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Proposing Internet-Driven Alternative Pedagogical System for Use in Teaching and Learning During and Beyond the COVID-19 Pandemic

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Abstract

One of the most significant changes the information and communication ecology is the internet. It not only allows for real-time contact and engagement across time zones, but it also allows for successful social growth and crisis management, including the promotion of distance learning, particularly during the COVID-19 epidemic and its associated lockdown on educational systems. This disruption of education poses a threat to learning in Nigeria, and the consequences of continuing to close schools and academic programmes might have detrimental consequences for students, parents, and the country. Students can be encouraged to explore their own interests and become active learners during the lockdown by using internet-enabled ICT as a resource. However, this was noticeably absent in Nigeria 's educational system. This paper aims to provide a simple, cost-effective, and alternative pedagogical system for use during and after the epidemic, particularly for open schools and institutions. This study offers an e-learning system based on the use of a computer and Android smartphone apps to help mitigate the detrimental effects of the continued lockdown on the Nigerian pedagogical system, or what this paper refers to as the 'edu-lockdemic.' The proposed system was developed as a framework based on a comprehensive examination of existing literature, and it is projected to allow institutional managers to monitor school and academic teaching and learning activities in a virtual learning area known as a "CT-learning area." In the conclusion, policy recommendations are made.

Keywords: alternative pedagogy, COVID-19 and education, COVID-19 pandemic, e-learning system, ICT in education, internet and education, Nigerian education policy, online pedagogy.

1. Introduction

On 30 January 2020, the Director-General of the World Health Organisation (WHO) declared COVID-19 2019 to be a public health matter of worldwide concern. The Federal Ministry of Health declared the first verified case of COVID-19 in Lagos State, Nigeria, on February 27, 2020. "The multi-sector coronavirus preparedness team, led by the Nigeria Centre for Disease Control [NCDC], has immediately activated its National Emergency Operations Centre [NEOC]," the Minister of Health declared in the same letter. Nigeria reached more than 12,233 cases across the country in less than four months. The numbers are maintained and updated daily by the NCDC (Anumudu, Ibrahim, 2020).

Recently, a series of government directives have been issued to combat sanctions and structural changes across the country, as well as to halt the spread of COVID-19, ranging from the closure of international airports to the closure of all schools across the country, as well as the

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closure of several key states for several weeks – Lagos, Abuja, Kano, and Ogun. The Federal Ministry of Education released a circular on 19 March 2020, approving the closure of all schools for one month beginning Monday, 23 March 2020, to avoid the spread of COVID-19, affecting almost 46 million students and children across the country (Ejeh et al., 2020; Obiakor, Adeniran, 2020).

While the COVID-19 epidemic has caused a partial and complete "lockdown" in numerous nations, academic activity can continue because of the shutdown. Many studies (e.g., Ho et al., 2021; Ifijeh, Yusuf, 2020; Zawacki-Richter, 2021) have demonstrated the importance of using electronic media in remote learning programmes. However, the use of electronic media in distance learning programmes is not solely centred on digital technologies, but also includes physical management. According to Dreesen et al. (Dreesen et al., 2020), and UNESCO (UNESCO, 2020), during the lockdown, Nigeria disrupts learning and access to key school services for a record number of students and pupils, with approximately 46 million students and pupils affected by school closures across the nation, including more than 91 % of primary and secondary school students (Adarkwah, 2021; Dreesen et al., 2020 April 24).

As a result of the outbreak, Nigeria's educational environment was disrupted in a short time, reducing pupils' access to schools across the country. The COVID-19 epidemic creates significant problems for the government, students, and parents, exposing and potentially exacerbating existing flaws in the educational system (Obiakor, Adeniran, 2020). As the country grapples with these issues, a critical question arises: Is Nigeria's educational system designed to adjust rapidly to changing circumstances? Given the current global circumstances, the country's ability to assure ongoing learning will be primarily dependent on its ability to quickly harness existing technologies, create suitable infrastructure, and mobilise partners to develop alternative educational programmes (Owolabi et al., 2013).

Education is the deliberate transfer of society's acquired knowledge, values, and skills from one generation to the next through institutions. As a result, for advancement from the individual to society and the economy, a proper educational system is required. The impact of repeated closures of schools and academic programmes on student learning can have detrimental consequences for students, parents, and the nation in Nigeria. This report analysed the immediate and long-term ramifications of Nigeria's education system, proposing an online media technology system as a means of e-learning and providing recommendations on how the government might ameliorate the disruption. Furthermore, this study looks to the future by offering suggestions on how to turn the tragic crisis into a chance to address a slew of supply-side educational issues in the run-up to the post-COVID-19 pandemic in Nigeria (Owolabi et al., 2013).

