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Re-Defining Education through E-Technology

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Abstract
This paper attempts a review of the various ways by which education as teaching-learning process has been re-defined by the electronic technologies. The various electronic technologies such as computer, Internet, open sources and mobile learning devices, cloud computing, 3-D printing technology and learning analytics among others have helped in transforming education process such that they affect the way the teachers teach, the way the students learn, and the way the schools are being administered. Hence, the application of electronic technologies in education has helped to re-define the roles of teachers, learners, school administrators, parents and guardians as well as government. This, however, does not leave us with attendant challenges. Some of these challenges are identified and discussed in the paper.

Keywords: e- education, e-teaching, e-learning, e-classroom

INTRODUCTION

The global education landscape has been experiencing dramatic changes due to the spate of globalization and rapid technological advances. These dynamic transformations necessitate the need for re-defining education in terms of the forms the education take as well as the roles of the key players in the educational sector. Prior to the recent revolution occasioned by technological innovations, education has been conceived as a process of teaching and learning, which takes place within the confine of physical classroom at a particular place and time. Then, education focuses more on the teachers and their books as information oracles who spread knowledge to learners using the same methods year-in and year-out. Since the advancements in technology, the way education is being planned and executed in different societies of the world is fast changing. Teaching and learning activities, which are important components of any education, are taking new dimensions. Many things about teaching and learning process as means of educating people in any society are changing. There are changes in the ways education contents and methods are being handled as well as the time and space education takes place in modern societies. In some developing countries like Nigeria, teaching and learning process still takes the form of face-to-face. With the advent of e-technologies, much can be achieved in teaching and learning. Teaching and learning need not be confined to the classroom alone. Unfortunately, the use of e-technologies in teaching and learning has not been fully embraced in Nigeria due to challenges such as epileptic supply of electricity, large class size and lack of needed infrastructure (Yusuf, 2007). However, the key players in education need to be aware of the benefit of re-defining education by adopting the current process of teaching and learning. Hence, there is the need to re-define education in the context of electronic technologies evolving in modern time. Re-defining education through electronic technologies (e-technologies) is about showing how e-technologies have helped to shape educational process in new ways.

The main aim of this paper is to demonstrate how we can re-define education through electronic-technologies. Specific Objectives include:

i. to review the concept of e-education and show how e-technologies have helped to shape educational process in new ways
ii. to x-ray how e-technologies affect the teaching-learning process, the education environment, and the traditional roles of the key players in education: the teachers, the learners, the regulators, and the levels of interaction between and amongst the various key players.
iii. to identify major challenges militating against the use of e-technologies in teaching and learning process in schools.

To achieve this purpose therefore, the rest of the paper is divided into four sections. Beside this introduction, the second section is on concepts' definitions, where we consider the concept of education and electronic technology. The third section is on the transformation of education through e-technologies. The fourth section identifies the factors militating against the use of e-technologies and the final section is the summary and conclusion.

DEFINITIONS OF CONCEPTS

The understanding of two concepts is essential in this paper. These are the concepts of education and e-technologies. We shall look at these in quick succession.

Concept of Education

Many attempts have been made to define education in the literature. Education has been defined as the theory and practice of teaching or information about or training in a particular subject. It can be described as a process of acquiring new values and skills for the purpose of effective functioning in the society (Dickson, 1985). It is a tool for acquiring skills, relevant knowledge and habits for surving in a dynamic world (Adepoju, 2007). It is the process of receiving or giving systematic instruction, especially at a school or university. Education is a form of learning, in which the knowledge, skills and habits of a group of people are transferred from one generation to the next through teaching, training and research. Thus, education involves pedagogical process, which entails teaching and learning for impartation and acquisition of values, skills and knowledge for maturing the recipients and makes them to function as balanced persons.

As education entails teaching and learning, teaching is about knowing what idea is to be communicated and communicating it well. Learning on the other hand is the process of acquiring knowledge or skills through study, experience or being taught. Learning takes place when an unknown becomes known or rather known ideas are updated or upgraded (Ringim and Kanya 2013). Traditionally, teaching and learning process takes the form of face-to-face.

