Integrating Web 2.0 Tools into Teaching and Learning Process through Mobile Device Technology in Nigerian Schools: Current Status and Future Directions

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Abstract

The status of usage and accessibility of Information and Communication Technologies in Nigeria's educational system have hitherto been investigated from the viewpoints of technological usefulness, without their pedagogical contributions. This paper examines the challenges of integrating ICTs into teaching and learning activities in Nigerian schools. It further investigates the accessibility of internet-connected mobile device technologies among learners and educators; and reviews the desirable features of Web 2.0 tools. Relevant views of learning theories on technology adoption in education are considered. The theories assist in ascertaining how the incorporation of Web 2.0 services into pedagogy through the use of mobile device technologies would benefit learning within the context of Nigeria's educational system. An alternative solution is suggested as a panacea to the present difficulty in using teaching and learning enhanced ICT facilities. A case is made for the integration of Web 2.0 services into the current traditional teacher-centred method through the use of mobile devices. Possible challenges to the implementation of the concept are identified with recommendations. Finally, future directions on the successful integration of the technologies into pedagogy are discussed.

Keywords: Web 2.0 tool; Mobile Device; Teaching; Learning;

1   Introduction

It is apparent that technologies will continue to set the pace for all human endeavours. It is also evident that Information and Communication Technologies (ICTs) have become a unifying frontier and key factor that bring change in every sphere of human existence. What remains vague however is the direction, pace of such changes, and the best practices that need to be adopted to take advantage of these changes. In the education sector, for instance, to remain a 21st-century educator providing adequate services to the 21st-century learner, it is necessary to work or improvise with the 21st-century tools such as teaching and learning supported ICT facilities.

ICT facilities have been used in many different ways to support educational system. Some are employed in administrative operations and support, while others are more useful in supporting teaching and learning activities. Among the ICT learning facilities are the Web 2.0 tools. Web 2.0 tools are second generation web services designed to facilitate communications, secures information sharing, interoperability, collaboration and so on. These tools include common applications such as Whatsapp, Wiki, Google Doc, Google Classroom and so on. Their applications offer a quick solution to the far more challenging issues of how institutions might engage with and support student-led participation (Attwell & Hughes, 2010).

Web 2.0 tools have been incorporated successfully into the educational system in developed societies; their performances have also been appraised and reported positively. However, in Nigeria, the integration of Web 2.0 tools into teaching and learning process is still at an infant stage. Available studies in educational research showed that the current status of ICTs accessibility and usage in Nigerian schools are abysmally low. The problems have been attributed not to non-availability of the facilities but largely to lack of necessary supporting infrastructures such as power supply, internet connectivity and in some cases inadequate human resources with technical know-how. Also, the current situation has encouraged continuous support for the traditional teacher-centred approach to teaching against the learner-centred method which has been backed by many researchers (Carter, 2009; and Attwell & Hughes 2010).

Despite these challenges, in Nigeria, there are opportunities to be explored as the numbers of mobile device users with regular internet connections are on the increase yearly (NCC, 2014), particularly among students and academics. Unfortunately, the focus and purpose of usage of these devices have been for social

networking (fun making) and entertainment (movies and music) rather than educational purposes (CcHub, 2014).

Consequently, the questions to ask about the current weak position and underutilised status of ICTs in Nigeria's educational system should not be limited to availability of the facilities. But also on how can available resources (mobile devices and web services) be explored to:

- o   assist students to learn better, access web-based contents and collaborate with other learners and teachers.
- o   help teachers to deliver media rich lecture materials to students and improve teachings activities.

Based on this premise, this paper sought to review and explore available facts in existing studies to determine: the challenges facing effective usage of ICT facilities in Nigeria's educational system; the status of mobile device accessibility among education stakeholders, and the stakeholders' present characteristics. Relates the findings with the lightweights and seamless compatibility with other web services found in Web 2.0 tools, and presents a case for the use of Web 2.0 tools through mobile devices in teaching and learning activities in Nigerian schools.

2   Background information

Education as described by Dewey (1930 pg. 1-4), is the process of facilitating learning, or the acquisition of knowledge, skills, values, beliefs, and habits. Attwell & Hughes (2010) cites (Coffield, 2008) who criticised limited understanding of learning as related to the transmission and assimilation of knowledge and skills. Coffied, in turn, refers to (Dewey, 1986), who states that learning, or 'the educative process' amounts to the 'severe discipline' of subjecting our experience 'to the test of intelligent development and direction' so that we keep growing intellectually and morally. This desirable change in human behaviour has been achieved through various approaches. Among these is *formal* education where an individual acquires knowledge and skills through chronically structured subject oriented activities within an institution; another method is a more flexible, learner-oriented and life environment *non-formal* education built on learner participation and diversified contents; and lastly, a life-long process of individual daily experiences in an *informal* education environment.

