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USING DIGITAL TECHNOLOGIES IN MITIGATING CHALLENGES OF TEACHING LARGE CLASSES IN NIGERIA TERTIARY EDUCATIONAL INSTITUTIONS

BY

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Abstract

This paper examined the Uses of Digital Technologies in Mitigating Challenges of Teaching Large Classes in Nigeria Tertiary Educational Institutions, Nigeria. Like most of countries across the globe has adopted and mostly implemented the Education for All (EFA) policy of the United Nations (UN), which has in no small measure resulted in the increased student population at all levels of education and this increased has led to another educational problem such as overcrowding (large class) across all levels. To address the ugly trend, in teaching and learning process of tertiary institutions in Nigeria needs to deploy and use digital technologies in this era of digitalization of knowledge and learning. It was on this premise that the paper was developed around the following headings: Meaning and conceptualization of the term digital technologies; Specifics digital technologies and their uses in tertiary institutions to managed large classes were discussed; This is ranging from: Edmodo Devices Socrative Devices, Thing Link Tool, TED-Ed, Class Dojo, EduClipper, Animoto among others. Similarly, the paper came up with typologies of digital technology as: educational technology, Information technology, Communication technology and operational technology. Moreso, the advantages of the use of digital technologies around large classes were identified as thus: Allow for individualized instructional process; It reduces learning poverty in our tertiary institution of learning; It provides opportunity and allows for collaborative learning among the students; Innovative in teaching and better Engagement and Building of Peer Communities among others. Then, theoretical framework guiding the use of digital technologies for large classes was discussed. Additionally, Challenges associated with the use of digital technologies were highlighted; Finally,

Conclusion and recommendations were made: Need to reduced teachers' stress due to heavy workload which affects engagement during teaching –learning and Teachers' should ensure they adequately meet the learning needs of individual learners through the use of digital technology

Keywords: Digital Technologies; Mitigates; Large Classes and Challenges

Introduction

Historically, It is important to note that digital revolution began in the mid-20th - Century and this was as a result of invention of vacuum tubes and transistors. Thereby, the vacuum tubes led to the development of first generation of computers, while transistors gave birth to the second generation and other modern systems. This development was by the American engineers, and they used these devices as mathematical concept described in the 17th century. This mathematical concept was binary computing and it relied on voltage levels represented by ones and zeros. Following this pathway, the developed transistors led to the development of digital devices. Going forward, in 1969, *Aparent* was established, and this led to the internet functionality. Given this background, the first mobile phone was invented in 1983 by Motorola called the DynaTAC 8000X and was followed by the development of the World Wide Web in 1989 (BBC Bitesize 2023; and UN75-2020).

All these inventions contributed to the development of digital technologies as they are known today. Digital technologies therefore, covers majority of the tools and devices that is used in today's educational sectors and in human modern organizations. A more practical reference as examples of these technologies are laptops, e-book-reader, and smartphones are the classic ones when talking about the digital technology while the internet is also part of this revolutionary technology. It has been established that, technologies can help make our world fairer, more peaceful, and more just. Similarly, it has been envisaged that, digital advances can support and accelerate achievement of each of the 17 Sustainable Development Goals, especially, with the new target of (2030) which hopefully would ensure in ending extreme poverty, to reducing maternal and infant mortality, promoting sustainable farming and decent work, and achieving universal literacy goals. Digital technologies have advanced so rapidly than any innovation in human history and which has reached around fifty percent of the developing world's population in only two decades and transforming societies. By enhancing connectivity, financial inclusion, access to trade and public services, technology can be a great equalizer (BBC Bitesize 2023; UN75-2020).

This digital technology in its holistic term refers to all electronic tools, devices, and systems that process, transmit and store data in binary form. These technologies can be used to create, store, and manage data in various fields and applications. Some categories of digital technology currently include computers, smartphones, smart TVs, and online games. The term represents technology that relies on the use of microprocessors; hence, computers and applications that are dependent on computers such as the Internet, as well as other devices such as video cameras and mobile devices like phones and personal-digital assistants (PDAs) all comes under digital technologies (Darren, 2023).

