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The Use of Electronic-Learning Tools for Enhancing Science Education in Nigerian Tertiary Institutions

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Abstract

One of the most powerful benefits of the electronic learning (E-learning) in higher education is its role in enhancing teaching and learning. E-Learning uses course materials that exist entirely on a computer or the Internet. Nigerian schools offer courses that are entirely e-learning based such: as Biology, Chemistry and Physics Education, meanings of all texts, assignments, quizzes and tests are accessible online and no face-to-face meetings are required. E-learning allows students with limited mobility or inflexible schedules to take courses and study at times that are convenient for them. The aim of this paper is to sensitize the science education teachers on the usage of e-learning tools to enhance teaching and learning in tertiary institution in Nigeria. Some of the major challenges in the availability of e-learning tools discussed are: inadequate funding, teacher's factor, corruption and insecurity, and lack of regular power supply. It was reviewed that the teacher could be in a far distance away from school and still perform his/her duty sending learning activities through e-mail. Both teacher and student can communicate together outside classroom situation online. The paper recommends among others that Electronic library (e-library) should be established in all schools and fund be made available to purchase computers and other ICT equipment and more trained computer teachers should be employed and those science teachers who are not computer literate should be mandated to go for computer training.

Keywords: E-learning, Science Education, ICT, Technology.

Introduction

Science education is very important to technological development of any nation because of its numerous benefits (Omosewo, 2009; Awolaju, Akinloye and Ilori, 2010). Developed nations of the world are not taking science education with loosed hands; they invest in it and that is why they remain developed. For Nigeria to attain a position of developed nation, we cannot afford to joke with the development of science education as the case is presently; there is the need for a positive change (Aina, 2013). In the past, hardware and software limitations have tended to reduce the real impact of electronic-learning on supporting science education (The University of York Science Education Group, 2002). There has also been growing interest in the use of e-learning to support whole class teaching and learning to complement ICT based activities for individual students. This paper seeks to lay greater emphasis on the role of the teacher and recognition of the need for training to help them learn operational skills to use new equipment and software as well as application skills to manage learning effectively using new technologies.

Problems militating the use of E-learning Technology in Science Education

In Nigeria, the major challenges militating against the application of E-learning tools are:

1. Inadequate Funding

The money needed for full ICT compliance is huge and this fund is not available because of economic situation of the country. Equipment like computers, projectors and internet facility are required; these materials are very costly to purchase by any school except there is external aids. Government is not sincere to quality education of the citizens as reflected in the annual budget of the government. Akindutire (2010) observed that Nigeria government has not met the UNESCO recommendations of 26% of the total budgetary allocation to education sector as reflected in her yearly budget.

2. Teachers' Factors

About one third of majority of science teachers are not computer literate and have remained in that condition for long time without seminar, conference, workshop and refresher course in computer (Ajayi & Ojo, 2010). Many of the science teachers who are computer literate don't have personal computer either because their low income could not afford one or they could not see the need to purchase one.

3. Corruption and Insecurity

Olagunju and Aina in Aina (2013) noted that there is high level of corruption and insecurity in the nation and that this is affecting every aspect of life of Nigerians including education. Money meant for the purchase of educational equipment are mismanaged and misappropriated by government officials. When government awards contracts for the purchase of school equipment like computers for the e-learning library; it is not done or executed poorly yet millions of naira must have gone into these contracts. Insurgents and kidnappers have destroyed infrastructures meant for teaching and learning in schools while many teachers have been kidnapped and killed at their duty post. University lecturers are on strike since February 2020 requesting for the revitalization of the university education system, and till date nothing has been done. All these have created fear for teachers and they are not ready to come out of their home for computer seminar, workshop, conference and refresher course just anywhere in the country; they remain as they were for many years.

4. Lack of Stable Power Supply

Nigeria is a country where electric power supply is probably the worst among developing nations with the latest hike in electricity tariff in October, 2020. Electric power supply is not reliable in the country therefore anything that make use of electric power will surely have problem. All government efforts to solve the problem has not yielded good results.

What are the Teacher's Skills Needed for E-Learning?

In the most effective examples of progress in the use of e-learning tools to support science, training of teachers has accompanied the installation of hardware infrastructure. The role of the teacher in using e-learning tools in science is changing. When classes had to move to a computer suite to find ICT facilities such as science CDs placed on the school network, the role of the teacher was fairly peripheral, and limited to organization of the activity. When e-learning facilities are brought into the science teaching space, the teacher becomes the main user and driver of the tool.

