

Virtual Environment: Alternatives to Face-To-Face Teaching and Learning Mathematics in an Insecure Environment

Salim B. Sidi ^a, Yusuf Badar ^b, & Garba Shu'aibu ^c

^a Department of Mathematics, Aminu Kano College of Islamic and Legal Studies, Kano.

^b Department of Mathematics Education, Aliko Dangote University of Science and Technology Wudil, Kano.

^c Department of Science and Technology Education, Bayero University, Kano.

Corresponding author: sidisalimsidi@gmail.com

Abstract

Mathematics has been a driving force behind any development, scientifically, technologically, and economically. So, teaching and learning mathematics become as important as the subject itself. Unfortunately, despite the role mathematics plays in national development, insecurity challenges have destroyed teaching and learning in some parts of the Northeast and Northwest of the country. This led to the lockdown of schools in the areas affected, with children remaining at home. Hence, the need for a virtual environment as a substitute for the face-to-face classroom setting in an insecurity-prone area. The paper concluded that a virtual learning environment is a substitute for a traditional classroom setting and would help the country achieve its mathematical aspirations. The paper suggests that the Nigerian government should provide all the necessary infrastructure for the proper integration and implementation of virtual learning environments for sustainable mathematics teaching and learning in the country.

Keyword: Virtual Learning Environment, Virtual learning, Teaching and Learning, Mathematics, Insecurity.

Introduction

Education system has been interrupted in Nigeria by an insecurity challenge even before the existence of Covid-19 pandemic (Corona Virus). The insecurity challenges destructed all human activities in some part of the country, more especially education sector and means of transportation. This has affected the education system and all other part human activities (Ojukwu, 2017). Education as an essential tool for developing a nation, a country with unstable education would not be able to raise disciplined citizens who will live in knowing and respecting the rights, laws and regulations, and so be underdeveloped. Education provides employment opportunity, improve the economy of a country, provide a prosperous, secured society, modern society and create a conducive atmosphere for empowerment of the youths. A qualitative education produces high quality of professionals socially, politically, scientifically, technologically, economically and provide security of a given country (Sidi 2020) Hence the impact of education in a country cannot be ignored especially during this time of falling economics.

In Nigeria system of education, English language and Mathematics are compulsory subjects taught at primary and secondary schools (National Policy on Education [NPE], 2014). English is the official language of communication in the country, while mathematics is made a compulsory subject due to its

impact in national development. Mathematics is a prerequisite for scientific, technology, economics and industrial development (Sidi, 2020).

Mathematics has been recognized as the backbone of all discipline which primarily concerned with creativity, problem-solving, and logical reasoning (Ajani & Popoola, 2013). Mathematics is one of the most powerful and adaptable mental tools which the intelligence of man has made for his own use over the years (Yadav, 2017). Mathematics has been recognized as a bedrock for successful functioning of all aspects of human endeavor and that no nation can achieve any measure of scientific and technological advancement without it. So, the teaching and learning of mathematics should not be interrupted by any means due to its enormous importance to human life. Unfortunately, the insecurity challenge facing Nigeria has destructed not only mathematics teaching and learning but the education system stopped students' movement from one state to another for their education. Then teaching and learning of mathematics should not be limited to classroom setting but rather to use a dynamic and an interactive platform as alternative in an insecurity situation.

Insecurity signifies the state or quality of being insecure, which is the state of uncertainty. Security, in simple terms, means the protection of lives and properties from destruction. Ojukwu (2017) viewed security as a dynamic situation that comprises the



relative ability of a state to counter threats to its core values and interests and their primary beneficiaries, the citizens of the country. The perception of insecure citizens about the world was a life of ill-fated, unsafe, unfriendly, rejection, and distrust (Ojukwu & Chigozirim, 2015); this gave a sign of aggravation, conflict, and guilt and tended to be aberrant and generally egocentric (Obarisiagbon & Akintoye, 2019).

