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UPTAKE OF INTERACTIVE WHITEBOARD BY SECONDARY SCHOOL TEACHERS IN A NIGERIAN CONTEXT

By

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Abstract

The use of educational technology device in teaching and learning has emerged over the years, in the Nigerian education system. Despite their affordances and usage in some of the secondary schools, many teachers find it difficult to integrate ICT related tools especially, Interactive Whiteboard (IWB) in their classroom activities. The 21st century teachers teaching in the developing countries in Africa, particularly in Nigeria, face some challenges in the area of effective use of IWB in their classrooms. This study investigates the uptake of Interactive Whiteboard and examine the influences of teachers' prior ICT experience as well as their perceptions on the use of IWB. This study employed qualitative research design with 7 teachers to ascertain the teachers' perceptions and use of IWB in teaching through observation and interview techniques. The data collected was analyzed by using qualitative and quantitative (triangulation or mixed) methods of data analysis. Simple percentage was used for the quantitative findings while thematic based approached was applied for the qualitative data obtained. The finding revealed that teachers with prior ICT experience have positive perception towards the use of IWB in teaching. In addition, the prior ICT experience of the teachers seem to have influenced the use of IWB.

Keywords: IWB, Prior ICT Experience, Teachers' perception, Technology device

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Chapter 1

1.0 Introduction

The significance of using digital devices in the education system cannot be over emphasized. The roles it plays in the field of teaching and learning is now superseded the traditional instructional aid (Suman & Sinha, 2013), it gains increasing popularity around the globe (Betcher & Lee, 2009; Kivunja, 2015). Some researchers states that, technological development have change many human activities according to today's technological demands (Monge & Contractor, 2003). Information and communication technology devices have been integrated into teaching and learning activities to optimize the business of education in many parts of the world (Onasanya, Shehu, Oduwaiye, & Shehu, 2010). By and large, the acceptability of technology is far-reaching and yet its predicament in the present day educational policy of many developing countries like Nigeria, is still at stake (Rosen & Weil, 1995; Thierer, 2000), (Aduwa-Ogiegbaen & Iyamu, 2005). An observation was made by researcher that, over the years, the federal government of Nigeria has initiated or adopted many ICT related policies aimed at guiding the development of the sector and harnessing its power for national development (Yusuf (2005a). Nigeria, like other developing countries in Africa faces the inevitability of the fast technological and market convergence of the global ICT industry (Evoh, 2007; Okoli, 2011). Therefore, there is needs to introduce new ICT policy frameworks to accommodate, reflect, and maximize the potential of ICT tools for national development (Yusuf, 2005a). The reality of ICT convergence has not yet been reflected in Nigeria, where the institutions that regulate and/or develop the ICT sector still function as distinct actors in the industry, without much coordination. (Yusuf, 2005a). Though, there had been significant enthusiasm in the last decade, especially with regards to mobile technology, however, lack of industry convergence in the Nigerian ICT industries has resulted in fragmented policy implementation largely due to insufficiency in the management resources (harmonization, 2012).

Similarly, the Nigerian government has stepping effort to make ICT become an integral part of the educational system of the country and this effort echoes through its ICT policy on education, the policy has begun to be implement and to an extent some universities and colleges are able to integrate some aspects of educational technology into classroom practice, though, the Nigerian national policy for Information Technology review, 2005 states that; "Information Technology (IT) is the bedrock for national survival and development in a rapidly changing global environment, and challenges us to devise bold and courageous initiatives to address a host of vital socio-economic issues such as reliable infrastructure, skilled

human resources, open government and other essential issues of capacity building" (Yusuf, 2005a).

Moreover, the Nigerian government provides basic infrastructure to the educational sector of the country in order to integrate ICT into primary, secondary and tertiary institutions. In other word, this provision is an attempt of translating the National policy on education of the Federal Republic of Nigeria, 2004 which stated that; *"Government will provide basic infrastructure and training at the primary and junior secondary levels, ICT has been made a pre-vocational elective, and is a vocational elective at the senior secondary school"(Yusuf, 2005a);*(Olatokun, 2006). Furthermore, the Nigerian national ICT Policy on education categorically states that if the policy is fully implemented, it will effectively promote teaching and learning activities in the educational industry of the nation, in order for the Nigerian government to actualize the dream and aspiration of integrating ICT into the classroom, therefore, it is paramount for the government to provide the necessary infrastructure and train the staff of educational sector in the country, in addition, government should develop a pool of IT engineers, scientists, technicians and software developers; increase the availability of trained personnel; provide attractive career opportunities; develop requisite skills in various aspects of IT; develop made in Nigeria software to earn foreign exchange; to develop domestic computer components as observed by (Olatokun, 2006). Nigeria formulated an ICT policy strategy as reported in the study which include:

"making the use of IT mandatory at all levels of educational institutions through adequate financial provision for tools and resources; developing relevant IT curricula for the primary, secondary and tertiary institutions; A virtual university system shall be established; encouraging IT companies with appropriate incentives to compel them to invest in education and training through certification for tax rebates through existing government bodies experienced in such matters such as the Industrial Training Fund (ITF) and Centre for Management Development (CMD); establishing study grants and scholarships to deserving Nigerians; promoting "Training the Trainers" scheme using existing establishments such as the National Youth Service Corps (NYSC), the National Directorate of Employment (NDE) to boost capacity building in IT; empowering IT institutions and development centres to develop IT capacities initially at zonal, state and local levels; facilitating the growth of private and public sector dedicated primary secondary and tertiary IT educational institutions" (Adewole & Fakorede, 2013)

Despite governments' commitment, observations were made that, there are many factors that are militating against the actualization of the policy at the school

and classroom level. Some of the factors identified includes inadequate supply of infrastructure, electricity, internet connectivity, man-power skills as well as funding (Aduke, 2008). Nigerian educational system has succeeded in partial integration of Information and Communication Technology (ICT) despite the hindrance, Government on its part provided some infrastructural facilities such as computer laboratories (Akintunde, 2006), internet connectivity (Harward et al., 2008; Oyelaran-Oyeyinka & Adeya, 2004). This research study focus on new technological device called Interactive Whiteboard (IWB) which is a new technological device introduced to the educational system of the study area. The device has embedded with features which can bring interaction among students during teaching and learning and it enhances collaborative learning. in addition, it improves collaboration amongst the learners, it shapes and brings more opportunities to the educational practice. Similarly, very few secondary schools in the study area have Interactive Whiteboard (IWB) in their classes (Aduwa-Ogiegbaen & Iyamu, 2005). most especially in Borno state, Consequently, most teachers are not familiar with this new device (IWB) and are not optimally using the IWB in teaching and learning business (B. A. Mustapha & Gabasa, 2010).

Research study indicated that a new illiteracy, also known as computer illiteracy, which encompasses the schools to make provision for digital devices such as computers and train personnel to handle the educational content for successful delivery in a digital way (Poole (1996).

The new literacy is now the focus of the developed nations and it is considered to be the computer know-how (Hoffman & Blake, 2003; Shapiro & Hughes, 1996). Few research study made the developing nations to emulate the developed countries around the globe by encouraging the new literacy among its schools (Rose & Straub, 1998). There is a strong belief and clear evidence shows that computer can enhance instructional processes by helping students to have easy access to learning (Aduke, 2008; Orr, 2008; Warschauer & Healey, 1998). In addition, the 21st century teaching in the developed nations seems to promote student engagement, increase collaboration between teachers and their learners'. Yet little is known compared to the developing countries like Nigerian educational practice (Tella, Tella, Toyobo, Adika, & Adewuyi, 2007). Moreover, in this aspect Nigeria is seem to be face some challenges as well as in the area of integrating ICT into the education sector (Tella, Tella, Toyobo, Adika, & Adewuyi, 2007). Despite the laudable ICT policy on education implemented by Nigerian government, still the effective utilization of technological tools in the classroom is very low (Aduke, 2008).

Number of research study have reported that, digital tools enhance and facilitate instruction (Burnett, 1994; Fitzgerald & Werner, 1996). Furthermore, a researcher maintain that the application and integration of ICT into the classroom is paramount for the purpose of enhancing more opportunities for the learners to acquire and utilize the vast knowledge in the field of digital technology (Aduke (2008). Some research study claim that, digital technology tools could make learning more successful and fruitful (Siemens, 2014). Another research study states that, how digital technology tools play an important roles in the classroom, the study concluded that teachers who had experience of using ICT emphasized on how it makes students active and control their studies with it (Hakkarainen et al. (2000).

Furthermore, digital technologies, also identified hardware and software as application tools as well considered as the basic components of all digital tools used in the classroom setting (Scheffler & Logan, 1999). The potentialities of digital tools over the years have dramatically changed the educational setting to increase the teaching and learning practice (Al-Faki & Khamis, 2014). Today's leaners are regarded as digital age learners or 21st century learners' due to the availability and easy access to technology both at home and in the school respectively (Beetham & Sharpe, 2013; Siemens, 2014); (Kivunja, 2015). These have made learning more interesting and motivating to both learners and teachers, moreover, learners today, have grown up in a world where digital tools are very common, the learners are expected to learn in an environment that reflects their lives and their futures (Beetham & Sharpe, 2013; Siemens, 2014). Researchers have now shifted their focus from studies of individual thinking and began to concentrate on how people solved problems in groups using different digital tools and machines with the zeal of assisting collaborative learning (Beetham & Sharpe, 2013). Present day ICT has infiltrated the globe at an exceeding pace making information to be readily available from many sources (Fraser, 2015). Learners in this digital age can learn independently with little effort from teachers who could only serve as pace setters (Kennewell, Tanner, Jones, & Beauchamp, 2008).

The hindrance of ICT integration in the education sector may lead to the failure to meet the yearning and aspiration of the 21st century learners (Hennessy, Wishart, et al., 2007; Khan, Hossain, Hasan, & Clement, 2012).Successful use and integration of educational technology in our schools probably depends upon the teachers' capabilities to facilitate interaction among the students (Ajayi, 2008; Kwache, 2007). However, many Nigerian teachers are said to have less prior ICT experience in using technologically driven pedagogy approach in their classrooms (Tella et al., 2007; Yusuf, 2005c). Consequently, this may hinder effective integration of many technology tools especially IWB (Aduwa-Ogiegbaen &

Iyamu, 2005). Moreover, the factors militating against the full implementation of ICT in Nigeria may include funding, inadequate infrastructure, lack of manpower and skills, inadequate application of technological tools for effective use in the classroom and level of teachers technological know-how (Esharenana, 2010).