Furthermore, education is a panacea for releasing individuals from enslavement, and universities serve as the nation's "brain box" since they play a key role in ensuring that countries migrate from poor to developed status (Oyeniran et al., 2020). The study presented a system that would allow professors and students to participate in academic activities during the closing session while also allowing institutional management to monitor ongoing academic activities using open-source computer and robot applications.

The COVID-19 pandemic's ongoing disruption of education has begun to damage the educational system, notably fundamental education, and particularly for public school students, learners, and parents. On the other hand, pupils, trainees, and students can use effective resources such as information and communication technology (ICT) to investigate things that interest them and become active learners during the closure period. It is vital to maximise the impact of online media, such as e-learning systems that encourage continual learning (Ibrahim et al., 2017; Nguyen, 2021). As a result, this article introduces the ICT-learning system as a technology-based instructional instrument for schools, universities, and higher education institutions across the country to investigate during the COVID-19 insurance process. The proposed system was designed to reduce the detrimental impacts of educational disruption caused by the illness outbreak in 1990.

The planned online media-based system would include computer and Android mobile applications that will be cost-effective and simple to use. Furthermore, it is expected that this system will allow teachers and lecturers to easily exchange and interact with curricula and e-lecture notes for students and pupils in e-classrooms known as ICT-learning areas, as well as provide schools and instruction management with the ability to monitor academic activities.

Nigeria's education system is failing to adjust to the COVID-19 challenge, and the country will continue to struggle in this area for the foreseeable future. However, in comparison to private schools, students and learners at public schools are expected to bear a disproportionate amount of

socio-economic burden. While several private schools have begun distance learning programmes, taking advantage of the international community's many opportunities for online learning, the government has yet to announce any formal plans to provide distance learning opportunities, particularly to public schools, due to a lack of funds and insufficient planning. This means that these pupils in public schools do not currently have official learning plans and maybe utterly unaware of what they are studying (Ibrahim et al., 2017; Onyema et al., 2020). As a result, by building and proposing a cost-effective ICT-learning system, this study provides a way to end the disruption of education caused by the pandemic's closure.

COVID-19 Pandemic and Internet Accessibility in Nigeria: According to the Nigerian National Centre for Disease Control (NCDC), on 24 November 2021, there were 3,479,682 tested samples of COVID-19, 213,677 confirmed cases, 3,906 active cases, 206,797 discharged cases, and 2,974 deaths. Since the supply of the first batch of COVID-19 vaccines in Nigeria on 2 March 2021, at least 9,483,387 doses of vaccine have been administered so far, which is approximately 2.4 % of Nigeria's 200 million population if every person needs two doses (Reuters..., 2021). "As COVID-19 began to be reported around the world, many countries (including Nigeria) by shutting public places such as schools, workplaces, and international borders to contain the spread of the virus" (Reuters..., 2021). Therefore, not fewer than 6 million Nigerians have been vaccinated as of November 2021 (NTA..., 2021). Fig. 1 shows a chart of how school lockdown measures were implemented during the pandemic in Nigeria. In early 2021, the lockdown was ongoing. The lockdown or 'lockdemic' on schools and universities was officially lifted on 12 October 2020 after a long lockdown of about six months (Reuters cited in Dessy et al., 2021).

Fig. 1. T A chart showing measures school lockdown measures implemented during the pandemic in Nigeria. Source: (Reuters COVID-19 Tracker, 2021 November 24)

About 60 % of Nigerians are offline, according to the Digital World Outlook (Digital..., 2020) report cited in Smith (Smith, 2020). Mobile phone statistics, which can also be used for electronic learning, are more optimistic. According to the survey, approximately 169.2 million Nigerians (83 %) have access to mobile phone connections; however, only half of them, or approximately 84.5 million, live in metropolitan areas. The population with access is biased towards a higher socioeconomic and urban home; most of them are private school pupils who already have an edge over their peers in public schools. The integration of ICT-based learning will be limited for children from low-income families who have limited access to the internet and computer, most of whom live in rural areas where indigenous languages predominate over English (Garanina, 2020; Kalas, 2010).

