Assessing the level of digital gaps in rural secondary schools, section C- identifying the digital needs of rural secondary schools

3.5 Inclusion criteria and exclusion criteria

3.5.1 Inclusion criteria

The following group of participants were recruited for the study:

- Secondary Students who were between the ages of 16 and above
- Students attending a rural Govt school
- Students who consented to participate in the study.

3.5.2 Exclusion criteria

The following group of students were excluded from the study:

- Students who did not consent to participate in the study
- Students that could not speak English Language

3.6 Data analysis

Data analysis Questionnaires were sorted, collated, serially numbered, and imputed into the computer. Descriptive analysis was done using the Statistical Package for Social Sciences (SPSS) 26 software version Data was cleaned and Descriptive statistics such as frequency, means and standard deviation was carried out.

In analysing the qualitative data, the rigour of the study was ensured by keeping a note of the audit trail on all decisions that were made during the study. Inter-coder reliability was done by involving two or more independent coders using the same coding scheme and then allowing the extent to which they agree on the coding influence the analysis. Using these codes, we then searched for patterns/themes across the qualitative responses and defined them within the context of the theoretical framework. Questions on reflexivity which included reflection on assumptions and preconceptions were considered and stated.

Finally, there was triangulation of both qualitative and quantitative data by gathering using different sources of information in order to increase the validity of the study

4 Results and Discussion

4.1 Socio-demographics of Participants

The study showed the average age of respondents was 17.5 ± 1.5 years with the minimum age being 14 years and the maximum age being 21 years. Majority (89.9%) were within the age group of 15–19 years with a little over half of the respondents being females (52.9%). More than half of the respondents were in SS3 (67.7%) and Christians (62.3%) with a little above one quarter of the participants being Hausa (30.4%).

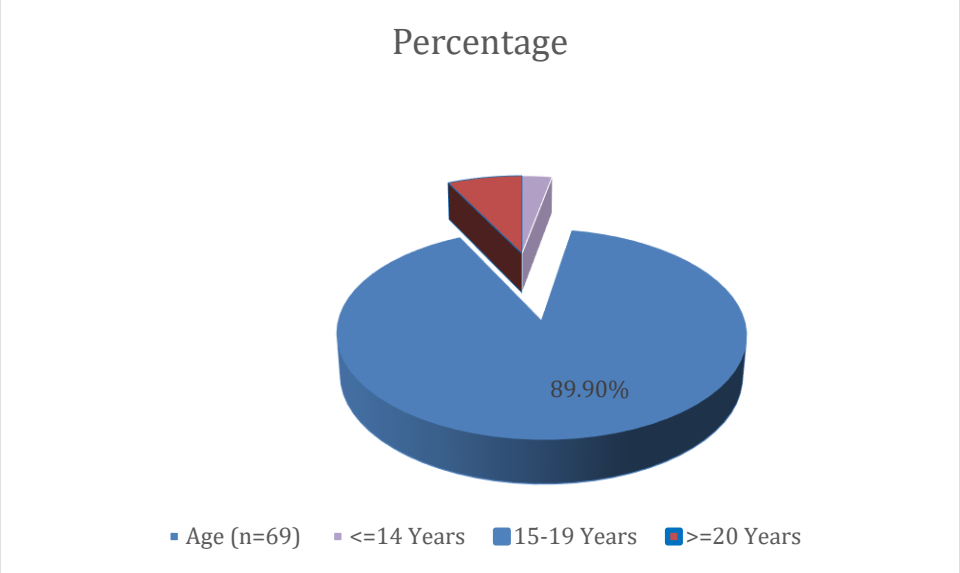

Figure 1. Age of Participants

Table 1: Socio-Demographic Variables

Demographics		Frequency	Percentage (%)
Sex (n=68)	Male	32	47.1

	Female	36	52.9
Religion (n=69)	Christian	43	62.3
	Muslim	26	37.7
Ethnicity	Igbo	1	17.4
(n=69)	Hausa	21	30.4
	Bayelsa	17	24.6
	Fulani	19	27.5
Class (n= 62)	Jss3	5	8.1
	SS2	15	24.2
	SS3	42	67.7
States (n=69)	Kano	20	29.0
	Adamawa	19	27.5
	Bayelsa	20	29.0
	Ebonyi	10	14.5