Education is a tool of transformation or change in any society. The purpose of education in Nigeria is couched in the Nigerian National Policy on Education (FGR, 2004). This is to train the citizens towards the achievement of national development objectives, which include: free and democratic society, a just and egalitarian society; a united, strong and self-reliant nation; a great and dynamic economy; and a land of opportunities for all citizens. The objectives of education in Nigeria are contained in chapter 11, section 18 of the Constitution of the Federal Republic of Nigeria (Promulgation) Decree of 1999 and the fourth edition of the National Policy on Education (FRG, 1998; Etuk et. al., 2012). These objectives include:

a. The inculcation of national consciousness and unity
b. The inculcation of the right type of values and attitudes for the survival of the individual and the Nigerian society.
c. The training of the mind in the understanding of the world around; and
d. The acquisition of appropriate skills and the development of mental, physical and social abilities and competencies as equipment for the individual to live in and contribute to the development of his society.

Concept of Electronic Technologies (e-Technologies)

Generally speaking, electronic technologies otherwise known as Information and Communication Technologies (ICT) refer to the computer and internet connections used to handle and communicate information for teaching and learning purpose (Agbetuyi and Oluwatayo, 2012). The electronic technologies are ICT used for accessing, processing, gathering, manipulating, presenting and communicating information (Yusuf, 2007). Electronic technologies are electronic devices, which are utilized for the information and communication needs of institutions, organizations, students and individuals. The electronic devices include computers (hardware and software), networking, telephone, video, multimedia, and internet. The application and utilization of these electronic devices convert information, text messages, sounds and motions to common digital forms. Thus, the electronic technologies refer to the use of computers and telecommunication facilities to store and retrieve information from various sources, generate and transfer ideas, and also impart knowledge to recipients (Osakwe, 2012).

Transformation of Education through E-Technologies

Current technological advancements have brought about dynamic innovations to the field of education. Electronic technologies allow education to be customized, individualized and universally accessible. Today, electronic technologies are now being introduced into every aspects of education. In this section, we examine some of the ways electronic technologies have been deployed into various aspects of education.

Electronic Teaching (e-Teaching)

One way by which electronic-technologies have been deployed in education is in teaching. Electronic-technologies are deployed in the classroom through electronic teaching. Electronic-technologies have helped to redefine the educational environment, which was one time confined to classroom but today has extended beyond classroom to home, community and the world. This means that education can take place anywhere and at anytime.

The application of electronic-technologies to teaching (e-teaching) has helped to redefine the roles of teachers as educational guides, facilitators, and co-learners. With the electronic-technologies, the role of teacher now extends beyond the inside of the classroom to outside the classroom. With the electronic-technologies, team teaching, where two or more teachers share responsibility for a group of learners or students, is possible. Hence, an individual teacher does not have to be all things to all students. This makes teachers to apply their strength, interests,

skills, and abilities to the greatest effect (Lanier, 1997). Electronic-technologies are currently being used to teach, manage classroom and promote classroom interactions. Electronic-technologies are being used to extend interactions in education in terms of students-instructors interaction; students-course materials interactions; and students-students interactions. With the help of electronic technologies, it is possible to create interactive electronic classroom. The interactions can take two forms: asynchronous and synchronous. By synchronous interaction the participants can expect immediate responses from each other during the class or lecture sessions. Asynchronous interaction does not permit immediate response by participants during the lecture session.

Electronic-technologies such as telephone, television and the Internet, especially e-mail are used in the classroom as tools for interaction. The two-way teleconferencing, lectures presentation by power point slides, the personal response systems (PRS), simple archiving of lecture materials, and digital recording of the lectures are other means by which electronic technologies have been adopted to redefine education (Almeawth, Maiger and Chun, 2007).

Chiemeke and Ukaoha (2006) designed and implemented a web-based multi-agent system for teaching and learning computer programming languages. The architecture is shown in Figure 1 showing client- server relationship. The teacher and student communicate through the World Wide Web (WWW). The Teacher-Agent serves as the "Server" and the Student-Agent as the "Client". At the server - end of the system, we implemented the teacher agents. The teacher agents from different tutors on different sites are able to interact and exchange semantic rules and other contents for the same or different programming language(s). The client- end of the system makes a very rich set of information and knowledge available to the students. A review of the performance showed that the multi-agent intelligent system outperformed the real life classroom setting as the students' learning could be random rather than sequential and learning could take place anywhere, anytime and without restriction.

