

# *ICTs in Education Industry: Understanding Virtual Learning Pedagogy: Evidence from Literature*

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**Abstract** – It will be observed that before the COVID-19 pandemic, online education was not popular in Nigeria’s higher and lower educational institutions of learning, either due to a lack of awareness, finance, or outright negligence by the authorities concerned. During the pandemic, most educational institutions were directed to study virtually (online), even when there were no previous plans. The remote learning idea failed to meet the needs of many students/learners in Nigeria, and some other parts of the globe alike. Many schools in Nigeria, if not all were shut down, and many educators noticed that the emergency virtual/remote learning option negatively influenced students’ and teachers’ social, emotional, and academic well-being. Because of these problems encountered, the Nigerian government cannot just watch, because online learning has become the in-thing, and has the potential to unlock every possibility in the Nigerian education system. So, the technological innovations of the 21st century have entrenched into most of all modern life activities, of which the education sector is now embedded in technology. Therefore, human beings need to keep pace with social change by adapting to the availability of these new technologies. Virtual learning has become one of these outcomes of technological innovations/inventions of the century in the field of education that has come to alleviate many educational challenges of citizens, especially in the Nigerian education system. Consequently, this paper, based on the evidence from the literature attempts to find out the importance, benefits, and pitfalls of a virtual learning environment in the Nigerian educational institutions’ context. Finally, the four learning theories that enhance or enable electronic learning were discussed, and in an attempt to discuss the characteristics of virtual learning, the author concisely highlighted the futuristic of online learning in Nigerian educational institutions.

**Keywords** –Virtual learning, Technology, ICT, Online learning, and E-learning.

## I. INTRODUCTION

Technological advancements of the 21st century have made teaching-learning much easier for teachers and learners alike in the education arena. Kundu (2018) observed that Information & Communication Technology (ICT) is recognized as an important catalyst for social transformation, and an important tool for education. Ratheeswari (2018) pointed out that in the digital age, the use of Information and Communications Technology (ICT) allows students to learn and apply the skills that they need in the 21st Century. Virtual learning has been made possible through the application of modern technologies in the education sector. Invariably, the use of ICT in the education arena is seriously powering the education industry more than it has ever been.

In contemporary Nigeria, virtual learning will go a long way in solving most admission problems depriving many Nigerian citizens, who have made up their minds and/or gotten the opportunities to attend higher education to achieve their goals. In practical terms, "Virtual" is broadly used to describe a course that is not taught in a classroom face-to-face, but through a substitute mode that can conceptually be associated "virtually" with classroom teaching, meaning that learners will not physically go to classrooms to learn. Accordingly, virtual education refers to a form of distance learning in which course content is delivered through various methods, such as course management applications, multimedia resources, videoconferencing, etcetera (Kurbel, 2001).

In virtual education courses, significant portions of the courses are delivered via the Internet. Pitts, Pillow, Dusseault and Lake (2022) observed that before the coronavirus pandemic, most virtual or online learning programmes took place in higher educational institutions learning. Therefore, this paper seeks to advise the rest of us that we cannot remain unprepared to implement online learning at other levels of our educational system. That is, we cannot wait to experience another coronavirus-like disease, or repeat the emergency distance learning that took place in 2020 and 2021 before integrating virtual learning in other levels of the education system in Nigeria.

However, this paper, despite creating awareness for education leaders, educators, schools, and policymakers to prepare for sustainable and quality virtual learning at all levels of the education system in Nigeria; it as well highlights the importance of virtual learning in contemporary education in Nigeria. Additionally, it also discussed the types of virtual learning and the prospects of integrating this mode of instruction in virtually all levels of the education system in Nigeria.

It will be pertinent for the paper to give the conceptual meaning of major terms or phrases for a better understanding of the above subject matter.

**Virtual Learning Environment:** Virtual learning environment (VLE), according to Yusny (2017), refers to the online platform of computer software that allows teachers and students to share educational materials, and exchange experiences and information in a controlled teaching-learning context. It is a computer-generated instructional strategy; as Yusny (2017) further put it, the word "virtual" means that the learning environment is online, thereby using a connected network of computers. Yusny (2017) further stated that virtual learning environment focuses on providing a learning space that supplements (not replacement) to the classroom to allow greater communication and sharing of information among students and between teachers and their students. The scholar further drew readers' attention that virtual learning environment needs to be understood not as a replacement of a classroom, but rather as a supplemental environment where classroom activities extend.

**Technology:** In education, the technology according to Harris, Al-Bataineh and Al-Bataineh (2016), refers to the technological movement of every child in the classroom, school, school district, etc., having a laptop, or device, in the classroom to manipulate and learn with as a tool. In addition to the practical educational experience, Committee for Draft National Education Policy (2018) stressed that educational technology is based on theoretical knowledge from various disciplines, such as communication, education, psychology, sociology, artificial intelligence, and computer science. It also encompasses several domains including learning theory, computer-based training, online learning, and m-learning, where mobile technologies are used.

