

Digital Innovations and the Need for Digital Literacy in the Nation's Education Sector

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Abstract: *The upsurge in technology and its skills application in recent years have created a revolution in information disseminations in the nation's education sector. This poses ardent challenges and opportunities to students and teachers at all levels of the education system. The students and teachers are required to be equipped with digital literacy skills and knowledge for competencies in word processing, record keeping, project works and the management of educational resources vital for academic prowess. Information and Communication Technologies (ICTs) in the form of digital devices are presently the most prominent, efficient and advanced academic tools available to achieving fast, creative and effective research works for administrative and the management of educational tasks needed for advancing knowledge frontiers for quality education in educational outfits. Digital devices play vital role in equalizing opportunities for marginalised persons and groups globally. But the paradox is that for the persons short-charged by the technological divide, the digital devices become tools for further marginalization. Here comes the need for digital literacy amongst students and teachers in the nation's education system to eliminate or minimize the challenges. The application of digital innovations in the nation's education system is endangered because of the high digital literacy deficiency among teachers, administrators and education commissions' staff entrusted with the scheme. And unless proactive steps are taken to addressing this, the disadvantages will deepen to affect the educational manpower development. The paper examined the digital innovations in education and the urgent need for digital literacy to achieving modern global education goals.*

Keywords: *ICT, Digital literacy, Digital Innovations, Educational goals*

I. Introduction

Information and Communication Technologies (ICTs) is the key to modern civilization globally. According to Nwagwu (2006), the rapid rate at which ICTs have evolved since the mid-20th century, their convergence and pervasiveness has given them a strong role in development and globalization. ICT facilities are increasingly getting employed in the educational system. Globally, we are moving towards the digitalization of information system with the aid of Internet and its facilities; such as the web, digital systems, smart mobile phones cum social platforms. Students and teachers alike are increasingly sourcing for educational resources with the aid of digital devices for their areas of need. Various educational programs and innovation have been designed and produced by professionals for application by students, and teachers to expand the educational horizon. The essence of digitalization is the ability to access

information with ease in various forms by the use of electronic gadgets and computerized devices like desktops, palmtops, smart phones, tablets, mini pads, laptops etc. (Techterms, 2010). This is to make for easy access to information and the processing of data in various forms for effective communication via Internet applications like; emails, fax, telephone calls, video calls, chats, messages, etc.

The advent of these innovations has made it possible for learners to learn independently of the class teachers, easing teachers' burdens. Digital literacy has become an integral part of our everyday life. Its knowledge and skills has impacted positively modern economies of the world. In the opinion of Aduwa-Ogiegbean and Iyamu,(2005), digital innovations and digital literacy possess the capacity to actualise the objectives of the desired taught concepts, strengthen the teaching-learning process, as well as create economic viability for future workforce, but that most

evolving economies like Nigerian's, are still disadvantaged. The disadvantage is caused by high digital literacy deficiency among teachers, administrators, and education commissions' staff who are saddled with the task of implementing the digital innovations and digital literacy. The acquisition of digital literacy by the teacher will aid in the effective and better administration of digital innovations to learners. Modern ICT-compliant teachers' vis-vis digital literates, use plugged-in devices to teach learners making uninteresting and difficult lessons to become interesting and motivating. Digital presentations, notes, and tests papers can be stored and transferred conveniently and speedily over ICT-complaint networked digital devices. Equally, students can submit assignments, project works and tests responses in soft copies, saving time and paper costs with the aid of digital devices.

Digital literacy knowledge and skills should be introduced early in learners' education so as to equip them with the fundamental skills for resourceful education geared towards human resource development. The advent of digital innovations in education has necessitated the acquisition of digital devices by students and teachers to facilitate resourceful teaching and learning.

The digital innovations shaping teaching, the classrooms and the future of education. Schools may still have desks and students may still have notebooks, but a lot has changed in the classrooms over the past years, especially in the developed climes due to the widespread access to the Internet. It has accelerated the implementation of digital innovations in the education sector. Ideas spread fast and people can research for the best methods for using technology in education. Hardware companies are producing devices such as laptops and tablets which are customized to meet specific education needs. Cut-throat competition among different technology firms is another factor that is accelerating the rate of digital innovations. Technology is causing massive changes in all sectors of the global economy especially in the education sector which is a key sector that have been affected by the digital innovations. Technology is playing a major role in the twenty-first century education. The new model of integrating technology into the curriculum means that computers are in great demand in the education sector day. Digital literacy teachers and administrators face the task of developing a technology plan that makes the most effective and efficient use of digital devices available

to them.

