Adoption of E-Learning as a Panacea to the Effects of Covid-19 on the Teaching and Learning of Science in Nigerian secondary Schools

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Abstract: **The focus of the article is on adoption of E-learning as a panacea to the effects of COVID-19Pandemic on the teaching and learning of science in Nigerian Secondary Schools. It is argued that conventional. Strategies of teaching are not adequate for teaching science during the pandemic because of the lockdown and social distancing. The script is of the view that E-learning would be the best alternative, however the various modes of E-learning required face-to-face lecturing, which may not be possible at this period. In light of this, the author believed the Google classroom and the zoom session frameworks, which have been in vogue in many countries of the world could be the best. The paper reviewed the benefits of Google classroom and Zoom based on the countries that had used the method. The manuscript mentioned some challenges that can militate the implementation of the strategy in Nigeria, it was concluded that Google classroom and Zoom session could be the alternative to science teaching and learning at this period if all the challenges mentioned were mitigated. Finally, the implications of the paper were highlighted**

Keywords: **Covid-19, lock down, Physical distancing, Google classroom, Zoom session, teaching and learning.**

I. INTRODUCTION

The emergence of corona virus known as the COVID-19 pandemic devastated all sectors of the global economy. The Coronavirus pandemic (COVID-19) has no doubt adversely affected the global economy, it has forced many businesses to temporarily shut down and governments across the world to place a restriction on movement while exempting providers of essential services who are to strictly observe physical distancing rules, while providing services as a way to contain the spread of corona virus . Unfortunately, the educational sector is a part of the receiving end. According to UNESCO, an estimated 1.725billion learners have been affected as a result of school closures, representing about 99.9% of the world's student population as of April 13th, 2020.The educational system of the world was halted because of physical distancing and the lockdown. The conventional paradigm of teaching fails and teaching/learning suffers a severe setback all over the world including Nigeria. Teaching and learning in science education are evolving. Many decades ago, in Nigeria the conventional methods of teaching holds sway in the educational sector (Aina & Langen hoven, 2015). In recent times, teaching and learning had developed into an electronic paradigm (E-learning) that pervaded the entire schools of the world. However, E-learning as an aspect of ICT is relatively new in Nigeria's educational system. The world is not static but dynamic and technology is changing human endeavor rapidly. Along with the changes are various challenges the human race is facing which makes our education fragile and weak such as the current problem ofCOVID-19 pandemic. The pandemic has exposed the weakness in teaching and learning in Nigerian schools because the typical teaching paradigm fails in Nigeria, the current lockdown in the country occasioned by COVID-19 pandemic is severely impacting science education. The advent of coronavirus (COVID-19) in Nigeria has dealt a severe blow to the education of the nation in 2020. The effect of the pandemic is alarming in the educational system of the nation (Sahu,2020). Within short months the virus entered the country it spread widely to nearly all the states. The government short down all schools in the nation and clamoring for physical distancing to curtail the spread of the virus. Physical distancing is one of the community mitigation measures that are recommended during influenza pandemics (Ahmed, Zviedrite & Uzicanin, 2018). Physical distancing has been considered effective to curb the spread of COVID-19 (Blocken, Malizia, Van Druenen & Marchal, 2020). It is a measure taken during a pandemic to restrict when and where people can gather to stop the spread of an infectious disease. The period of COVID-19 pandemic is a typical example of times when conventional teaching paradigm could not work in schools. During this period, as a measure of physical distancing, students and teachers are not allowed to interact physically. Schools are closed down for many weeks thus teaching and learning are disrupted (UNESCO, 2020). Teaching and learning in science required interactions between students and the teachers which may not only be physical (Akhtar, Hussain, Afzal & Gilani, 2019). Therefore, students staying away from schools for a long period may adversely impact their academic performance. It is therefore essential the Nigerian government is more committed to e-learning in our secondary schools. Although e-learning is not new in the Nigerian educationalbut the quality and effectiveness are critical. One of the learning frameworks that enable students to connect with the teacher to learn outside the school context is Google classroom.

II. THE CONCEPT OF E-LEARNING

The e-learning comprises all educational activities that are carried out by individual or groups working online or offline and synchronously where all the participants engage in exchange of ideas and information without dependence on other participants' involvement at the same time through networked or stand-alone computer and other electronics device. E-learning in education is the wholesome integration of modern telecommunications equipment and ICT resources, particularly the internet, into the education system. Tracy((1995) defines the internet as the international network of communications in which computers in the Wide Area Network(WAN) talk to each other. Shavinina(2001) defines ICT as all the digital technologies, including: computer, scanner, printer, telephone, internet, digital satellite system(DSS), direct broadcast satellite (DBS), pocket-switching, fiber optic cables, laser disc, microwaves and multi-media systems for collection, processing, storage and dissemination of information all-over the world.

