The Future of Educational Technology in the 21st Century Nigeria: Changing Educational Landscape through Emerging Technologies

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Abstract
Education is increasingly becoming individualised, customised and universally accessible. Its future is being shaped by current and emerging technologies that are drastically changing the way in which teaching and learning are experienced. Such changes are as a result of development in the field of educational technology to utilise game based learning, mobile learning devices, cloud computing, 3-D learning tools, blended learning and multifaceted technologies like laptops, ipods, ipads, Smartphone, tablet computer and e-book reader to its own advantage. Consequently, independent learning is at the forefront of the paradigm changes that are shaping the future of education. This paper reflects on the potential benefits of educational technology in the 21st century, its implication for institutions of learning, challenges and prospects for teachers and students. Building upon this, the paper also examined why these technologies are changing the landscape of education thereby making both teachers and students in the realm of learning context.

Key words: Educational Technology, Emerging technologies, Educational landscape

Introduction

Educational technology is fast becoming a vital tool for all 21st Century students and this is made manifest in using information and communication technologies, thinking skills and personal capabilities as being a crucial part of children's education (Merrill, 2002). It is believed that when young people discover their creative abilities at the initial stage, it can have an enormous impact on their self-esteem and on overall achievement. Commenting on this, Oliver and Goerke (2007) noted that creativity combined with media awareness and technical skills are important for the success and employment of the future generations. How then do we cultivate creative minds that can withstand the challenges of the 21st century? Reacting to this, Augar, Raitman and Zhou (2004) remarked that creative minds are the products of creative learning which involves an active, structured approach that relies on the application of acquired knowledge, mastering of techniques and the organisation of ideas.

Similarly, New Media Consortium (2005) contends that 21st century skills are better taught through the use of emerging digital technologies thereby making all students digitally literate. Digital literacy is the ability to access, understand and create communications in a variety of contexts using digital technology. Supporting this, Brown (2008) observed that 21st century students receive their ideas, stories, information and entertainment not only from books and other printed forms of media, but also from television, films, digital video disk (DVDs) and increasingly from the internet and mobile devices. Indeed, these technologies can be better described as a basic entitlement for every schooling child in the 21st century. Consequent upon this, the principal focus in this paper is on the most modern computational and communication devices embedded in educational technology that have potential benefit to the 21st century generation of students and capable of changing the educational landscape.

An Overview of Educational Technology
Educational technology has both general and specialized meanings. Thus, to the lay public and to a majority of educators, the term refers to the instructional use of computers, television, and other kinds of electronic hardware and software. According to Bates (2005) the term educational technology represents both a process and the particular devices that teachers employ in their classrooms which specifically refer to the use of technology in educational settings, whether it is elementary, secondary schools, colleges and universities, corporate training sites, or independent study at home. Similarly, the Association for Educational Communications and Technology, (AECT) one of the principal professional association representing educational technologists, came up with a universally accepted definition of educational technology as a complex, integrated process involving people, procedures, ideas, devices, and organization for analyzing problems, and devising, implementing, evaluating, and managing solutions to these problems, in situations in which learning is purposive and controlled. However, many educators, Merrill (2002) and Spector (2013) noted that educational technology often employs the term instructional media to represent all of the devices that teachers and learners use to support learning. Thus, specialists in educational technology in particular, both in colleges and university faculties who conduct research and teach courses in educational technology, prefer the term instructional technology because it draws attention to the instructional use of educational technology.

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Technology according to Wright (2014) is having an unprecedented impact on education; its future is being shaped by current and emerging technologies that are drastically changing the way in which teaching and learning are experienced. The typical view among educators as noted by Clarke, Dede and Dieterle (2008) and Spector (2013) is that technology can be used effectively to supplement instruction by providing instructional variety, by helping to make abstract concepts concrete, and by stimulating interest among students. In the past, technology used in education included transparencies, overhead projectors, film strips, slide projectors, and recently slideshows. In today's classroom, Bates (2005) noted that technology include a range of tools, from calculators and PowerPoint presentations, to laptops, ipods, ipads and other electronic devices. In the virtual or e-learning environment, Thomas and Knezek (2008) commented that instructional technology encompasses computer-based courses, online databases, and synchronous (real time or direct) learning which requires participation in events such as live discussions, chat sessions, or real-time lectures and asynchronous (indirect) teaching and learning which makes learning materials available online at the learner's convenience, and include such items as assignments, resources,

discussion boards, and previously recorded lectures or presentations. From other perspectives, Pearlman (2006) observed that students in the 21st century are spoon- fed with information, education and references such as: (podcasts, updates, audio and video recorded materials); collaborations in form of (coaching, conferencing, feedback, mentoring, social networking); pre-recorded assessments through (quizzes, tests, surveys or polls); and user-generated content that includes: (note taking, transcription, translation, photos, videos, audio capture).