Meaning and Conceptualization of Digital Technology

In the recent studies by scholars, such as (Ademola 2014; & Angelo 2008), revealed that, there are issues around class size and classroom overcrowding with its consequential impacts on students learning and achievement. Given this fact, education is seen as a systematic training of individuals in order to bring about positive change in behavior so as to become fulfilled citizens. Across the globe, trends in education have reflected a significant increase in students enrolment and this is very evident in Nigeria with an upward trend in school enrolment at all levels of education after the civil war in 1970. Nigeria, like most countries across the globe has adopted and mostly implemented the Education for All (EFA) policy of the (UN), which has in no small measure resulted in the increased student population at all levels of education. The increased numbers in enrolment have led to another educational problem. Therefore, the population explosion coupled with economic meltdown experienced in Nigeria in the years back has made large class sizes in Nigerian tertiary institutions inevitable. This is so because, lecturer–student ratio in all the public tertiary institutions in Nigeria today has gone far beyond the stipulated directive. Due to its unavoidability, the situation has to be managed with one form of digital technology or the other for an improved students' academic achievement (Ademola 2014; Angelo 2008).

Hence, Nigeria being the giant of Africa is possibly taking the lead in the experience of large class environments at her higher education institutions. And these environments have been posing real challenges and potential threats to the quality of education for Nigerian educators and students as well, since this has been leading to overstretched of educational facilities, ineffective teaching and learning and mass production of poor-quality graduates. It was on this note that the growth of large classes in the developing world is a result of global initiatives for universal education, rapid

population growth, the quest for higher education and better living conditions (Alimi, Fagbohun & Abubakar, 2021; Yelkpieri et al,. 2012).

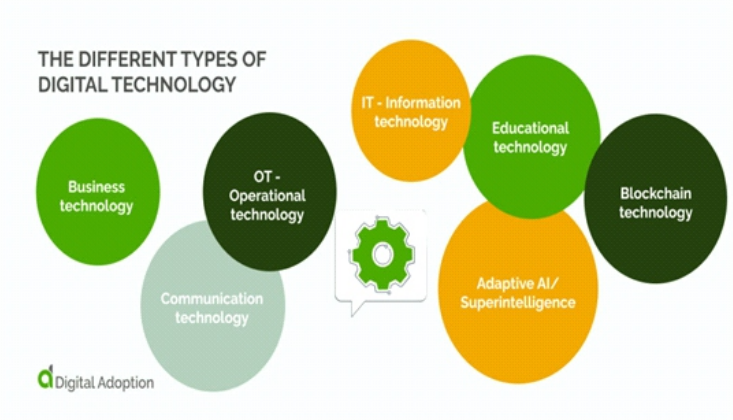
In line with the above development, it is hope that leveraging right type of digital technology for teaching and learning in tertiary institution in Nigeria educational system will reduce the challenges posed by large classes. This is because it is an established fact that. earlier before now digital technology is primarily used with new physical communications media, such as satellite and fiber optic transmission while modem is used to convert the digital information in a computer to analog signals for phone line and to convert analog phone signals to digital information for the computer. This now shows that digital technology in a more technical sense is a piece of physical equipment that uses digital data and personal computers are generally for the purpose of computing devices like desktops and laptops. They are relatively small and inexpensive and are commonly used in the workplace for tasks like word processing, desktop publishing, etc. There are many modern technological devices used in education in recent times such as online teaching software, podcasts, smartboards, wiki-grade blogs, interactive whiteboards, digital projectors, and mobile devices. We can take advantage of these technological tools in education in various ways and to address difference educational challenges which can include classroom overcrowding (Abah 2019; Abdu et al., 2016 & Scort 018).

Therefore, Digital Technologies, simply means any electronic, digital, magnetic, optical or information processing device or system which by using electronic source will perform logical, mathematical and memory programming, and any digital or computer device system or computer network connected with it or all kinds of input, output, processing, accumulating digital software device or communication facilities are all-inclusive. Digital technology has the capability to create, generate, send, share, communicate, receive, store, display, or process information, and such electronic devices shall include, but not limited to, desktops, laptops, tablets, peripherals, servers, mobile telephones, smartphones, and any other similar storage device which currently exists or may exist as technology continues to develops due to knowledge explosion. (Abah 2019; Abdu et al., 2016 & Scort 2018).