Despite the fact that the Nigerian government invested heavily in the educational sector of the country and the budgetary allocation of educational sector in Nigeria has kept on increasing year in year out, but, the full implementation of ICT in Nigerian secondary schools has not yet been realized due to high level of corruption (Jones, Beynon-Davies, Apulu, Latham, & Moreton, 2011). The actual funds release for intended projects are hardly spent, rather it goes to the pockets of some few individuals who are assigned to execute particular projects, unless the government takes some necessary measures to wipe out the corrupt practices among such individuals from the system for actualizing the implementation of ICT in the Nigerian schools may not be realized (Nwabuzor, 2005).

Several number of researchers identified that, to fully integrate ICT into the educational sectors, provision of infrastructure is paramount, further maintain that, globally technology evolution, certainly has unmarked Nigeria's insufficiency in the area of technology infrastructure development and the use of ICT, many technologically advanced nations around the globe are fostering new technologies that will develop the 21st century as well as program digital age learners for technological advancement demands, Nigeria and some developing nations are emulating developed countries to gear up to meet the inadequate ICT infrastructure (Greenhow, Robelia, & Hughes, 2009); (Arikpo, Osofisan, & Usoro, 2009). Lack of infrastructure could dwindle the use of ICT in Nigerian secondary schools (Asogwa, Ugwu, & Ugwuanyi, 2015).

Lack of manpower and skills are major challenges that affect integration of ICT into Nigerian schools. Some of the schools are partially equipped with infrastructure but the skills of manpower to run such facilities is the question (Igun, 2005). Therefore, there is need to train personnel to overcome this problem. Most of the technology tools used in Nigerian schools today, for example, overhead projector (OHP), slide and sound projector, film streaming and opaque projector and so on do not seem to be up-to-date and some may be obsolete compared to the 21st century digital age tools like, podcasts, Voicethreads, Myspace, skype, YouTube, blogs, Wikipedia, IWB among others (Robin, 2008). Today's learners are more acquainted with technology than their instructors, learners grows up in a digital society where technology becomes the order of the day (Al-Faki & Khamis, 2014). To integrate 21st century digital tools in Nigerian schools, there is every need to provide the required infrastructure as well as manpower and skills to fully

implement and optimally use them, since many Nigerian teachers seem to have less prior ICT experience (Rosen & Weil, 1995). There is need for human capital training that will assist teachers to use the tools in the classroom (Bingimlas, 2009). However, the absence of the ICT may dwarf full scale of acceptance of ICT into the Nigerian educational sector, most especially, among secondary school teachers. Despite the fact that digital technologies have a notable effect on all areas of human endeavor, especially the educational sector of any developing country like Nigeria, it is not yet fully harnessed (Ben & Ashang, 2013). The application and use of digital technology tools in Nigerian secondary schools will bring more benefits to the students and make them potentially active in their studies and improve the standard of education system toward economic building of the country (Goshit, 2006).

Since the successful integration of ICT into the classroom depends upon the competencies and experiences of teachers and how they operate the particular technology device, teachers' prior ICT experience and how they can integrate IWB into classroom seems to be the focus of the study. Thus, this study investigates the prior ICT experience of teachers, how it influences the use of IWB as well as teachers' perception on the use of IWB.

1.1 Statement of Problems

Many young learners enjoy new things as part of teaching and learning business (Gee, 2005). Therefore, integrating new teaching tools may promote learners interest – thereby making learning easy and motivating (Torff & Tirotta, 2010). Despite many new digital tools for instruction in classroom, not many are fully tapped in Nigerian schools (Smaldino, Lowther, & Russell, 2008; Weigel, 2002; Aduwa-Ogiegbaen & Iyamu, 2005; Igwe, 2005). IWB is considered by many studies as effective instructional device which integrate multimodal interface in teaching and learning. This considers all the learners' interest and learning characteristics (Biggs & Collis, 1991; Kress, 2001; Moreno & Mayer, 2007). Many research studies reported that, educational institutions in the developed world, the use of IWB became part of the classroom instructions (Beauchamp, 2004; Betcher & Lee, 2009; Domingo & Marquès, 2011; Gillen, Staarman, Littleton, Mercer, & Twiner 2, 2007; Higgins et al., 2005; Knight, Pennant, & Piggott, 2004; Mercer, Hennessy, & Warwick, 2010; Sharma & Barrett, 2011). Despite its pedagogical and practical importance IWB is yet to be fully implemented in the Nigerian secondary schools (M. A. Mustapha, Wali, & Ali, 2015; Zevenbergen & Lerman, 2007). Also there is no much research on its impact on the school instruction in Nigeria (Chijioke, 2013), especially in the study area (Borno State) (M. A.

Mustapha, Wali, & Ali, 2015). Therefore, this study will investigate the use of IWB in secondary school setting in Borno state, Nigeria.

1.2 Objectives of the Study

i. To examine teachers' prior ICT experience
ii. To determine teachers' perception on the use of IWB in teaching.
iii. To investigate the uptake of IWB by secondary school teachers.
iv. To examine the influences of teachers' prior ICT experience on the use of IWB in teaching.

1.3 Scope of the Study

This research work is limited to Model Secondary School Kashim Ibrahim College of Education, Maiduguri-Borno State-Nigeria. Data for the study is also limited to the year 2016. It focused on the ability and acquaintance of teachers to use educational technology device in lesson delivery. The lessons considered for the studies last for about three (3) months, and in each month a teacher conducts four (4) lessons using the technology device (IWB) totaling twelve (12) lessons per teacher.

1.4 Significance of the Study

This research work will add to the number of literatures on the use of educational technology device in secondary schools. It will also furnish policy makers with data on whether teacher's skills about using the IWB are up to date or not. Apart from extending the frontier of research on education technology usage in secondary schools, this study will also create avenue for academic discussion.

The findings of this research are intended for the use by the ministry of education official who formulates educational policies and procedures, the school administrators, who are the managers of schools' human and material resources and the teachers who are at the centre to actualize educational purpose.

The ministry of education and all educational practitioners would benefit from the work to reappraise its policies from time to time when the importance of ICT become clear to them, and this can result to laying more emphasis on ICT in the school curriculum. The students who are the recipients of the school curriculum will see the importance and need to become digital literate.

This research will also help teachers to have a better understanding of individual's needs and demand of their profession and the teacher will have a broader view and idea as to its role in enhancing effective learning through the use of IWB in secondary schools.

Lastly the outcome of this research work will be of great benefits to any researcher who may like to conduct research on a similar topic.

1.5 Operational Definitions

For the purpose of clarity and understanding, certain terms used in this research were defined.

MSKICOE: This is an acronym for; Model School Kashim Ibrahim College of Education

Uptake of educational technology device: This refers to the way in which digital tools are optimally use in educational setting.

Teachers: This referred to any person who is capable of impacting knowledge in a school. In Nigerian content the minimum qualification for teaching is Nigeria Certificate in Education (NCE).

Model school: a designated or classified school usually operated under the supervision of tertiary institutions, especially, Universities and Colleges of education of teachers training in Nigeria used as a model in organization and methods of teaching.

Educational Technology device: Any information and communication technology (ICT) related tools means for teaching in the educational programmes.

Interactive whiteboard: is an electronic board, which has sensitive screen use for teaching and found in most of the 21st century smart classrooms

Prior ICT experience: This refers to the teachers who have previous knowledge on the use of Information Communication Technology tools otherwise they received formal training on the use of ICT tools in teaching activities.

Chapter 2

2.0 LITERATURE REVIEW

In this section, some related literatures of past scholars were reviewed.

2.1 Teachers' prior ICT experience and the use of IWB

Recent study shows that digital technology device (IWB) in Nigeria have the potential to revolutionize the quality of teaching and learning when fully integrated into the classroom (source). The teacher plays a major role toward the integrating the new technologies. Yet, the factors militating the teachers' in using ICT related tools in the classrooms are their readiness and confidence, the efficiency and the gain of this technology tools geared towards the learners in attainment of their objectives (Passey, Rogers, Machell, McHugh, & Allaway, 2004). Many research studies indicates that, despite the potentialities of ICT identified, but its effective integration in teaching and learning business could be influenced by teachers' prior ICT experience, skills and competence of usage of ICT in their day-to-day classroom activities (Butcher & Wilson-Strydom, 2008; Olalere & Taiwo, 2009; Ben & Ashang, 2013; Kennewell & Beauchamp, 2007). However, some research study Supported that, there are evidences indicating that most teachers who have the knowledge and skills competence still partially integrate ICT in their teaching (Moursund & Bielefeldt, 1999). The teacher's characteristics such as experience and level of computer literacy and experience with the ICT tools for teaching and learning can influence integration of technology tool such as IWB (Buabeng-Andoh, 2012). Teachers with ICT experience have more opportunities to use and integrate technology tool into teaching and learning in the classroom activities, but teachers' readiness and preparedness to use ICT tool (IWB) into teaching environment seems to promote the effectiveness of the technology tool and not present in the classroom (Schiller, 2003).

Furthermore, some research study claims that, lack of competence and inexperience teachers are often drawback ICT to traditional learning pedagogy (Kreijns, Vermeulen, Kirschner, Buuren, & Acker, 2013) . Therefore, level of teacher's experience can determine the influence and integration of ICT tools positively to teaching and learning adequately (Russell & Bradley, 1997). Moreover, the successful initiation, implementation and integration of technologies tools in school's curriculum depends strongly on the teachers' experience and capability to facilitate how to use the particular technology tool, it is believed that if teachers perceived technology programs as neither fulfilling their needs nor their students' needs, it is likely that they will not integrate the technology into their teaching and learning. Among the factors that influence successful integration of ICT into teaching are teachers' experience and background towards the use particular technology technology, teachers' experiences are positive toward the use of technology tool then they can easily provide useful insight about the adoption

and integration of such technology into teaching and learning processes (Hew and Brush, 2007; Keengwe and Onchwari, 2008)..
Teachers' ICT experience relates positively to their ICT background, those teachers who possesses the experience of ICT may likely exhibit positive attitudes towards the usage of ICT tool (IWB) (Rozell & Gardner, 1999). Positive ICT attitudes are expected to foster technology integration in the classroom. Research study indicates that, "for successful transformation in educational practice, user need to have experience toward the innovation" (Woodrow, 1992; Van Braak, Tondeur & Valcke, 2004).