**Educational Technology:** This is commonly abbreviated as EdTech or edtech. Several terms or phrases have been used to describe modern electronic educational technology. Presently, educational technology, according to Day and Payne (1987) is a broad term that embraces the following: -

- 1). Electronic learning (e-learning)
  - 2). Instructional technology
  - 3). Learning technology,
  - 4). Multimedia learning
  - 5). Information and Communication Technology (ICT) in education
  - 6). Technology-enhanced learning (TEL)
  - 7). Personal learning environments
  - 8). EdTech
  - 9). Computer-based instruction (CBI)
  - 10). Computer-managed instruction
  - 11). Computer-based training (CBT)
  - 12). Computer-assisted instruction or computer-aided instruction (CAI)
  - 13). Cyber-learning
  - 14). Internet-based training (IBT)
  - 15). Flexible learning
  - 16). Web-based training (WBT)
  - 17). Digital educational collaboration
  - 18). Computer-Mediated Communication
  - 19). Online education
  - 20). multi-modal instruction
  - 21). Digital education
  - 22). Virtual education
  - 23). Virtual Learning Environments (VLE) (also called Learning platforms)
  - 24). M-Learning
  - 25). Distributed learning
  - 26). Networked Learning
  - 27). Ubiquitous learning (Wikipedia, 2022).
- According to Moore, Dickson-Deane and Galyen (2011), each of these terms above has its advocates that point out their prospective distinctive features.

According to Wikipedia (2022), educational technology is the combined use of computer hardware, software, and educational theory and practice to facilitate learning. When referred to by its abbreviation, EdTech, it often refers to the industry of companies that create educational technology (Woo, 2017). Additionally, educational technology is the process of integrating technology into education in a positive manner that promotes a more diverse learning environment and a way for students to learn how to use technology as well as their common assignments. (Woo, S. (2017).

However, The Association for Educational Communications and Technology (AECT) has defined educational technology as "The study and ethical practice of facilitating learning and improving performance by creating, using and managing appropriate technological processes and resources" (Richey (2008).

**Online Learning:** Aziaris (2015) described online learning as any form of pedagogy delivered using digital technology; such methods incorporate visual graphics, text, animations, videos, and audio. In addition, an online instructional strategy can also facilitate group learning and the assistance of instructors within specific fields. Online learning is also defined as a teaching-learning process between teachers and students that involve various digital mediums, such as WhatsApp, Zoom, Google Classroom, et cetera (Basar, Mansor, Jamaludin, & Alias, 2021). Virtual learning easily overcomes many drawbacks of the physical environment, such as time, facilities, location, etc. Online environments allow teachers to work with larger numbers of students and optimize their routine tasks. It as well brings new pedagogical techniques into the traditional forms of education and makes learning more personalized and convenient.

**ICT/ICTs:** This is an abbreviation for Information and Communication Technology/technologies. The term covers a wide variety of areas. Pratt (2022) declared that there is no universal definition of ICT. The term, the scholar stressed is generally accepted to mean all devices, networking components, applications, and systems that combined allow people and organizations (i.e., businesses, nonprofit agencies, governments, and criminal enterprises) to interact in the digital world. It may include hardware, software, processes, system designs, data management, programming languages, data mining, data retrieval, multimedia, and computing ICT, or information and communications technology (or technologies), which is the infrastructure and components that enable modern computing.

In a nutshell, it involves the utilization of computers and software to manage information, and this could be processing the information, storing the information, retrieving the information, protecting the information, and transmitting the information when required.

## II. CONCEPT OF VIRTUAL LEARNING & RELATED TERMS/PHRASES

To start with, the word "Virtual" in the educational technology sense invariably means online. Therefore, the term or phrase "*Virtual learning*" is usually associated with online courses or online environments. It has been defined severally based on individual scholars' perceptions or understanding. It is a learning experience that is enhanced via the use of computers and/or the internet, both outside and inside the facilities of the educational organization; it also refers to an environment where students study a digital-based curriculum, taught by instructors that lecture online through video or audio techniques. In this mode of learning, the instruction can take place either in a self-paced (asynchronous) environment or in a real-time (synchronous) environment.

It has further been defined as "an environment where students study a digital-based curriculum taught by instructors that lecture online via video or audio. This instruction can take place either in a self-paced (asynchronous) environment or in a real-time (synchronous) environment" (<https://www.coursera.org/articles/what-is-virtual-learning>). Virtual learning has also been conceptualized as "Distance learning conducted in a virtual learning environment with electronic study content designed for self-paced (asynchronous) or live web-conferencing (synchronous) online teaching and tutoring". Virtual learning means that the teaching activities are carried out online, whereby the teacher and learners are physically separated in terms of place, time, or both (<https://www.vedamo.com/knowledge/what-is-virtual-learning/>).

There are many forms and related terms or phrases for the virtual learning concept. Though these terms are very similar, they represent different aspects of teaching-learning, which helps to understand the real meaning of "virtual learning". The most common of these related terms are discussed below.

1. Online learning
2. Electronic learning (e-learning)
3. Web-based learning
4. Distance learning
5. Blended learning

Virtually, all the above-related terms involve the use of electronic technologies for teaching and learning processes; also, the teaching-learning activities take place either entirely or partly online. That means that in some, teaching-learning can be conducted employing electronic media without the use of the Internet, while some will require both (<https://www.vedamo.com/knowledge/what-is-virtual-learning/>). On the other hand, it is worth explaining each of the terms for clarity purposes.

Herold (2016) emphasized that educational technology is not restricted to high technology but is anything that enhances classroom learning in the utilization of blended, face-to-face, or online learning (Herold,2016), thereby describing it as an inclusive term for both the material, tools and processes and the theoretical foundations for supporting learning and teaching.