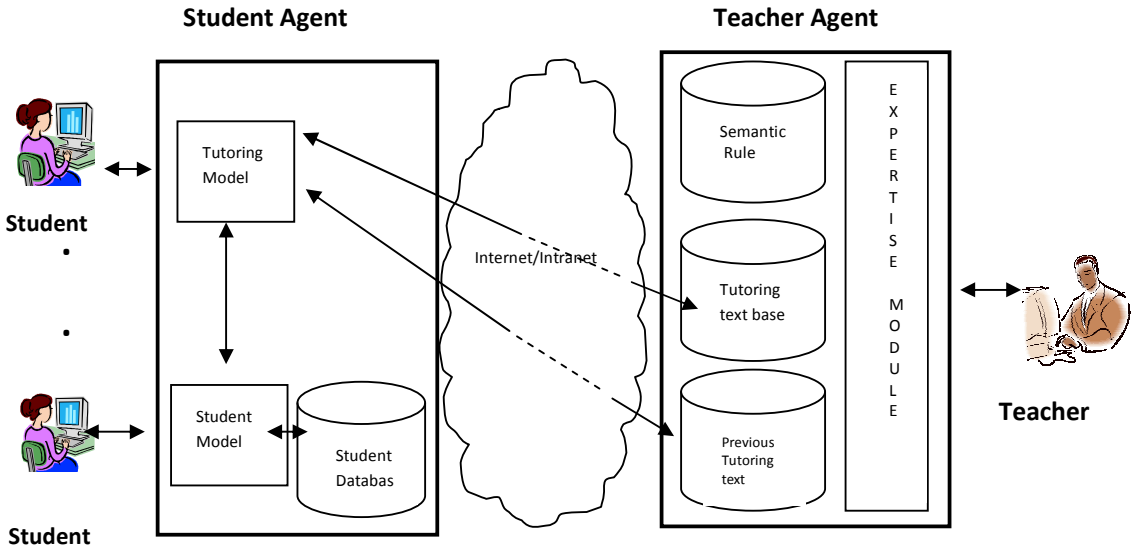

Fig. 1 Agent-based Tutoring System

Electronic Learning (e-Learning)

One other way by which electronic-technologies have helped to redefine education is through electronic learning (e-learning). E-learning is a learning program that makes use of an information network such as the Internet, an intranet (LAN) or extranet (WAN) whether wholly or in part, for course delivery, interaction and/or facilitation. **Web-based learning** is a subset of e-learning, which is learning using an internet browser such as the MOODLE (Modular Object-Oriented Dynamic Learning Environment), blackboard or internet explorer (Tinio, 2002). Today, we now have **blended learning**, which combines the traditional face-to-face classroom practice with e-learning solutions. The teacher can facilitate the student learning in class contact and uses the MOODLE to facilitate out of class learning (Mikre, 2011).

Electronic-technologies have helped to create learner-centred learning environment where attention is paid to knowledge, skills, attitudes and beliefs that learners bring with them to the learning process based on constructivism paradigm. There are a wide range of electronic learning solutions such as web-based courseware, online discussion groups, live virtual classes, video and audio streaming, web chat, online simulations and virtual mentoring (Kaimal, 2012). Some of the electronic technologies widely employed in education include the following.

Open Source Technologies

The Open source technologies allow education to be decentralized. This is available through:

Web 2.0 Platforms

The use of Web 2.0 platforms have helped to bring the classroom-learning environment online through blogs, wikis, podcasts, social network and bookmarks. These allow students access to the classroom anywhere and at anytime. Web 2.0 platforms encourage students to work within a class community outside the classroom, allowing students to share their contributions and inputs. They are also used to expand school curriculum by incorporating informal in-class learning (New Media Consortium, 2013). These encourage learner's independence and student collaboration. They include:

(i) Blogs

Blogs are frequently updated websites consisting of dated entries arranged in reverse chronological order. Blogs are used as learning journals, gallery spaces, for peer reviews and as display platforms for problem -solving exercise. They encourage students to reflect, think critically, respond to feedback and to develop authenticity (New Media Consortium, 2013).