Access to vulnerable populations in Nigeria will require the adoption of multiple educational media, ranging from television and radio to mobile SMS platforms, which are more readily available to the poor. With more than 80 % of the adult population having access to radio and mobile phones, most of the children left behind will be able to access the instructions that are addressed through these media. However, while online platforms provide personal learning, other service delivery media require a central scheme, as well as coordination between the three levels of government and the private sector (media system owners). Here, the role of the Ministry of

Education will decisively go beyond the development of traditional policies and regulations. Education commissioners can help deploy and use these tools within the states, while the Federal Government coordinates state efforts by closing capacity and funding gaps. The government could benefit from the experience of Sierra Leone, where the Ebola crisis led to the closure of schools for almost nine months (Harrism, 2009; Smith, 2020). To reach the most vulnerable and excluded children, the government of Sierra Leone has harnessed radio and television to "deliver lessons." Whatever strategy the government chooses to include, it must ensure that it is cost-effective (at least available at home) and easy to use (children and their parents have some prior knowledge or can easily learn to use it).

The unequal access to ICT-based learning can have a negative impact on further intensification of differences in learning outcomes based on social and economic conditions and the gap between urban and rural areas. As the lockdown on schools is "currently indefinite", pupils, trainees and students may lag, more especially those pupils having "learning disabilities, and those living in fragile and conflict-affected regions, the outlook is even bleaker" (Obiakor, Adeniran, 2020: 3). This poses a major challenge to inequality in education regarding the technological system with the attendant "income-based digital divide", how does Nigeria "harness" the technology currently in use toward supporting "marginalized" pupils and students during the widespread and protracted lockdown, or 'lockdemic'? Unless this challenging question is addressed, the lockdemic could worsen "the gap in the quality of education and unwitting socio-economic equality" (Smith, 2020).

The Role of ICT in Teaching and Learning: Information and communication technology (ICT) is a type of electronic technology that allows people to store and retrieve data (Al-Rahmi, 2020; Nkechinyere, 2020). ICT plays a significant role in our daily lives to the degree that it is nearly impossible to go a day without using some forms of ICT such as cell phones, smartphones, laptops, and the internet. Technology has made "teaching and learning" easier, more accessible, and more productive in education. It aids teachers and administrators in keeping track of pupils' academic progress. In addition, students can learn in a fun, entertaining, and accessible way. Technology research and educational materials more accessible, regardless of time or location. To improve teaching and learning, teachers and students now have access to massive open online courses (MOOCs). Students have become digital natives due to the digital revolution. Nowadays, young people want to learn about mobile devices and through social media sites. Because technology is a vital part of their life, it has become the most convenient way for pupils to learn. There are fewer learning limits with technology, and the present generation of students appears to be quite conversant with digital skills. Not only does technology make student-centred learning easier, but it also stimulates student enquiry, teaching, and learning innovation (Garanina, 2020; Onyema et al., 2020: 124).

Previous studies have shown that the use of ICT in teaching and learning increases student participation and enhances learning outcomes. For example, Francis and Shannon (Francis, Shannon, 2013), Dawson et al. (Dawson et al., 2010), Harandi (Harandi, 2015), and Agbetuyi and Oluwatayo (Agbetuyi, Oluwatayo, 2012) described ICT as a critical resource because its absence could lead to a lack of knowledge and poor decisions. According to Diane and Steven (Diane, Steven, 2007: 165) there an evolving relationship exists between education and technology, and that the developing pedagogical systems are "taking advantage of newly designed or emerging technologies." As researchers (Oliveira et al., 2019) noted, emerging technological artefacts such as computer simulations, virtual laboratories, mobile devices, robots, games, painting, and digital photography increase learners' experience. Bao (Bao, 2020), and Yakubu and Dasuki (Yakubu, Dasuki, 2019) argue that "emerging technologies have spawned the exponential development of software and AI-aided, cloud-based technology that aims to adapt learning methods and customise curricula to fit each student's ability to move forward at his or her own pace." Whereas Hemant (Hemant, 2018) asserted that technology played a critical role in making teaching and learning activities more meaningful, and it that is one of the most efficient tools to advance knowledge and skills. As the need for home-schooling and learning from home increases due to the COVID-19 pandemic, technology will play a key role in the present and future of teaching and learning in Nigerian schools and institutions of learning. Teachers should also adopt more flexible educational approaches that support students (Onyema et al., 2020)

Nearly 1.5 million Nigerian students and 27 Nigerian federal universities have been connected to the internet by the Ministry of Communications and Digital Economy through its

collaboration with the Ministry of Education and the World Bank's STEP-B project in 2015 (Samson, 2015). This is a milestone in the Nigerian education system because it shows efforts to introduce students to information and communication technologies and the internet. More than 1,500 (1,522) secondary schools have been equipped, resulting in an estimated 1,458,880 million students being introduced into ICT, according to the ministry. It also revealed that the National Information Technology Development Agency (NITDA) has launched the Third Enterprise Access Project (TIAP), which has provided desktop computers, printers, and wireless network facilities to selected educational institutions across the country (Samson, 2015).