The introduction of new methods or techniques into teaching and learning process has always been guided by principles. Integrating technologies into formal education are not an exception. Psychologists and scientists over the centuries have proposed a plethora of theories of purpose, application and interpretation which attempt to explain the phenomenon of learning and provide various propositions and rationale that stimulates the learning process. It is pertinent to refer to these theories as guides while striving to improve or promote teaching and learning delivery. Such reference will enable right selection of instructional tools, techniques and strategies. However, there are three broad categories of these theories: the behaviourism; cognitivism and constructivism which viewed the learning process from different perspectives (Hung, 2001). The behaviourism which stems from the works of Skinner, Thorndike, Watson and Pavlov is of the opinion that behaviour or change of behaviour is acquired through associations between stimuli and response (Mergel, 1998). That is, learning begins when a cue or stimulus from the environment is presented, and the learner reacts to the stimulus with some responses. The Cognitivism believes that learning occurs through internal processing of information rather than merely responding to stimuli (Celikoz et al. 2016). While the constructivism posits that learning is an active, constructive process where learner as information constructors actively construct or create own subjective representations of objective reality and the new information is linked to prior knowledge (McMahon, 1997).

Enonbun (2010) points out that learning does not take place in a vacuum, but as a social activity that intimately associated with individual connections with other people. This collaborative nature of learning is emphasised in Lev Vygotsky's social constructivism theory (Derry, 1999; McMahon, 1997), which is at

variant from the assumptions of other cognitivist such as Piaget and Perry who believed it was possible to separate learning from its social context. Vygotsky argued that all cognitive functions originate in, and must, therefore, be explained as products of social interactions and that learning was not simply the assimilation and accommodation of new knowledge by learners; but was the process by which learners were integrated into a knowledge community.

The social constructivist idea is based on explicit assumptions about reality, knowledge, and learning. The reality is constructed through human activity. Knowledge is personal product and is socially and culturally constructed Gredler (2005), this explains how individuals create meaning through their interaction with others and with the environment they live. While learning is a social process which does not take place only within an individual, nor is it a passive development of behaviours that are shaped by external forces (McMahon, 1997). The assumptions established that social constructivists see as crucial both the context in which learning occurs and the social contexts that learners bring to their learning environment. Within the framework of social constructivism Gredler (2005), explains four perspectives that informed how learning could be facilitated. These perspectives are cognitive tools, idea-based, pragmatic or emergent approach and transactional or situated cognitive. Further explanation is provided on the last two perspectives which are of interest to this study.

The pragmatic or emergent approach according to (Cobb, 1995; Gredler, 2005), opines that knowledge, meaning, and understanding of the world can be addressed in the classroom from both the view of individual learner and the collective view of the entire class. They stated further that this should be emergent as the need arise. However, this explains the necessity of collaborative learning within a traditional formal education setting where services such as Wiki space, blogs, Google Docs have applications. Furthermore, the transactional or situated cognitive perspective focuses on the relationship between the people and their environment (Derry, 1999). It is believed that human is a part of the environment, and the environment is, in turn, one of the characteristics that constitute the individual (Gredler, 2005). Therefore, learning should not take place in isolation from the environment.

Up to now in Nigeria, the common way of delivering formal education to learners remains through the traditional teacher-centred approach. A situation under which students exclusively listen and put all of their focus on the teacher, they work alone and collaboration not encouraged. Although, this approach has some advantages on the one hand, among which are effective class control, learners being independent and make own decision. On the other hand, it is characterised with the boring learning environment, no control over own learning, wandering and daydreaming minds. However, in developed societies, transfer of knowledge within formal education settings has gone beyond traditional classroom teacher-learners relationships. It has moved towards a progressive student-centred approach which recognises the social aspect of learning through conversation, collaboration, interaction with others and the application of knowledge as an integral aspect of learning. In Nigeria, this approach can also be made possible with the thoughtful integration of technologies into a formal education environment. The idea will allow teaching processes to be modified to suit the learning needs of students and encourages learning to take place anywhere at any time while teachers remain guidance and adviser.

2.1   Information and communication technologies in Nigeria

The emergence of Internet in the 1990s and new ICTs have changed the sphere of teaching and learning activities in the world over. Unfortunately, Nigeria as a developing country has not seen much of these changes due to challenges of facilities availability and accessibility (where available) in various sectors. For instance, in agriculture, Adebayo & Adesope (2007) and Albert (2014), identify poverty, lack of ICT resources and inadequate knowledge of computer as significant constraints to the efficient use of ICTs among extension professionals. Ekerete & Ekanem (2015), emphasise awareness of the common form of ICT devices as the barrier to agro-processors. In the banking sector, Osabuohien (2008), Luka & Frank (2012) and Agboola (2007), report positive impacts of the use of ICTs for the improvement of the corporate

business image, and productivity. However, this cannot be said about other sectors of Nigeria's economy such as education.