Teachers with ICT background is paramount for the success of integrating technology into the classroom, considering the importance of teachers technological experience in implementing teaching with technology device (Koehler & Mishra, 2009). However, new technology came with new way of operation and thus poses challenges to teachers with no prior ICT experience to use technology in classroom activities, perhaps, teaching is a complex activity that requires an integration of different experiences and skills to be successful (Koehler, Mishra, and Cain, 2013). One of the skills for effective teaching and learning is considered to be skills in technology (Hew & Brush, 2007). ICT skills could promote effective teaching at the part of the teacher, "the expert teacher needs to make creative links between what is being learned (content), how it is taught (pedagogy), and the appropriate tools (technology)", teachers need to relate their mastery of subject matter to the technology use in their classrooms, teachers with prior ICT experience may be a factor in full implementation of ICT into the classroom (Koehler, Mishra, & Cain 2013).

Some researchers provide definition of the ICT as, "being able to handle a wide range of varying computer applications for various purposes" (van Braak et al., 2004). Teachers' ICT competence is largely determinant of integrating technology tool in teaching and learning. Number of evidence suggests that, "most of the teachers who reported negatively or neutral attitude towards the integration of ICT into teaching and learning processes lacked knowledge and skills that would allow them to make "informed decision" (Berner, 2003; Na, 1993; Summers, 1990; Aloteawi, 2002; Bordbar, 2010: p.253).

This largely consider how the teachers use particular technology tool for a particular context for successful delivery of their lessons, teachers should embrace the Technology Pedagogy Content Knowledge. According to a study by Koehler, Mishra, and Cain (2013) described TPCK as "the basis of effective teaching with technology, requiring an understanding of the representation of concepts using technologies; pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and

how technology can help redress some of the problems that students face; knowledge of students' prior knowledge and theories of epistemology; and knowledge of how technologies can be used to build on existing knowledge to develop new epistemologies or strengthen old ones". Furthermore, another research study, which described TPCK as "a framework for teacher knowledge and technology integration" (Mishra and Koehler 2006). In the 21st century, ICT comes up with new direction in learning on how to process and access knowledge in the field of all educational endeavors information technology also polish ways in which methods are used to engage students (Koehler, Mishra, and Cain (2013).

Some researchers observed the use of IWB by teachers in their studies and reported the frequency and purpose of using IWB in their lessons (Higgins et al., 2005). IWB is employ in uptake, repeat, or probing questions in teachers during lessons. Moreover, IWB is used in direct teaching and questioning of the whole class as well as facilitate classroom discussion, despite these Aduke (2008); Walker (2002b) lamented that some teachers in spite of the presence of IWB in their classes, they prefer using traditional talk-chalk. This is a practice among many Nigerian classroom teachers (Aduke 2008; Walker 2002). On the contrary, many researchers in the field of education most widely accept and say their minds on the benefit of incorporation of ICT to teaching and learning (Demetriadis et al., 2003; Galanouli, Murphy, & Gardner, 2004; Zhao & Cziko, 2001). Use and integration of IWB in the classroom perceived to be positive to many teachers and students as well encourage effective teaching and learning activities (Kearney & Schuck, 2008; DiGregorio & Sobel-Lojeski, 2010; Whyte, Beauchamp, & Hillier, 2012). Moreover, use of IWB belief to be motivating and ease teaching and learning (Glover, Miller, Averis, & Door, 2005). Proper integration of ICT into the classroom, it may enhance interaction between the teachers and students (Smith, Hardman, & Higgins, 2006)

2.2 Use of IWB by Secondary School Teachers

What is interactive whiteboard (IWB)?

Many researchers point out that, Interactive whiteboard is one of the technology tool emerged in teaching industries over the years, IWBs initially known for office use, especially for, conferences and meetings, however, later its importance was identified as an instructional aid which facilitate teaching and learning in the classroom setting; and this made it a popular teaching technological device in the educational sector, Similarly, others regarded this technology tool as SMART Board/electronic or whiteboards. This tool has the capability of

connecting both computer system with data and a projector, multimedia through it interactive tools which embedded within it pictures in the computer can be cast on the IWB by means of a multimedia projector, the cast picture can easily be controlled and manipulated by the user via a software which is already installed to the computer system, there are two techniques of IWB namely; computer control and writing techniques. A pen/stylus, acts as a mouse while a tab as a mouse is said to be computer control technique. When in writing technic, the pen/stylus functions as actual writing implement. Similarly, the IWB is also a digital device or tool that supports teaching and learning and enhances collaboration between the teacher and h/her students. (Manny-Ikan, Dagan, Tikochinski, & Zorman, 2011). IWB supersede the functions of traditional instructional aids known as chalkboard/blackboard and it is widely used around the globe for the purpose of teaching and learning that support collaboration (Armstrong et al., 2005; Betcher & Lee, 2009). The Interactive Whiteboard provides opportunity for the creation of collaborative and interactive learning through it embedded features with experienced teachers who are capable in manipulating the resources (ibid). Furthermore, teachers use IWB for different purposes and these will give teachers more benefits, such as illustration and presentation of different content through internet resources as in multimodal, these will help the students to visualize their learning through motivation and engagement. Furthermore, some researchers reported that Interactive whiteboard, comprises of a computer, data projector and display screen that gives a large sensitive interactive display; and it is connected to a computer system and a projector, the projector displays pictures from a computer unit unto the screen, on the board of IWB, users can drag and animate objects, select text, save and retrieve back the work, further, maintained, the users can connect IWB to the Internet through the installed software on the system and It has special embedded features which the user of IWB can write, draw and make some manipulation with special pointer pens or illustrate with fingers by using the interactive tools in it (Zheng (2002); Morgan (2010); Faiella (2012). Several researchers claim that, to manipulate IWB users should have an ICT background, further maintained that, the IWB also popularly known as a new digital technology tool for instruction in the 21st century, that facilitates teaching and learning and also considered as one of the emerging technologies, the interactive whiteboards give more advantage to teachers and students to relate with technology in a manner that was not previously possible (Slay, Siebörger, & Hodgkinson-Williams, 2008); (Min & Siegel, 2011). The touch-sensitive board allows users to interact directly with applications without having to be physically at the computer which is projecting the image onto the board, providing two-way interaction between the teacher or student and the medium, further agreed that, many teachers use IWB for different purposes to achieve their predefined content objectives ((Kennewell &

Beauchamp, 2007); Hadlevik, 2014). Some of the purposes for the use of IWB by teachers; are for illustration, questioning and presentation of lesson (Higgins et al., 2005). It increases the learners' ability to participate in a particular subject, this in turn engage and promote the practicality of IWB amongst the learners by means of collaborative learning in the classroom setting (Hennessy, Deaney, Ruthven, & Winterbottom, 2007; Kearney & Schuck, 2008; SERIN, 2016; Whitby, Leininger, & Grillo, 2012). Some studies observed that, Interactive whiteboards are a popular technology and are in high demand by schools and practitioners, perhaps it offer transparent benefits to learning and teaching (Lee, 2010). It is easy for institutions and teachers to recognize how IWBs enrich and enhance learning and teaching something which may not always be so immediately transparent to practitioners in the case of other technologies (Lee, 2010; Lee & Finger, 2010; Morgan, 2010). Furthermore, the IWB is a digital device or tool that enhance teaching and support learning (Bullock, 2013; H. J. Smith, Higgins, Wall, & Miller, 2005; Winzenried, Dalgarno, & Tinkler, 2010) and it brings about effective collaboration between teachers and students, IWB undermine the functions of traditional instructional aids known as chalkboard/blackboard and it is widely used around the globe for the purpose of teaching and learning process (Armstrong et al., 2005; Slay, Sieborger, & Hodgkinson-Williams, 2007).

The use of IWB by secondary teachers' in the classroom is not new in most of the technologically advanced countries, like the United Kingdom, the United States of America, France and Germany and even some parts of Asia for the past decades, (Cox, Cox, & Preston, 2000; Smaldino et al., 2008). research on relevant literatures about uptake of educational technology devices have revealed that the importance of technological tools has come a long way in the history of education (Leidner & Jarvenpaa, 1995). Some researchers asserts *that, "Since the mid-nineteenth century, the classroom has become home to a succession of technologies (e.g. textbook, chalkboard, radio, film and television)" p2*. This indicates that technology has continued to play an important role in the classroom in the history of teaching and learning over the years, further states that, it has enhanced and facilitated teaching and learning for a long period of time Cuban (1986).