As pointed out above, Nikolov and Nikolova (2008) noted that these ideas offers quick and easy access to up-to-date knowledge and utilises tools for knowledge sharing and content creation, which is not constrained by geographic location and considered learning to fit well with current ideas about organizational learning, networked learning or the learning that takes place in open source community. Supporting this view, New Media Consortium (2005) maintained that ideas and concepts originating in the field of educational technology have succeeded in shaping the approach to educational delivery system as a way to understand collaborative learning and knowledge advancement in a technology-rich environment. Similarly, Nikolov and Nikolova (2008) observed that technological tools are employed in education in order to scaffold learning and to support the articulation of thought by individual learners for the benefit of the entire learning community. Based on the foregoing, it can be deduced that the 21st century students have more learning opportunities than their previous generation.

The Potentials Benefits of Educational Technology in the 21st Century
One reason for the increasing interest of academics in using technologies for educational purposes lays in its potential to give 21st century students a sense of embodiment and possibility for interaction with the technology and other students -- a feature that clearly goes beyond conventional pedagogic platforms. Also, for teachers, it's relatively easy to create learning environments that resemble traditional classroom approach including the option to use PowerPoint presentations or web sites such as: Wikipedia, YouTube, Flickr or Facebook to deliver content in a distant mode (Thomas & Knezek, 2008). A further potential aspect of educational technology in the 21st century is its ability to increase the active role of all learners, which can lead to higher motivation and shared responsibility in an iterative process aimed at achieving common goals in an efficient collaborative way (Merrill 2003). Consequently, apart from the software's such as sketch pad, note editor, wikis, blogs adapted to various practices and made useful in various domains of knowledge thus enabling end-user appropriation, Brown (2008) noted that 21st century students can benefit from a shared knowledge space with versatile tools available as weblogs, social networking sites or podcasts supporting educational activities. In continuation, Brown clarified that such could be achieved by developing and managing knowledge artefacts, organizing processes and people, and reflecting on practices from several perspectives.

According to Augar, Raitman and Zhou (2004) there are various possibilities available to educators and learners of the 21st century, these possibilities includes: rich sensory immersive experiences, blended learning environment, simulation and game, modelling of complex scenarios, and a platform for data visualisation. In a similar view, McCauley (2011) opined that there are existing opportunities for collaboration and content creation to document sharing that allows students to upload drafts, pictures, links, videos, maps and notes about tasks to make them accessible to all learning community irrespective of where

they are. Commenting on the above possibilities, Pearlman (2006) stated that it is possible to store, manage, found and exchange resources for knowledge advancement through Google document, Drop box, Wikipedia, YouTube, Flickr or Facebook. These technologies are portals through which students across the world can access education cheaply, from any location and at any time, shattering the rigidity and barriers associated with traditional education system. Moreover, several commentators, Brown (2008) and Augar, Raitman & Zhou (2004) shared the view that the net-generation students' familiarity with digital technologies has affected their preferences and skills in keys areas related to education. For example, most students prefer receiving information quickly; process rapidly; have a low tolerance for lectures; prefer active rather than passive learning; rely heavily on communications technologies to access information and to conduct social and professional interactions; and expect technology to be an integral part of their education.