4.2 Assessing the level of digital gaps in rural secondary schools

Figure 2 showed the level of digital gaps in rural secondary school. A higher proportion (63.1%) of students reported that they do not have access to digital learning tools prior to the pandemic. Majority (61.1%) did not have access to a phone, 84.1% did not have access to a laptop, and 75.4% did not have access to the internet. More than half (53.8%) of the students did not have access to a radio and 66.7% did not have access to a television. Slightly over half (50.8%) of the participants reported that they had their learning disrupted during the school closure. As shown in the figure above, the majority (82.5%) of students that learnt during the pandemic did not have access to any school online management learning system as while 70.7% of the students stated that they did not have access to any radio or television program provided by the Government.

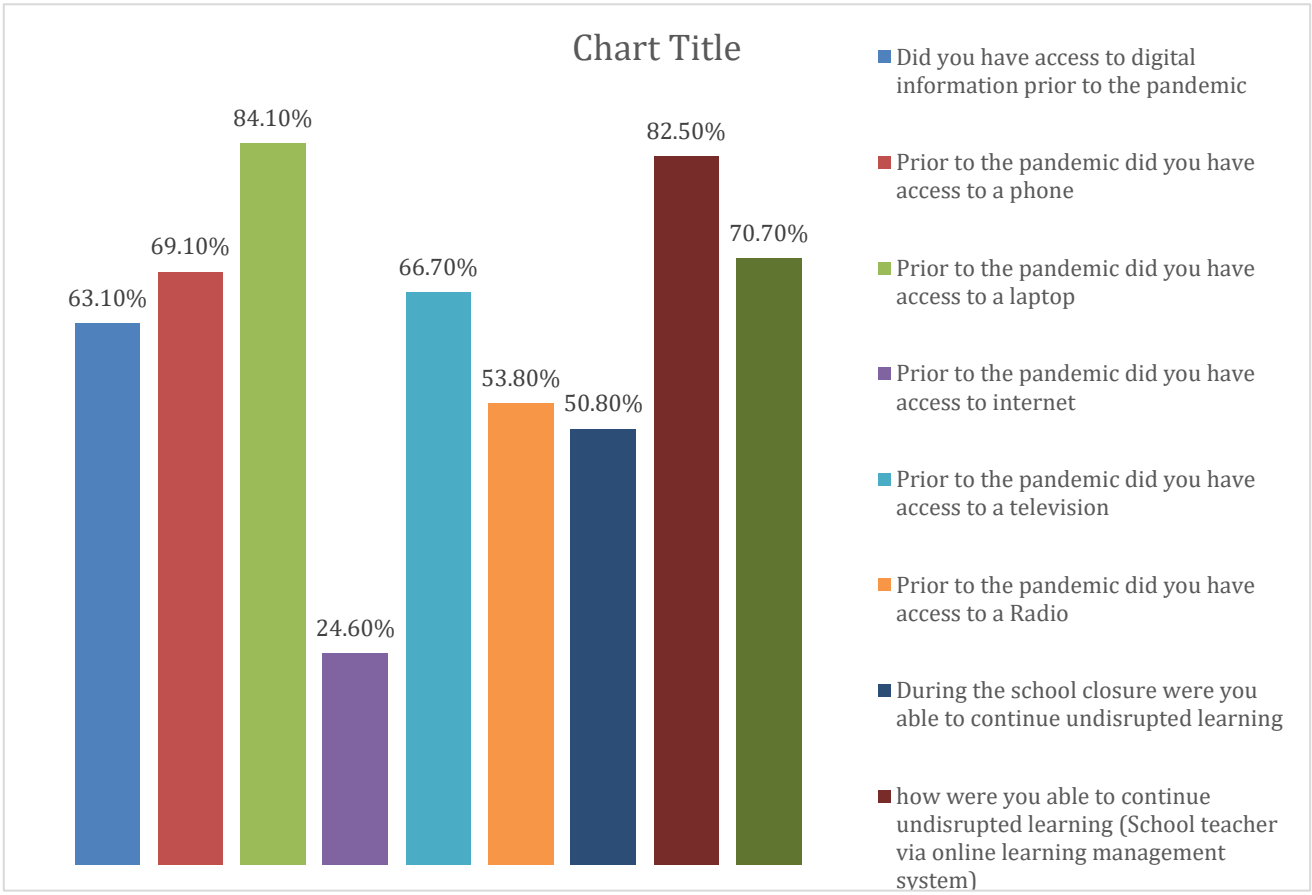

Figure 2. Assessing the level of digital gaps in rural secondary schools

4.3 Identifying the digital needs of rural secondary schools

In identifying the digital needs of secondary school students in rural communities, questions relating to the reasons why students could not participate in the digital learning intervention provided by the government, major factors that impeded their learning and strategies to improve digital learning in their communities were asked.