Several researchers describe that, ICT is considered as an important educational tool for many years, whither Nigerian educational system integrated this important tool? (Smaldino et al., 2008; Leidner & Jarvenpaa, 1995; (Ashcroft & Watts, 2005; Lal, 2007). Further studies revealed that the emergence of ICT has precipitated modern ways of teaching and learning in the Nigerian educational system (Ashcroft & Watts, 2005; Lal, 2007). Thus, one could say this has overtaken the traditional methods of teaching in the field of education of the past

decades (Smaldino et al., 2008; Leidner & Jarvenpaa, 1995). The traditional methods of teaching are regarded as a generation of use of chalk and blackboard which slowly paved way to the new direction in learning with Digital Technological tools (DTT) through the utilization of ICT resources (Gambari & Okoli, 2007). In addition, in recent times, new approaches to teaching and learning in the educational system in general are unavoidably framed from a constructivist viewpoint (Orlando, 2013; Taylor, Fraser, & Fisher, 1997). Constructivist learning theory viewed an individual's making sense of their experiences through the use of technology tools in the classroom settings (Brooks & Brooks, 1993). As such use of ICT in relation to constructivist viewpoint in teaching and learning provide an opportunity where learners have power to use their potentiality in learning, as well use of ICT seems very crucial for better educational training (Smaldino et al., 2008; Leidner & Jarvenpaa, 1995). Futher research maintained *"No nation can be great or rise above the quality of its educational system and no educational system can rise above the quality of its teachers" p.24-34*. The development of any nation depends on the quality of its educational system operated in that country (ibid). Therefore, technology tools enhance learning through collaborative learning, more so, the roles of technology in education is practical; and it may promote teaching and learning, many scholars concluded that using technological tools could contribute immensely towards the development of the education system of the 21st century (McLoughlin & Lee, 2010; Nickerson & Zodhiates, 2013; Yildirim, 2000). In most of the technological advanced countries for example UK, USA, France Germany and some parts of Asia, there seems to be full integration and implementation of technological tools in their educational system (Buabeng-Andoh, 2012; Dawson & Rakes, 2003). Similarly, Nigeria is in the same spirit and it has a predefined goal to achieve full implementation and integration of ICT in the educational sector (Agbetuyi & Oluwatayo, 2012). Is the ICT tool optimally utilize in the Nigerian educational system? Though, the Nigerian government has made a laudable effort and shown commitment to improve the ICT skills of its citizens, and to bridge the digital divide by targeting Nigerian higher institutions (Federal Ministry of Education, 2007). In another study indicates that, yet the full scale implementation of ICT devices in the learning institutions are not up-to the desired expectation (Ramsden, 2003; Reynolds, Treharne, & Tripp, 2003; Säljö, 2010). There seems some hindrances for the scale implementation of ICT Nigerian institutions, describe that, Some of the factors hindering the integration of ICT in Nigerian schools as observed by (Aduke (2008); Aduwa-Ogiegbaen and Iyamu (2005). However, among many others technophobia and negative perception among teachers toward the use of ICT includes, computer illiteracy among secondary school teachers has hindered the integration of ICT in the classroom, In addition, many secondary school teachers hardly operate some of the ICT tools to

be used in the classroom (Aduke, 2008). Often, teachers prepare using talk-chalk rather than the ICT instructional materials provided (Walker, 2002a). Therefore, use of IWB by secondary school teachers should remain relevant and very important so as to deliver lesson presentation for the benefits of both students and as well the teachers, with clear researches indicating that it motivates and make the teaching and learning more organized.

2.3 Teachers' perception on the use of IWB

Many studies reported that the IWB have numerous impact on teaching and learning (Betcher & Lee, 2009; Cuthell, 2005; Glover, Miller, & Averis, 2004; Kearney & Schuck, 2008; Lee & Winzenried, 2009; Ostovar-Namaghi & Alinejad; Shi, Yang, Yang, & Liu, 2012; F. Smith et al., 2006; H. J. Smith et al., 2005; Türel & Johnson, 2012). A research study supported that, technology tools can improve teaching and learning (H. J. Smith et al., 2005). further studies point out that, technology tools can enhance teaching and learning, depending on how the impact of specific digital tools can be tackled in a specific teaching and learning contexts for attaining the desired objectives, the present elements may either restricts where absent or can be aided where available to the teaching and learning operation (Glover, Miller, & Averis, 2004; Kearney & Schuck, 2008; Lee & Winzenried, 2009). In addition, many researchers observed that, how teachers incorporate and use the technological device, IWB, could translate for its success in teaching and learning, which relates to a good indications that the prospects and promising features of IWB practically depend upon the teachers' capabilities and experiences of how they deliver particular learning contexts, Subsequently, maintained that, the use of IWB in the classroom can enhance interaction amongst the learners and retained teachers-students relationship because students can take charge of their studies by taking into consideration the sociocultural theory profounded by Vygotsky which gives more emphasis to constructivist learning, typically in the zone of proximal development (ZPD) as leaners centred (Huang & Chuang, 2012; Jonassen, Peck, & Wilson, 1999; Liang, Huang, & Tsai, 2012; Verenikina, 2010). In a related study, researcher concluded that *"The distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers"* (Vygotsky (1978) p.85). This shows that using IWB by teachers during lessons can increase engagement and interactivity amongst students, by allowing them to participate fully in a particular subject and to realize the potential benefits of the interactive whiteboard (Beauchamp & Parkinson, 2005; Butcher & Wilson-Strydom, 2008; Kennewell & Beauchamp, 2007; Olalere & Taiwo, 2009; Whyte et al., 2012).

Some researchers laments that, despite the fact that IWB is costly, it is one of the most revolutionary technology tools for instruction that is widely used in classroom setting in most of the developed countries, like the UK and the USA at different levels of their educational systems (Betcher and Lee (2009). Despite it is costly to obtain, many research studies have been reported that its impact and teachers' perception cannot be over emphasized with the respect to its practical importance to classroom settings (Gillen et al., 2007; Lee & Winzenried, 2009; Suman & Sinha, 2013). In addition, some researchers revealed in their study that, "Interactive whiteboard revolution" that *"IWBs are the first and, as yet, only digital instructional technology that all the teachers in a school are able to use in their everyday teaching"* (Betcher and Lee (2009). However, a contrasts assertion identified that, not many teachers in Nigerian schools could use IWB in their everyday teaching (Aduke, 2008). Similarly, the impact of IWB in teaching and learning seems to be very positive: Enhances student engagement; Effective visual representation; Learning via peer-to-peer with medium in classroom interactivity, when teachers use IWB features effectively it make teaching and learning efficient and successful (Beauchamp and Parkinson (2005); Winzenried et al. (2010).

Many researchers observed that. new pedagogy of teaching for the 21st century learners through the use of digital technology device provide multimodal (audio and visual) interface between the students and their teachers, this may promote effective delivery of content and evaluation of methods (Olofsson, Lindberg, Fransson, & Hauge, 2011; Ugochukwu, 2014). Further assert that, new digital technology device (IWB) has significant improvement towards teaching and learning, especially the technological advancement of developing country like Nigeria it seems not fully harnessed. (Roco & Bainbridge, 2003; Ben & Ashang, 2013; Onwe & Ezekwe, 2014)

Furthermore, according to some researcher the "applications of the IWB and the balance in its use by teachers and students had a direct effect on student engagement, though the same degree of effect was not necessarily consistent" (Winzenried et al.,2010).

In the last decade, IWB is consider as one of the recognized which bring technological change in the uptake of digital tools in the classroom settings, as well it is found in most schools in the developed nations around the globe (Betcher and Lee (2009). That make reference to teachers who are computer literate, unlike some developing nations like Nigeria (Slay et al., 2008);Esharenana (2010). Therefore, the perception of teachers in relation to IWB usage in the classroom is paramount, its relevance and aiding of the process in teaching and learning to

ascertain successful outcome. Teacher's computer illiteracy may negatively affect effective use of IWB in Nigerian schools.

2.4 Influence of Teachers' Prior ICT experience in using Interactive Whiteboard (IWB)

Considerable number of researchers reported that, modern education face a lot of challenges, especially, the effective use of technologies tools in the classroom (Adeyemi & Olaleye, 2010; Glover & Miller, 2001; Levin & Wadmany, 2008; Nwaocha, 2014). This attempts made at solving those problems that led to the new teaching and learning system through the use of digital tools (Bullock, 2013; Glover, Miller, Averis, & Door, 2007; Holmes, 2009; Littleton, 2010; Roco & Bainbridge, 2003). Some studies revealed that, the new methods and strategies in teaching and learning by using ICT through integration of digital tools involves the use of organized combination and utilization of teachers, materials, facilities, equipment and laid down procedures to achieve the desired instructional objectives (Kivunja, 2015; Koh & Divaharan, 2013; Lee & Winzenried, 2009; F. Smith et al., 2006). Furthermore, the instructional materials, instructional media and teaching aids virtually mean the same thing, they are media derived from communication technology revolution which can be used to promote the teaching and learning process (Bennett & Lockyer, 2008; Gillen et al., 2007; Wall et al., 2005; Gillen et al., 2007; Glover et al., 2007; Hanewald & Ng, 2010). The basic rationale for the use of educational technology device, especially the IWB, in the teaching and learning process, they possess the criteria to stimulate or influence learners through the auditory and visual control (Baek, Jung, & Kim, 2008; Beeland, 2002; Koh & Divaharan, 2013; Lee & Winzenried, 2009; Wall et al., 2005).

Uptake of ICT by pre-service teachers are determine by the following,

"The technology skills of teacher education faculty were comparable to the skills of the students they teach; and that, most teacher educators did not model the use of technology in their teaching. Thus, lecturers need to be inducted not only to be competent in using ICT but also in integrating them in instruction" p316-321.

Many research studies noted, that "This sharp rise in the use of ICT resources in the curriculum has been driven to a large extent by the adoption of interactive whiteboards (IWBs) and related technologies" P6. Therefore, teachers' computer literacy is paramount in the effective utilization of IWB in classroom, as well, some studies pointed out that the use of IWB depends upon the prior ICT experience of teachers that influence the delivery of context in the classroom (Alghamdi, 2013; Campbell & Martin, 2010; Rosen & Weil, 1995). However, Technology Pedagogy Content Knowledge is the believed to be as, use of IWB in classroom teaching faces some challenges and It is imperative to note that this research will also reflect on the technology pedagogy of content knowledge

(TPCK), which defined by various scholars in the field of instructional technology (Aduke, 2008; Al-Faki & Khamis, 2014); Jang (2010); Koehler and Mishra (2008); Mishra and Koehler (2006); Schmidt et al. (2009).

"basis of good teaching with technology and requires an understanding of the representation of concepts using technologies; pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems students face; knowledge of students' prior knowledge and theories of epistemology; and knowledge of how technologies can be used to build on existing knowledge and to develop new epistemologies or strengthen old ones".

Moreover, definition of "Technology knowledge (TK) has provided as: Knowledge about various technologies, ranging from low-tech technologies, such as pencil and paper, to digital technologies, such as the Internet, digital video, interactive whiteboards" (Koehler & Mishra, 2009).