**Online Learning:** This method, though partly discussed above, is the best medium by which to ensure the continuity of students' learning during situations like the COVID-19 pandemic (Ariffin et al., 2020; Fauziana, 2020; Mansor, Zabarani, Jamaluddin, Mohd Nor, Alias & Mansor, 2021; Raheim, 2020; Samat, Awang, Hussin, & Nawi, 2020). Pusvyta (2015), has also declared that online learning is an alternative pedagogy for the era of technological development and communication that students in particular need to adapt. Mat Dawi, Theam, Palaniandy and Dolah (2016) noted that in times of globalization and the advancement of ICT, technology-based and online learning is highly encouraged. Hussin (2017) affirmed that by interacting online, instructors and educators remain connected with their students despite being in different locations.

**E-learning:** This is an abbreviation for electronic learning. According to Arkorful and Abaidoo (2015) as cited in Bouchrinka (2022), the definition of e-learning is the subject of much debate in the education and technology communities, as different definitions tend to focus on varying aspects of the method, depending on the interests of the researcher. It is a form of learning that utilizes all digital means (electronic tools\devices). These ICT tools include – Computers and Tablets, Interactive Television, Radio, Internet and Intranet, CDs, DVDs, CD-ROM, and Audio and video tapes. Others are Mobile phones, Flash drives, memory cards, satellite broadcast, WhatsApp, Zoom, webcam, live chat, Google Classroom, and other numerous ones. E-learning enables students/learners to interact and take courses online with teachers/instructors without attending a physical. This technique of instruction is fast, independent of time and place; it further reduces cost and increases access to learning materials, and learning is not restricted to gender, race, colour, or tribe (Orijji, 20; Broder, 2014, & Basar, Mansor, Jamaludin, & Alias, 2021).

**Web-based Learning:** This means that both electronic media and the Internet are used for course delivery. It involves the use of web browsers for learning. Students must connect to the internet to have access to course materials on the web for learning. Web-based learning is associated with the provision of electronic content available on computers/mobile devices (<https://www.vedamo.com/knowledge/what-is-virtual-learning/>).

**Distance Learning:** In distance learning, we have online distance learning and physical distance learning. Physical distance learning took place in the 19th century. When we talk of distance education today, we mean distance online learning, where technologies are involved. Distance learning, as the name connotes, means learning from a distance. In other words, the participants (the teachers and the learners/students) are physically separated from each other. It is an instruction provided to a person, who is learning in a place and at a time different from that of the instructors and the other learners (<https://www.vedamo.com/knowledge/what-is-virtual-learning/>).

As stated earlier, in modern times, with the development of digital technologies, distance learning is strongly associated with online learning. The use of virtual classrooms for live online teaching brings distance learning closer to the traditional form of learning by reproducing its main characteristics in the online environment. Online learning can be done through programs installed on personal devices, which can also be used offline as the case may be learners (<https://www.vedamo.com/knowledge/what-is-virtual-learning/>).

**Blended learning:** Ordinarily, to blend means to mix, merge, or combine something. In the educational arena, it means learning which combines virtual, where the learning content is digitalized and made available online. Again, it involves the physical contact of learners and the teachers in a specified place, time, and venue. Therefore, it combines both the traditional methods of teaching and learning and the online methods, which involve digital technologies.

### III. APPLICATIONS OF LEARNING THEORIES IN ICT-ENABLED TEACHING AND LEARNING PROCESSES

Educational technology theories have played major roles in the aspects of learning in school. Various pedagogical viewpoints or learning theories may be considered while designing and interacting with educational technology. ICT or electronic learning theories examine some of these approaches in the teaching-learning process. There are four theoretical perspectives of the theoretical schools or philosophical frameworks that help in designing educational technology-related instructions. They are – Behaviourism, Cognitivism, and Constructivism

**Behaviourism:** This theoretical framework was developed in the early 20th century by Ivan, Pavlov, Edward Thorndike, Edward C. Tolman, Clark, L. Hull, and B. F. Skinner based on animal learning experiments, and these psychologists used these results to develop theories of human learning (Wikipedia, 2022). Behaviourism as a theory examines how learners behave while learning. The main function of this theory is to find out how learners/students respond to a certain stimulus as they study. When a teacher repeats the stimuli, the teacher observes, controls, and modifies that learner's behaviour ([https://en.wikipedia.org/wiki/Virtual\\_learning\\_environment](https://en.wikipedia.org/wiki/Virtual_learning_environment)).

Behaviourism has been linked to training, emphasizing animal learning experiments. Since behaviourism consists of the view of teaching people how to do something with rewards and punishments, it is related to training people. Learners perform based on what they were told or instructed to do. They frequently reproduce basic facts and repeatedly perform tasks. Therefore, in a virtual learning classroom environment, behaviourism can be applied through step-by-step video tutorials, game-based activities, regular and constructive feedback, quizzes, gamification, etc. <https://www.vedamo.com/knowledge/what-is-virtual-learning/>.