Typologies of Digital Technologies

There exist different categorizations of Digital Technologies currently in usage in order to simplified process of human learning in an educational setting and same in other

human organization other than the education sector. These technological component structure varied as illustrated from the array of the current forms being identified by researchers. Although, selection process and choice would largely be influenced by the content objectives to be achieved and as well the pedagogical knowledge and teachers preference. However, Digital Adoption Team (2023) identified the following components categories:



Source: Digital Adoption Team (2023)

It would be helpful to be aware of the different types of digital technology available in today's technology revolution, where virtually all things are now done more perfectly with the use of modern technology. Hence, the identified were briefly explained as the taxonomy:

i. Educational technology: EdTech, or educational technology, has revolutionized how students learn by offering break throughs such as computer-based instruction, interactive learning tools, audio-visual systems, and online resources which can be applied and used for educational purposes
ii. Information technology: By leveraging IT – Information Technology – comprised of both hardware and software, in addition to telecommunications in education and businesses can store, send and retrieve data effortlessly.
iii. Communication technology: As an amalgamation of information and communication, Communication Technology (CT) involves digital communication networks for users and devices. Virtual assistants, social media platforms, Wi-Fi networks, and Bluetooth are examples of CT.
iv. Operational technology: Operational Technology is a powerful combination of hardware and software that can enables education sector, organisations and companies to secure their networks for their intent and purposes.

v. Adaptive AI/ Superintelligence: Superintelligence uses artificial intelligence and computer systems to expand and upgrade human life. AI-based examples of digital technology include chatbots, virtual agents, and self-driving cars.
vi. Block chain technology: Block chain offers a secure, web-based financial system with encrypted data. Initially designed to manage digital assets, its applications now extend far beyond that; from online stock exchanges to social media platforms, this tech is quickly becoming an essential tool for businesses. Digital Adoption Team (2023).

Specific Digital Technologies and Use in Teaching Large Classes.

Issues around teaching in large classes in Nigeria tertiary institutions are becoming more overwhelming perhaps this could be associated with already existing crises and challenges contending with the current practice and trends which include overcrowding and learners' explosion in classrooms resulting from infrastructure deficit; poor classroom control and management. Moreso, the looming and frequent strike of ASUU which gave birth to matched semesters and streaming systems in most of the universities could be another responsible factor. Similarly, poor teacher-student interactions; teachers' stress due to heavy workload, and inability of teachers to adequately meet the learning needs of individual learners (Abah 2019; & Aina et al., 2020).

Attempt to curtail these menaces, teachers and students in tertiary institutions of learning can import to the use of Digital Technology that have the potential to effectively manage our current existing outrageous number of students in a class (Large Class). This approach to learning in this era of digitization of knowledge which is flexible and learners' centered oriented, worth to be applied and hope to maximize and improved learning outcome for students in our tertiary educational system at largeIt was in line with the above submission that, the following Digital Devices when appropriately deploy and effectively utilized will challenge the existing problems because hundreds of digital education tools have been created with the purpose of giving autonomy to the student and improving the administration of academic processes, encouraging collaboration, and facilitating communication between teachers and learners. (Abah 2019; Aina et al., 2020). Hence, the below were identified as some of the digital technologies for teaching and learning.

Edmodo Device

Edmodo is an educational tool that connects teachers and students, and is assimilated into a social network. In this one, teachers can create online collaborative groups, administer and provide educational materials, measure students' performance, and communicate with parents, among other functions. Edmodo has more than 34 million users who connect to create a learning process that is more enriching, personalized, and aligned with the opportunities brought by technology and the digital environment. . (Abah 2019; Aina et al; 2020; Anderson 2010; Edinyang et al., 2015; & Song 2017).

Socrative Device

Designed by a group of entrepreneurs and engineers passionate about education, this is a system that allows teachers to create exercises or educational games which students can solve using mobile devices, whether smartphones, laptops, or tablets. Teachers can see the results of the activities and, depending on these, modify the subsequent lessons in order to make them more personalized.

Project Device

This project is a tool that allows you to create multimedia presentations, with dynamic slides in which you can embed interactive maps, links, online quizzes, Twitter timelines, and videos, among other options. During a class session, teachers can share with students academic presentations which are visually adapted to different devices.(Abah, 2019; Aina, et.; al; 2020; Anderson, 2010; Edinyang, et.al2015; & Song, 2017).

TED-Ed

It is an educational platform that allows the creating educational lessons with the collaboration of teachers, students and animators—generally people who want to expand their knowledge and good ideas. This website allows democratizing access to information, both for teachers and students. Here, people can have an active participation in the learning process of others. (Abah, 2019; Aina, et.al 2020; Anderson, 2010; Edinyang, et.al 2015; & Song, 2017).