The need for ICTs support in educational sector development in Nigeria has long been recognised. Jegede & Owolabi (2003) report that Nigeria Federal Government through Nigerian Educational Research and Development Council (NERDC) developed and introduced Computer Education into the nation's secondary school curricula in 1987. Long before this, computer education has been taken as course of study in Nigerian universities. However, following the official inauguration, several studies focussing on the level of availability, accessibility, usage and general awareness about ICTs in education have been carried out. ICTs or ICT facilities in this context include all computer related equipment, applications and materials such as computer machine, internet connection, projector, smart board, digital multimedia, teaching assisted software, radio, television, etc. Among the studies is the appraiser of ICT integration into teacher education program (Ololube, 2006). Others focused on the awareness, usage, and accessibility of ICTs in different educational sectors (Adebayo & Adesope, 2007; Olatokun, 2007; Ajayi & Ekundayo, 2009; and Tella *et al.* 2007; Adomi & Kpangban 2010). Recently, Apagu & Wakili (2015), investigate availability and utilisation of ICT facilities for teaching and learning vocational and technical education. While Nwankwoala (2015), looks into their usage among lecturers and students in Nigeria; Okeke *et al.* (2014) and Omotosho *et al.*(2015), examine adoption, use, and availability among university students in Nigeria. The findings from these studies can be summarised as follows:

- o lack of supporting infrastructures such as power supply, internet connectivity, application software, and incessant equipment breakdown
- o inadequate training to sustain technical know-how and
- o non-incorporation and integration of ICTs usage into schools' curricula.

Moreover, these challenges and some others that are not mentioned here have retarded optimum applications of the available ICT facilities in supporting learning process; reduce opportunities to acquire expertise through regular usage, and made integration of tools into the existing teacher-centre approach difficult to achieve in Nigerian schools.

Besides, the constraints mentioned in the studies reviewed. The present state of ICTs usage in Nigerian schools is limited to facilitating the teacher-centred approach to teaching rather than extending teaching and learning activities beyond the classrooms to encourage the learner-centred method. The studies considered ICTs in education practice as being technologically driven rather than pedagogical. None of the studies assessed the impact of ICT facilities on learners' achievement or the level of integration into the learning process. They rather focused on and recorded technologies that teachers identified as those they used most often (where the facilities are available) such as interactive whiteboard and projectors. In a real sense, these devices perform no other functions more than a new traditional chalkboard. Attwell & Hughes (2010), argue that such view held by these studies is open to debate on whether these are specific technologies or only electronic devices which substitute chalkboards. Nevertheless, the point here is to bring forth the current status and perceptions of ICTs application in Nigeria's educational sector.

2.2   Web 2.0 in Nigeria Educational system

Web 2.0 is the second generation of web development that was designed to facilitate communications, secures information sharing, interoperability, and collaboration on the World Wide Web (Darwish & Lakhtaria, 2011). Enonbun (2010) observes that Web 2.0 makes a radical shift from the monopolistic and static use of the internet to a more proactive and interactive platform. Its foundation encompasses a range of web-based services and applications which Ebner *et al.,* (2007), described as the future of learning that has found to be useful to professionals world over. Among the Web 2.0 services are ***Social networking*** (e.g. Facebook, Myspace, Twitter, LinkedIn) and ***Collaborative*** (e.g. Wiki space, blogs, Google Classroom, Google Docs, Edmodo). Other services include ***Lesson plan*** (e.g. Edcanvas, Pinterest) ***Teaching and Learning*** (e.g. Podcast, Vodcast, Slideshare, Animoto); and ***Storage facilities*** (e.g. Dropbox, Google Drive, etc.).

Scottish Qualification Authority (http://www.sqa.org.uk) argues that there is no definitive list of the types of service that make up Web 2.0, they all have certain characteristics in common which include:

- hosted in the cloud rather than PC based
- user control of data rather than the data being owned by the hosting service
- user-friendly and interactive environment through the web
- collaborative/participatory facilities
- mostly lightweight applications

Weller (2013) further highlights several advantages of Web 2.0 tools in education. The services include: accessing the same application on many different devices (smartphone, tablets, notebooks, etc.) at anytime, anywhere in the world; open source applications with lower hardware specification requirements; and consisting services mostly built on HTML which is the common language of the internet that unites all the different devices.

The above features point to the fact that web 2.0 tools are potentially useful in promoting teaching and learning activities. However, positive impacts of its integration into the educational system in the case of developed countries have been recorded (Weller (2013); Greenhow *et al.* (2009); Shih(2011); Clark *et al.* (2009)).

In Nigeria, limited information is available on the awareness and usage of Web 2.0 tools. Moreover, the tools being an integral part of internet web services are not immune from the common challenges facing seamless ICTs applications in Nigerian schools. Nevertheless, some studies on Web 2.0 tools in Nigeria's educational system have emanated mainly from the library professionals. Baro *et al.* (2013) investigate their awareness and uses in some southern Nigeria university libraries. Okonedo *et al.* (2013) assess Web 2.0 tools awareness in the south-western region and Baro *et al.* (2013) compare their usage among Nigeria and South Africa librarians. Owusu-Ansah *et al.* (2015) examine their uses in some selected African university libraries which include Ghana, South-Africa, Uganda and Nigeria. Besides the librarian investigations on Web 2.0 tools in Nigeria, Diyaolu & Rifqah (2015) and Eze (2016) assess their usage among students in private and public universities respectively.