**Constructivism:** This theory is associated with Piaget. The theory has a lot of value to online practitioners. The theory's primary focus is on how learners construct their meaning from new information as they interact with reality and with other learners, who bring different perspectives (Wikipedia, 2022). As Oriji (2021) stated, this theory is synonymous with a 21st-century education. Confucius once quoted thus: "I hear and I forget. I see and I remember, and I do and I understand". The theory is based on practice. It is a philosophical theory that is rooted in human knowledge, and student-centeredness. Constructivist learning environments require students to use their prior knowledge and experiences to formulate new, related, and/or adaptive concepts in learning (Termos, 2012).

The theory emphasizes active learning that is centred on problem-based learning, project-based learning, and inquiry-based learning, which involves real-world scenarios, in which students are actively engaged in critical thinking activities. Virtual learners construct knowledge rather than just passively takes in information; they incorporate new information into their pre-existing knowledge. Virtual learning environments allow students to discover things by themselves, thereby conforming to the theory. Some of the advantages of the theory include – high-level thinking, active engagement of learners, team skills, self-management skills, and problem-solving skills, among others (Tudor, 1996).

The theory suggests that educators should primarily function as guides, rather than function as authoritative sources of knowledge as practiced in the traditional classroom. The theory suggests that learning is an active process, because learners create, synthesize, and apply new concepts based on their current and past knowledge. Constructivism is synonymous with assimilation (the process of taking new information and fitting it into an existing one) and accommodation (using newly acquired information to revise or modify and redevelop an existing one).

As virtual learning is based on practice and individualized learning, consequently, the constructivist theory fits into the learning style because students construct their knowledge and also learn best when engaged in learning experiences rather than passively receiving information as in the traditional instructional approach where teachers directly impart information to students. The application of constructivism in virtual learning gives students many opportunities to construct their knowledge and express their understanding.

Conclusively, the application of constructivist theory in learning enables teachers or educators to function as guides/facilitators of learning, fosters self-guided learning, allows learners to collaborate and learn from one another, encourages reflections on the

learning process, embraces social approaches to learning, enhances self-exploratory study, and information is processed based on existing knowledge.

**Cognitivism:** Cognitivism as a theory focuses on the role of the mind; it explains how the brain functions. The theory helps instructors understand how people learn and how to teach more effectively. The theory looked beyond behaviour to explain brain-based learning by considering how human memory works to promote learning. It refers to learning as "all processes by which the sensory input is transformed, reduced, elaborated, stored, recovered, and used" by the human mind (Irby, Brown, Lara-Alecio, Jackson, 2013 & Hergenahn, 2008).

Computer science and information technology have had a major influence on cognitive science theory. The cognitive concepts of working memory (formerly known as short-term memory) and long-term memory have been facilitated by research and technology from the field of computer science. Today researchers are concentrating on topics like cognitive load, information processing, and media psychology. These theoretical perspectives have immensely influenced instructional design (Dejong, 2010).

In virtual learning, cognitivist theory can be applied through customizable learning environments, adaptive and personalized learning applications, artificial intelligence, learning analytics, etc. It is important to provide content that is tailored to learners' cognitive abilities, such as text, images, multimedia, etc., in which the learners can choose how lessons are presented (<https://www.vedamo.com/knowledge/what-is-virtual-learning/>).

**Connectivism:** This is one of the learning theories that acknowledge the importance of technology in the field of education. It is one of the learning theories for the "Digital age" that shows that learning and knowledge rest in diversity of opinions, which utilizes the Internet and social networking platforms to expand classroom discussion beyond the traditional classroom, school, local community, and the nation at large (Orij, 2021). It also acknowledges the impact of society, personal networks, and work-related activities. The theory is student-centred, as the new learning responsibilities shift from the teacher to the learner. It emphasizes that the conventional method of instruction is no longer adequate for the present-century educational environment, thereby asserting that learning has changed with the advent of the internet and its tools (web browsers, search engines, social media, etc.). The theory advocates learning occurs when peers are connected, and share opinions, viewpoints, and ideas through a collaborative process. It emphasizes that knowledge does not reside in a particular place, but is connected.

The theory believes that what is right today may be wrong tomorrow due to the influx and alterations in the information climate affecting the decision (<https://en.wikipedia.org/wiki/Connectivism>). Connectivism shifts the learning responsibilities from the teacher to the student, and promotes group collaboration and discussion, allowing for different viewpoints and perspectives when it comes to decision-making, and problem-solving. The theory believes that the new learning responsibilities shift from the teacher to the learner, and the educator's job is to guide students to become effective agents for their learning and personal development.

The learner creates his own learning experience, engages in decision-making, and enhances his learning networks. Connectivism promotes group collaboration and discussion. The theory relies heavily on technology, hence, a Connectivist classroom should be based on digital learning, that is, online courses, webinars, social networks, blogs, etc. the teachers' job in a Connectivist classroom is to guide the students to become effective agents for their learning and personal development.

Connectivism is incorporated into the classroom environment when teachers use social media platforms, for instance, the Twitter account could be used to share information, engage in discussion or announce homework assignments/tasks. In this case, both the teachers and students will be engaged in class activities. Another method is through games (Gamification). Teachers can introduce such competitive games for students, such as the DuoLingo app (an online learning tool that helps students learn languages through fun, and game-like lessons). Other apps are - Brainscape, Virtual Reality House, and Gimkit. Teachers can track students' progress while students can earn "points" for progressing through lessons.