Class Dojo

A tool to improve student behavior: Teachers provide their students with instant feedback so that good disposition in class is 'rewarded' with points and students have a more receptive attitude towards the learning process. ClassDojo provides real-time notifications to students, like 'Well Done David!' and '+1', for working collaboratively. The information that is collected about student behavior can be shared later with parents and administrators through the web. (Abah, 2019; Aina, et.al; 2020; Anderson, 2010; Edinyang, et.al 2015; & Song, 2017).

EduClipper

This platform allows teachers and students to share and explore references and educational material. In the eduClipper you can collect information found on the internet and then share it with the members of previously created groups, which offers the possibility to manage more effectively the academic content found online, improve research techniques, and have a digital record of what students achieved during the course. Likewise, it provides the opportunity for teachers to organize a virtual class with their students and create a portfolio where all the work carried out is stored. (Abah, 2019; Aina, et.al; 2020; Anderson, 2010; Edinyang, et.al 2015; & Song, 2017).

Story Bird

The major aims of story bird are to promote writing and reading skills in students through storytelling. In this tool, teachers can create interactive and artistic books online through a simple easy-to-use interface. The stories created can be embedded in blogs, sent by email, and printed, among other options. In Story Bird, teachers can also create projects with students, give constant feedback, and organize classes and grades. (Abah, 2019; Aina, et.al; 2020; Anderson, 2010; Edinyang, et.al 2015; & Song, 2017).

Animoto

This is a digital tool that allows teacher/students to create high-quality videos in a short time and from any mobile device, inspiring students and helping improve academic lessons. The Animoto interface is friendly and practical, allowing teachers to create audiovisual content that adapts to educational needs. (Abah, 2019; Aina, et.al; 2020; Anderson, 2010; Edinyang, et.al 2015; & Song, 2017)

Smart Phones

The smartphone has become one of the most valuable tools for students in higher education and has come to play an important role in in-class learning, study organization and management, student/community life and planning, dealing with finances, and personal safety and security.(Abah, 2019; Aina, et.al; 2020; Anderson, 2010; Edinyang, et.al 2015; & Song, 2017).

Notability

Notability has been ranked as one of the best note-taking apps available. More than a note-taking app, students can annotate PDFs/images/GIFs, brainstorm their ideas and make quick and easy notes of them for future reference, record lectures, and many other functions. Students can often find it difficult to follow lectures while attempting to take notes. This app lets students manage their own lectures and notes, plus share, connect, and synchronize with other students. Notability can synchronize with Dropbox, Google Drive, and OneDrive.(Abah, 2019; Aina, et.al; 2020; Anderson, 2010; Edinyang, et.al 2015; & Song, 2017).

GoConqr

In an attempt, in retaining the mass of information that accumulates over the course of a semester or the first few weeks of school resumption can be so challenging. However, GoConqr can assist with this challenge by providing users with interactive functions such as courses, mind maps, flashcards, notes, quizzes, slides, and flowcharts. This is education and learning management at its best. This app features an extensive digital library for learners, the means for educators to create their own learning materials and create an interactive community among their students and can provide and support institutions with campus portals and campus groups. (Abah, 2019; Aina, et.al 2020; Anderson, 2010; Edinyang, et.al 2015; & Song, 2017).

Coursera

Not all learning needs to take place in the classroom and or even through online degree programs. Coursera offers hundreds of Massive Open Online Courses (MOOCs) to anyone interested in gaining basic understanding of a wide array of topics and subjects. Courses offered through this educational company are organized and taught in together with hundreds of universities and companies. 24 million users cannot be wrong.

Coursera offers online studies in 12 different categories and learners can receive verified certificates for their online achievements. Many universities today have even recognized Coursera credit and allow students to complete online courses as part of their regular degree programs at university. Other sites offering a host of interesting MOOCs include: FutureLearn, edX, XuetangX, Udacity, Udemy, and Mirнada X (Spanish). MOOC-based credentials through these education-based companies and initiatives are diverse, ranging from auditing, to certificates, to master's degrees.

bSafe

Personal safety has become a paramount concern on university campuses these days. Campuses–while often patrolled and observed using CCTV cameras–can be quite large, quiet, and dark, and a litter uncomfortable for anyone walking alone at night or unfamiliar with his or her surroundings. The bSafe app helps provide some security by putting virtual eyes on you as you walk home through live GSP tracking (a function called "Follow Me"), featuring an SOS alarm, automatic video and audio recordings that can be instantly sent to other mobiles (Marzouki, Idrissi & Bennani, 2017).