In all the studies mentioned above, it is worthwhile to state that the common findings from both library professionals and other educational use of Web 2.0 in Nigerian schools revealed that there is awareness of the existence of some services such as Facebook, Twitter, Hi5, and LinkedLn, instant messaging, Blogs and Wikis. But the usages of these applications have been limited to social networking. While records about the use of RSS feeds, podcast and other collaborative tools which are mainly useful in achieving desired pedagogical goals are lacking. The studies also mentioned some infrastructural deficit as part of the constraints. The infrastructural problems include lack of good internet facilities, skills, and inadequate time (Baro *et al*., 2013). While Okonedo *et al*. (2013), in their study identify inadequate publicity on the existence of the tools among the library professionals, low bandwidth, erratic power supply and lack of training. These challenges are not in any way different from the findings on general ICTs usage earlier discussed in section 2.1. However, it is also evident in the librarian studies that little attention has been afforded pedagogies in the use of Web 2.0 tools for learning.

It is a general knowledge that efficient use of any tool or technology is a function of its know-how and accessibility. Web 2.0 tools are not exceptions, therefore, from our point of view, and in addition to challenges recorded in the existing works reviewed. The current low status on the integration of Web 2.0 tools in teaching and learning in Nigerian schools might also be connected to the lack of motivations, technical know-how and pedagogical 'know- when' on the path of educators (teachers and curriculum developers). Motivations that target audience (students) have little or no access to facilities that support Web 2.0 services. Technical know-how to use required technologies, for instance, the use of a Web 2.0 technology (e.g. Audacity) to develop teaching material (contents) to be deployed through another technology (e.g. podcast) for learning. And the pedagogical 'know-when' to use appropriate Web 2.0 tools for teaching 'what' concept.

In the next section, we examine the current position of mobile device ownership and usage among education stakeholders in Nigeria. We also look at the opportunities provided by these devices to remove the constraints of accessibility currently imposed on efficient and pedagogical usage of various ICT facilities.

2.3　　Mobile Device Usage among Educators in Nigeria

Internet use is not confined to computer machines. Many other devices have the capability of internet connections, among these are mobile devices such as telephone handsets, smartphone, tablets, etc. these handheld devices can go a long way in addressing some of the challenges known to be barriers to effective usage of ICT facilities in Nigerian schools. But the present situation of mobile device usage in Nigeria school is well described by Livingston (2009) assertions which state that the past decade has witnessed two revolutions in communication technology. The first being the internet revolution which has changed everything in education. While the second, the mobile phone revolution has changed nothing. Mobile device technology usage in Nigeria has recorded nothing fascinating in promoting learning activities other than oral communication, entertainment and social networking ((CcHub, 2014; Mojaye, 2015; *Osang et al.,* 2013). However, for teaching and learning activities in schools not to be out of sync with the technologies revolution. There is a need to improvise with the available facilities (e.g. mobile devices and web services) to achieve the objectives of integrating technologies into pedagogy while efforts are being made by government and education stakeholders to provide formal and traditional ICT facilities as it obtained in the developed societies.

According to Nigeria Communications Commission (NCC, 2014), Nigeria has about 170 million connected telephone lines, 128 million of which had an active subscription. Total active internet subscriptions were 65 million with the wireless broadband (3G) connections as at December 2013. The report further states that Global System for Mobile communication (GSM) market is the primary driver of Nigerian telecom industry with 97.83 % share of the entire telecoms market while others such as Code Division Multiple Access (CDMA) and Fixed/Fixed Wireless segment account for the remaining 2.27%. Furthermore, the National Population Commission of Nigeria (NPC, 2006) puts Nigeria population at 140 Million. The youths between (15-35) years make up 60% of the entire country's population, according to National Bureau of Statistics, Nigeria (NBS, 2012). The NBS reports further that 17.5 % of the youth population had never been to school while the remaining 42.5% were in schools or had been to school, 79% of educated youths had at least secondary education. This record shows that significant numbers (84 million) of Nigeria population are youths with over 59 million are at different levels of education, and a good percentage of this figure (47 million) are not studying below the secondary school.

Moreover, in a study conducted by Co-Creation Hub on mobile phone users' experience (CcHub, 2014). In an online survey of 5213 Nigerian students, 99.6 % of the respondents own a mobile phone. 89.6% of this population have regular internet subscriptions on their phones, while 25.3% are limited to phone calls and texting. It states further that students spend at least 10% of their monthly allowance which is between $12.5 - $25 (i.e. Naira 5000-10000) on internet data. Also, 44% of the respondents own two or more phones to avoid network failure issues, enjoy extra battery life, and multiple SIM cards. These facts point to the high level of accessibility and usage of the mobile phone among Nigerian students. Surprisingly, the study states that the primary purpose of mobile phone ownership apart from making calls is for social networking. The Cchub study corroborates the findings in Mojaye (2015), and Osang *et al.*, (2013), about the limited use of mobile devices for pedagogical activities