The technological pedagogy and content knowledge (TPCK) framework guided this research to explore on the research question on how does the prior ICT experience of teachers influence the use of interactive whiteboard (IWB)? It is necessary for teachers to follow the TPCK guideline in using and handling IWB, similarly, TPCK guideline also helps teachers maximizing the benefits of ICT incorporation and can appropriately use IWB applications in the classroom (Dietrich, 2011). Teachers need to be trained on the TPCK framework for effective ICT implementation, to ensure equal access to educational opportunities and quality education for all, there must be wide range of education reforms, such reforms are not likely to succeed without addressing the new role or trend been played by teachers in preparing learners for an emerging knowledge-based and technology driven society, educators must have access to adequate training and benefit from on-going professional development and support, so that they can be motivated to use new teaching and learning strategies and techniques combined with information communication technology (ICT) (Parkay, Stanford, & Gougeon, 2010). This allows educators to have many options for: communicating, facilitating and enhancing teaching and learning (Gibbon et al., 1994; Kivunja, 2015; H. J. Smith et al., 2005). They noted that the society changes and becomes more complex as a result of new and innovative technology. Teachers need to train to handle the new innovative technology in classroom, therefore, there is need to introduce Innovative strategies and techniques to improve delivery methods of teaching in Nigerian schools. Consequently, upon the ever-increasing societal and educational needs, educators have sought the proper teaching and learning tools as

well as technology pedagogy content knowledge (TPCK) to improve, not only the teaching profession but also the learners higher level of thinking and problem solving skills for example, metacognition (Zevenbergen & Lerman, 2007).

2.5 Research Questions

This study investigates the experience of teachers in the field of educational technology during lesson, in order to identify their problems with integrating the technology device (IWB) into the classroom. The researcher in this study tried to answer the following questions:

i. What are the teachers' prior ICT experience?
ii. What are the perception of the teachers towards the use of IWB in teaching?
iii. How, when and why does the teachers use the IWB in the teaching process?
iv. To what extent does the teachers' prior ICT experience influence their use of IWB in teaching?

Chapter 3

3.0 Methodology

Methodology is the link that give shape for any research by introducing philosophical position based on ontology, epistemology and the strategies or tool that are used in carrying out the research. It is an instruction which help the researcher's experience throughout the study Cohen (2013). This chapter presents the procedure and method employed in conducting this research. The research design, participants, method of data collection, procedure for data collection and method of data analysis were presented.

Both quantitative and qualitative research, consist of an explicit that is audible, which mostly accorded with disciplined and has systematic approach to research problems, using the technique which is most appropriate to the research questions being asked (Hancock, Ockleford, & Windridge,1998). Most of the research in the social sciences such as (psychology, sociology and anthropology) have interest in studying human attitude and behaviour and the social world inhabited by human beings, which relate to difficulty in trying to explain human attitude and behaviour in quantitative method. People behave in a distinct ways and to understand how and why can only be determine by means of measurements. Qualitative research attempts to broaden understanding of how things happens the way they are in the social world (Hancock, Ockleford, & Windridge, 1998). To achieve a successful outcome of this study, the researcher employed qualitative methods of approach, this derived from methodology, ontology and epistemology. The study focus on uptake of interactive whiteboard by secondary school teachers and explore on how does the teachers prior ICT experience influence the use of IWB and their perception towards the use of IWB in teaching. The researcher adopted a position of interpretative; which deal with social world and trend as well view the relationship by discovering new things and collect data from the participants setting (Staff Model School) and prove by testing. According to researchers assert that, "Qualitative research is a situated activity that locates the observer in the world. It consists of a set of interpretive practices that make the world visible. These practices trans- form the world. They turn the world into a series of representations, including field notes, interviews, conversations, photographs, recordings and memos to the self" ((Richardson, Denzin, & Lincoln, 2000)). Purposely this researcher study employed qualitative approached to explain or make interpretation by naturalistic approach to the natural world. This study makes some investigation under natural setting and explore the findings by interpreting the phenomena from the data collected (Johnson & Christensen, 2008).

3.1 Research Design

Both qualitative and quantitative procedures was used to collect data required to solve the research questions. The instrument consists of observation and semi-structured interview. The qualitative (observation) data dealt with how, why and when teachers use IWB in their teaching. Quantitative (interview) which dealt with teachers' perceptions and their influence towards the use of IWB in teaching. The research design employed to the current study is most appropriate considering the method employed in the collection of the data. Moreover, a study that collected data through observation and interview are considered to be a qualitative research (Cohen, Manion, and Morrison (2013); Jamshed (2014)).

3.2 Research Participants

This study adopted a purposive sampling technique to obtain data on the uptake of interactive whiteboard device by secondary school teachers in Nigerian context. Denscombe (2014), describes the technique, operation on the principle that data obtain through concentrating on a small number of participants who are selected based on their characteristics on relevancy and knowledge. For this research, 7 secondary school teachers, who have ICT experience, were selected from a model secondary school in Nigeria. All participating teachers selected used interactive whiteboard in their teaching activities and have prior ICT experience. The researcher used a qualitative method of data collection to investigate prior ICT experience of teachers and their perception on the use of IWB in teaching.

3.3 Data Collection

The data for this research was collected through qualitative (observation) and quantitative (interview) methods. The researcher collected data has observed the teachers in classroom using a classroom observation checklist on the use of IWB during their lessons. In addition, after the classroom lesson period, the researcher interviewed the participatory teachers, employing a focus group approach. This method of data collection is purely a qualitative method as maintained by (Cohen et al., 2013; Creswell, 2013).

3.3.1 Classroom Observation Checklist (COC)

The observation was employed to identify how the participatory teachers use IWB during their lessons. This is to get first-hand information on the use of IWB by the teachers during their lessons; and this method is considered as appropriate to answer research questions formulated in this study (Cohen et al. (2013). Furthermore, classroom observation checklist (COC) contained two (2) sections, the first section contained 12 items with five (5) likert scale ranging from always = 5, often = 4, rarely = 3, seldom = 2, and never = 1 and the second section contained 18 items with yes/no likert scales respectively (Brown, Agree, & Disagree, 2010).

COC is a formative assessment to monitor participatory teachers' behaviour and progress towards reaching their predefined objectives (Burke, 2009). Classroom Observation checklist (COC) can best be describes as "a strategy to monitor specific skills, behaviours, or dispositions of individual students or all the students in the class" (Burke, 2009). COC is the tool to observe the lessons which answered the research questions on how, when and why the teachers employ the IWB during their lessons (see appendix 1).

3.3.2 Classroom Observation Procedure

The researcher conducted a classroom observation with the help of a research assistants to observe teaching of the participatory teachers using the technology device (IWB) during their lessons. The researcher trained the research assistants on the processes and procedures governing the conduct of the observation i.e. how to use the checklist. The participatory teachers are the subject teachers in the school; these teachers taught social studies, integrated science, civic education, mathematics, biology, chemistry and computer studies respectively in the school and during the periods of the observation as well. The school operation time is 7am to 2pm (7hrs) from Monday to Friday, the researcher and the 6 research assistants conduct observation each daily. Each teacher was observed for 45minutes which is the duration of the whole lesson. Also, each teacher was observed 12 times throughout the study period of three months, which means 1 lesson per teacher per week (84 lessons observation in all). The researcher tried to make the setting of the observation (in the classroom) look natural to the participatory teachers where the teachers teach their students using the school syllabus (the school textbooks). The researcher only introduced the IWB as an instructional aid. Making observation setting look somewhat natural which may make the participant to exhibit their natural habit and attributes (Cohen et al., 2013).

Classroom observation checklist was employed to assist the researcher to conduct the observation; this is use to observed the participatory teachers and other important noticeable teaching attributes like lesson objectives, lesson strategies, activities, delivery, classroom management, and student's engagement were all taking into consideration during the observation.

3.3.3 Interview Procedure

The interview was conducted after the classroom observation to ascertain how, when and why the teachers use the IWB during their lessons during the period of the study. The interview also elicits responses of the participatory teacher about their perception on the use of IWB. The researcher conducted a focus group

interview across 7 participatory teachers. The interview method was used to support the data collected through the observation. A semi structured interview questions was conducted with the teachers using a focus group approach after the classroom observation, which lasted for a period of three months of the study. Focus group interview is one of the qualitative method of approach in interview method. The teachers were briefed on the conduct and procedure of the interview. The interview focus on the teachers' prior ICT experience, perception, and their use of IWB during the teaching activities.

The interview was conducted within the school premises (computer laboratory). The centre was constructed purposely for computer lessons/practical, as at when the laboratory is free from lesson/practical the centre is mute and siren. Which is appropriate for conducting a focus group interview (Ritchie, et al, 2013). The interview lasted for about 35 minutes and the process is recorded, transcribed and group into themes (see appendix 2).

3.4 Method of Data Analysis

To analyse the data collected for this study, the researcher employed both qualitative and quantitative methods of data analysis. The study maintained that, qualitative and quantitative method of data analysis can be best described as triangulation method or mixed method (Jick (1979). This method is appropriate in social sciences and education (ibid). The qualitative analysis, data collected through the interview were analyzed using thematic-based method. A thematic – based approach according to Braun and Clarke (2006); Guest, MacQueen, and Namey (2011) Bulsara (2015) is a type of method strictly use for "identifying, analyzing and reporting patterns (themes) within data. It minimally organizes and describes the data set in (rich) detail. However, frequently it goes further than this, and interprets various aspects of the research topic" p79. The qualitative data in this research study answer research question 1, 2 and 4. For the quantitative analysis, data collected through the observation were analyzed using a descriptive statistic (simple Percentage %), in order to answer research question three (3).

3.5 Ethical Issue

The researcher followed appropriate channel to obtained permission and considers ethical issue on conducting this study, by writing a letter to the Director of the school to gain access to the school (see appendix 3), an approval was granted (see appendix 4). The participants were notified to give an audience to brief them on their roles in the research. The 7 teachers who participated in this research were provided with participant consent form before scheduling for a meeting with them. This was done to enable them read and understand the purpose of the study, have a

clear mind and identify their roles and rights to withdraw at any time. It was also to assure them that confidentiality and anonymity would be preserved, for that pseudonyms. This is supported by a study as stated as, "In the most radical understanding, all statements about the external world have such strong subjective elements that no shared observation can exist. The acknowledgement of the role of interactions between researchers and the object of the research poses many ethical issues; among others, whom to accept as a sponsor, how much to reveal about the research to the interviewees, how to protect their privacy, how to compensate them for their collaboration, how to keep them informed about the results of the research and how to avoid manipulation" (Richardson et al. (2000).

They were informed about the processes: audio recording of the interview. The participants agreed with the purpose of the research and the research procedure; and they all signed and returned the consent form (see appendix 5).