In Nigeria, security issues become a big challenge that make government spend a lot of resources. Politics, religious, ethnic tribalism and terrorism are considered the major causes of the insecurity in Nigeria (Ogunode & Chijindu, 2022). Nigeria experienced all the four causes of the security challenge; however, terrorism is the most recent and it is the major insecurity challenge faces Nigeria nowadays. The oldest terrorism in Nigeria started in the Southern of the country with kidnapping, Niger Delta militant and robbery (Ladan, 2019; Obi, 2015). In 2021 IPOB order for school short down, called sit-at-home in Southeastern part of Nigeria (Okah, 2021), this cause the discontinuation of schooling for some period of time. Along the way, Bako Haram from the Northeastern part of the country were also attacking and bombing government properties including public and private schools, kidnapping school children (Ojeleye et al., 2022), this led to the closure of all schools in the affected areas. In the recent day, banditries, kidnapping, unnecessary killing, banditry, and other forms of terrorism in the country are increasing rapidly (Obi, 2015; Ojeleye et al., 2022; Ogunode & Chijindu, 2022). The rate at which insecurity has taken several villages and town in the country has been a major challenge for the Nigeria education system (Ladan, 2019), including the teaching and learning of mathematics. Some primary and secondary schools where look down in some state more especially Northeast and Northwest of the country. This provide additional gap in the process of teaching and learning mathematics been a bedrock of the national and economic development.

Due to the enormous importance of mathematics, the teaching and learning of the subject should not be disrupted for even a single day. Therefore, teaching and learning of mathematics in an unsafe, unfriendly and distrustful environment characterized by insecurity, the student and the teachers may suffer socially, mentally and emotionally and it makes sense hypothetically to state that all these are likely to affect not only their behavior and psychosocial adjustment but the academic performance of the students and the

purpose of teaching the subject may not be achieved (Obarisiagbon & Akintoye, 2019). Therefore, there is need for alternative platform such as online teach (virtual learning) to support the teaching and learning. Hence, this study viewed virtual learning environment as an alternative means of teaching and learning of mathematics in an insecurity situation.

Virtual Learning

Virtual learning (VL) has become increasingly prominent across the globe nowadays. It has become one of the best practices in instruction, especially in recent years (Navarro-Ibarra, 2017). According to Şenel (2016), virtual learning is about learning that takes place outside of the school or bringing what is outside of the school into the school. So, think about the online environment as a way of connecting students who may be physically located in a school with their learning that is somewhere else. It's mostly practiced in developed nations, particularly at higher levels of education. Virtual learning offers the advantages of expanding student exposure to curriculum options and personalizing their learning experience (Dung, 2020). Virtual learning is structured for alignment with the contents of the curriculum and the smooth running of the program. Virtual learning is the system of components presented by a set of integrated information and pedagogical technologies and the interaction between subject and object (Blinnell & Haase, 2010). Virtual learning uses computer software, the internet, or both to deliver instruction to students; in another language, it is technology instruction that is referred to as virtual learning. It is reported that virtual learning improves student academic achievement in mathematics (Navarro-Ibarra, 2017), provides equal educational access, and provides students with different learning opportunities. It is an alternative way for teachers and students to share classrooms in a virtual format without putting a stop to learning. Dung (2020) categorized virtual learning into three classes depending on the nature of instruction and teacher-student interaction, especially the time at which the interaction occurs:

- i. Asynchronous is an online course in which it does not take place in real-time. In this type students are self-directed, doing the course work and assignments within a time frame. The teacher-student interaction takes place through discussion email, you-tube video, and blogs etc. Asynchronous virtual learning has no meeting schedule or time. Asynchronous

- would be flexible and effective considering Nigerian internet and network connectivity, computer availability and so on.
- ii. Synchronous this virtual learning required the interaction between teacher and students simultaneously, it is an online base virtual learning. In this type, students interact with their course mate, and received instruction from their teacher at the same time through texts, audio and video chats (Zoom) in a virtual classroom. Synchronous learning environments enable students to participate in a course from home in real time, so it required internet connectivity and other ICT facilities like computer.
 - iii. Hybrid virtual learning also called blended virtual learning, incorporate both face-to-face and online interaction. Hybrid require virtual meeting and in-person session during a term or semester. Hybrid type of virtual learning therefore can be asynchronous or synchronous, and face-to-face interaction.

Any of these three types of virtual learning interaction can be suitable for mathematics teaching and learning in Nigeria. Implementing virtual learning in Nigeria would save many lives especially in the areas where insecurity caused school short down. However, the mathematics teaching and learning would not be destructed, so its role in insecurity, agriculture, science and technology, economic and national development would continue. Anyway, there are some challenges that can be raised when it comes to the utilization of virtual learning system in Nigeria.