Furthermore, Mojaye (2015), investigates from different perspectives the impacts of the mobile phone on teaching and learning and its usage among Nigerian University students. The study identified the positive impact of the device to include easy access to information, instructional usage, and personal convenience. While the adverse effects such as distractions in the classroom, cheating during examinations, addiction and poor writing skills are mentioned. Osang *et al.* (2013), discuss the benefits and prospects of implementing mobile learning and challenges of sustaining it in open and distance learning education in Nigeria. Mojaye and Osang's studies were the papers found (from our several searches) on mobile devices and web 2.0 tools

assessment in teaching and learning in Nigeria. This fact further attests to the limited literature on the use of certain ICTs facilities in the educational process in the country. However, Mojaye's work did not look into how well mobile devices have been used in teaching and learning activities. The work tends to quantify the impact of the device regarding students behaviour; while Osang and colleagues failed in their study to mention Web 2.0 tools and how they can be used in the open and distance learning environment.

From our experience and observations on the trend of mobile device operations within Nigeria's telecoms industry, in addition to the works reviewed in this paper. We can state that one of the factors responsible for high level of internet connections through mobile devices is the opportunity provided by the liberalisation of the industry. Several mobile telecommunication companies in recent times have consistently been rolling out various marketing strategies to attract users due to competitions among operators. Their strategies include free internet data bundle attached to the purchase of airtime for a given period. This practice encourages more people to become internet user, especially students from low socio-economic background. The seasons of such promotions may not likely come to an end anytime soon. Even though, if the promotions end, there is the likelihood that most of the new mobile internet users who have a positive experience while the promotion last, might be less worried about any little increase in their budget due to data subscriptions hence, continue in using the facilities.

3   Web 2.0 through Mobile Device Technologies in Nigerian Schools

Attwell & Hughes (2010), state that 'One of the factors driving the exploration and development of new pedagogies and use of technology for learning is a concern that education may become out of step with the way that people use technology today for socialising, working, learning'. In Nigeria, the current status of ICT usage in teaching and learning is still limited to traditional classroom tools such as display screen technologies (e.g. overhead projectors), access research materials, and creating paper-based teaching materials. While the facilities are less used for communication with learners, track students' progress, collaborative learning, training delivery and provide one-to-one attention. If this practice continues for too long without incorporation of relevant ICTs into pedagogies, the product of the Nigeria's educational system (students) may find it difficult to secure positions in the competitive labour market, and compete favourably with their colleagues around the world.

However, there are untapped alternative solutions that can be explored in Nigeria to overcome the current challenges. The solutions are in the use of mobile devices to deliver Web 2.0 services which can assist greatly in enhancing teaching and learning activities in the schools. Web 2.0 services can be accessed through the computer machines as well as mobile devices connected to the internet. Hence, their uses as teaching and learning platform would benefit greatly from the present status of learners and teachers' accessibility to internet active mobile devices. Nevertheless, there are some envisaged problems such as motivation to use the new technology; lack of technical know-how to implement and deliver learning contents through the Web 2.0 tools, the device screen size and more important, curriculum adaptation could still be a barrier to effective implementation of this idea. However, while some of the problems mentioned can be resolved within a reasonable short time through continuous training and proper sensitization of stakeholders. The current curricula structures may need to be reviewed to suit transition from expert developed and sanctioned knowledge to collaborative and flexible forms of knowledge construction tailored to meet students' expectations.

There are several education theories of purpose, application, and interpretation of teaching and learning that can assist curriculum developers and teachers to integrate technology and in particular Web 2.0 tools into teaching and learning activities. These theories (see section 2) explain how individuals acquire, retain, and recall knowledge. Therefore, to remain in-tune with technologies available for education within the context of Nigeria, and to extend learning activities beyond the classroom. There is a need for educators to acquit themselves with instructional models that have relevance to the purpose of learning achievements which can be found in social constructivist views.

Social constructivist approaches supported peer collaboration, problem-based instruction and other methods that involve learning with others. It stresses the need for collaboration among learners and with practitioners in the society (McMahon, 1997). However, the approach not only provides the grounds for communication but also supports people to extend their understanding of new information and activities among the group member (Gredler, 2005). Instructional materials based on social constructivist view will assist both educators and students to promote the idea of knowledge sharing among individuals who have shared interest on the point of discussion. Therefore, the principles provided by these theories can be guidelines to teachers and curriculum developer in developing learning contents that can benefit from the Web 2.0 tools and also help teachers select instructional tools, techniques, and strategies that promote learning for the current set of learners.

Consequently, we therefore, advocate for an urgent needs to explore the current characteristics of stakeholders in Nigeria's educational system which include: high numbers of mobile devices ownership, enthusiasms towards the use of the devices, familiarity and expertise in new technology adoptions, high levels of internet accessibility through mobile devices. Combining the users' characteristics with desirable features of Web 2.0 tools such as lightweight, open source, and high compatibility with all devices (including mobile devices). And the mobile device advantage of power storage and seamless internet connectivity, to extend teaching and learning activities beyond classroom settings.

We believe the identified problems limiting the ICTs use in pedagogies could be eliminated. Hence, allows for a good blend of traditional teacher-centred and more dynamic learner-centred approaches in Nigerian schools.