The impact of digital innovations in education is rapidly changing how students learn and how teachers instruct. They are giving classrooms a new look and changing the ways lessons are conducted.

Savar (2017), Ame (2019), and Room 241 Team (2018); listed the most impactful and amazing digital innovations in the education sector till-date to include: **Overhead Projectors;** while versions of image projectors had been in existence since the late 1800s, the more recognizable overhead projector didn't come until the 1960s. Roger Appeldorn of 3M, invented a projector that displayed text and live writing on clear film sheets. Overhead projectors are now a staple in classrooms.

Microfiche/Microfilm; Microfilm was invented to make copies of bank records in the 1920s, but in the 1970s it became widely used in libraries when housing hard copies of records and media became too bulky. This enabled schools and town libraries to become research centres, with microfilm readers found in most—making it possible for students to easily search for records, articles, and information.

Scantron; was invented in the 1970s. Scantron sheets changed the way students take tests and the way teachers grade them in the United States of America. Scantron sheets are machine-readable answer sheets for multiple choice tests. The Scantron Corporation created the sheets as well as the image scanners that read them, and it's said they are actively used in 98% of school districts in the United States. With the Scantron sheets, teachers no longer have to strain their eyes grading endless class tests, as they only have to run answer sheets through a machine that instantly shared results.

Mimeograph Machines to Photocopiers; teachers spend a lot of time making copies of tests questions, examinations questions, and others periodically especially in the United States for the smooth operation of the education process, which wasn't always easy. Hand-cranked mimeographs created dittos, printed in purple ink. That process created worksheets that had a distinctive and nauseating smell in the 1950s to the 1980s. The Xerox machines came in the 1950s and became fully integrated into schools functions and library services in the 1980s. Photocopies made it possible for teachers to quickly prepare and share copies of texts, examinations or images to students. It also aided in duplicating test

materials, or for students to copy and take home research materials in a library.

Handheld and Graphing Calculators; handheld calculators in the 1970s were a revolutionary and portable electronic device that could perform calculations, including basic arithmetic to more in-depth Math. In the 80s and 90s, calculators became more affordable for everyday use and became increasingly sophisticated. When the TI-81 graphing calculator hit the market in 1990, by Texas Instruments, it became possible to work on equations at the touch of a button!

Smart Boards; their advent was a shift from the dusty and musty chalkboards to the dry-erasable whiteboards. These interactive whiteboards called SMART Boards or touch boards are interactive whiteboards with more sophistication and popularity in schools and workplaces. These interactive boards allow students to actively participate in learning instead of the teacher-centred lectures, where students merely read the board and receive information. With the boards, students can now interact with materials on the board. An example is the LCD Touch Board. The touch of the hand or a pointer on it makes it easier to manage than a traditional computer.

Interactive boards create multi-sensory learning experiences that allow several users to draw and write on the board simultaneously. This means several students can collaborate on a project together at the same time. A prime benefit is that LCD touch boards don't rely on an overhead projector, which means there won't be any shadows when an instructor touches the screen. A variety of companies such as; Hitachi, Panasonic and Mimio are producing smart boards. The new interactive boards have brought about cutting-edge technology to the classic whiteboard.

Computers and WiFi; learning games such as the popular Oregon Trail allowed students learn with technology. However, from the 21st century, came the laptops, hand-held devices, school-wide WiFi, social media, and more apps, allowed technology to become an integral part of classrooms learning experiences.

YouTube; YouTube was launched in 2005 and has since become a go-to source for entertainment, learning, and information for billions of people around the world. But the site has found itself on the

banned web site list at many schools, seen as a distraction to students. The fact is, teachers rely on YouTube like other social platforms as a teaching and learning tool. To combat the banned site issue, Teacher Tube was invented in 2007 by educators to provide a more school-friendly resource for video content.

Maker spaces; came into existence in the early 2000s in Germany and the U.S. as places for innovators to invent and tinker. Dale Dougherty, creator of the Maker Faire and *Make* magazine, in 2011 called for a movement of maker culture in education. Since then, maker spaces and programs have become a popular learning tool in school districts across the U.S.A and other countries.