Chapter 4

4.0 Findings

This chapter presents the results and discussion of the data collected and analysed. The data were collected through both observation and interview. These data were analysed to answer the research questions. For research question one, data collected through observation were analysed and presented in table one and two to answer the research question. While for research questions two, three and four, data collected through the interview were analysed and presented to answer them.

4.4.1 How, when and why teachers use IWB in teaching

The classroom observation checklist was employed to identify how the teachers use IWB in the classroom, the researcher focusing on noticeable teaching attributes through the observation. Table 4.1 shows the observation on how the teachers' use IWB in teaching, while table 4.2 presents when and why teachers use IWB. Which answer research question one.

Table 4.4.2: How Teachers' Use of IWB in Teaching Secondary School Students

S/N	Classroom Observation checklist	Always F (%)	Often F (%)	Rarely F (%)	Seldom F (%)	Never F (%)
1.	Accessing internet	67(79.76 %)	9 (10.71%)	3 (3.57%)	5(5.95%)	0(0.00%)
2.	Student-student interaction	52 (61.90%)	20(23.81 %)	6(7.14%)	6(7.14%)	0(0.00%)
3.	Provide real pictures	35(41.67 %)	24(28.57 %)	11(13.10 %)	14(16.67 %)	0(0.00%)
4.	Provide audio sound	31(36.90 %)	27(32.14 %)	10(11.90 %)	14(16.67 %)	2(2.38%)
5.	Provide video	23(27.38 %)	31(36.90 %)	8(9.52%)	19(22.62 %)	3(3.57%)
6.	Internet failure	22(26.19 %)	30(35.71 %)	11(13.10 %)	18(21.43 %)	3(3.57%)
7.	Difficulty in uploading pictures	29(34.52 %)	26(30.95 %)	10(11.90 %)	16(19.05 %)	3(3.56%)
8.	Difficulty in playing video	29(34.52 %)	19(22.62 %)	17(20.24 %)	13(15.48 %)	6(7.14%)
9.	Difficulty in playing audio	29(34.52 %)	17(20.2% 4)	17(20.24 %)	9(10.71%)	12(14.29%)
10.	Life animation triggers student interest	28(32.33 %)	19(23.62 %)	16(19.05 %)	12(14.29 %)	9(10.71%)
11.	How frequent the teacher use the IWB	29(34.52 %)	24(28.56 %)	15(17.86 %)	9(10.71%)	7(8.33%)
12.	Power failure	27(32.14 %)	24(28.57 %)	14(16.67 %)	10(11.90 %)	9(10.71%)

Table 4.4.3 When and why teachers use IWB

S/N	OBSERVATION CHECKLIST	YES F (%)	NO F (%)
1.	IWB is used when questioning	67 (79.76)	17 (20.24)

2.	Teacher use IWB in direct questioning	73 (86.90)	11 (13.10)
3.	Teacher employ IWB in repeat questions	74 (88.10)	10 (11.90)
4.	Teacher use IWB for individual discussion.	60 (71.43)	24 (28.57)
5.	Teacher use IWB for whole class discussion.	60 (71.43)	24 (28.57)
6.	The Teacher use IWB for illustration	59 (70.24)	25 (29.76)
7.	The Teacher use IWB for pictorial topics	61 (72.62)	23 (27.38)
8.	IWB is used during lesson	63 (75.00)	21 (25.00)
9.	Teachers employ IWB for presentation of lesson	63 (75.00)	21 (25.00)
10.	IWB is used when summarizing	62 (73.81)	22 (26.19)
11.	Teacher employ IWB for evaluation of lesson	64 (76.19)	20 (23.81)
12.	IWB is used at the end of the lesson	62 (73.81)	22 (26.19)
13.	Help the teacher manage time	61 (72.62)	23 (27.38)
14.	The teacher seems motivated when he use IWB	64 (76.19)	20 (23.81)
15.	The learners seem motivated when IWB is used	58 (69.05)	26 (30.95)
16.	Enhances collaboration between the teacher and learners	70 (83.33)	14 (16.67)
17.	Enhance interaction between the teachers and students	62 (73.81)	22 (26.19)

4.4.4 Discussion

Table 4.4.2 reveals that, How teachers' use of IWB in Teaching Secondary School Students indicates that, most of the teachers tried to connect to internet while using the IWB during their teaching, to provide easy and accessibility to learning materials in the classroom. As the study revealed that, some of the teachers are

often, rarely and seldom accessed internet. The highest percentage of the teachers observed always access internet, however, never shows percentage. Therefore, teachers use internet while using IWB during their teaching. Concord with Lai, H. J. (2010), use of internet seem necessary in operating IWB. Most of the lessons observed have indicated that teachers create rapport among the students during teaching. All the teachers observed created student-student interaction always, often, while none never. Supporting this finding is a study by Smith, et al., (2005) who concluded that the use of IWB create interactivity and participation in lessons, Provision of picture seems frequent while teaching using IWB. All lesson observed have shown some frequency of provision of picture and none have never provided picture throughout the lesson. Audio sounds and video were also provided during teaching using IWB. Only some of the lesson observed had never provided audio and video during the lessons respectively. Similarly, audio play a major role in the lessons especially teachers always provide audio sound as well as provided video using IWB. This indicated that the teachers provide their students with pictures and audio-visual materials during lesson. This finding agreed with what researchers have said (Smith, Higgins, and Wall & Miller 2005) on some of the benefits of using IWB which include among others the multimedia and multi-sensory presentation. These findings answer the research question on how teachers use IWB during lesson. Giving more illustration on use of internet provide opportunity to optimize effective use of IWB in classroom, Beauchamp, G. (2004), suggest that IWB class should be fully equipped with high speed bandwidth for download/uploading of audios and videos play.

However, the finding of this study reveals that, at part of the lessons observed most of the teachers experienced internet failure, few of the teachers observed had never experience internet failure (observation statement 6). The finding further reveals that, the teachers most of the time experience difficulties of uploading picture and never had experience of difficulty in playing video; while they had never had the challenges of uploading audio sound. Interestingly animation seems triggering students' interest.

On the general use of IWB, the finding of this study indicates that teachers always use IWB in their various subjects especially, computer studies, civic education, English and mathematics and very few of the lessons never used it. Unfortunately, there is a power outages observed during the observation. This also goes with what Aduke, (2008). Lamented as one of the challenges of using ICT tool in developing nations. Based on the finding above teachers frequently used internet for downloading and uploading audios, pictures and videos which consequently triggers students interest and create interaction, however, there is a

report of difficulties in downloading and uploading multimedia. Other challenges revealed in the study include internet failure for the uploading pictures and videos, playing sound. Unfortunately, these have been reported by many scholars as some of the challenges of employing technology devices in classroom (Aduke, 2008; Esharenana, 2010; Jones et al., 2011;Yusuf, 2005b). Moreover, why and when teachers use IWB is also observed and presented in table 4.2 below:

Table 4.4.3 on when and why teachers use IWB of this study reveals that, the teachers have used the IWB for so many purposes and at different periods of lessons. Based on the finding of this study, teachers employed IWB for questioning purposes. Particularly, most of the teachers use IWB for indirect questioning as well as for repeat questions this is concord with (Kennewell & Beauchamp, 2007). Teachers observed use IWB for classroom discussion purposes. Specifically, most of the teachers use the IWB for both individual discussion and whole class discussion (ibid). Still, on why teachers use IWB during lesson, the observation revealed that teachers employ IWB for illustration and pictorial purpose (see item 6 and 7). As Zheng (2002), Morgan (2010) and Faiella (2012) identified the purpose of the use of IWB in classroom to include illustration and displaying pictures for students. Therefore, teachers usually employ IWB for illustration and pictorial purposes as indicated from the interview.

The teachers similarly, used IWB during lesson presentation, summarizing, evaluation and as well as ending the lesson (Dobrovolná, 2015). During the observation, the teachers use IWB for the purposes of lesson presentation, summarizing and as well evaluation. These mean teachers observed used IWB throughout the lesson. According (Manny-Ikan et al., 2011) maintained that IWB support teachers to engaged their students during lesson, Interestingly, use of IWB by the teachers as observed had assisted the them in managing their time. In a similar vein Holmes, K. (2009), revealed that the teachers and the learners seem motivated with the use of IWB. Moreover, the use of IWB as observed enhances collaboration between the teacher and the learners while teacher-student interaction observed to be enhanced by the use of IWB as seen. The quantitative findings supporting the qualitative data. The data collected through the qualitative means (interview) from the 7 participatory teachers in this study were presented using the thematic based analysis approach, the study adopted pseudonyms for ethical reason. The names of the participatory teachers were represented with letters A, B, C, D, E, F and G to ensure confidentiality and anonymity. The responses of the interview are identified, analyzed and presented below. The interview questions elicit teachers' perceptions on the use of IWB as well as how their prior ICT experience on the use of IWB. These interview questions answered the research