A basic level of skills in the use of e-learning hardware and software is required by all science teachers. This is usually a whole school or college issue and has implications for the provision of technical support and training for teachers. More importantly, and often much less well developed, are strategies to meet the training needs of teachers in terms of approaches to learning using the new technologies. In some schools and colleges, the introduction of an effective e-learning infrastructure has led to a re-evaluation of styles of teaching and learning in science, and a sharing of expertise and ideas. In examples of effective practice, e-learning activities are used in the laboratory or classroom, and students continue them outside of class time, sometimes at home, so that e-learning becomes an integral part of learning.

Training and e-learning infrastructure need to be considered together. Where teachers have individual lap top computers, ICT can become a part of the teacher's normal activity, and not as some 'bolt on' or enrichment experience. The very process of creating this kind of infrastructure, however, immediately brings with it a demand for training, so that teachers can feel familiar with hardware and software.

Can E-Learning be Applied in Science Education?

Williams and Nguyen citing Collis and Moonen in Aina (2013) classified application of e-learning in classroom teaching as:

- learning resources and
- instructional organization of learning and communication.

The classifications made use of educational software; computer- based testing system, e-mail system, internet, telephone, radio etc.

Generally, e-learning will be applicable in Computer Assisted Instruction [CAI]; Computed Aided Design [CAD]; Teleconferences and Library Computer System [LCS]. A more professional and recent e-learning applications utilized especially during the Covid 19 pandemic with expanded functions and features include Skype, Google Hangouts, and Zoom. All three services include the capability to easily share the screen and chat simultaneously as the user interact with their tutor at a distance. That is, Teachers and students can view, take part in conferences and take part in a debate in the comfort of their offices or home through this medium. Through satellites, transmission of conference proceeding from far distance could be made available within few seconds without travelling at reduced expenses.

Google Hangouts has more options about which part of the screen is shared while Zoom and Skype automatically share the entire screen. All three applications enable group chat as well. Skype and Google Hangouts allow up to 25 people per chat for free, and Zoom allows up to 50 for free but limits the meeting to 40 minutes. Skype and Zoom also have paid versions with increased capabilities. Setting up meetings is especially simple with Zoom and Google Hangouts. A user creates a URL which acts as a meeting room; the URL can then be shared with anyone to easily join the meeting. Zoom has the highest video and audio quality, but the difference is marginal. If most participants in collaboration already have and are familiar with one of the software options, any of them will suffice with adequate internet speeds. That being said, Zoom has the highest quality and is light on computer resources making it superior over Google Hangouts and Skype in two important areas for video conferencing users (Henshall, 2017).

How Relevant are the E-learning tools to Science Education?

The paper discusses the relevancy of e-learning in biology education, chemistry education and physics education separately;

1. In Biology Education

Computers and Interactive whiteboards help students visualize objects that are difficult or impossible to view. For example, computers can be used to display human anatomy, internal structure of human and animal cells. Software are already developed to show actions of viruses and bacteria of which if teacher were to teach such; apart from the danger poses to both teacher's and student's health, these microorganisms cannot be well learnt without seeing them in action. Many plants in botany, animals in zoology and insects in entomology can never be found here in Nigeria,

yet must be learnt by students electronically. All these are made available to students as if they are in real forms

2. In Chemistry Education

One of the fundamental aspects of chemistry is chemicals and their reactions of which are very dangerous to life if not handled with caution. Reactions of these chemicals in most cases are not easy to understand by students without seeing them in real term; teachers usually explain these reactions abstractly and through molecular diagram. CAI has been of tremendous help in solving this problem (Bryan, 2019); software is available where students could watch this reaction on computer as in real life. Animations and videos of complex molecular structures in chemistry are available for classroom teaching for all categories of students in chemistry. For example, students will find it difficult to appreciate the chemistry of atom if not supported using ICT; other area of chemistry that would be difficult to teach and learn if not supported by ICT are quantum theory, chemical reaction, ionization, electrochemistry and many more.

3. In Physics Education

Physics an abstract subject as regarded by many people (Adeyemo, 2010); may be because of the way the teacher teaches it. Educational software can be used to teach difficult concepts or observe difficult skills in physics. For example, teaching of electric generator in physics can be facilitated with the assistance of educational software. The rotation of the coil in the magnetic field is very clear when student see it demonstrated through this software. Most physics teachers could not explain the mechanism of electric generator to student properly because of its complexity; the teacher could use projector and computer to allow students view action of electric generator by a large physics class. Information on text, picture, tables and graph are presented to students using ICT especially, to visualize a complex process in physics teaching. When this information is presented, students can manipulate it to make changes and at the same time evaluate the changes made. Feedback is very important in teaching and learning process (Aina & Adedo, 2013) because it improves student learning. This could be done through computer. For example, CAI tools like word- processor and spreadsheet help student to learn how to spell words correctly, when text is being underlined by the computer. Without the presence of a teacher student can learn any activity prepared for that period through already programmed work in a system. Students can improve their learning when they spend quality time working or practicing any skill already learnt on the computer.