Finding from the study found that More than Half (54.2%) of the participants were not aware of learning intervention provided by the Govt and for the few (45.8%) that were aware of the programme, majority (71.6%) did not learn via the radio and television programme with a little above half (51%) attributing lack of time as the reason, with a high percentage (74.1%) stating cost and preference for face-to face learning (61.4%)

Table 2: Identifying the digital needs of Rural secondary school students

Reasons for not learning via the Govt digital learning intervention	Freq(%)
During the lockdown did you know about the radio and television programme provided by the Govt	
Yes	27(45.8)
No	32(54.2)
Did you learn via the radio and television programme provided by the Govt?	

Yes	19(28.4)
No	48(71.6)
What were the reasons why you could not participate in the virtual learning provided (Cost)	
Yes	40(74.1)
No	14(25.9)
What were the reasons why you could not participate in the virtual learning provided (preference for face to face teaching)	
Yes	27(61.4)
No	17(38.6)

4.4 Factors Impeding access to digital learning among students

The reported factors impeding digital learning among students were lack of technical knowhow (78%), financial constraints (84.1%), preference for face-to-face learning (72.9%), electricity (85.3%), access to digital learning tools (73%), and cost (88.2%). Only few students stated factors such as internet connectivity (24.2%), and lack of parental support (49%) as a factor impeding their digital learning.