The use of simulation is yet another form of incorporating technology into virtual learning because it engages students in deep learning, as it empowers understanding, which is different from the face-to-face instructional strategy that encourages memorization of facts. The simulation also boosts the interest of learners and makes learning become fun in a classroom environment. These online instructions enable students/learners to have more control over their learning by providing opportunities for self-directed (individualized) learning, which matches each learner's/student's distinctive needs and learning

ability, and at the same time pace their learning to suit other schedules. It enables learners to create their own learning experience, while the role of the teacher/educator becomes that of a facilitator.

#### **IV. ATTRIBUTES/CHARACTERISTICS OF VIRTUAL LEARNING**

Virtual learning has unique characteristics associated with it. Usually, it is a mode of learning that is conducted online. The convenience, flexibility, and affordability of this type of instructional delivery cannot be compromised. In a virtual environment, what the student need is just a computer that is connected to the Internet, which makes it environmentally friendly, as students are not required to commute for class and there's very little paper waste throughout the semester (Coursera, 2022).

When students are online, physical distractions could be avoided because the student can go to a hidden or dedicated place, far removed from people to effectively focus on his studies. Virtual learning demands self-discipline to avoid procrastination (Coursera, 2022). The mode of learning presupposes that the learner must be technologically compliant. The learner must be conversant with the working of ICTs, especially computers. Virtual learning focuses on learner-centred content instructional strategy; self-paced classes, and the flexibility of modules that have simplified layouts and are easy to follow and comprehend. Students' data/information is usually stored and protected on the cloud, and most of the evaluation is taken online, and certificated at the end of the programme. (<https://memberpress.com/blog/5-characteristics-virtual-classroom/>).

Virtual Learning Environments are characterized by a constructivist approach (Pinner, 2014). Moodle (2017) affirmed that its development is guided by social constructionist pedagogy. Another essential basic feature of a VLE is that it allows students to communicate in a discussion forum over a topic or issue pointed out by the teachers.

#### **V. FUNDAMENTAL BENEFITS OF VIRTUAL LEARNING ENVIRONMENT**

The growing shift toward online learning, according to Archambault, Leary & Rice, K. (2022), has brought new expectations for teachers, including skills needed to combine content knowledge with engaging pedagogical strategies that leverage the affordances of technology. Digital technology, according to Hamimi (2018) as cited in Basar (2021), if positively used is extremely useful and beneficial for students in many ways. Many scholars have given vital reasons why they choose virtual learning instructional strategy over traditional classroom instruction. This mode of learning has been credited with lots of advantages, which include free access to online coursework. According to Gupta (2017), e-learning enables relatively faster delivery cycles and also enables lessons and programs to roll out within a few days or weeks, thereby increasing the effectiveness of instruction and as well helps students learn easily and quickly. This is so because once the instructor posts the coursework online on the student's portal on the university or any other named websites, the student/learner has free access to the course material(s) anywhere at any time of the day. The freedom to study, and complete coursework 24/7 from anywhere, any place, and at any time that suits the individual's busy schedule, depends on the student/learner irrespective of geographical location.

What the learners need is just a networked computer/laptop or any other digital device. Virtual learning allows students to access assignments, post homework, watch faculty presentations, join student discussions, conduct research, contact their teacher and classmates, get assistance from student support services, receive feedback, and access their test grades (<https://www.waldenu.edu/programs/resource/seven-benefits-of-a-virtual-classroom>).

Virtual learning requires sophisticated technology or ICT literacy. Virtual learning allows students to be digitally literate. Digital literacy is very inevitable for any online learning. For instance, all the students must be computer and Internet literate to effectively participate in online learning programmes. Online learners must know how to utilize interactive online tools, such as online tests, drop boxes for homework, collaboration tools, e-mail communications to faculty and classmates, and video presentations by faculty (<https://www.waldenu.edu/programs/resource/seven-benefits-of-a-virtual-classroom>).

Virtual learning improves the communication skill of the learner. The student's ability to read and write well is not in doubt because this is very important as most of the communication with instructors and peers requires good written communication skills. Invariably, students have strong communication needs to effectively participate in online environments.

It also improves "discipline", and "effective "time management" skills in students, especially working adults, who have tight time schedules and family responsibilities. Again, virtual learning is not limited to national frontiers but cut across national boundaries. At the same time, the courses offered cut across the globe. Traditional educational institutions have limited courses of disciplines for students to choose from. But in an online programme, the students have the option of choosing course(s) from any university

of their choice and have the opportunity to collaborate with instructors from other universities, work on group projects, and globally collaborate with course mates/classmates. Secondly, the teachers can now collaborate by teaching in groups/clusters.

Furthermore, in virtual learning, asynchronous (delayed), synchronous (real-time) and hybrid methods of communication (instruction) could be utilized, which makes online learning very interesting. For instance, synchronous classes could be achieved via zoom, webcam, or videoconferencing. This method makes it very easy for learners to receive instantaneous feedback; it offers the students the opportunity to attend online live-streamed lectures. Instructors stream their presentations or lectures online, thereby allowing students to ask questions in real-time via webcam, microphone, live chat, zoom, videoconferencing, etc.

Asynchronously, delayed methods of instruction could be achieved mainly through e-mail messages, text chat, and pre-recorded lectures that enable students to watch at their own convenient time. In this method of instructional delivery, the instructor will post either a video or audio file along with lecture notes. To ascertain if the students are watching the video clips, the lectures set a quiz on the materials posted on the website portal. Students are oftentimes assisted through any of these means (email, live chat, telephone, a forum, WhatsApp, etc.)