Reviewing Related Literature on the E-Learning Communication Devices

1. Internet

It is a global network of computers connecting millions of computers made up hardware and software infrastructure interlinking several computers worldwide (Deore, 2012). The Internet can be seen as a repository of free materials that can be beneficial for students and teachers in the classroom. By having access to thousands of books, games, websites, etc., teachers can provide a world of knowledge for their students for no additional charges. Internet can be a virtual classroom. The teacher may not be able to provide hands-on experiences for all learning. The Internet encourages students to conduct independent research. Having access to world databases at the tips of their fingers enhances student access to information by making searching convenient, easy and quick.

2. Computer

Yazid (1999) defined computer as a programmable electro mechanical device that can store, retrieve and process data. It can be used in education to;

- Collecting notes /pictures/videos from web pages for detailed information and projects/assignments.

- Saving the documents as soft copy for future use
- Learning through animations, as they are much near to the students
- E-books/online libraries/online encyclopedias help to guide in minutes and save precious time and resources.
- Creating videos using images, albums for better power point slides.
- Simulated Learning gives them an idea of the real situation.
- Publication of pamphlet/brochures for awareness with institution and among community members.

3. Smart-boards

Interactive whiteboards are good replacements for traditional whiteboards as they provide ways to show students everything which can be presented on a computer's desktop (educational software, web sites, and others). SMART boards help teachers use a student-centered approach to teach language arts.

4. Mobile Phones

Mobile phones as a learning tool have a wide variety of applications. The teacher can ask the students to make a photo documentary using the camera function on their mobile phones. After taking a sufficient number of photos, the students can upload the documentaries prepared by them to websites and type narrative descriptions for each picture to share with their teachers, classmates, family and friends. Instead of taking out a dictionary, the students can simply use their translator, and instead of trawling through books for a piece of literature, they can find the online books and be directed to a specific word.

Benefits of E-Learning Tools in Science Education

There is considerable research evidence that learners are more highly motivated when their learning is supported by e-learning tools. Students are more engaged in e-learning activities by showing increased interest and demonstrate a longer attention span. E-learning tools can provide access to a huge range of resources that are of high quality and relevant to scientific learning. In some cases, the resources fill gaps where there are no good conventional alternatives; in other cases, they complement existing resources. It also widens the range of material that can be used in teaching and learning to include text, still and moving images and sound, and increases the variety of ways that the material can be used for whole class and individual learning. This means that a teacher can go some way to meeting the needs of students with different learning styles.

E-learning tools also allow teachers with different teaching styles to modify materials and the way they are used in different and effective ways. The tools can improve the quality of data available to students. Information gotten from the internet can be more up to date, and data obtained from loggers can include more frequent and more accurate experimental readings. Computers also allow repetitive tasks to be carried out quickly and accurately so that more student time can be spent on thinking about the scientific data that has been generated.

Learning activities are communicated through e-mail system nowadays (Nguyen, Williams & Nguyen 2012). Teacher could be in a far distance away from school and still perform his/her duty sending learning activities through e-mail. Both teacher and student can communicate together outside classroom situation online. Learning activities are sent to student and the student will respond once they are connected online; this is the principle behind online degree many possesses today. This will continue optimize the use of e-learning tools in the teaching and learning post Covid 19 pandemic era.

Conclusion

In conclusion, Science education is not just going to school to study biology, chemistry or physics but study of these subjects in conjunction with education. E-learning is good for effective teaching and learning in science education; e-learning have many applications in science education that can facilitate learning of difficult concepts in biology, chemistry and physics. The relevant of E-learning in science education are so many; the limit to these applications is a matter of knowledge; the more knowledgeable someone is in ICT the more he or she will be able to apply it. Teacher is able to send class activities and assignment through mobile phone like in business world. Subscribing to bundles of SMS can help teacher to reach hundreds of students at a time; this method could be employed when the teacher is not even present in the class and could afford student the opportunity of working at their own pace.

Recommendations

Based on the challenges with availability and optimization of E-learning tools in Nigeria, the following suggestions are recommended:

i. Electronic library (e-library) should be established in all schools and fund be made available to purchase computers and other ICT equipment;
ii. More trained computer teachers should be employed and those science teachers who are not computer literate should be mandated to go for computer training;
iii. Government should make it mandatory for science and computer teachers to always; attend seminar, workshop, conference and refresher course in computer.
iv. Government should provide more jobs for young unemployed graduates as a measure of security for the nation.
v. There should be a serious punishment for any individual or group who mismanaged or misappropriate money meant for education
vi. Government and stakeholders in education should provide all science teachers with laptop
vii. Government should work hard to solve problem of power failure in the country.

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