With the outbreak of the COVID-19 (which has ravaged and crippled various sectors of the world with devastating and seemingly long-lasting consequences), many African countries including Nigeria have been forced to close down schools and higher institutions as part of the containment measures against the spread of the virus. This gave educational institutions no other option than to look forward to using ICT to give lectures and communicate with students (Garanina, 2020; Onyema et al., 2020). However, this has largely highlighted the gap between educational institutions in Nigeria and countries with a much better ICT infrastructure and educational instructions within the country with better infrastructure and implementations than others, making for the majority, as well as students within the university itself who are challenged by the financial situation to withstand the power of the internet or the network concerning urban or rural developments. Despite the struggle for the application and use of ICT in education, most schools and higher institutions lack the primary capacity to implement any meaningful e-learning system with few private universities capable of having any recognisable e-learning system and, probably, only the National Open University of Nigeria (NOUN) has been able to handle distance teaching and learning effectively (Muhamadbhai, 2020).

To understand the exigency of the need to provide scholarly support toward overcoming the challenge of educational system lockdown, or what this paper describes as 'edu-lockdemic', there is the need to make sense of the challenges the adoption of ICT in the Nigerian education system faces.

Constraints of ICT-Driven Alternative Pedagogy in Nigeria: The efficient use of ICT in Nigerian schools and higher education institutions faces several problems. One of them is the unfortunate lack of well-trained ICT teachers (Adeoye et al., 2013), as well as some people's unwillingness to adapt to technological advancements in the education system (Oluwole, 2015). The few ICT facilities in some of these schools are not well managed and are not being used effectively due to a shortage of ICT-trained staff and teachers in Nigerian schools and higher institutions. Another impediment to the growth and use of ICT in Nigerian education is a lack of funding. Due to a lack of finance, institutions' most essential and important survival needs are frequently prioritised (Idowu, Esere, 2013). Another important issue that most ICT users in Nigeria face is an insufficient supply of electricity and frequent power outages.

Finally, there is the issue of political will. The policies in existence are a little out of date and discourage the use of ICT in Nigerian education (Martens et al., 2020; Usman, 2016). Despite Samson's (Samson, 2015) claims, recent studies show low levels of computer integration in the school system (Egielewa et al., 2021; Eze et al., 2018; Ibrahim et al., 2017; Olayemi et al., 2021; Peimani et al., 2021). These are just a few of the challenges that Nigerian schools and higher education institutions face when it comes to using ICT to promote education in the country.

Educational institutions take advantage of the advantages provided, such as the ability to create small, simple, and quick content, a social factor that ensures immediate communication and feedback, which promotes the creation and improvement of digital content, as well as the development of communication skills, which are critical in the process (Jiang et al., 2021). Some organisations try to create a safe study environment by choosing to build their own internal networks, others choose an integrative approach and use existing media that are already open to the public and try to move the study process into the public space creating study communities there. Students in the digital environment benefit from communicating with peers and lecturers who can enable students to achieve a higher level of understanding. Online discussions allow students to improve their reading and writing skills. The use of the internet in education requires focusing on the interests and needs of students as well as enhancing communication with students not only because of the physical presence in the classroom (Oyeniran et al., 2020).

Theoretical Underpinning: Understanding and predicting the factors associated with e-learning or ICT-learning are crucial to the Nigerian education system's success during and after the lockdown. The basic goals of communication-psychological theories are to interpret and predict

behaviour. The Technology Acceptance Model (TAM) is one of the most useful theories. According to Agarwal and Prasad (Agarwal, Prasad, 1999) and Davis (Davis, 1989), TAM is a potent tool for gauging user acceptance of new technology that was developed by Davis (Davis, 1989, 1993). The model has been proven over the years through a variety of applications and expansions, including web-based information systems like online banking, electronic tax delivery systems, and e-learning (Yi, Hwang, 2003). Because e-learning is still relatively new, particularly in Nigeria, it is reasonable to investigate it using the TAM model.

TAM consists of six constructs, namely "external variables, perceived usefulness [PU], perceived ease of use [PEoU], attitude [AT], behavioural intention [BI] and actual use [UB]" (Shyu, Huang, 2011: 493). The user's behaviour is determined by the behavioural intention that is influenced by attitudes and perceived usefulness. Perceptions of the usefulness and ease of use of a specific technology determine attitude (Adams et al., 1992). External variables, depending on technology, context, and users, affect perceptions of usefulness and ease of use. According to the model, "two behavioural beliefs, perceived usefulness and perceived ease of use are fundamental factors for predicting user acceptance, and that the effects of external variables on intention are mediated by these two beliefs" (Shyu, Huang, 2011: 493). PU is defined as an individual's perception that the use of new technology will enhance or improve its performance (Davis, 1989, 1993). Based on this definition, PU in this paper is the user's perception that e-government learning will enhance their job performance.