4   Discussion and Future Directions

The implementation of the suggested alternative to poor pedagogically driven ICTs usage in Nigerian schools can bring immense positive impact on learners' academic achievement, while also enhancing teachers' teaching performance and technology expertise. However, the need for proper monitoring and evaluation of the progress and achievements of the new concept over a period is necessary. The periodic evaluation and re-evaluation will assist in gaining insight into what works well and what does not meet expectations; what can be done for improvements and where the improvements are needed; the level of willingness and affordability, etc.

Consequently, for the monitoring to be achieved. Robust data collection mechanisms are required to be in place. This process will assist in keeping track of learners' activities with Web 2.0 services, and also the specific purposes of usage. The collected data can later be analysed to reveal the performance of the integrated technology at the various strata of Nigeria's educational system (e.g. regional, institution, individual, discipline-based, etc.,). Furthermore, the data can be explored at both aggregate and disaggregate levels, to reveal specific issues of interest at individual, programme, and institution-based in teaching and learning activities within Nigeria's education sector. Moreover, insight into who use what, and for what purpose; the effects of such facilities on the users' educational performance can be gained. The knowledge gained from such investigation may further explain the specific needs of individual students, and those students that require special assistance can be identified.

5   Conclusions and Recommendations

The current status of ICT facilities usage in teaching and learning activities is considered to be low in Nigeria's educational sector. The reasons for the poor integration of the available facilities have been attributed to inadequate supply of supporting infrastructures such as power supply, poor internet connectivity, lack of technical know-how, etc. The situation has also encouraged continuous adoption of the

traditional teacher-centred approach to learning rather than the learner-centre method. However, in the presence of the problems, this position paper considered the current characteristics of stakeholders in Nigeria's educational sector with regards to their mobile device ownership status, internet accessibility through the mobile device, expertise and purpose of mobile device usage. Relevant learning theories are considered, the views of social constructivist on the integration of technology into pedagogy were particularly reviewed. An alternative solution that leverage on the currently available learning supported web services and the current learners' features is proposed. The alternative solution is capable of eliminating the present shortage of ICTs infrastructures support and provide a means of effective integration of Web 2.0 services into teaching and learning activities.

However, immediate possible challenges to smooth implementation of the alternative solution are identified to include motivation to use new technology, low level of expertise in using Web 2.0 tools to deliver learning materials among teachers, and the need for the current curricula to be reviewed to benefit from 21st-century technologies.

Based on the challenges to using ICTs as revealed in the existing studies, and the envisaged problems to the successful implementation of the suggested alternative solution to using ICTs in teaching and learning, the following recommendations are made:

- o Policies should be put in place to ensure that teachers and curriculum developer integrate Web 2.0 tools into their plans.
- o The need for the curricula to be reviewed such that contents can easily be incorporated into the new technologically driven teaching tools.
- o There should be continuous and periodic training for teachers on various ICT skills acquisition and in particular application of Web 2.0 tools. Such training will help to provide them with practical and functional knowledge of the tools, with the hope of integrating it with instructional methods of teaching.
- o The training should emphasise the pedagogies behind the use of ICTs for teaching/learning, and be tailored towards among other things how the existing curriculums' contents can be developed into ICT deliverable packages that can promote students' learning

With the present level of inadequate supply of primary ICT and its supporting facilities in Nigeria schools, Nigerian students still deserve a good education that can make them compete in the technologically driven labour market. Therefore, Nigerian teachers and school administrators should "think outside the box" and improvise with the available facilities to achieve the aims of training students that meet expected standards. The government should also look beyond the provision of electronic gadget (computer machine, projector, etc.) and invest in supporting facilities such as reliable power source, active internet and periodic training for the stakeholders to complement the previous investments.

6. References

Adebayo, E. ., & Adesope, O. M. (2007). Awareness, Access and Usage of Information and Communication Technologies between Female Researchers and Extensionists. *International Journal of Education and Development Using Information and Communication Technology(IJEDICT)*, *3*(1), 85–93. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=eue&AN=507965015&site=ehost-live&scope=site

Adomi, E. E., & Kpangban, E. (2010). Application of ICTs in Nigerian Secondary Schools. *Library Philosophy and Practice (E-Journal)*. Retrieved from http://digitalcommons.unl.edu/libphilprac

Agboola, A. (2007). Information and Communication Technology (ICT) in Banking Operations in Nigeria – An Evaluation of Recent Experiences. *African Journal of Public Administration and Management*, *XVIII*(1), 1–21.

Ajayi, I., & Ekundayo. (2009). The application of information and communication technology in Nigerian secondary schools. *International NGO Journal*, *4*(5), 281–286. Retrieved from http://www.academicjournals.org/journal/INGOJ/article-abstract/514710E40081

Albert, C. (2014). Constraints to effective use of ICT among extension professionals and farmers in extension delivery in Rivers State, Nigeria. *Singaporean Journal of Business Economics, and Management Studies*, *2*(11), 1–7.