The E-Learning Intervention

The e-learning is classified as computer-based and internet based (Arkorful & Abaidoo, 2014). The type depends on the user mode. The computer-based involves the use of ICT while the internet-based is purely online. The computer-based includes the use of computer software and hardware (Algahtani, 2011); the internet-based comprises e-mail, blog and other references (Almosa in Arkorful & Abaidoo, 2014). Upon this, the e-learning could be classified by this thesis to blended and online learning. The definition of blended learning varies according to the individual perspective (Bryan & Volchenkova, 2016). The blended learning is rotation, self-blended and enriched virtual (Bryan & Volchenkova, 2016). Cleveland-Innes and wilton(2018) categorized blended learning to three, which are blended presentation and interaction, blended block and fully online. Some tools are peculiar to e-learning for effectiveness depending on the types. The e-learning required the utilization of some tools for instructions in higher education for its effectiveness. According to Pande, Wadhai and Thakare(2016), Weblog,social bookmarking, Wiki, RSS, Podcasting, instant messaging, Text chat, and internet forums are essential tools for any e-learning. The benefits or advantages of e-learning are enormous. Some of the advantages according to Pande, Wadhai and Thakare (2016), includes flexibility, efficiency in knowledge and qualification enhancement, motivation of students' interaction, cost-effectiveness and others. Despite the vital roles e-learning plays in secondary education in many countries of the world: most developing nations including Nigeria are yet to unlock the full potentials of it (Kyari, Adiuku-Brown, Abechi, Pyochi & Adelakun, 2018). E – learning attempts to shift the focus of the educational environment away from the physical teacher-student context while disseminating information (Franklin & Nahari,

2018).The e-learning in some parts of the globe is not a new phenomenon in promoting education; Nigeria schools are using it to promote distance education and life-long learning (Ajadi,Salawu & Adeoye,2008). Several studies had been documented on e-learning how students receive instructions from teachers and learn adequately at all times including the vacation period (Zare, Sarikhani, Salari & Mansouri,2016; Franklin & Nahari,2018; Aina& Olanipekun,2018). Different types of e-learning could be explored as practiced in most developed nations. The typical e-learning in most Nigerian universities is the distance learning programme. There are concerns about how the distance learning programme could effectively teach online students by exploiting ICT technologies and collaboration to enhance in-depth interactive engagement (Magen-Nagar & Shonfeld), 2017). Some devices used for this distance learning programme are TV, CD-ROM and Radio (Kyari, Adiuku-Brown, Abechi & Adelakun, 2018) and recently the mobile phones (Aina & Olanipekun, 2018). E-learning is critical to secondary education as it is the use of information and communication technologies in various processes of education to support and enhance learning (Pande, Wadhai & Thakare, 2016). Therefore, to mitigate the impact of COVID-19 on the learning of science education in higher education required the adoption of e-learning during the period of lockdown. However, due to the rule of physical distancing, any e-learning that requires physical contact during teaching and learning may not be effective. Given this, any of the blended learning may not be the best for science education at this period except for the full online mode. Therefore, making an extensive literature search shows that the best e-learning suitable for teaching and learning at this period could be the Google Classroom

Google Classroom

This is a free web service that is developed by Google for schools that aim to simplify, creating, distributing and grading assignments in a paperless way with the purpose of streamlining the process of sharing files between teachers and students. Google Classroom is a Google Apps for education that helps the teachers to create and organize assignments quickly, provide feedback efficiently and communicate with their learners easily (Shaharanee, Jamil & Rodzi, 2016). The application has been used as e-learning (Henukh, Rosdianto & Oikawa, 2020). Reseach studies indicate the application helps students to learn more electronically and teachers spend more time with students than with papers(Basher, 2017; Rabbi, Zakaria & Tonmoy, 2018). Google classroom is an emerging technology in education since 2014 which had impacted teaching and learning in most developed and developing nations (Shaharanee, Jamil & Rodzi, 2016; Basher, 2017; Rabbi, Zakaria & Tonmoy, 2018; Henukh, Rosdianto & Oikawa, 2020). Previous studies show that Google classroom enhances ongoing learning on the basis that the students and the teacher can be sited in various geographical contexts (Mafa, 2018; Henukh & Rosdianto, Oikawa, 2020). Previous studies had suggested that e-learning has challenges that could