Implication of Educational Technology Tools for the 21st Century Students

Given the potential significance of educational technologies in the 21st century, there is a clear imperative that this trend will continue to improve the mode of educational delivery over the next decades, and will encompass personal and mobile devices. Conversely, in developing countries, observations revealed that young people are high users of established technologies, such as computers, the internet, email, and mobile phones (Oliver & Goerke, 2007). This is in line with the remark made by Thomas and Knezek (2008) that the current students are described as "digital natives" who have "spent their entire lives surrounded by and using computers, videogames, digital music players, video cams, cell phones, and all the toys and tools of the digital age". Specifically, Clarke, Dede and Dieterle (2008) attributed the successes of digital natives with the availability of 'Web 2.0' technologies--an umbrella term used to describe web-based applications, including social software tools, such as blogs, social networks, social bookmarking, podcasts, and wikis. The major impact these tools have on the 21st century students as commented by Clarke, Dede and Dieterle (2008) is the central role users' play in *creating*, rather than simply *consuming* the content that they contain. Thus;

> Students do not just consume information, they create – and re-create – it with a do-it-yourself, open source approach to material. Students often take existing material, add their own touches, and republish it, bypassing traditional authority channels such as copy writing and self-publishing – in print, image, video, or audio – is common (Clarke, Dede & Dieterle, 2008, p. 2).

Furthermore, Nikolov and Nikolova (2008) asserted that Web 2.0 technologies, such as blogs, wikis and podcasts, have practical application in education contexts. For instance, Blogging refers to the practice of publishing reflections, articles, and information in chronological order on a web site, where others can read and respond to the information (Nikolov & Nikolova, (2008). It appears to offer great potential as a reflective learning tool that can promote peer knowledge-sharing. Similarly, Wikis are websites that can be edited by multiple users and often used as collaborative writing tools and have the potential to facilitate "collaborative knowledge building among learners" (Bates, 2005). Wikis have been used to support weekly discussion activities, group projects, the development and publication of student essays, the development of a class annotated bibliography (Oliver & Goerke, (2007), and as a way of encouraging informal student interaction in an online course (Augar, Raitman & Zhou, 2004). Indeed, the use of audio and video as an instructional media has been the subject of many implementations in education, for example, the terms podcasting and vodcasting refer specifically to the distribution of audio or video over the Internet via

syndication feeds that users intentionally subscribe to. Many websites routinely offer users audio files (e.g. MP3s) as direct downloads or via streaming, once downloaded, they can then be accessed on the user's computer or transferred to a mobile device (e.g. iPods, MP3 players) for later playback. Podcasting can be applied in education to distribute lectures and other learning content. Similarly, from the instructional perspectives, Thomas and Knezek (2008) noted that teachers can transfer their knowledge and experience to other teachers and apply this knowledge within their own teaching discipline to further improve their teaching practices. The key aspect of this transfer is made possible through retrieving, modifying, re-using, sharing and assembling their contents to support their teaching designs without any programming involved.

Looking differently at educational technology in the 21st century, Pearlman (2006) presented approaches to the application of educational technology, namely: building student capacity for research, making student inquiry more realistic, enabling students to present information in an appealing form, and offering students access to learning resources within and beyond the school. Considering the first approach, Pearlman (2006) reiterated that in the past, students relied upon school libraries with printed reference materials to research topics, however, with modern civilization; computer technologies provided access to digital versions of these references including e-libraries available worldwide. For instance, encyclopaedias available on CD-ROMs provide information in form of digital images, video, audio, and links to websites where students access tools such as live web cameras and global positioning satellites. In addition, dictionaries and thesauruses are built into word processors where students can gain access to a wide variety of primary and secondary sources, including government documents, photographs, and diaries.
The second approach stresses on how technology makes student inquiry more realistic by engaging students in real-world activities, for example,

- In the sciences, electronic probes allow science students to collect precise weather or chemical reaction and digitally trace trends and answer hypotheses.
- Similarly, graphing calculators, spreadsheets, statistical software's, and graphing software provide mathematics students with the ability to visualize and compute difficult mathematical concepts.
- In the social sciences, electronic communication tools (e.g. Internet conferencing, e-mail, electronic discussion groups) allow students to communicate with their peers from many parts of the world.
- In the language arts, students use handheld computers and wireless networks to create joint writing exercises and read electronic books that allow them to explore related topics.
- Concept-mapping software provides students with the opportunity to build scientific framework with appropriate linkages.
- Electronic communication tools such as mobile learning devices, Skype and webcam support interactions and increase the probability of prompt responses from experts such as scientists, book authors, and political leaders.