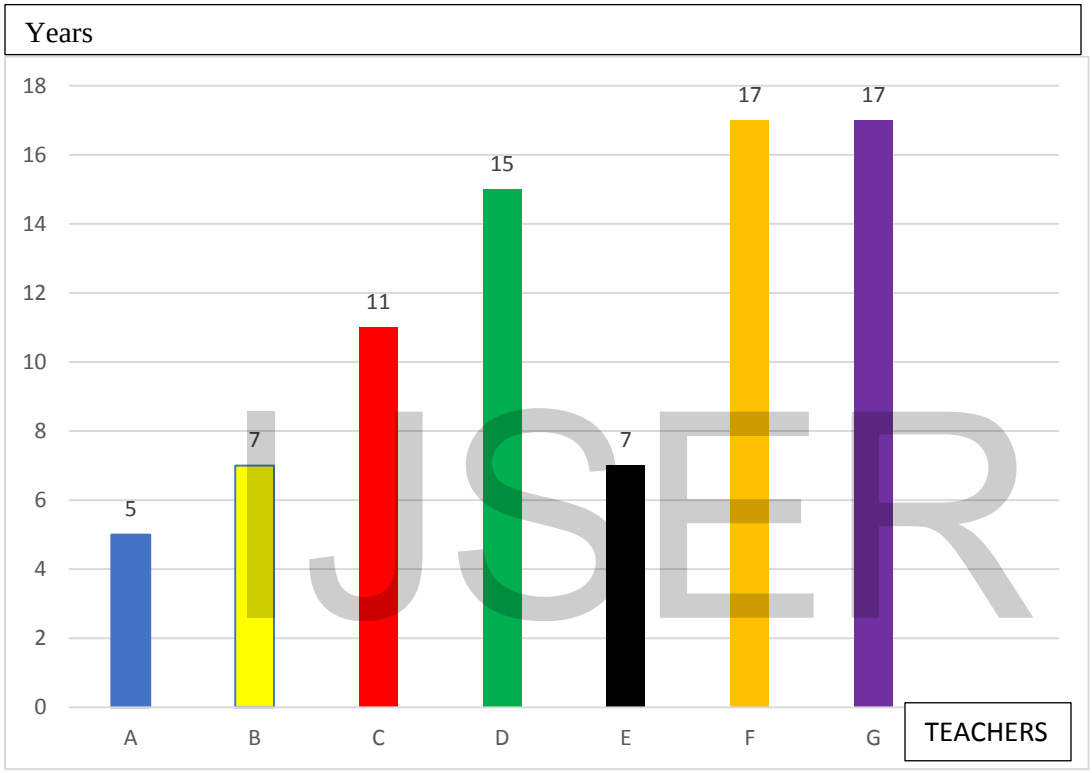
questions 2, 3, and 4. The responses of the interview are presented below based on the following themes identified:

i. Prior ICT experience
ii. Perception on the use of IWB
iii. ICT experience and the use of IWB

4.4.4 ICT Prior experience

The following responses were recorded from the teachers on their prior ICT experience. This answered research question 2. There are mixed responses about the teachers' ICT experiences ranging from 5 – 17. This is presented graphically below for pictorial view:

Figure 1: TEACHERS' PRIOR ICT EXPERIENCE (BY YEAR)



Keys:

Blue	-	Teacher A
Yellow	-	Teacher B
Red	-	Teacher C
Green	-	Teacher D
Black	-	Teacher E
Orange	-	Teacher F
Purple	-	Teacher G

The figure 1 above presents the teachers interviewed in this study on how their prior ICT experience to handle the IWB in teaching. The teachers are of the

opinion as a result of their prior ICT experience they found using IWB interactive, motivating and engaging above all their teaching strategies has improved. The interviewed revealed that the teachers have computer. This finding contrast what Esharenana (2010) reported in his study that many teachers seem to be computer illiterate. However, Koehler and Mishra, (2009) their study on technology pedagogy content knowledge (TPACK) revealed that many teachers in the technological advanced society can use educational technological devices such as ICT tools. Supporting what (Koehler & Mishra, 2009) revealed, a survey study conducted by Esharenana (2010) on Nigerian teachers ICT background, concluded that most of the Nigerian schools teachers have some appreciable level of ICT experience. Olakulehin (2007), appreciate the level of computer literacy among lectures in Nigerian Universities. As such, the teachers' prior ICT experiences is appreciable.

4.4.5 ICT experience and the use of IWB

One of the focus of the interview is to elicit the teachers' prior ICT experience as well as their experience on the use of IWB. This answered research question 4. The teachers responded on the importance of prior ICT experience and use of IWB. The teachers were practically observed and interviewed in the school setting. The interview revealed that the teachers have positive perception on the use of IWB in their classes as a result of their prior ICT experience. Some of the responses from the teachers about the importance of prior ICT experience and effective use of IWB is quoted below:

Teacher A: *"Without ICT experience you cannot operate the IWB".*

Teacher D: *"Teachers without ICT background will find it difficult to operate IWB because of its inbuilt features".*

Teacher E: *"without ICT experience/background one could not fully operate the IWB".*

The teachers are on the opinion that without ICT experience or background, one could not fully operate IWB let alone integrating it into the classroom. This concurred with what Esharenana (2010) find out on how prior ICT experience could positively influence the use of any technology tool. Because in using IWB, there are certain embedded screen tools aiding it operation which require basic computer knowledge, t without basic computer skills one may find it challenging in manipulating the IWB for classroom teaching purposes (Slay et al., 2008). The knowledge of computer seem paramount in successful use of digital devices for teaching (Hakkarainen et al., 2000). additionally, teachers need to manipulate IWB

in delivering of lessons, they could download, upload, record, and play audio or video teaching materials and these require knowledge of basic computer operation (Slay et al., 2008). Similarly, Koehler and Mishra (2009) urge that teachers with computer literacy may effectively use ICT in their classrooms and may integrate TPACK..

4.4.6 Teachers Perception on the use of IWB

One of the themes identified from the teachers' responses in the interview is their perception on the use of IWB. The findings indicates that, the teachers have positive perception towards the use of educational technology tool (IWB). Some excerpt from the teachers' responses are presented below:

According to teacher B:

"There is an implementation of Interactive Board in Nigeria Universities and Colleges of Education (Virtual Class), because it consists of an interactive environment where students can be engaged in learning and interacting with the course content on a more individualistic platform, while functioning in a collaborative environment".

More so, according to teacher G:

"The importance of IWB in teaching and learning in the secondary schools in Nigeria seems to be promoting collaboration among the learners in the teaching activities".

Equally, Teacher C also is on the opinion that *"Students can interact and collaborate among themselves or with the tutor without much distraction and can also view recorded session at their own pace, this promote personal study".* In addition, Teacher A added that, *"it is another way of improving the pedagogical method of teaching using technology as a tool especially, the IWB in the Classroom teaching activities".*

Moreover, Teacher F responded that, from his experience, he found the class very interesting when teaching Mathematics with the IWB. He reiterated that *"the IWB enhances interaction among the learners and also help the students to participate in the teaching context. It also captures their attention as well as allow the students to build interest in the learning context".*

From the above, the teachers perceived IWB could create interactive environment for a collaborative teaching and learning; which promote learners'

interest. These findings are supported what (Wood & Ashfield, 2008) revealed about teachers' perception and the use of IWB. They maintained that IWB provides with the teacher a wide range of opportunity during teaching. Similarly, researchers concluded that IWB promotes motivation between teachers and students and learning interest (DiGregorio & Sobel-Lojeski, 2010) through collaborative and interactive learning method (ibid). As some of the teachers responded similar to this assertion:

Teacher B "with the use of IWB in teaching, the class seem to be interactive between the teacher-students and the medium". He further states that "I think that the students seem to be engaged in their learning and became an active agent of their learning at their own pace".

The teachers also believed that:

"IWB can help the teacher in playing animation such as videos, audio above all organize virtual class".

This also confirmed by ((Beeland, 2002) that IWB could be used to provide a video conferencing interface to promote inter and intra school learning, and to improve learning experiences. Possibly, this could be the possible reason why the students felt motivated as reported by some teachers. Excerpt from the interview:

"… as a modern or 21st century chalkboard, it's really motivating for students at the same time (IWB) to become more popular and engaged the learners".

Explaining further, the teachers identified that the use of audio, video, and image trigger learner interest than traditional blackboard teaching:

"IWB makes learning more interesting. Secondly, you can put audio, video and image, together as a result of these, it is better than traditional blackboard".

In a similarly vein,

"The effectiveness of IWB proved to be more engaging, making learning more interesting and the performance of the learners seem to be improving compared to the traditional instructional aids".

The teachers are of the opinion that this can allow the students to focus on the learning context which gives more room to students to participate in the classroom activities and this may lead to an increase in motivations and engagement in the teaching and learning. This agrees with what (Baylor & Ritchie, 2002) concluded that Classroom activities not only increase learner engagement,

but also help to facilitate the teaching and learning activities. Similarly, when IWB is used properly students' performance is promoted.

Adding further, the teachers are on the opinion that:

"It is timely to use IWB. The effectiveness of IWB proved to be more engaging, making learning more interesting and the performance of the learners seem to be improving compared to the traditional instructional aids"

Confirming this findings, scholars explicitly recommended the IWB in teaching and learning (Dhindsa & Emran, 2006; Manny-Ikan et al., 2011) because it promote learner interest as well as improve performance (ibid).

Similarly, from the excerpt below, the teachers' positive perception on not only use of the IWB in a classroom but also on its full integration into the educational practices of research and productivity.

"…With the current innovation in the field of ICT or ICT in education, the use of IWB will help in achieving the educational objectives, which stated is in Nigerian educational policies. Similarly, it will also promote research, innovation and productivity in the education industry".

On the same note the teachers stated that, see the quote below:

"Considering Nigeria as a developing nation, the inversion of IWB will really help in promoting students' performance in their various subjects."

Chapter 5

5.0 SUMMARY

This study consists of five chapters. Chapter one gives the Background and objectives of the study. This chapter give an insight on why this study is important considering the prospects of integrating technology devices into teaching and learning. Therefore, this chapter reviewed the incorporation of ICT tools in Nigerian schools. The use of ICT is not new in most developed nations (Cox et al., 2000). This is considered as important tools in classroom teaching. Teachers employ ICT in teaching/learning and proved to be effective (ibid). There are many educational ICT tools which includes among others is the IWB (Northcote, Mildenhall, Marshall, & Swan, 2010). IWB is an emergent tool for the 21st century learners, it is one of the component of an ICT device used in teaching and learning (Kennewell & Beauchamp, 2007). It promotes collaboration and interactivity among the students through it features embedded in it which allow interactivity between the teacher, students and the tool. There are specific number of interactivity within the tool, which the teachers to operate. To operate the IWB effectively teachers and students can manipulate the tools, for certain operation teachers and students need to have basic computer knowledge that influence teachers' prior ICT experience in using IWB. According to some researchers, teachers face some challenges when using IWB without any basic computer knowledge. IWB has some special features that requires computer literacy (Slay et al., 2008).

Impact of IWB and teachers perception on the use of IWB; from the literatures reviewed, teachers using IWB have positive perception towards the uses of this tool. In addition, some scholars identified some of the important of using IWB in class which includes triggering students' interest, motivating both teachers and the students (Torff & Tirotta, 2010), promote collaboration Kershner, Mercer, Warwick, and Staarman (2010) and interaction (ibid) as well as improves learning performance.