Virtual Reality (VR) technology; is the hottest technology worldwide. Companies such as Google, Sony, Oculus (backed by Facebook), Samsung, and more are involved. One of the areas of application of VR technology is education. With VR, students can learn by interacting with a 3D world. Google has been on the forefront of introducing experiential learning in schools using VR technology.

Artificial Intelligence (AI) and Machine Learning; artificial intelligence is being applied from the lowest to the most advanced levels of technology. AI is used in schools to automate key activities such as grading of subjects and the provision feedbacks in areas that need improvement. It is also used to enhance personalized learning among students, especially those with special needs. Through machine learning, adaptive programs have been developed that care for the individual needs of students. AI tutors have been developed to teach students subjects such as mathematics and writing.

Cloud Computing technology; has made variety of software and educational resources accessible from any part of the globe by students and teachers. The accessing to software online helps saves installation and maintenance costs associated with upgrading of dozens of laptop and desktop computers in the school system. Vital resources such as written lessons, audio lessons, videos, and video assignments can be stored on a school's cloud terminal and made available students from the comfort of their homes. With it students can complete and submit their assignments to their tutors. Cloud computing will eliminate the hassle of carrying tons of books or practically living at the local library. It will also allow students to chat

live with their tutors.

3D Printers; with it, subjects/courses contents taught via text books can now be expressed through 3D models. Through this printing technique, students can have a better understanding of complex concepts translated into realities. In higher educational institutions, the technology is used by engineers and system designers to develop prototypes to be used in the development of final systems in institutions of higher education.

Social Media; educational institutions have not been left behind in capitalizing on the impact of social media. In fact, most of these social networking sites were developed on campuses and the first users were college students. Universities and colleges can connect with each other through social networking sites even if they are several continents apart. Through these sites, they are able to organize contests, meetings, and parties. Students from different schools use social media to exchange ideas which can change lives.

The Use of Biometric; the introduction of biometric systems in schools has helped to enhance discipline by discouraging truancy and cheating associated with students. Facial recognition, fingerprints, voice recognition, and eye tracking are some of the biometric methods that schools have implemented to streamline their operations. Apart from being used to monitor a student's class attendance, they are used when borrowing school properties such as books in the library. Teachers use eye tracking methods to monitor how students are absorbing content that they have been taught.

Virtual Learning; has been part of the curriculum for home school students for years. Increasingly, public schools are also incorporating a variety of online technology. Virtual learning includes video instruction to educational chat rooms. Several companies are making incredible advances in the field of virtual learning, including Immerse Education and zSpace. The line between home learning and public education continues to blur as both continue to use virtual learning in various ways.

Gamification; gamification provides several excellent tools, such as games and fun online competitions to enable students learn new materials and reinforce old skills. Gamification is a process that

transforms classroom activities into fun games that ultimately increase learning. For example, failure can be used as an instant source of feedback. Earning badges or prizes when specific goals are met are part of the gamification process. Some examples include DuoLingo for learning new languages and Play Brighter, which enables assignments to be turned into missions. Deloitte Leadership Academy is an example of a cutting-edge company producing gamification products.

Digital Library; digital libraries are vital resources reservoir for institutions of learning. E-books are cost-effective and environmentally friendly, often with multimedia tie-ins. An easy access to a digital library makes it easier for instructors to assign the same book to an entire class, and also assist the needs of special students by providing increased text size or read-aloud selections.

Big Data & Analytics; with the advancement in technology, the use of data in the classroom has reached a whole new level. Devices can monitor heart rates while computer software can track and analyze a child's online activity. This type of data can be used to provide detailed insight and specific recommendations to improve each learner's ability to learn. Companies such as Affectiva are developing facial recognition and expression technology for the class.

The Concept of Digital Literacy

Gilster (1997), defined digital literacy as 'the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers'. He further described digital literacy as an essential life skill in this computer age. According to him, it incorporates knowledge, skills, and behaviour involving the effective use of digital devices such as smartphones, tablets, laptops, and desktops for the purposes communication, expression, collaboration and advocacy. Digital literacy initially focused on digital skills and stand-alone computers, but the focus has shifted from stand-alone to networked devices in relationship with the Internet and social media.