Virtual/online learning makes it very easy for students to receive immediate feedback on any test conducted online. Computer-based tests usually give learners immediate feedback on their results as soon as the answers to the questions are submitted; this is opposed to the traditional mode of instruction, which takes many days and weeks to get results.

Self-paced learning is another advantage of virtual learning. The flexibility of virtual learning makes it appropriate for full-time workers, who cannot attend in-person classes to continue their education uninterrupted. The self-paced option of a virtual learning environment gives the learner the autonomy to control his study and still enjoy the benefits of his full-time working environment. Students choose the time they will attend online classes instead of stick on to a strict schedule imposed by an educational institution of learning.

A hybrid method of instruction enables learners the use both virtual and in-person learning processes. Some lessons require both online and in-class or in-person contact; this technique provides a good platform, especially for those courses that require laboratory component/practice. Students in medical practice are good examples. Virtual learning makes it easy for content updates. Additionally, Hussin, (2017), and Hussin (2017) affirmed that by interacting online, instructors and educators remain connected with their students despite being in different locations.

Interactive online learning allows students to uncover new information by exploring digital libraries and websites (Basar, Mansor, Jamaluddin & Alias, 2021). According to Harrison (2018), young children can access pictures and videos, navigate 'YouTube', and interact and participate in games and digital applications that are suited to their age. Students can revisit their lessons by re-watching recordings made by the educator, and obtaining information from books or using the internet to strengthen their knowledge (Fauziana, 2020).

## **VI. CHALLENGES OF VIRTUAL LEARNING**

Virtual learning is full of numerous challenges as noticed by various stakeholders involved in e-learning programmes, especially as Schools, colleges, and universities are forced to conduct lectures and classes online, as an alternative method by which to continue students' learning (Basar et al, 2021). Mailizar, Maulina, and Bruce (2020) observed that several studies have highlighted the challenges and opportunities associated with e-learning, especially during the COVID-19 pandemic. Some of the problems of virtual learning have been associated with non- accessibility of technologies and the digital divide among students and teachers alike in various schools. Harris, Al-Bataineh and Al-Bataineh (2016) pointed out that there are so many students without technology accessibility and the digital divide still exists in schools and even among students and teachers to this day.

The financial constraints have also added to the list of challenges of virtual learning in Nigeria, as most of the schools are underfunded; hence, they find it extremely difficult, sometimes impossible to acquire the needed technological devices (Computers/laptops, tablets, etc.) in the schools. Resistance to technology adaptation is one of the problems affecting the virtual classroom. Most immigrant teachers are very resistant to change from their old ways of doing things. They find it extremely difficult to reverse their old lesson plans that they claimed took them several hours and months to prepare to suit the online mode.

There are lots of technologically incompetent teachers in the school system. There are no training opportunities for most of them, thereby rendering their work very unproductive. Even when training opportunity is available; there are inadequate or incompetent professionals to train the teachers on the use of these new technologies of instruction.

The Incompatibility of software and hardware also poses another problem for online learning programmes. Most of the software does not suit the hardware components. Again, one of the biggest problems of virtual learning is the provision of electricity in this part of the world. The challenge of electricity in Nigeria is a big case study. Many places have no power supply, and where there is, it is erratically supplied. Nigeria seems to be one of the countries in the developing world that are facing an acute shortage of power supply. Some of the communities in Nigeria have never seen an electricity pole, and talk less of seeing electricity light. In a situation like this, it will be very difficult to effectively embark on online programmes.

Basar, et al. (2021) and Hazwani et al. (2020) noted that some of the obstacles and challenges preventing the implementation of online learning are poor internet access in schools, campuses, and residential areas, the cost of internet packages, issues with technological facilities, and students' attitudes. Time is another factor that is hampering the successful integration of ICTs in online education. Angadi (2015) noted that the constraining factor is that many educators have limited time for interaction and collaboration because of heavy teaching loads.

There is a problem with Internet connectivity and the cost of internet packages (Basar, et al, 2021). Hazwani et al. (2020) stated that internet connection was the most significant factor to influence the effectiveness of e-learning. Some areas, just as they have no power supply, particularly in Nigeria, they do not also have internet connectivity. There are some remote communities in Nigeria that hope not to get Internet connectivity for many years to come. Many homes in Nigeria lack well-equipped Internet facilities and a stable internet connection for effective learning; hence, most of the students cannot connect their computers or smartphones to the Internet for effective learning. Basar, et al (2021) have noticed that online learning can be ineffective due to a lack of interaction between pupils and teachers, and the absence of social relationships between pupils and teachers, and among pupils themselves, compared with conventional classes. This lack of social interaction, according to Adnan, 2020; Hazwani et al,2020) made it difficult for pupils to conduct group work virtually, and may also decrease learning motivation.