Apagu, V. ., & Wakili, B. A. (2015). Availability and Utilization of ICT Facilities for Teaching and Learning of Vocational and Technical Education in Yobe State Technical Colleges. *American Journal of Engineering Research (AJER)*, *4*(2), 113–118.

Attwell, G., & Hughes, J. (2010). Pedagogic approaches to using technology for learning: Literature review. *Lifelong Learning UK*, (September), 1–86. Retrieved from http://dera.ioe.ac.uk/id/eprint/2021

Baro, E. E., Idiodi, E. O., & Zaccheaus Godfrey, V. (2013). Awareness and use of Web 2.0 tools by librarians in university libraries in Nigeria. *OCLC Systems & Services: International Digital Library Perspectives*, *29*(3), 170–188. http://doi.org/10.1108/OCLC-12-2012-0042

Baro, E. E., Joyce, E., Vera, E., & Godfrey, Z. (2013). Web 2.0 tools usage: a comparative study of librarians in university libraries in Nigeria and South Africa. *Library Hi Tech News*, *5*, 10–20. http://doi.org/10.1108/LHTN-04-2013-0021

Carter, L. (2009). Globalisation and Learner-centred Pedagogies: Some Thoughts. *Journal for Activist Science & Technology Education*, *1*(1), 58–60. Retrieved from http://jps.library.utoronto.ca/index.php/jaste/article/viewFile/21174/17240

CcHub. (2014). How I use My Phone Series-Nigerian Students. *Co-Creation Hub, Nigeria*. Retrieved from http://cchubnigeria.com/mxlab/

Celikoz, N., Erisen, Y., & Sahin, M. (2016). Cognitive Learning Theories. In Z. Kaya & S. A. Akdemir (Eds.), *Learning and Teaching: Theories, Approaches and Models* (1st ed., pp. 104–141). Ankara: Cozum Egitim Yayincilik. Retrieved from http://peoplelearn.homestead.com/BEduc/Chapter_5.pdf

Clark, W., Logan, K., Luckin, R., Mee, A., & Oliver, M. (2009). Beyond web 2.0: Mapping the technology landscapes of young learners. *Journal of Computer Assisted Learning*, *25*(1), 56–69. http://doi.org/10.1111/j.1365-2729.2008.00305.x

Cobb, P. (1995). Continuing the Conversation: A Response to Smith. *Educational Researcher*, *24*(7), 25–27. Retrieved from http://www.jstor.org/stable/1177062

Coffield, F. (2008). Just suppose teaching and learning became the first priority. Learning and Skills Network. Retrieved from https://www.researchgate.net/profile/Frank_Coffield/publication/237463290

Darwish, A., & Lakhtaria, K. I. (2011). The Impact of the New Web 2.0 Technologies in Communication, Development, and Revolutions of Societies. *Journal of Advances in Information Technology*, *2*(4), 204–216. http://doi.org/10.4304/jait.2.4.204-216

Derry, S. J. (1999). A fish called peer learning: Searching for common themes. *Cognitive Perspectives on Peer Learning*, 197–221.

Dewey, J. (1930). *Democracy and Education. An Introduction to the Philosophy of Education*. New York: The Macmillan Company.

Dewey, J. (1986). Experience and Education. *The Educational Forum*, *50*(3), 241–252. http://doi.org/10.1080/00131728609335764

Diyaolu, A. M., & Rifqah, O. O. (2015). Investigating the Educational Use of Web2.0 Among Undergraduates in Nigerian Private Universities. *JLIS.it*, *6*(1), 69–97. http://doi.org/10.4403/jlis.it-9478

Ebner, M., Ebner, M., Holzinger, A., Holzinger, A., Maurer, H., & Maurer, H. (2007). Web 2.0 Technology: Future Interfaces for Technology Enhanced Learning? *Proceedings of the 12th International Conference on Human-Computer Interaction (HCI 2007)*, *7*, 559–568. http://doi.org/10.1007/978-3-540-73283-9_62

Ekerete, B. I., & Ekanem, J. T. (2015). Assessment of Information and Communication Technology Utilization by Agro-Processors in Ikono Local Government Area of AkwaIbom State, Nigeria, *5*(1), 22–28. http://doi.org/10.9734/AJAEES/2015/13839

Enonbun, O. (2010). Constructivism and Web 2. 0 in the Emerging Learning Era : A Global Perspective. *Journal of Strategic Innovation and Sustainability*, *6*(4), 17–28.

Eze, E. M. (2016). Awareness and use of Web 2. 0 tools by LIS Students at University of Nigeria, Nsukka, Enugu, 0–20.

Gredler, M. E. (2005). *Learning and instruction: Theory into practice*. Upper Saddle River, NJ: Pearson/Merrill Prentice Hall.

Greenhow, C., Robelia, B., & Hughes, J. E. (2009). Learning, Teaching, and Scholarship in a Digital Age: Web 2.0 and Classroom Research: What Path Should We Take Now? *Educational Researcher*, *38*(4), 246–259. http://doi.org/10.3102/0013189X09336671

Hung, D. (2001). Theories of Learning and Computer-Mediated Instructional Technologies Theories of Learning and Computer-Mediated Instructional Technologies. *Educational Media International*, *38*(4), 281–287. http://doi.org/10.1080/09523980110105114

Jegede, P. O., & Owolabi, J. A. (2003). Computer Education in Nigeria Secondary Schools: Gaps Between Policy and Practice. *Meridian: A Middle School Computer Technologies Journal*, *6*(2).