Virtual Learning Environment (VLE)

Virtual learning environments comprise the use of ICT technologies and network resources in the teaching and learning process. The virtual learning environment (VLE) comprises the use of ICT facilities that replace the physical classroom setting in a virtual form and support teaching and learning (Barajas & Owen, 2000). A virtual environment is an environmental system that replaces the physical environment where digital technologies play a significant role (Martín et al., 2021). It aimed to create an interactive and active learning environment through the use of the internet. It allows students to attend and interact with teachers through ICT and internet technologies, either offline or online (Naresh & Meenia, 2019; Martín et al., 2021). It is an environment for teaching and learning that comprises ICT components like computers, the

internet, software, and web sites that are designed specifically for the teaching and learning process. VLE allow the implementation of pedagogical models to move from knowledge transmission to knowledge construction (Navarro-Ibarra et al. 2017). According to Naresh and Meenia (2019), VLEs are software systems designed to support teaching and learning in an educational setting, as distinct from a Managed Learning Environment (MLE) where the focus is on management. The principal components of the VLE package include curriculum mapping (breaking the curriculum into sections that can be assigned and assessed), student tracking, and online support for both teachers and students. It also enhances teachers' educational practice. Caprara & Caprara (2022), affirmed that virtual learning environments support effective teaching and learning and enhance the learner's cooperation, teacher-student interaction, and student-student interaction, as well as both teachers and student's technological know-how.

Teaching and Learning of Mathematics Through Virtual Environment

Mathematics has been a significant subject all over the world and, by its nature, is one of the most challenging subjects. It requires student activeness through cooperation, collaboration, group work, and instant evaluation in the teaching and learning process. Based on the urgent need for alternative means for teaching and learning mathematics with the destruction of the mathematics learning process due to insecurity or any other things that may come across like the COVID-19 pandemic, developed countries have employed the use of virtual learning environments in place of conventional systems of learning (Dung 2020). The findings of Dhakal and Sharma (2016) submit that VLE seems to be very instrumental in improving students' engagement and achievement in mathematics. Thus, VLE can serve as a replacement for the conventional method of teaching mathematics, especially in these insecure times that destruct the atmosphere of the country (Nigeria). The benefits of a virtual environment for both students and teachers were continuously recorded, including its flexibility and time optimization regardless of the locations of both students and teachers.

Benefit of a Virtual Learning Environment for Mathematics Teaching

The teaching and learning of mathematics at all levels of the education system is not an easy task. Several

challenges were recorded in a normal (face-to-face) environment, let alone a virtual one. With a large number of students (or fewer) on the VLE as an alternate means to face-to-face environments, it enhances student engagement and creates an interactive learning environment, especially in the case of mathematics subjects. According to Arkorful and Abaidoo (2014), the VLE increased learners' access to information and provided a rich environment for collaboration among students, which improved their academic performance. Teaching mathematics through a VLE enhances students' knowledge, collaboration (such as student-student, student-teacher, and teacher-teacher interaction), consulting (synchronous and asynchronous), experimentation (simulation), and management (homework, evaluation, and follow-up) (Navarro-ibarra et al. 2017). Navarro-Ibarra et al. continuously count the benefits of mathematics teaching through a virtual learning environment as:

1. VLE is flexible for learners i.e. they visit and revisit the virtual classroom at their pace
2. Every student has access to the learning resources regardless where and when he/she visit the platform.
3. It supports students' learning outside classroom 24hours a day.
4. VLE supports students to interact cooperatively and get instant feedback.
5. Students study mathematics fluency with the same tools as professionals in their field.
6. Increased emphasis on students as autonomous, independent, self-motivated managers of their own mathematics learning.
7. Discussion of students' work in the classroom and peer to peer assessment
8. There will be a change in emphasis from receiving information from the teacher, and learning to 'pass the test' towards using knowledge not only to pass the test, but on every day activity
9. Emphasis on developing effective mathematics learning strategies (both individually and collaboratively).