Students' level of ICT (computer) literacy is very crucial to the effectiveness of online learning. Basar, Mansor, Jamaludin& Alias, 2021) affirmed that students need to familiarize themselves, and experience modern technologies, particularly with various online applications to update their knowledge and adapt to current realities; else, they will not succeed in any virtual classroom environment. Furthermore, Adnan (2020) and Hazwani et al. (2020) claimed and stated that learning is still new and unfavourable among students. Regardless of poor Internet facilities at home, the unfamiliar learning environment, such as 'different' learning activities and tasks that are new to them might affect their motivation to learn, as most of the tasks need to be completed online; according to Rahiem (2020), they might feel that most of the tasks, such as group discussions, and assignments were challenging to be completed. The scholars further affirmed that the above personal encounters usually affect how they perceived their learning.

## **VII. PROSPECTS OF VIRTUAL LEARNING IN NIGERIA**

In as much as there are continuous advancements and improvements in ICTs on daily bases, the hardware, and software of teaching-learning will continue to emerge. Information and Communication Technologies, as exemplified by the internet and interactive multimedia are the bases for future education and need to be effectively integrated into formal teaching-learning, particularly in teacher education institutions, where the teaching and learning of ICTs will form the major curriculum.

To address future learning, the existing infrastructure should be upgraded to enhance the effectiveness of online learning for students. Additionally, all stakeholders (educators and students), need to adapt to this new technological breakthrough. Teachers, students, and stakeholders in the education sector need to adapt to the new technologies. In this case, adaptability, according to Nurul et al (2020) is defined as the capacity to transform current behaviour in response to a new situation. The scholar further stated that whether they want to or not, educators and students alike should strive to increase their knowledge of technology to manage their studies effectively. This is essential to meet the new technological challenges in education.

Since the spread of COVID-19, which triggered the development of new pedagogical models and online learning applications to facilitate the achievement of learning goals (Schneider & Council, 2020), many countries globally have now known the importance of virtual classroom environments, and have started investing in ICT tools and skills in response to innovation in the

field of education. Many scholars also believe that these innovative ideas will continue to ensure that development does not cease, knowing that modern life and education in particular are presently embedded in technology (Nurul, Muhammad, Muhammad and Mohamad, 2020).

Nurul et al. (2020), in the same manner, stressed that technology adaptation is crucial, in modern classrooms, not necessarily because life is embedded in technology. Students keep pace with social change by adapting to the availability of new technologies. Once these skills are attained, students will be able to adapt regardless of their circumstances and respond to the emergence of new or familiar problems (Nurul et al. (2020).

The future of virtual learning is brighter because, according to Fauziana (2020), various ICT devices and Internet packages are now available in the market and at an affordable cost. Consequently, parents can choose any of their preferred packages, depending on their budget. The author is of the opinion that with the widespread availability of mobile phones, computers, laptops, tablets, and other devices, and their increasingly accessible and user-friendly interface displays, more students and parents should be able to access the internet in their local area, which will invariably improve future learning.

### **VIII. SUMMARY**

Before COVID-19, mostly in 2020, most Nigerian schools, and other countries alike practiced face-to-face teaching. Nigerians will not forget in a hurry when all the schools and other public institutions at that period were closed down. This closure affected the daily lives of students, teachers, and any individual involved in educational organizations. Nigerians were the worst hit because there was little or no plan on the ground for a virtual classroom. All levels of educational institutions have definite learning objectives and goals, they seek. Consequently, this paper tried to advocate for the immediate integration of online learning to avoid a situation like a coronavirus pandemic. This paper concisely conceptualized some salient terms or phrases relevant to the topic and as well exposed teachers and students/learners alike to the significance of Information and Communication Technologies (ICTs), particularly the use of PowerPoint in teaching-learning practice. It further discussed some theoretical frameworks that are relevant to online learning environments; also discussed are the attributes/characteristics of virtual learning. Further discussed are the inherent challenges associated with its integration. The authors in addition discussed the prospects of the ICTs tools that will power futuristic education in this part of the globe. Generally, an attempt has been made in this paper to address the inevitability, and the significance of ICTs in the enhancement of quality education, especially in Nigeria.

### **IX. CONCLUSION**

During the COVID-19 pandemic in Nigeria, all Public and private schools, ranging from nurseries, to primary, secondary, and higher educational institutions were shut down. These closures affected all schools, including skills training/acquisition institutes, as well as the daily lives of students, teachers, and any individual involved with educational organizations throughout the country (Basar, Mansor, Jamaludin & Alias, 2021). Because of these problems encountered, the Nigerian government cannot just watch and wait for another eventuality, but take immediate action to save any future occurrence, because online learning has the potential to unlock possibilities in the Nigerian education system. Virtual learning has come to stay with us, as most educational institutions globally are striving to go online. Globally, virtual learning is fast taking over all forms of the traditional mode of instruction in most educational institutions of learning. Having known the enormous benefits inherent in this type of learning in contemporary times, the Nigerian government should be prepared to provide a virtual learning mode of instruction at all levels of her education system that will be accessible, and provide high-quality remote learning options for all students/learners, and give school systems more flexibility to determine where and when learning happens based on students' needs (Pitts, Pillow, Dusseault & Lake, 2022). Again, pre-service and in-service teacher training institute programmes must develop teachers' basic ICT skills and competencies to enhance their lesson delivery in modern classroom environments (Angadi, 2015).