The above afore explained digital devices and how they can be use a gesture which if appropriately applied can go a long way in reducing challenges around large classes. Some of the identified ones above brings to limelight that, a practical utilizations of digital devices can undoubtedly challenge the existing problem of large class in our university system. The array of devices identified could be suitable to any given discipline or subject specialization of students in our universities. This could be possible because most of our students can interact with most of these learning tools at his or her pace and whether with the teacher present or not because simple instructions can serve and support them because they are digital native students, hence the role of a teacher is a mediator and a guide.

Benefits of Using Digital Technologies for Learning in Tertiary Institutions

Teaching with the use of technology aimed at achieving major two benefits for teachers and the students. This implied teacher teaches with less difficulty but succeeded in bringing about learning and this could happen when they leverage on appropriate technology. While, on the other hand, the students learn so easily with the support of the available technology made available to them or that, they possess. This therefore, means

teaching-learning activities happen anywhere and any place which becomes possible with digital technology and student's conferment to classroom is eroded there by students overcrowding is mitigated. Based on this development, the following were identified as the benefits of using digital technology in Nigeria tertiary institution for learning: (Marc, 2021).

Easy Learning:

Education has enjoyed many benefits as a result of digital technology. E-learning is now the preferred choice for many parents, teachers, and students. Digital video conferencing and online chats provide instant feedback on the course material, answers to questions, **and private tutoring.**

School and students reduces cost: By utilizing these modern conveniences, schools and students can reduce costs on travel and supplies and focus on education.

Mass storage of information: Mass Storage of Information Digital technology enables the storage and retrieval of tremendous amounts of data through devices like smartphones and PCs. It eliminates the need for bookshelves and cabinets. Cloud storage even reduces the need for local storage media. With cloud services, you don't need hard disks and flash drives anymore. You can easily access and share files with other people by sharing the cloud link.

Collaboration and quick sharing of information: Digital technology enables quick sharing of information, enhances automation of processes, and eases learning. Summarily, Digital technology encompasses all electronic devices, tools, and systems that encode, process and store data in binary. This revolutionary technology is everywhere. It is in your home, workplace, roads, cars, and so on. Digital technology began with the invention of transistors and vacuum tubes in the 20th century. Examples of this technology include digital gadgets, social media, websites, and artificial intelligence. (Marc, 2021).

Advantages of the Use of Digital Technologies to Curtail Challenges Around Large Class

The nature of learning has changed significantly in the last few years. As with most things in our society, new technology is used to improve learning both in terms of the engagement with and the effectiveness of teaching, with the aim of ultimately ensuring better results for students. Similarly, it has been observed that, 21st Century students

across the globe are digital natives and most of them were being exposes to one form of digital mobile devices or the other. Some could have used them for business while others could be for education or entertainment. But more specifically, Pande, Wadhai, and Thakare 2016 and Scott, (2018) Submitted that, at tertiary level digital devices have the following potential advantages as thus:

i. Allow for individualized instructional process because the learner interacted with the device to carry out instructional strategy at his/her pace within a given topic
ii. It reduces learning poverty in our tertiary institution of learning
iii. It transforms teaching and learning to digital thereby breaking the monopoly of traditional physical face-to-face interaction between the teacher and the learners all the time and provides opportunity and allows for collaborative learning among the students.
iv. Digital technology is very flexibility, efficiency in knowledge and qualification enhancement, motivation of students interaction, cost-effectiveness. It equally enhanced learning: research shows increased depth of understanding and retention of course content; more meaningful discussions; emphasis on writing skills, technology skills, and life skills like time management, independence, and self-discipline.
v. It is a leveling of the playing field where students can take more time to think and reflect before communicating; shy students tend to thrive online; anonymity is guaranteed in an online environment. Moreso, Interaction: increased student-to-teacher and student-to-student interaction and discussion; a more student-centered learning environment; less passive listening and more active learning; a greater sense of connectedness and synergy.
vi. It is an innovative teaching: in nature, meaning student-centered approaches; increased variety and creativity of learning activities; address different learning styles; changes and improvements can translate to on-ground courses as well
vii. Maximize physical resources: lessen demand on limited campus infrastructure; decrease congestion on campus and parking lots. It facilitates Collaboration: Working along with others is an important part of the working together in education can also benefit from digital learning as a collaboration tool, by bringing people together through video conferencing, enabling students and teachers to use shared documents, or simply by helping to prepare students for the world of work. (Scott, 2018).
viii. More Resources: Resources such as recorded lectures or additional reading can

be easily shared, giving students the opportunity to maximize their learning, and to go over subjects that they find more challenging as well as get extra information relating to subjects that they wish to understand better (Scott, 2018).