Consolidating this belief creates a positive attitude towards e-learning, which increases users' intention to use e-learning sites. PEoU is defined as an individual's perception that the use of new technology will be effortless (Davis, 1989; 1993). Based on this definition, PEoU in this paper represents the perception that e-learning or ICCT-learning sites are user-friendly. PEoU has been shown to affect PU. "Moreover, both perceived usefulness and perceived ease of use are affected by external variables and have a positive effect on attitude" (Shyu, Huang, 2011: 494). Although TAM applies to various technologies, it has been criticised for not providing sufficient information on individual views on new systems. Davis (Davis, 1989: 985) noted that external variables enhance TAM's ability to predict the acceptance of future technologies. In other words, tam constructions must be expanded by incorporating additional factors. These additional factors depend on the target technology, users, and context (Shyu, Huang, 2011).

2. Materials and methods

This study utilised secondary sources to retrieve relevant data for use in the designing of the internet-enabled alternative pedagogical system. Relevant existing and past literature was critically reviewed over four weeks. Thematic analysis was used to ascertain the primary arguments and viewpoints associated with the conceptualisation of internet-based systems through rigorous reviews of extant literature. The method of theme analysis was chosen to "capture the complexities of meaning within a textual data set" and to "describe both implicit and explicit ideas" (Dimitriadis, Kamberelis, 2011). Key issues and concepts were coded to identify recurrent key phrases and to organise the data. According to Saldana's coding, "repetitive patterns of action and consistency in human affairs" (Yerpude, Singhal, 2018).

Furthermore, when conducting thematic analysis, the inductive method is used. This means that no a priori list of codes or subjects is generated before data analysis. The meaning of a sentence or paragraph is represented by codes. During the review of literature, texts were re-read several times, resulting in many modifications to the codes. Due to its simplicity, open coding is a common coding technique in exploratory research (Saldana, 2009). A couple of hundreds of pages were reviewed and coded using many open codes assigned to several categories. The term "category" refers to a collection of codes that have the same meaning as various arguments or points of view. According to Ryan and Bernard (Ryan, Bernard, 2011), it is critical to evaluate repeating themes, similarities, and the expression of individual participants, as well as language linkages, interpersonal interactions, societal tensions, and control difficulties, while developing categories (Dovile, 2017). For instance, the categories classify codes associated with internet accessibility, internet penetration, internet of things, information and communication technology use, internet data, Wi-Fi, broadband penetration rate, government policy on education, e-learning, alternative pedagogy, socio-economic factors affecting education, health, public diseases and social wellbeing, pandemics and social wellbeing, and COVID-19 and lockdown.

By performing this last analysis and classification, the study can determine which ideas have the most in common and why they are so highly regarded. Six major themes were developed from the reviews, namely: COVID-19 pandemic and internet accessibility in Nigeria; the role of ICT in teaching and learning; constraints of ICT-driven alternative pedagogy in Nigeria; theoretical underpinning; operationalisation of the internet-enabled alternative pedagogical system; and advantages and disadvantages of ICT-enabled alternative pedagogical systems

Limitations of the Methodology: The disadvantage of using literature review-based thematic analysis is that it does not generate empirical findings, and, hence, limits the generalisability of the conclusions because they are based on subjective rather than objective data (Dimitriadis, Kamberelis, 2011; Saldana, 2009). Future investigations will demand quantitative, qualitative, and data-driven evidence to draw more acceptable conclusions. When data are analysed using a theme analytic framework, there is a risk of interpretation, because codes are reviewed by a researcher and are influenced by that researcher's experience. Some of the theme's codes may have been generated incorrectly.

3. Discussion

This research has identified many emerging internet-based technological interfaces that are used in this kind of situation which is, more or less, a teleconference-like setting. Some of the most popular include Zoom, Google Classroom, etc. Smartphone mobile applications such as WhatsApp and online blogging are also included to facilitate flexibly effective pedagogy. All these apps and gadgets comprise ICT. However, for effective distance-learning-based teaching and learning occasioned by the COVID-19 pandemic with its attendant lockdown, internet service must be provided. After all, the technologies mentioned are internet-enabled.