There is no gainsaying that what is bad will one day be good, or what is wrong will one day be corrected. There is likely to be an improvement in the integration/use of ICTs in Nigerian schools. This idea has been highlighted by Hennessy, Harrison, & Wamakote (2010) when the scholars expressed their optimism on the improvement of ICT connectivity in developing countries, of which Nigeria is no exception. The scholars further declared that schools are increasingly getting equipped with computers for teaching, learning, and administrative purposes. A good example could be drawn in America, where the role of technology in the world of education has been ever-changing, as most recently, technology has been a new phenomenon to help motivate, differentiate, and allow students to achieve and excel in ways that they have never been able to before.

Many educators and scholars (Johnson, 2003; Harris, Al-Bataineh& Al-Bataineh, 2016) have also come to understand that, if technology is used correctly, it can “invoke dream in the minds of visionary educators who saw the endless potential for altering traditional notions of teaching and learning. If America’s Presidents, Bill Clinton, and George W. Bush will see the need for fundamental change in education to keep American students in competition with technology with other students from around the world, and also calls upon the Department of Education to create a national strategy to involve technology into all educational programs at both the state and local school systems, then, Nigeria and other developing worlds will equally follow the same step to educate millions of Nigerian citizens that are out of school (Harris, Al-Bataineh& Al-Bataineh, 2016).

Again, many developing countries of the world have started decreasing the digital divide among them, and also between students in urban and students in rural areas on the use of technologies in classroom environments.

#### **X. RECOMMENDATION**

Asamoah, Asiedu, &Buadi(2022); Gberevbie, Ayo, Iyoha,DurujiandAbasilim (2015), and Mugizi and Amwine, (2020) have made the under-listed suggestions to improve the use of ICTS in teaching-learning process in the education sector.

The Nigerian government should keep investing in ICT infrastructure. Nigerian government should as a matter of necessity provide ICT facilities in schools to meet today’s education needs. Most common technological devices, such as computers, projectors, Android phones, printers, and scanners, among others should be provided to enhance teachers’ effectiveness in school. As Kundu (2018) put it, investment and financial support--- are needed in both rural and urban areas.

1. Training should be provided for both teachers and students for the most used hardware and software in daily classroom activities. This has been supported by Lisenbee (2016), as the author stated that teachers need to be given adequate training, which will increase their self-confidence in the use of new technologies.
2. Some researchers believe that an appropriate level of school strategic planning is needed to enhance the successful integration of ICT in classrooms (Baylor & Ritchie, 2002). Teachers would be more willing to integrate ICT into teaching and learning when schools underpin and strengthen the importance of using ICT in daily teaching.
3. Expansion of internet access points in various schools. There is a need to install Internet facilities in classrooms, hostels, and offices for effective use in teaching and learning. This will motivate students and even students.
4. Stakeholders in the education sector, including the Ministry of Education, Directors of schools, and head teachers should promote teachers’ access to electronic information resources.
5. There is a need for an evaluation system at both the school and the government levels to find out how well the integration process works in schools. At the school level, an evaluation system should be built to measure teachers’ performance in ICT integration; while at the government level, evaluation systems can measure the gap between different states and help policymakers better distribute resources equitably (Kundu, 2018).
6. Government must develop the necessary infrastructure in areas, such as energy power supply. Teachers should be encouraged and trained to effectively integrate technology into the instruction they provide. In-services should be provided for teachers. It is on record that until now, the number of qualified teachers still cannot support the development of ICT in Nigerian schools (Kundu, 2018). Teachers should be made to attend conferences, and seminars to regularly update their knowledge because new educational technologies and software emerge daily. In another development, teachers’ roles, as Kundu (2018) suggested should change from authority models to active mediators, because they are the key factors affecting the usage of ICT in education because they are organizers, guides, and coordinators in teaching and learning. It is however believed that how well the teachers can engage themselves in these roles can determine how effective ICT is integrated into classrooms. The teachers should understand the essence of constructivist learning and encourage students to use ICT in self-directed learning and collaboration activities (Kundu, 2018).
7. The poverty level of Nigerian citizens is one of the problems hunting the integration of ICTs in teaching-learning. Teachers’ poverty level is a contributing factor. Nigerian government sometimes cannot provide every ICTs tool needed for teachers’ jobs. This is so because some of the ICT’s tools, such as computers and Android phone that enables Internet connectivity, which can facilitate classroom activities cannot be purchased by teachers due to the meagre salaries they receive from the government.

8. Research has shown that teachers' negative attitudes and lack of confidence in ICT use can seriously pose challenges to ICT integration in schools, hence teachers' education should be carried out in a conducive and less-threatening environment, as this will allow teachers to gain competence in using ICT for teaching and learning in a confident manner (Teo, 2008). Teacher education in ICT integration can also improve teachers' understanding of ICT and equip them with the latest teaching and learning theories. In totality, therefore, teacher education should reconsider its training approaches in ICT integration (Kundu, 2018).
9. The quality and quantity of online-based educational resources should be improved by education stakeholders by building resource-sharing platforms; (Kundu, 2018) stressed that ICT integration can never be achieved without easily accessible online resources and resource-sharing platforms that will teachers with basic Internet access to get teaching materials with high quality, such as videos, pictures, and curriculum instructions. Teachers in remote areas can get training in teaching pedagogy, while teachers in urban areas can learn from their peers with better teaching skills and form online learning groups to communicate and learn from each other (Kundu, 2018).
10. Hazwani et al. (2020) suggested that management personnel need to improve dormitory/hostel areas to provide all students with access to the internet.

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