Livingston, A. (2009). The Revolution No One Noticed: Mobile Phones and Multimobile Services in Higher Education | EDUCAUSE. *Educause Quarterly*, *32(1)*. Retrieved from http://er.educause.edu/articles/2009/3/the-revolution-no-one-noticed-mobile-phones-and-multimobile-services-in-higher-education

Luka, M. K., & Frank, I. a. (2012). The Impacts of ICTs on Banks A Case Study of the Nigerian Banking Industry. *International Journal of Advanced Computer Science and Applications*, *3*(9), 145–149.

McMahon, M. (1997). Social constructivism and the World Wide Web-A paradigm for learning. In *paper presented to ASCILITE conference. Perth, Australia.* Australia.

Mergel, B. (1998). Instructional Design & Learning Theory. Retrieved from http://www.usask.ca/education/coursework/802papers/mergel/brenda.htm

Mojaye, E. M. (2015). Mobile Phone Usage Among Nigerian University Students and. *Global Journal of Arts Humanities and Social Sciences*, *3*(1), 29–38.

National Bureau of Statistics Nigeria. (2012). *2012 NATIONAL BASELINE YOUTH SURVEY Final Report*. Retrieved from www.nigerianstat.gov.ng/pages/download/191

NCC. (2014). *2013 Year-End Subscriber / Network Data Report for Telecommunications Operating Companies in Nigeria*.

NPC, N. P. C. (2006). *Federal Republic of Nigeria: 2006 Population and Housing Census*. Abuja. Retrieved from http://www.ibenaija.org

Nwankwoala, H. N. (2015). An Investigation of Lecturers ' and students ' use of ICTs in Nigerian university education as a panacea for national development, *5*(20), 167–176.

Okeke, I. E., Oghenetega, L. U., & Umeji, E.. (2014). Availability and Uses of ICT Facilities among Students in Faculty of Social Science, Madonna University, Okija. *International Research: Journal of Library and Information Science*, *4*(2), 346–356.

Okonedo, S., Azubuike, F. C., & Adeyoyin, S. O. (2013). A Survey of the Awareness and Use of Web 2. 0 Technologies by Library and Information Professionals in Selected Libraries in South West Nigeria, *2*(4), 61–68. http://doi.org/10.5923/j.library.20130204.01

Olatokun, W. M. (2007). Availability, accessibility and use of ICTS by Nigerian women academics. *Malaysian Journal of Library and Information Science*, *12*(2), 13–33. http://doi.org/Article

Ololube, N. P. (2006). Appraising the relationship between ICT usage and integration and the standard of teacher education programs in a developing economy. *International Journal of Education Development Using ICT*, *2*(3). Retrieved from http://ijedict.dec.uwi.edu/viewarticle.php?id=194&layout=html

Omotosho, A. O., Lateef, E. B., Amusa, O. I., & Bello, T. O. (2015). Information and Communication Technology Adoption and Use Among Students Of A Nigerian University For Distance Learning. *Library Philosophy and Practice(e-Journal)*, (AUGUST 2015).

Osabuohien, E. S. C. (2008). ICT and Nigerian Banks Reforms: Analysis of Anticipated Impacts in Selected Banks. *Global Journal of Business Research*, *2*(2), 67–76. Retrieved from http://eprints.covenantuniversity.edu.ng/166/1

Osang, F. B., Tsuma, C., & Ngole, J. (2013). Prospect and Challenges of Mobile Learning Implementation in Nigeria: Case Study National Open University of Nigeria (NOUN). In *International Conference on ICT for Africa.* Retrieved from http://www.ictforafrica.org/attachments/section/4/ict4africa2013_submission_50.pdf

Owusu-Ansah, C. M., Gontshi, V., Mutibwa, L., & Ukwoma, S. (2015). Applications of Social Media and Web 2.0 for Research Support in Selected African Academic Institutions. *Journal of Balkan Libraries Union*, *3*(1), 30–39. http://doi.org/10.16918/bluj.77572

Shih, R. C. (2011). Can Web 2.0 technology assist college students in learning English writing? Integrating Facebook and peer assessment with blended learning. *Australasian Journal of Educational Technology*, *27*(5), 829–845. http://doi.org/10.14742/ajet.v27i5.934

Tella, A., Tella, A., Toyobo, O., Adika, L., & Adeyinka, A. (2007). An Assessment of Secondary School Teachers Uses of ICT ' S : Implications for Further Development of ICT ' S Use in Nigerian Secondary Schools. *The Turkish Online Journal of Educational Technology*, *6*(3), 5–18.

Weller, A. (2013). The use of Web 2.0 technology for pre-service teacher learning in science education. *Research in Teacher Education*, *3*(2), 40–46.