The term is now used in relationship to a web of 'digital literacies' which include; ICT/computer literacy, information literacy, e-literacy, and others. Martin(2006), said that digital literacy can be called 'a frame work for integrating various literacies and skill-sets without the need to encompass them all or

to serve as one literacy rule for them all. Digital literacy is a set of competencies required for full participation in the global knowledge society by the effective use of digital devices such as; smartphones, tablets, laptops and desktop. While digital skills are concerned with practical abilities in the application of digital devices.

A digitally literate person possesses a range of digital skills and knowledge for manipulating computing devices and networks. Such person is able to find, capture, and evaluate information on Web sites speedily and efficiently. Digital literacy functions side by side with the traditional forms of literacy. Digital literacy equips persons to communicate and learn through a plethora of ways with social and critical thinking skills.

Digital Natives versus Digital Immigrants: Brown, Collins and Duguid (1998) and Lessig (2004) viewed literacy as a matter of social practice with regard to organizing and disseminating information. So from the socio-cultural point of view, users of information are divided into social classes in the digital society as digital natives and digital immigrants. A digital native is one born into the digital age, who grows up in the technologies, while a digital immigrant is one who adopted the technologies or got exposed to them at an adult age.

The Need for Digital Literacy in this Era of Digital Innovations

The Federal Government of Nigeria in the National Policy on Education, Federal Republic of Nigeria, (2004), envisioning the import of ICT in modern education, integrated it into the nation's education system. To actualise the scheme, the government produced a walking document that committed government to providing the basic infrastructure and training at the basic and senior schools levels, but without the fundamental digital literacy for teachers to handle the scheme.

The government made computer education a pre-vocational elective and a vocational elective at the basic and senior secondary schools levels respectively. (Aduwa-Ogiegbaen and Iyamu, 2005) harangued that computing devices were not part of classroom technology in more than 90% of the nation's public schools at that time. This implies that the chalkboard and textbooks were the dominant technologies in classroom activities in Nigerian

schools.

Based on the above facts, the Federal Ministry of Education launched an ICT-driven project called School Net intended to equip Nigerian schools with computers and communications technologies. It was observed by Goshit (2006), that most public and private schools do not offer ICT training programmes due to the lack of professionals with digital literacy.

The unavailability of critical ICT components in schools has hindered teachers' digital knowledge and skills acquisition and application in teaching. According Kaku (2005), the lack of adequate digital literacy among teachers has inhibited the effective use of the Internet by school teachers.

Digital literacy aids people to communicate globally and to keep up with societal trends. Social media such as Email, Facebook, Twitter, Whasapp, personal websites and blogs, aid global conversations and communication. However, without digital literacy, one will fail to maximize the benefits of these modern communication media.

Digital literates are more likely to be economically secured than digital illiterates. Most jobs globally require from their intended work force proficiency in digital literacy to be engaged. Nowadays employers often use employment websites to recruit potential employees magnifying the significance of digital literacy in jobs availability and security. The timely deployment of digital innovations and acquisition of digital skills in the educational sector can contribute immensely to the sector's development vis-à-vis the production of resourceful and efficient manpower for the nation's socio-economic development.

The Factors Affecting Digital Literacy and Innovations' Application in Schools

1. The absence and or inadequacy of ICT facilities in schools; Adomi and Anie, (2006) found out that digital innovations and literacy are of poor foundation in Nigeria because of the faulty information technological infrastructure. It is affirmed that remote areas not covered by telecom services, experience connectivity problems and suffer from its gains. Majority of schools lack the needed digital facilities to impact quality technological digital literacy knowledge and skills in their students. Enakrire and Onyenenia, (2007) are of the opinion that the above causes are hinged on underfunding by concerned agencies.

2. **Inadequacy of ICT Professionals in Schools;** manpower shortage in the education sector is a basic barrier to establishing the culture of ICT education in Nigeria (Goshit, 2006). The teaching profession in Nigeria is seen as the job for the less privileged. So, only a limited number of ICT trained personnel prefer to engage in it, while the majority of them get engaged in telecom companies, banks and the oil industries where they can earn mouth-watering packages. But those in the education sector are not motivated by the deplorable condition of service and the paltry incomes paid to them discouraging others from getting engaged in the education sector. And this has created the scarcity of qualified ICT teachers with the ideal digital literacy.