(ii) Wikis

Wikis are designed to make people to send, receive and express ideas, edit someone else's work, or post links to other relevant sources. Wikis can be used in education to promote teamwork, continuous review and to develop sharing in a conversational manner (New Media Consortium, 2013). They are used in brainstorming activities, knowledge creation, collaborative writing exercises and group work.

(iii) Social Networking Sites

Social networking sites are websites people sign up to in order to chat, post comments and share media. These offer students and teachers a private, interactive network where they can communicate outside the classroom. Social networking sites like Twitter and Facebook are being used by teachers to keep parents and guardians informed of class activities, to keep post homework or other reminders for students, and to share the activities of different classes with the rest of the school.

(iv) Podcasts

These allow audio-based files to be created and distributed on a regular basis. They allow students to listen or watch education lectures anywhere and at anytime.

(v) Bookmark Sites

These allow users to create and categorize a library of websites, images and other media.

Massive Open Online Course (MOOCs)

These are free online courses with open, unlimited enrolment. They provide access to courses being taught by leading scholars and industry experts. These afford the students to complete their education anywhere and at anytime in the world.

Mobile and Multi-Faceted Technology

Mobile and multi-faceted technologies provide learning platforms which change the way the teachers teach, structure and deliver education. Mobile technology, such as cloud computing, one-to-one device systems, interactive white boards and 3-D printing, allows the students to work on the school network from anywhere, and at anytime. The interactive platforms of multi-faceted technology engage students more as learning becomes a more active experience.

Cloud Computing

Cloud computing allows the use of a network of remote servers hosted on the internet to store, manage and process data instead of using a local server. Cloud computing allows a myriad of mobile devices. With cloud computing, students are now becoming more mobile, flexible learners as they are increasingly able to access information and software anywhere (Gold Mercury International, 2014).

Mobile Learning Devices

Mobile learning devices provide opportunity to students to make use of the advantage of web 2.0 platforms and flipped classrooms models in education. These include smart phones, tablets computers, e-book reader, or a laptop, all which have redefined mobile learning. Mobile learning devices help to change the learning experience in and outside of the classroom.

3-Dimensional Learning Tools (3-D Learning Tools)

The 3-D learning tools allow students to comprehend complex concepts and help them to integrate soft skills such as creativity into students' repertoires.

Virtual Learning Environments and Learning analytics

Virtual Learning Environments

Virtual Learning Environments (VLEs) are educational electronic learning systems based on online models that mimic conventional in-person education. They provide students with real-time interaction with their teachers through threaded discussions or instant messaging.

Learning analytics
Learning analytics are the measurements, collection, and analysis and reporting of this data. They are used in education to understand and optimize the subjects and learning environments that students engage with. They are also used to monitor and assess students.

Digital Collaboration is one other area which electronic-technologies have helped to redefine education in terms of improving student learning experiences. Instructors now make use of computers and internet to promote collaboration among learners. There are a number of electronic-technologies which instructors now use to extend interaction. These include personal response systems (PRS), course management system (CMS), synchronous messaging, asynchronous messaging and lecture material archiving. Personal Response System (PRS) allows an instructor to ask all students to answer a question from a menu of possible choice and gets immediate feedback simultaneously. Likewise, personal response system can be used to take attendance or monitor the engagement of students with the current material. Course Management System (CMS) is another electronic-technology which provides the students with a consistent interface to course materials. A CMS is a collection of tools that allow students and instructors to interact using the internet and a web browser. With synchronous messaging such as short messaging system (SMS), instant messaging and group chats, the students are allowed to talk to each other and to their instructors on one-to-one or one-to-many basis and thereby increasing digital collaboration. Asynchronous messaging such as forums, bulletin boards, mailing lists or news groups allow the users to login, then leave questions, comments or responses to previous posts to promote digital collaboration.

Also, by lecture material archiving, it is possible to digitally record each lecture session and place the lectures online through the CMS for students to download. By this, it is possible to allow students to review missed lectures or lecturers not understood by them (Almeroth, Mayer and Chun, 2007). Chiemeke, Osubor, and Ukaoha (2006) designed a framework for e-learning system to augment the traditional classroom based learning system in Nigeria Universities. This e-learning system was based on the two-tier architecture of web application. At the front tier, we have the student interface where students can access lecture notes and other materials in text or graphic format. At the back-tier, the system allows for notes and other materials upload by the lecturer or tutor. Still at the back- end, the system allows tracking and assessment of students' performances.