make them not suitable at this period of COVID-19. The inadequacy of Nigeria's weak and underdeveloped broadband infrastructure is a significant shortcoming (Trucano, 2014). For Mohamedbhai (2014), inequalities could be one problem of distance e-learning because of the differences existing between urban and rural students; between the rich and the poor who cannot afford the cost of internet(Ajadi,Salawu and Adeoye,2008), the problem of bandwidth and diversion of intention on the net are some of the problems associated with e-learning. Earlier studies show that Google classroom enhances learning on the basis that the students and the teacher can use it in different geographical locations (Mafa, 2018; Henukh & Rosdianto, Oikawa, 2020). Google classroom launched less than a decade ago has been one of the compelling ways technology is impacting teaching and learning in the world (Azhar & Iqbal, 2018). Given the above, it is apparent that one way to mitigate the impacts of COVID-19 on science education may be to adopt e-learning mode to teach science in Nigerian secondary schools. Therefore, the online e-learning, which does not depend on traditional paradigms like the Google |Classroom would be the best for instruction in science education. The Google Classroom framework would provide the same instruction to every student irrespective of their parents' background. It will offer the students the same classroom context as against the present situation where some students attend school well equipped with learning resources while some do not. The three fundamental menus when anyone logs into the Google Classroom account are streams, classwork or student activities and people (Henukh & Rosdianto, Oikawa, 2020). The stream is used for creating announcements, to discuss ideas or see the flow of assignments, materials, quizzes from the topic taught. The teachers use Classwork to make test questions, pretests, quizzes, upload materials and hold reflections (Henukh &Rosdianto, Oikawa, 2020). The teachers use the people menu to invite students by using the access code that is available in the people bar. Research shows that many countries are using Google Classroom in their schools because of its effectiveness. Studies conducted at the Bostwana College (Mafa, 2018), Barett Hodgson University (Azhar &Iqbal, 2018). Musamus University (Henukh &Rosdianto, Oikawa, 2020); Basher (2017); Rabbi, Zakaria & Tonmoy (2018) shows it develops students' skills. Google Classroom has lots of educational benefits that could be excellent for science education. According to Hussaini, Ibrahim, Wali, Libata and Musa (2020), it allowed teachers to post notes, assignments, create different groups in one class, invite another teacher to the class and it is flexible. Google classroom can be accessed anytime and anywhere. Students do not need to get to a designated building called classroom before receiving lectures and parents and guardians can track the progress of their wards (Mafa, 2018). It minimizes the paperwork for the teachers, helps classroom management. It enhances the student-teacher interaction as well as communication (Azhar & Iqbal, 2018). However, there is no perfect system without any challenge. Studies indicate that

Google classroom has some instructional challenges (Mafa, 2018; Henukh& Rosdianto, Oikawa, 2020). Some of the challenges may not be peculiar to it only but to all e-learning strategies. For instance, laboratory experiments cannot be taught with Google Classroom except to demonstrate .Therefore, the laboratory experiment for students during COVID-19 may not be possible through the Google Classroom. The best alternative is to teach the practical aspects of science by demonstration through the Google Classroom and the laboratory works come later in a safe environment.

Nevertheless, some factors may make the adoption of Google Classroom unsuccessful for science education in Nigerian secondary schools.

Webinar Zoom Meet

Zoom Meet is a Face-to-Face Conference Platform where Educators and students can interact directly as they meet face to face. In this application there are many advantages such as file sharing in PDF format that can be done easily. Zoom offers the easiest facilities for individuals who want to participate in conferences or meetings with just a link or room number. Zoom online format also includes two-way live broadcast lectures. The Zoom making online courses are very popular due to saving time, costs, and its impact towards the environment. Zoom requires low financial cost and offers a good webinar experience. The use of Zoom also allows participants to write and discuss together throughout the process. Zoom also can be used for community-based discussions, etc (Abdillah, & Darma, 2020)

A zoom session is one of the types of synchronous learning. Synchronous learning is a modern notion derived from e-learning which focuses on integrating technology with teaching methodologies as a means of delivery within educational institutions for the sake of making the learning process easier for students and teachers. This concept is characterized by a combination of many traits such as a technological device connected to a network (zoom application), a suitable timing for both teachers and students, different locations, real time communication, online participants and instantaneous feedback through video, voice or text chat interaction between participants (Hrastinski,2007). Many universities are training students to integrate technology like zoom applications to be used during instruction within education because people are rapidly adapting to accessing these technologies to facilitate communication which leads to the widespread popularity of distance learning (Romoszowski & Mason, 2004). This comes as a solution for educational researchers who are constantly trying to develop innovative means to enhance the interactivity of the learning process in order to stimulate students' motivation and engagement in discussions for knowledge exchange, which also leads to developing general language learning (Tanti, 2012). On the other hand, teachers integrate these tools into language instruction process to make