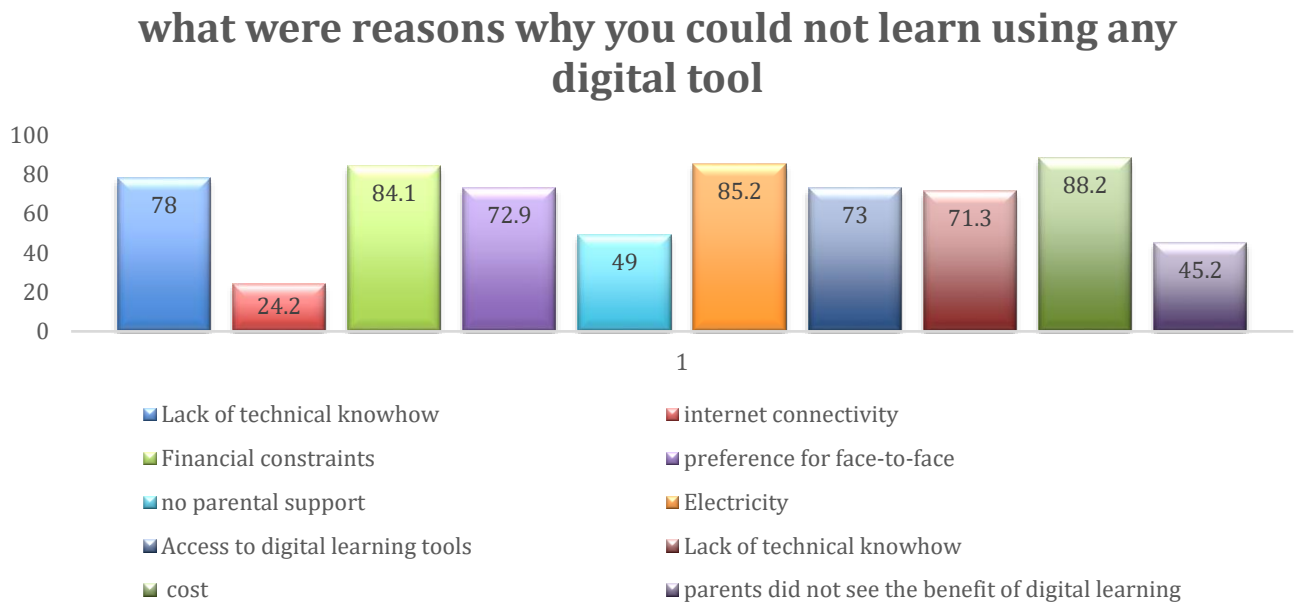

Figure 3. Factors Impeding access to digital learning among students

4.5 Strategies to promote digital inclusion in schools

From table 3, almost all (95.1%) of the students agreed that access to digital information and improve their digital literacy skills. Furthermore, 97.1% of the students suggested the need for having Information and communication technology related subjects in schools. Majority (69.6%) of the students cannot afford the cost of using digital learning tools while 87% are of the opinion that there is a need for a school-based ICT centre. All students mentioned the need for an ICT teacher, with (98.5%) opining the need for students

training on ICT. A higher percentage of students (84.8%) and (93.8%), preferred provision of Phones access to internet connectivity.

Table 3. Strategies to promote digital inclusion in schools

Strategies to promote digital inclusion	Freq(%)
Do you think access to digital information can improve your digital literacy skills	
Yes	58(95.1)
No	3(4.9)
Do you have interest in taking an ICT related subjects if provided	
Yes	66(97.1)
No	2(2.9)
Can you afford the cost of using digital tool for learning	
Yes	21(30.4)
No	48(69.6)
Do you think your school can maintain a school-based ICT centre if provided	
Yes	60(87)
No	9(13)
How do you think the govt can promote digital inclusion in your school (provision of computer)	
Yes	39(59.1)
No	27(40.9)
How do you think the govt can promote digital inclusion in your school (provision of phones)	
Yes	56(84.8)
No	10(15.2)
How do you think the govt can promote digital inclusion in your school (Training of students in ICT)	
Yes	66(98.5)
No	1(1.5)
How do you think the govt can promote digital inclusion in your school (Recruitment and training of qualified teachers)	
Yes	66(100)
No	0

How do you think the govt can promote digital inclusion in your school (Access to internet connectivity)	
Yes	61(93.8)
No	4(6.2)

4.6 Assessing the effect of digital gaps on e-learning in rural secondary schools during the Covid19 pandemic

Majority of the participants had a low level of readiness to e-learning which was largely due to the perceived benefit of digital learning, poor knowledge and low level of awareness of digital learning tools. Almost all students stated that lack of digital devices and infrastructure because of cost and low level of Government support hindered school-based digital support and interventions. All participants reported learning losses, disruption in school timetable and how the long-time school closure could further strengthen the existing systemic barriers to education.

"Even before the lockdown, I had no access to phone, internet. Dont know how to use Google classroom,zoom or WhatsApp" - Female, South West.