ix. Better Engagement: Digital analysis can help educational institutions to get a better understanding of the engagement of their students with specific parts of their courses, or the institution as a whole. This means that educational institutions can quickly pick up on it if a student is becoming disengaged, struggling with the course, or is ill, and have the tools to remedy the situation more efficiently (Scott, 2018).

x. Personalized Learning: Digital learning can help enable personalized learning, in that everybody has specific techniques and learning methods that suit them. Digital learning can help students and teachers to get a better understanding of the most effective teaching methods for them, helping the delivery of teaching and learning to be more effective (Scott, 2018).

xi. Building Peer Communities: Younger people especially often feel more comfortable sharing with their peers online, rather than face-to-face. Whether it is simply through community chat groups or a more structured learning environment, technology can be an excellent way to build communities among students as well as with their teachers, providing support and benefits to everyone. This can be used to connect students from around the world, without the need for them to be confined to the same room (Pande, Wadhai, & Thakare 2016; Scott 2018).

Challenges in Using Digital Technology for teaching in tertiary institution

Digital technology have gained popularity and widespread used for educational purposes because of their benefits and advantages in checking problems of overcrowding which might have resulted if it were the face to face classroom engagement. However,, there are some specific challenges that were affecting digital technology tools for mitigating challenges large class among which include the following:

i. It is challenging in designing and producing cost-effective custom digital technology that meet operational needs and specification sometimes.

ii. Weakness of internet connectivity and internet speed in many of the tertiary institutions in Nigeria and high prices for a good internet services which might not be affordable.

iii. In adequate of customized computers/laptops/tablets/smartphones that can support full online teaching and learning.
iv. Many online instruments, platforms, and websites crashed when an unexpectedly high number of clients connected to them.
v. Unethical behavior, physical health concerns, and data privacy issues. And as well cheating via text messaging, sharing inappropriate content, and possibly Cell phones provide an additional means for cyberbullying..
vi. Small screen sizes, and limited battery life of some digital technology which ultimately affect their effective used during engagement with students

In addition to the above challenges, Eldridge, (2010) identified the following as major challenges to digital technology utilizations as thus:

Teachers' Apprehension and Teacher Adaptability

The said above challenges are related to teachers, like most people, are often reluctant to change, but when the change involves technology, fear and misunderstanding can also happen. The two specific types of challenges people face when dealing with change: technical and adaptive. A technical challenge is the type of change that involves using information that already exists and is often controlled by the people in charge. For example, if the lunch schedule is not working out because there are too many students in one of the lunch periods the principal will switch some of the classes around to balance things out. An adaptive challenge requires people to learn new ways of doing things. The only way to make this happen is to change the hearts and minds of those who need to make the change, so they will see the need. Asking teachers to implement technology into their instruction is an adaptive challenge.

Conclusion

The use of digital technology by Nigeria tertiary institution's students will be a means of democratizing knowledge and information, to be acquired by students and this go along way to reduce teacher's role to be a guide and teaching -learning encounter in one perspective and it goes extra-mile in making the learners actively involved and with direct contact on what they were to learn. Similarly, learning tends to be become fun with the uses of digital technology because the mode eliminate physical presence of students and teachers within the classroom system before learning takes place thereby breaking away from the monopoly of the teacher and the traditional perspective in practice of face-to-

face engagement

Recommendations

The following recommendations are made with the view of reducing challenges inherent in the use of digital technology as mitigating challenges of overcrowding in tertiary institution in Nigeria and these include:

i. Teachers need to have updated skills and knowledge on the effective application and use of various forms of available digital technology for the teaching-learning process in tertiary institutions of learning in Nigeria.
ii. Deficit in Nigeria's tertiary institution infrastructure needs to be improved upon in order reduce overcrowding in classes. Therefore, Tetfund should leverage on this
iii. ASUU frequent strikes should be averted at all costs because it gave birth to matched semesters and streaming systems in most of the universities which contributed to a large classes in the tertiary institutions in Nigeria
iv. Need to reduced teachers' stress due to heavy workload which affects engagement during teaching-learning
v. Teachers' should ensure they adequately meet the learning needs of individual learners through the use of digital technology
vi. Need for improved internet connection and internet speed in universities campuses for improved digital device uses should be ensured
vii. University to put in place measures to check issues around crashing of online instruments, platforms, and websites which unexpectedly happens

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