So, the ICT-learning area is a combination of Android and computer apps for teaching and learning purposes. The Android apps and computer programmes that are suggested to be used in the learning area are outlined below.

1. *Zoom:* Zoom is a video communication platform that offers video telephony and internet chat services via a peer-to-peer cloud-based software system for distance learning and social networking.
2. *WhatsApp:* WhatsApp is a free mobile app that provides cross-platform messaging and VOIP services. Facebook is the owner of WhatsApp. Users can send text and voice messages, make voice, and video calls, and share photos, documents, user location, and other multimedia through WhatsApp.
3. *Google Classroom:* This is a free web service developed by Google for schools to simplify the creation, distribution, and classification of assignments in a paper-based manner, as well as the handling of file exchange between instructors and students.
4. *Blog:* A blog is an online "journal" or information site where content is displayed in reverse chronological order, with the most recent entry appearing first. It is a platform in which the author shares their opinion on any subject of interest.

The immediate consequences of the epidemic may be dire, but this crisis is a unique turning point; an opportunity to learn, reshape and build resilience in Nigeria's education system. The need to integrate the electronic education system into the curriculum is increasingly becoming dire. Key evidence generated by the current pandemic is the need to integrate more technology into the classroom. Technological solutions, such as adaptive learning technology can ensure personal learning with minimal teacher participation and have the potential to provide better learning experiences at low costs. However, the pace of adoption of these technologies has been slow and uneven in Nigeria. The post-pandemic period could represent an opportunity to invest in technology in both private/commercial and public-school systems.

To design this system on a large scale, it will be important to strengthen educational partnerships between the public and private sectors. Many relevant stakeholders, including the government, its ministries, and departments such as the Ministry of Communications and Digital Economy, the National Telecommunications Commission, internet and telecommunications services providers, educational professionals, among others, will need to cooperate to drive the required innovation. Conscious efforts are also needed to bridge the digital divide by ensuring that the cost of technology is low. In general, the introduction of innovative technology into the classroom can help improve learning outcomes across the board.

The COVID-19 crisis has been added to the list of policies aimed at treating the out-of-school population because forced school closures have led to the proliferation of different ways of reaching children and adolescents when they are not educated. However, the prevailing political response to the problem of most children and adolescents in Nigeria has focused only on bringing them to school. In the future, some of how education was introduced during the crisis should also be explored for out-of-school populations before the pandemic spread. This approach is like the "school meets the learner" approach used to provide education to girls in the North-Eastern part of the country by providing education to children and adolescents in situations where cultural and economic conditions prevent them from attending school. While the goal must remain to bring all school-age children to school, finding ways to reach children and adolescents at home can be part of the process.

The epidemic has alluded to the need to integrate appropriate electronic media technology into learning and to fill existing educational gaps. However, without deliberate and concerted efforts, its effects on education can be lasting and negative. The responsibility now shifts to us: is either we permit this pandemic to deepen the education crisis further or do we take the opportunity to influence the change that can address the challenges of the pandemic now and beyond? The model proposed in this paper is an attempt to provide an answer to this question.

This proposed system, like other ICTs, is likely to have both positive and negative aspects. The subsections below detail some of the projected significant benefits (advantages) and drawbacks (disadvantages). As Oyeniran et al. (Oyeniran et al., 2020) noted, some notable payoffs for the use of the alternative pedagogical system during pandemics include the following:

1. Ongoing learning: Because there is no barrier on the side of the lecturer or student for the mandated classes in the ICT-learning domains, this framework provides for continuous learning. The cost of establishing individual remote learning platforms is eliminated: because this framework provides open-source distance learning apps, no learning institution needs to design its own remote learning application.
2. Effective feedback mechanism: This framework ensures that students receive adequate feedback and that they can interact with both their peers and lecturers. This enables them to ask and answer questions that may appear to be tough or unclear. Furthermore, because the ICT-learning rooms are equipped with many sorts of applications, each student will be able to communicate with their professors and peers using any platform.
3. Makeup Lessons: With multi-platform technology, any student who misses a session will be able to take makeup classes on other platforms since courseware is available on other accredited ICT-learning platforms and available for use at any time by students.
4. Moderate installation and accessibility costs: Because the ICT-learning platform is open source and may be utilised by anybody for free, there are no implementation or maintenance costs. The network provider, on the other hand, charges a data subscription cost for internet access.
5. Exposure to a new method and curriculum: While all ICT-learning platforms in the ICT-learning sectors may not be novel to some, they will provide a way for many others to learn about new learning platforms and platforms.