The third approach is the possibility of students using technology to move from being knowledge consumers to being knowledge producers. As earlier stated by New Media Consortium (2005), Pearlman (2006) concluded that with advanced technologies, students can present their original data or newly interpreted data by integrating digital video, audio,

and text into word-processed documents, multimedia presentations, or web- based documents as opposed to printed reports or oral presentations. In developed countries where technology is a common place, media fairs are organised at local, state, national, and international level to showcase the new knowledge representations that students are capable of creating in form of photographs, original digital images, videos, and interactive multimedia projects from students of all ages. Interesting projects like cultural preservation of food, safety tips or soap making can be made in form of multimedia presentation.

The fourth approach presents the possibility for students with physical or learning disabilities to use a variety of learning resources through assistive technologies in order to be an active member of a mainstream classroom. For example:

- Braille writers and screen readers allow students with sight limitations to use a computer for work and communication.
- Various switches similar to a computer mouse allow students with limited mobility to use a computer to speak for them, complete assignments by manipulating the computer through a touch pad, by head or eye movement, or even by breath.
- Educational technology tools can also be used to provide alternative forms of assessment for disabled students, including digital portfolios that electronically capture the accomplishments of students who are not able to complete traditional assessments.

Challenges Faced by Educational Technology Implementation in Developing Countries
Despite these opportunities for using technology in educational settings, there are potential challenges involved that might deter its successful implementation and timely adoption by many developing countries like Nigeria. Based on the foregoing, Wright (2014) cautioned that the success of educational technology in the 21st century are unlikely to occur without addressing topical issues like– power, Internet connectivity and bandwidth, quality teacher training, respect and better pay for teachers, and the sustainability of implementations. In continuation, Wright (2014) highlighted that electrical power is highly needed to run technological devices and until power is widely available, reliable, and affordable for many in Africa and elsewhere, educational technology uptake will be slow. In addition, the increased poor Internet accessibility and bandwidth without genuine reason from the internet providers to making it accessible, reliable and affordable by students, teachers and school administrators is a great challenge for all in education industry.

Similarly, teachers who have earlier on described in this paper as "digital immigrants" are brought up in a world with limited technology and can find it difficult to use technology to engage and support learning without effective training. Furthermore, the value, respect, earnings and compensation given to teachers are not relative to what others earn with equal qualification in other profession. In this respect, it is difficult for teachers to focus on teaching if they must hold several part-time jobs in order to support themselves and their families. Finally, McCauley (2011) lamented that glitzy technology is initially very appealing and accompanied by exaggerated claims of being a "dragon slayer" or a solution to all that ails the educational system; but with poor technical support, maintenance and sustained effort by all stakeholders, it becomes a sophisticated paper weight. However, overcoming these challenges can pave away for the future prospect of educational technology in the 21st century.

Prospects of Educational Technology in the 21st Century Nigeria

In a bid to get Nigeria's students ready for the 21st Century and meet the technological literacy challenge, a far- reaching vision for the effective use of technology in primary, secondary and tertiary education that will help the next generation of school children to be better educated and better prepared for the evolving demands of the economy must be in focus. However, Building on the present, it is worth noting that Web 2.0 technologies such as wikis, blogs, podcast, bookmarks, and social media sites including facebook and twitter as earlier mentioned are still alien in developing countries. Indeed, the effective use of these technologies that includes: flipped classroom, instructional videos, mobile learning, cloud computing, 3-D learning tools, game based learning and blended learning environment as tools to support teaching and learning remained untapped, for instance;

1. **A flipped classroom** which refers to a scenario where students would be assigned an informative video lecture as homework and gives teachers more time to support a student's learning journey, rather than merely correcting the errors on the students' homework. However, this idea of swapping homework for class work allows class time to be used for hands-on activities and subsequently apply the knowledge taught at home (Bates, 2005). The flipped classroom model if properly adopted in developing countries, classrooms will become more flexible and student-centred as students move from being the product of teaching to the centre of learning.

2. **Professionally designed instructional videos** including linear, interactive and special documentaries on a specified content area in education are lacking in the market. Although, instructional videos cannot replace professionally trained teachers, however, the increasing prevalence of such in schools will shift the teacher's role from being the information source to a more complex role of negotiating lesson objectives with students, providing a varying degree of support for different students, monitoring students' progress, and encouraging reflection on classroom activities (Nsofor, 2010).