"Although teachers have whatsapp group to communicate with one another they did not share this group with us. In fact, we did not have any online lesson, the purpose of not having this online lesson is because we are not in a private school. Schools like REOMICHS had online lessons our teachers were saying there was whatsapp group this whatsapp group cannot help us because if it was that we had a website and all of us can go to that website. The website will show all the subjects that we have and we can learn from it. But having a facebook or whatsapp group cannot help us" - Male, SS3,North Central

"Because of the lockdown we had to just go home and when we resumed there were things we could not recollect, and they had to start all over again" - Female 17,North Central

"yes, because one of the challenges is the teachers are no longer teaching us, I am on my own. the challenges I am even confused whenever I carry my book, I cannot be able to understand everything but with the help of the teachers I can understand it very well" - Female, SS3, South East

"Number 1, learning on my own was boring because if I was learning online, it will not be only me.And two again I might not be able to be exposed to some pictures about the things I might be reading and this pictures and videos will be able to help me" - Male SS2, North Central

"The problem is that in our area now there is no light where we can charge it, that is the problem, and the money for internet we don't even have the money to buy it" - Female SS2, North West

"*Some were learning through radio but as for me I don't have radio, I usually go to my friend's house to learn with them because when lesson will be going on the radio, there are some certain things that you need to jot down in order for you not to forget it the next time but they usually rush the lesson we cannot understand as we should" - Female, SS3*

"Some are hairdressers, the other people I don't know what they are doing because I have not set my eyes on them" - Student, South East Nigeria

5. Conclusion and Recommendations

This study presents findings detailing the various challenges experienced by secondary school students in rural Nigeria in accessing e-learning opportunities during the COVID19 pandemic. We revealed specific contextual factors that exacerbate the digital gaps for students in rural communities as lack of digital awareness, financial constraints, poor internet connection, poor parental support, unstable power supply, lack of access to digital learning tools, and inability to afford usage costs. The statistical analysis of the critical factors concluded that while the significance of remote learning opportunities to students' learning outcomes is well understood, geographical limitations, socioeconomic costs, household dynamics as well as lack of access to digital infrastructure to leverage online learning options remains a huge challenge. We found out a statistically significant relationship between low level of readiness to e-learning adoption in rural communities with perceived benefit of digital learning, poor knowledge and low level of awareness of digital learning tools. The extent of exclusion as shown by the digital needs of our respondents also reflects the degree of marginalization that continues to deepen social and educational inequalities. This study therefore complements existing literature on the state of technology access and usage for learning and teaching in Nigeria, specifically during the COVID-19 pandemic.

The adoption of digital technologies as a major element of remote learning strategies during humanitarian emergencies such as the COVID19 pandemic would require bold commitments from the government to ensure schools, children and/or teachers in rural communities are not left out and can access school-based digital support and interventions. For vulnerable children from remote communities to acquire digital competence, schools must incorporate digital awareness into learning activities. Addressing infrastructural inadequacies is central to maximising the potential of remote learning for rural students. The government should provide amenities such as internet-enabled community e-learning centres and equip them with computers that can ease physical access to technological tools and aid the acquisition of digital literacy skills. As our results demonstrate, internet access and connectivity in Nigeran rural communities is a necessary accessory for social equality and must be prioritized as a developmental necessity. Not only will the availability of internet services at community levels help improve students' attitude toward learning, but it will also facilitate access to educational opportunities for community children, including older learners. More significantly, the role of family members, community leaders and stakeholder groups in fostering access to quality e-learning opportunities can not be overemphasized. Also, as established in the literature on remote learning and e-learning opportunities, an offline learning model can help address the digital divide among students. In rural communities with limited technology access and internet

connectivity issues, governments and schools can leverage the use of home learning kits including printed study guides, reading lists and lesson notes. The use of other low -tech tools such as radio, television and messaging platforms like Whatsapp needs to be encouraged. In conclusion, this study offers clear evidence on how most vulnerable students in rural communities are disproportionately excluded from e-learning during the COVID19 pandemic. Further studies still need to be done to establish how other factors such as gender or disabilities contributed to digital exclusion.

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