The following are some of the critical challenges of the use of the alternative pedagogical system during pandemics (Gruzina et al., 2020; Oyeniran et al., 2020):

1. Learning equipment affordability (smartphone): Not all students have or can afford smartphones because some parents are still struggling to pay for their children's education and may not be able to provide them with smartphones at any point during their studies.
2. Unpredictable network problems: Another issue here is that network problems might occur in various parts of the country at different times of the day.
3. Internet access (data subscription): The data discount rate you subscribed to is quite concerning, and this might be a significant disadvantage because lecturers and students will need to sign up for it regularly to deliver it to classes online.
4. Instability of electric power supply: Because of Nigeria's current situation of epileptic power supply, the first disadvantage that needs to be addressed is this. This poses a serious threat to the system's smooth operation, and many lecturers and students will be forced to spend a significant amount of money on generators and fuel.
5. Inadequate technical knowledge: Because not all lecturers or students are familiar with certain platforms, some people will require training, guidance, or assistance to use them effectively.
6. Environmental distraction: A succession of environmental distractions, as recognised by

society, can be a detriment to this system. Addictions, household chores, and family influence are just a few examples.

7. An unexpected shutdown of any ICT-learning platform will obstruct learning: this is the final disadvantage to discuss. Some technologies and applications have been bought by new people with new terms and conditions, or they have been phased out entirely.

8. Dual curriculum on different learning platforms: Because different learning platforms provide comparable services, materials and curriculum observations will be available on all platforms, therefore materials will be repeated on platforms.

4. Results

Operationalisation of the Internet-Enabled Alternative Pedagogical System: The proposed internet-enabled alternative pedagogical system is organised into three main dimensions or regions, as indicated in Fig. 2, namely teaching areas, learning areas, and e-learning areas. The teaching spaces are where the instructor (teacher, lecturer, or trainer) delivers their lessons to the learners (pupils, students, or trainees), whereas the learning areas are where the learners live and receive the instructor's lessons. Between the two places in the e-learning area, which is essentially an internet-enabled technology interface via which both parties (instructors and learners) connect. The sharing of instructional messages is a big part of this communication activity. The lessons imparted by the teacher, lecturer, or trainer to the pupils, students, or trainees are referred to as pedagogical messages in this context.

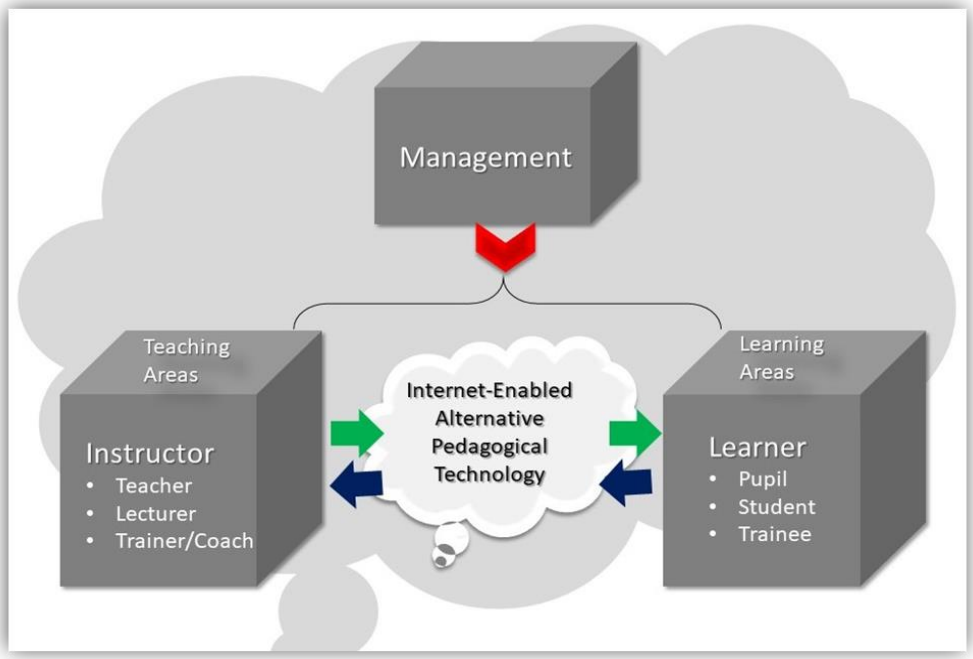

Fig. 2. An illustration of the internet-enabled ICT-pedagogical system. Source: Authors

The internet-enabled ICT-learning system was designed based on the two critical constructs of the TAM: PU and PEoU. The perceived usefulness (PU) of the system is expected to drive towards its adoption by all Nigerian schools and institutions. Its prospective payoffs are intended to help both private (commercial) and public schools and institutions. However, because the system should be in place within the school or higher during the lockdown, private school and college teachers appear to be the most affected by job loss and furloughs, as the management of commercial (private) schools and colleges are unable to continue paying teachers while they are at home, in contrast to public school and institution teachers and lecturers, who have been receiving their monthly salary despite the lockdown.