Navarro-Ibarra et al., (2017) and Martín et al., (2021) concluded that teaching mathematics through virtual learning improved students' academic performance. The amount of time students spent on a VLE determine his/her academic achievement in the subject (Mathematics). Based on the above views, the benefit of teaching mathematics from VLE,

- i. Students Motivation and Emotional Engagement: how interactive and friendly the environment encourages the students to keep revisiting with constant practice, which with time they will unconsciously get used to VLE.
- ii. Students can revisit at their convenience time. That is the zealous students will visit and revisit the VLE based on their convenience and commitment, while lazy will be left behind since the study of Mathematics request repeated practice.
- iii. VLE control the students' mathematics engagement while the methodology adopted determines the students' commitment.
- iv. Teachers are supported with assisted mathematics software to ease learning of the subject. The shift of roles of teachers and students in learning management and learners spend more time on task behavior compare to attending traditional courses in classroom (page number needed).

Requirement for Mathematics Teaching through a Virtual Learning Environment

For sustainable mathematics teaching and learning in Nigeria regardless of the security challenges, and to cope with the challenge of twenty-first century, virtual learning environment become necessary. For any of the three types of virtual learning environment previously discussed, the following requirements are needed: virtual laboratory, internet connection, accessible network, availability of computers (laptops or desktop), tablet, smart phone etc, competent teachers that can teach virtually and standard electric power supply.

- a) A virtual laboratory is a place that contains all the equipment required for a qualitative virtual environment. The virtual laboratory equipment includes both hardware and software. The hardware equipment (computer desktops, laptops, tablets, and iPads), LCD projectors, DVD/VCRs, LCD interactive whiteboards, microphones, and lab technicians However, the must-have set of virtual laboratory equipment is a learning management system, interactive whiteboards, a classroom control system, a response pad, and a lab technician. The software tools include Maple for algebra topics, SPSS for statistics, Geogebra for geometry, and other construction topics.
- b) Internet connection: this is the backbone of the virtual environment; without internet

connectivity, the environment would not exist. The internet is now an important ICT tool in the education system, not only as a library, but also for pedagogical approaches to teaching and learning, as well as for education administrators.

- c) Accessible network: There are different types of networking systems for virtual environments such as personal area network (PAN), local area network (LAN), virtual LAN (VLAN), metropolitan area network (MAN), campus area network (CAN), wide area network (WAN), content delivery network (CDN) and virtual private network (VPN), depending on the virtual laboratory. Effective participation, attendance, assignment, and examination in a virtual learning environment require the use of a stable and accessible network.
- d) Availability of computers and iPads: for the virtual learning to take place, computers, iPads, and/or smart phones must be available for the students; otherwise, the virtual learning will not work.
- e) Competent teachers: for effective and successful virtual learning, the teachers are expected to have good communication skills, be technologically literate, be good at time management, and have assessment and evaluation skills. A teacher with these skills will confidently deliver the intended lesson in a virtual environment. The more the teacher takes classes in a virtual environment, the better the teacher develops confidence and the more effective the pedagogical practices become.
- f) Standard electric power supply: power is the crucial part of the virtual learning environment where all other requirements lie. Poor power supplies hampered the effectiveness of the virtual learning environment. It limits the teachers and student's ability to participate, interact, and complete assignments within the allotted time frame, and also undermines the aims of the virtual learning environment.

To teach mathematics through VLE, the listed equipment's are needed. The presentation (i.e. the contents) and assignment during preparation need to be systematically designed to suits the objectives of the lesson and student's aspiration. And the tutor needs to be familiarized with the virtual classroom environment to be sure of what to do before teaching starts. Also, the communication should be clear, audible, well prepared message board, chat or test message should have a clear channel and provide

feedback in a through, complete and timely manner. Learning may decrease if the audio and visual elements used in a lesson interfere with human cognition (Clark & Mayer, 2016). Therefore, teaching mathematics through the medium might be a bit tougher especially for newly online students and even the teachers.

Conclusion

Base on the review, it is concluded that virtual learning environment is a substitute of traditional classroom setting in an insecurity state. And any of the type of virtual learning as discussed earlier, is applicable for mathematics teaching and learning in the country (Nigeria). This would help the country achieve the mathematics aspiration.

Suggestion

The paper suggests that Nigeria government should provide all the necessities needed for the proper integration and implementation of virtual learning environment, for sustainable mathematics teaching and learning in the country.

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