3. **Mobile learning** is another future prospect for educational technology in the 21st century. This is because, mobile learning devices such as: Smartphone, tablet computer, e-book reader, and laptop are capable of revolutionising the way teachers teach and students learn, if implemented in educational institutions correctly, learning will become individualised, customised and accessible for every student (Spector, 2013). Mobile learning devices are also increasingly necessary for students and educators alike, if they are to partake in the aforementioned revolution of education.

4. **Cloud computing** is the practice of using a network of remote servers hosted on the internet to store, manage and process data, rather than using a local server, thus allowing schools to provide students with easy, simple access to teachers' lesson plans, and the ability to submit their homework or access educational programs and websites that the school subscribes to. McCauley (2011) stated that cloud computing was increasingly adopted for the cost savings and efficiency it could deliver, and that the platform of cloud-based sharing such as (Dropbox and Google Drive) is expanding the opportunities available for collaboration in education. This new system will allow schools to save money on energy, software support and hardware costs and offers the possibility to revolutionise the structure and delivery of education.

5. **3-D Learning Tools**: Engaging students with a virtual world via mobile and multi-faceted technology can still be regarded as a passive activity, however, Loyd and Grossman (2012) noted that 3-D learning tools promise to change this by increasingly focusing on integrating soft skills, such as creativity, into students' repertoires. Moreover, exploring the art of designing 3-D images to producing 3-D objects will continue to open up new learning possibilities for the 21st century students.

6. **Game based learning** is another embryonic future of educational technologies in the 21st century because games are positioned in such a way that students will enthusiastically engage in learning without direct instruction from the teacher and without boring, repetitive questions from a textbook and that students generally commit to games because they are both fun and challenging. Brown (2008) remarked that game-based learning often engages the players through a narrative or storyline that both rewards students' progress, and allows them to develop an understanding of consequentiality. In addition, these narratives also allow students to engage in social, civic and political contexts that mimic real-life complexities and experiences in a risk-free environment. Similarly, Thomas and Knezek (2008) added that the journey of progress within a game, rewards students for their achievement; whilst also encouraging them to learn new concepts, experiment, make mistakes and be creative with what are often real-world challenges.

7. **Blended learning environment** equally have greater prospects for reaching students in the 21st century. In blended learning, students can access or download recorded lectures and supplementary content online, receive alerts about course information and result via Really Simple Syndication (RSS) and Short Message Service (SMS), use instant messaging to interact with other students, teaching and administrative staff. Teachers on their part can design, develop and share course related files (in form of video, audio, text or graphics) via the internet as the main or supplementary content, then provide students with course information via SMS to access or download online. In addition, students may be asked to use videoconferencing, instant messaging to interact with each other. Nikolov and Nikolova (2008) added that a similar opportunity can be use to provide students with pre-class discussion questions via SMS, and ask them to contribute to a wiki and comment on a blog.

Conclusion
This paper focused on how educational technology is impacting on the future of education in the 21st century. Though technology impact is however, not reserved for the future; it is impact is made manifest by the innovative capacity of the educational technology experts, innovating the ideas and methods of education delivery, utilising emerging technologies for future generations of students. Consequently, this is not the case with the "old" educational paradigms but through awareness, better understanding and utilization of these incredibly powerful new revelations of the 21st century tools, future generations of students can be better prepared, ensuring that all avenues through which learning is delivered are optimised for greatness. Thus, educational landscape is surely susceptible to change through all these emerging technologies.

Recommendations
Based on the above discussion, the following recommendations are proffered, thus;

1. The government should strive to provide an enabling environment (i.e. power stability and better pay and welfare for teachers) and private enterprise such as the internet providers and

mobile phone operators on their part, should increased internet accessibility and bandwidth that will support the demand of the 21st century students.

2. Implementing new technologies in the classroom requires that teachers are effectively trained to develop new skills in using the technology and often in innovating new types of teaching activities. Teachers will therefore need both time and guidance to develop these competencies, and administrators should allow for this when planning the timing and length of the implementation.

3. There will be a growing need for new instructional materials, professionals in educational technology, and new kinds of assessments that are aligned with higher standards and provide much richer learning experiences and more vibrant sources of information. To that end, universities and colleges of education should restructure the curriculum to reflect the 21st century demand, expand the market of suppliers, assess learning in deeper ways and respond to the diverse learning styles of students.

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