Furthermore, the system's perceived simplicity of use can be used to determine its PU (PEoU). The simplicity of the system informs its ease of use. Essentially, the system consists of two virtual pedagogical areas – the teaching area (TA) and the learning area (LA) – which are connected via the internet and are facilitated by internet-enabled teleconferencing technology involving a computer (e.g., a smartphone, a laptop, a PC, an iPad, a tablet, and so on) and free

open-source software (FOSS) (e.g., Zoom or Google Classroom). The FOSS installed on an internet-connected computer or mobile device facilitates pedagogical communication between instructors and students from any location (teaching area and learning area). The TA and LA could be somewhere where the participants are confined, such as a home or a store.

Multimedia mobile instant messaging programmes such as WhatsApp and Messenger may be used to supplement FOSS because they allow people to communicate media-rich communications such as photographs, video, audio, and voice over the internet. For instance, the instructor might want to share an important e-handout instantly with the learners whilst explaining points on Zoom or Google Classroom. All they need to do is to upload the e-copy of the handout to their WhatsApp or Messenger app and share it with the students. It is assumed that the instructors and learners must have exchanged their mobile phone numbers especially if they want to use WhatsApp. Alternatively, the instructor may publish the content of the handout in their blog especially it is not for instant use during the online class session. So, the usefulness of the system lies in its ease of use and its ease of use informs its potential for use across all categories of schools and institutions. The schools', colleges or institutions' management may be a part of the pedagogical sessions as a non-participant observer by assigning a representative to oversee the activity. So, the management's presence there is basically for administrative purposes.

The arrows (a shown in Fig. 2, above) indicate the directions of the flow of the pedagogical messages (lessons and the learners' responses), which are in a two-way protocol – a dialogic process which each section of the two parties can send and receive pedagogical messages simultaneously as in real life.

5. Conclusion

Even though several countries have been "locked down" because of the COVID-19 issue, academic activity can be maintained. Many studies have shown the value of using online media in remote learning programmes; nevertheless, distance learning programmes are dependent not only on the use of computer technology but also on physical management activities. As a result, this article presents a framework for lecturers and students to participate in academic activities using FOSS, Android, and computer apps.

Except for data subscription fees from respective data network providers, using these apps does not incur any additional costs for instructors, professors, lecturers, or students. According to the framework, instructors, teachers, and lecturers will submit curricula and lecture notes to ICT-learning areas, and students will have access to the ICT-learning areas to attend their various classes as scheduled by lecturers or as instructed by the school or institution's administration. The ICT-learning areas, in essence, function as a meeting place or lecture hall for students, trainees, professors, and lecturers. Pupils and students can take and "submit assignments" in the ICT-learning areas, while instructors, teachers, and lecturers can attend to students utilising various technical functions integrated into the areas.

While this is helpful information, the school's contingency plan is lacking, as it does not guarantee that learning will continue despite the problem. This school shutdown, funded by COVID-19, may have been the catalyst for identifying certain crucial sector-wide inadequacies. Given the rise in the number of infectious diseases worldwide and the conflict in the North-East, the COVID-19 pandemic is certainly not the most recent crisis threatening the continuation of education in Nigeria. As a result, the government must develop a comprehensive contingency plan that includes not only school safety measures but also ways to ensure that students and teachers continue to learn and receive support in times of crisis. The government should also provide major support for essential social services and other services that are directly or indirectly related to home learning, such as power costs and internet/Wi-Fi.

Limitations of the Study: The study used secondary sources to generate data from which the proposed internet-driven alternative pedagogical system was conceptualised and designed. As such, no empirical data (results/findings) were generated from the research. Hence, when deciding to adopt the proposed system, caution should be exercised because the system may or may not suit specific contexts. However, since the system was designed after a rigorous review of literature and concepts related to the main research problems, it is anticipated that the simplicity of the system could encourage policymakers to order for the design of prototypes and testing in smaller, specific Nigerian contexts before recommending for wider use and application nationally and continentally. Future research should adopt mixed methods, including quantitative, qualitative, and data-driven

methods to generate empirical data to guide in the designing of such alternative teaching and learning systems that are internet-enabled for adoption during future pandemics and/or lockdowns.

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