E- Books and Digital Storage
With electronic technologies, it is possible to re-define the media for conveying study materials from books, compact disks (CD), tapes and records to digital storage on Virtual servers. It is possible to store data through cloud computing, SSD's holographics storage and quantum storages (Alenezi and Rashad, 2013).

E- Examination and Digital Assessment
Electronic technologies have also helped to re-define the conduct of examinations, which have hitherto be paper and pen mode to electronic based or computer and internet enabled. Thus, it is possible to carry out electronic examination and tutor-marked assignments facilities to aid the conduct of assignments and examinations (Ogidan, 2010).

Electronic Guidance and Counseling (e- Guidance and Counseling)
Guidance and counseling are integral parts of education process. With electronic technologies it is possible to carry out guidance and counseling electronically in schools. In 2005, Chiemeke and Daodu developed an intelligent agent- based academic guidance and counseling system that can facilitate the interaction between students and their counselors. This system has features that can retrieve detailed records and past history of any prospective student that needed counseling. Designed to elicit some vital information about the student counselee's psychological state of mind, the system generate veritable responses that guide the student's counselee. One of the important benefits of this system is that a counselor is able to attend to many students while the counseling advice is tailored to meet the unique requirements of the individual students.`

In our search to improve the teaching of software engineering and enhance the performance of students in software engineering courses, we designed a teaching methodology, which combines conventional lecture system with a project- based learning system to teach software engineering courses. Our findings showed that students would perform better if project-based learning (PBL) system is adopted as the students are likely to be motivated and challenged to develop knowledge, creative skills and abilities (Egbokhare & Chiemeke, 2007).

The need for development and deployment of e-learning facilities for the visually impaired students formed the basis of our study in 2008. We found solution in the web-based technologies for teaching visually impaired and specified what should be the inputs by government towards realization of this lofty educational objective (Orhionkpaiyo & Chiemeke, 2008).

To aid the work of course level advisers in our Nigerian universities we designed and developed a web-based course advising system that incorporated a

decision support system (DSS). This system is equipped with a rich set of features that allow students to extract courses to register taking all necessary requirements into consideration. In circumstances where the number of courses selected exceeds the credit limit, the system advises the student on how best to select courses in line with the acceptable credit limit (Chiemeke & Nwelih, 2009).

Challenges in the Use of E-technologies in Schools in Nigeria

There are some factors which militates against the use of e-technologies in Nigerian schools. Three major factors are explained as follows:

- *Power Supply*: Almost all communication and technological tools require steady supply of electricity to function. But unfortunately electricity supply in Nigeria is epileptic and is rarely made available in many rural areas. This creates serious problems in the use of e-technologies in the teaching and learning process.
- *Low Funding:* Generally, education is low funded in Nigeria. This has resulted in low level provision of ICT facilities to the students in Schools. Investment in ICT educational services is low because the equipment, soft and hard-wares are costly (Yusuf, 2006).
- *Internet Connectivity*: Connectivity refers to the quality and extent of the internet infrastructure. In Nigeria, the internet does not reach to a vast population of rural residents, but is available in urban and semi urban areas private homes and offices, government agencies and in public settings including schools and libraries. In spite of the Global System of Mobile (GSM) telecommunication, the use of ICT resources for educational purposes is still very low.

SUMMARY AND CONCLUSION

From the foregoing we have observed that in today fully inter-connected, digitalized, knowledge-aged and networked society, technology is having unprecedented impact on education in such a way that electronic technologies in education have produced a concept of electronic-education (e-education or e-ducation). This has helped to change the way the students learn; the way the teachers teach; the way the schools are structured and managed; and removed the barriers between the school and home life. Electronic technologies are enabling and driving the transformation of education landscape. E-education has helped to re-define the values of education and the roles of the various key players in education sector. However, we must be prepared in Nigeria to face the challenges associated with the re-defined roles of e- education even as education becomes individualized, customized, equitable and more accessible in a highly networked world.

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