3. **Poor Perception of Digital Literacy Knowledge and Skills among Teachers and Administrators;** one of the basic inhibitors to the integration of the innovations in the nation's school system is the average Nigerian's lack of exposure to its global benefits. The average teacher and administrator, assume it as a strange, foreign and mysterious concept met to replace them on their jobs instead of accepting it as a tool for personal and national development. Some Nigerian educators are not even aware of the existence and importance of the Internet to teaching and learning according to Adomi, Okiy and Ruteyan, (2003). Equally, large number of teachers and students in the nation's schools lack access to modern digital devices or facilities for quality teaching and learning.

4. **Unstable Source of Power Supply;** the frequent electricity power outages in the country, stands a major hurdle to digital innovations application and gains in the education sector in the nation's schools. Hence, the few schools with ICT facilities and the needed are unable to use them regularly and efficiently. This in turn frustrates the inculcation of the desired digital literacy skills and knowledge to students.

5. **The High Cost of Digital devices;** the exorbitant cost of purchasing ICT facilities is reported to be a factor influencing the provision and application of digital innovations and literacy knowledge and skills in the education system said Adomi, (2006). The networks monthly Internet rates are exorbitant and digital satellite television stations charges are presently unaffordable for most people in Nigeria. This has made it difficult for Nigerian schools to

acquire and install digital facilities for the use of teachers and students respectively.

6. **Poor ICT Policy/Project Implementation Strategy;** Computer cum ICT education, was first introduced into the nation's education system by the Nigerian Federal Government's 1988 policy. Evoh (2007), observed that despite the crucial role of ICT innovations and literacy in the improvement of modern education, it remains a low financial priority in the budgets of governments at all levels.

7. **The Absence of Consistent ICT Teachers Certification Requirements;** majority of the nation's schools employ non-ICT/computer science trained teachers to instruct ICT/computer science subject. Most of the states of the nation developed their own ICT education requirements that vary slightly from the Federal Government's, creating disharmony in the education system. Government's consistency on the ideal ICT teachers' certification standard will greatly encourage professionalism and boost digital literacy.

8. **The lack of Adequate Funding;** often times, lawmakers and the executive arms of governments, make and pass legislations and policies in promoting ICT education, but with no corresponding funding mandate. The nation's ICT education should be adequately funded by concerned stakeholders to boost digital literacy for rapid and consistent ICT educational development for the implementation of digital innovations. This will in no doubt positively impact on the socio-economic life of the nation and citizens.

Conclusion

Digital literacy is a skill that must be acquired by all so as to actively participate in the present global digital codification of information. Its impact cuts across all facets of knowledge, as a result the digital illiterates will fall into the academic and social limbo. The adoption and application of innovations in the educational system will have positive impact on teaching, learning and research.

Despite the positive roles of these digital innovations in education, schools in Nigeria are yet to extensively adopt them for teaching and learning. The efforts geared towards the innovations integration into the nation's education sector are dwarfed by the high digital illiteracy of teachers, poor policy implementation, and funding by governments at all

levels and limited information infrastructure.

Consequently, teachers together with other stakeholders should ensure they acquire digital skills and knowledge for digital literacy so as to fully participate in the global digital benefits and to effectively upgrade their students' digital capabilities. This will go a long way to enhance the competitiveness of the sector's products

Recommendations

i. Government should ensure that ICT policy statements are translated into reality in the lives users. The established ICT agencies/commissions should be adequately funded and empowered to provide the needed facilities such as; laptops to facilitate the acquisition of digital literacy by all in schools.

ii. Computer Science/ICT education should be made compulsory for all basic and senior secondary schools students, to better equip them for higher education challenges.

iii. The Ministries of Education at all levels should make deliberate efforts to post skilled ICT/Computer Science teachers/personnel to schools for resourceful ICT knowledge and skills impartation to students.

iv. The Federal Ministry of Power, Transmission Company of Nigeria (TCN) and the distribution companies (DISCOs) should work towards stabilizing electricity supply in the country, especially in the institutions of learning.

v. The Ministries of Education and non-governmental agencies by means of interest free loans and grants should sponsor teachers to acquire relevant digital skills and knowledge. vi. The non-governmental organizations such as Mobil, MTN, Airtel, Glo, BUA, Dangote and others operating in the country should by way of cooperate responsibilities assist to fund ICTs application in our schools.

vii. Stakeholders in the education sector such as investors, teachers, parents/guardians and students should be given periodic re-orientation towards the realization of the needed knowledge and skills for digital literacy for the urgent growth in the education sector.

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