the material easily comprehensible whether it is used on individual or group level of communication(Blau & Barack, 2012). Various researchers proposed that a zoom session (a synchronous learning strategy) can have a direct link with positive impact on students' academic performance and motivation towards the learning process (Watkins, Carnell, Lodge and Whalley (1996) sated that a zoom session enhances the main skills involved in language learning such as high order thinking, critical thinking skills and problem solving skills through interacting, collaborating and participating within the instructional process. As a result, McCloskey,Thrush, Wilson-Patton and Kleskova(2013) suggested that the designing and implementation of activities involved in a zoom session setting should help students to attain what the lesson design aims to achieve for the sake of motivating students through the instructional process. Mcloughlin and Lee (2010) believed that using zoom sessions(a synchronous learning strategy) can facilitate students' acquisition of syntactic and semantic cognition with respect to sentences through the process of writing and rewriting before sharing these sentences due to the feeling of vulnerability of sharing them with their classmates and teacher which encourages them to structure correct statements. Many scholars support the significance of a zoom session to the academic performance of students in such a way that Marjanovic (1999) emphasized the importance of such a strategy when used for collaborative learning.

Harris and Hover (2009) proposed that a zoom session obliges students to concentrate more during the online sessions which lead to higher levels of memorization and therefore learn more. This is a video communication that provides video telephony and online chat services through a cloud-based peer-to-peer software platform that is used for distance education and social relations. Zoom is a web based tool which enables collaboration between individuals and groups through video conferencing, video and audio calling, instant and persistent messaging, and file sharing. It helps, for instance science teachers bring their students together in a frictionless environment to get more done. Zoom is the leader in modern enterprise video and audio conferencing, collaboration, chat and webinar across mobile devices, desktops, telephones and room systems. In addition to screen sharing zoom motivates science teachers to annotate their shared screen making lessons more interactive, science teachers can record their lessons to the cloud or locally, science students can also record and turn recording on and off as many times as they like during a lesson if the teacher enables this feature. Teacher can record lessons and watch them again to assess science students' strengths and weakness and learners can self-assess their skills by watching recorded lessons. Science students can watch the recorded lessons in a sequence to see their improvement over time. In addition, science teachers can assess science students' development by showing the recorded lessons to another science teacher, whom they trust and asking for constructive feedback. Zoom grants science teachers to present the content of their lessons

in various ways. Zoom's screen sharing can give science teachers a great opportunity to develop science students' intercultural skills by sharing engaging materials such as videos and articles and presentations.

III. CHALLENGES IN THE USE OF E-LEARNING IN NIGERIA

- Instability of electrical power supply: The first challenge to be addressed here is this because of the current state of the epileptic power supply Nigeria is facing as a country. This poses a major threat to the smooth running of this system as many teachers and students will spend so much on generator and fuel usage

- Network problem: The unpredictable network problem is another issue here as some areas in the country may have network issues at different times of the day

- Internet Access (Data subscription): The rate at which the data subscribed are deducted is quite alarming and this can be a major drawback as teachers and students will need to be subscribing from time to time so that they can be available for the online classes

- Affordability of learning equipment(smart phone): Not all students have and can afford smartphones because some parents are still struggling to fund their children's education and may not provide smartphones to them at some point in their studies

- Inadequate technical knowhow: Since it is not all the teachers or students that are aware of some of the platforms, some people will need training, guide or help in order to use the platforms successfully

- Environmental Distraction: As observed from the society, series of environmental distraction can be a drawback to this system. These could include various addictions, house chores, family influence e.t.c

- Duplication of courseware on different learning platforms: Since the platforms offer similar services, the materials, courseware and lecture notes will be available on all the platforms, therefore, duplicating the materials on the platforms

- Unexpected shutdown of any of the e-learning platform will lead to obstruction in learning

- The last disadvantage to be discussed here is this. Some technologies and application have either been bought over by new people with new terms and conditions or go into extinction fully

IV. THE IMPLICATIONS OF THE PAPER

The paper has lots of implications for the Nigerian educational system. The Google Classroom and Zoom session would be innovation in the educational system of the nation. Therefore, to adopt it for the teaching of science implies the following:

- The government should be prepared fully to adopt the paradigm without any political bias

- The government should make adequate money available to strengthen and develop the Nigerian broadband infrastructure
- There should be proper monitoring to ensure the correct software and hardware are purchased and adequately installed in every higher institution
- Academic personnel of every institution must be adequately trained through seminars and conferences. Those who are not computer literate must make use of staff development to update their computer's knowledge

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