Chapter 3 of this research study dealt with methodology. The chapter presents the research design (qualitative methods), the research participants, method of data collection (observation and interview), and the method used in analyzing the data (simple percentage and thematic based analysis). The forth chapter, presents the results and discussion of the study while the fifth chapter summarized and concludes the study.

5.1 CONCLUSION

This research study examined teachers' prior ICT experience and the use IWB in teaching and learning in the classrooms. In addition, teachers' perception

towards the use of IWB is also investigated. The teachers have appreciable level of ICT background. Therefore, this study concluded that the teachers' prior ICT experience contribute positively in the way which they handle the technology tool (IWB) in their classroom activities. Substantially, on the teachers' perception, the teachers have positive perception on the use of interactive whiteboard in the cause of lessons deliveries. Therefore, when IWB is used properly as an instructional tool, it will increase motivations on students and classroom engagement as well as enhances teaching and learning. This technology device (IWB) seems to offer teachers and students a considerable opportunity that other ICT tools may not, which include student-student interaction, collaborative learning, as well as learning autonomy through the use of certain embedded features which aids in accessing useful instructional resources in the web. Despite the use of the IWB by the teachers, power outage and internet failure is considered as some of the challenges in the area of operation.

It is evident that teachers can use IWB in teaching and learning through which they have a positive perception towards the use of IWB. Government should look into the challenges of integrating ICT to schools by providing uninterrupted power supply and dedicated bandwidths in order to optimally use all the features of IWB in the class. Finally, much attention should be given to the development of ICT skills among teachers through training and retraining to improve and up rise teachers' technological skills.

REFERENCES

Adewole, E., & Fakorede, S. (2013). Strengthening the Nigerian Higher Education System Through the Use of Information Communication Technology. *International Journal of Social Sciences & Education, 3*(4).

Adeyemi, T., & Olaleye, F. (2010). Information communication and technology (ICT) for the effective management of secondary schools for sustainable development in Ekiti State, Nigeria. *American-Eurasian Journal of Scientific Research, 5*(2), 106-113.

Aduke, A. F. (2008). Usage and Challenges of Information Communication Technology (ICT) in teaching and learning in Nigerian Universities. *Asian Journal of Information Technology, 7*(7), 290-295.

Aduwa-Ogiegbaen, S. E., & Iyamu, E. O. S. (2005). Using information and communication technology in secondary schools in Nigeria: Problems and prospects. *Educational Technology & Society, 8*(1), 104-112.

Agbetuyi, P., & Oluwatayo, J. (2012). Information and communication Technology (ICT) in Nigerian educational system. *Mediterranean Journal of Social Sciences, 3*(3), 2039-2117.

Ajayi, A. (2008). Towards Effective use of Information and Communication Technology (ICT) for teaching in Nigeria Colleges of Education. *Asian Journal of Information Technology, 7*(5), 210-214.

Akintunde, S. A. (2006). *State of ICTs in tertiary institutions in Nigeria: Window on the universities.* Paper presented at the Compendium of Papers Presented at the 44th Annual National Conference and AGM of Nigerian Library Association, Abuja.

Al-Faki, I. M., & Khamis, A. H. A. (2014). Difficulties Facing Teachers in Using Interactive Whiteboards in Their Classes. *American International Journal of Social Science, 3*(2), 136-158.

Alghamdi, A. (2013). An Investigation of Saudi Teachers' Attitudes towards IWBs and their Use for Teaching and Learning in Yanbu Primary Schools in Saudi Arabia. *unpublished MA dissertation, School of Education, Newcastle University*.

Arikpo, I. I., Osofisan, A., & Usoro, A. (2009). Bridging the digital divide: the Nigerian journey so far. *International Journal of Global Business, 2*(1), 181-204.

Armstrong, V., Barnes, S., Sutherland, R., Curran, S., Mills, S., & Thompson, I. (2005). Collaborative research methodology for investigating teaching and learning: the use of interactive whiteboard technology. *Educational review, 57*(4), 457-469.

Ashcroft, L., & Watts, C. (2005). ICT skills for information professionals in developing countries: Perspectives from a study of the electronic information environment in Nigeria. *IFLA journal, 31*(1), 6-12.

Asogwa, B. E., Ugwu, C. I., & Ugwuanyi, F. C. (2015). Evaluation of electronic service infrastructures and quality of e-services in Nigerian academic libraries. *The Electronic Library, 33*(6), 1133-1149.

Baek, Y., Jung, J., & Kim, B. (2008). What makes teachers use technology in the classroom? Exploring the factors affecting facilitation of technology with a Korean sample. *Computers & Education, 50*(1), 224-234.

Baylor, A. L., & Ritchie, D. (2002). What factors facilitate teacher skill, teacher morale, and perceived student learning in technology-using classrooms? *Computers & Education, 39*(4), 395-414.

Beauchamp, G. (2004). Teacher use of the interactive whiteboard in primary schools: Towards an effective transition framework. *Technology, Pedagogy and Education, 13*(3), 327-348.

Beauchamp, G., & Parkinson, J. (2005). Beyond the 'wow'factor: developing interactivity with the interactive whiteboard. *School Science Review, 86*(316), 97-103.

Beeland, W. D. (2002). *Student engagement, visual learning and technology: Can interactive whiteboards help.* Paper presented at the Annual Conference of the Association of Information Technology for Teaching Education.

Beetham, H., & Sharpe, R. (2013). *Rethinking pedagogy for a digital age: Designing for 21st century learning*: routledge.

Ben, C. B., & Ashang, M. U. (2013). The role of ICT in skilled manpower development through vocational technical education among higher institutions in Cross River State, Nigeria. *International Journal of Vocational and Technical Education, 5*(5), 92-99.

Bennett, S., & Lockyer, L. (2008). A study of teachers' integration of interactive whiteboards into four Australian primary school classrooms. *Learning, Media and Technology, 33*(4), 289-300.

Betcher, C., & Lee, M. (2009). *The interactive whiteboard revolution: Teaching with IWBs*: Aust Council for Ed Research.

Biggs, J. B., & Collis, K. F. (1991). Multimodal learning and the quality of intelligent behaviour. *Intelligence: Reconceptualization and measurement*, 57-76.

Bingimlas, K. A. (2009). Barriers to the successful integration of ICT in teaching and learning environments: A review of the literature. *Eurasia Journal of Mathematics, Science & Technology Education, 5*(3), 235-245.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology, 3*(2), 77-101.

Brooks, J. G., & Brooks, M. G. (1993). In search of understanding. *The case for constructivist classrooms*, 101-118.

Brown, S., Agree, S., & Disagree, S. (2010). Likert scale examples for surveys. *ANR Program Evaluation. Iowa State University Extension*.

Buabeng-Andoh, C. (2012). Factors influencing teachers' adoption and integration of information and communication technology into teaching: A review of the literature. *International Journal of Education and Development using Information and Communication Technology, 8*(1), 136.

Bullock, S. M. (2013). Using digital technologies to support Self-Directed Learning for preservice teacher education. *Curriculum Journal, 24*(1), 103-120.

Bulsara, C. (2015). Using a mixed methods approach to enhance and validate your research. *Brightwater Group Research Centre*.

Burke, K. (Ed.). (2009). *How to assess authentic learning*. Corwin Press.

Burnett, G. (1994). *Technology as a tool for urban classrooms*: ERIC Clearinghouse.

Butcher, N., & Wilson-Strydom, M. (2008). Technology and open learning: The potential of open education resources for K-12 education *International handbook of information technology in primary and secondary education* (pp. 725-745): Springer.

Campbell, C., & Martin, D. (2010). Interactive whiteboards and the first year experience: Integrating IWBs into pre-service teacher education. *Australian Journal of Teacher Education, 35*(6), 5.

Chijioke, A. I. (2013). Computer Technology in Nigerian Secondary School Education: Problems and Prospects. *Journal of Resourcefulness and Distinction, 6*(1).

Cohen, L., Manion, L., & Morrison, K. (2013). *Research methods in education*: Routledge.

Cox, M. J., Cox, K., & Preston, C. (2000). What factors support or prevent teachers from using ICT in their classrooms?

Creswell, J. W. (2013). *Research design: Qualitative, quantitative, and mixed methods approaches*: Sage publications.

Cuban, L. (1986). *Teachers and machines: The classroom use of technology since 1920*: Teachers College Press.

Cuthell, J. C. (2005). The impact of interactive whiteboards on teaching, learning and attainment. *TECHNOLOGY AND TEACHER EDUCATION ANNUAL, 3*, 1353.

Dawson, C., & Rakes, G. C. (2003). The influence of principals' technology training on the integration of technology into schools. *Journal of Research on Technology in Education, 36*(1), 29-49.

Demetriadis, S., Barbas, A., Molohides, A., Palaigeorgiou, G., Psillos, D., Vlahavas, I., . . . Pombortsis, A. (2003). "Cultures in negotiation": teachers' acceptance/resistance attitudes considering the infusion of technology into schools. *Computers & Education, 41*(1), 19-37.

Denscombe, M. (2014). *The good research guide: for small-scale social research projects*: McGraw-Hill Education (UK).

Dhindsa, H. S., & Emran, S. H. (2006). *Use of the interactive whiteboard in constructivist teaching for higher student achievement.* Paper presented at the Proceedings of the Second Annual Conference for the Middle East Teachers of Science, Mathematics, and Computing.

Dietrich, K. (2011). Being Smart about Smartboards: A Technological Pedagogical and Content Knowledge (TPACK) Analysis.

DiGregorio, P., & Sobel-Lojeski, K. (2010). The effects of interactive whiteboards (IWBs) on student performance and learning: A literature review. *Journal of Educational Technology Systems, 38*(3), 255-312.

Dobrovolná, A. (2015). Using Interactive Board and Communication in Teaching English at Lower-Secondary Stage of Elementary School. *Practice and Theory in Systems of Education, 10*(1), 16-22.

Domingo, M., & Marquès, P. (2011). Classroom 2.0 Experiences and Building on the Use of ICT in Teaching/Aulas 2.0 y uso de las TIC en la práctica docente. *Comunicar, 19*(37), 169.

Esharenana, E. A. (2010). Application of ICTs in Nigerian Secondary schools.

Evoh, C. (2007). Policy networks and the transformation of secondary eucation through ICTs in Africa: The prospects and challenges of the NEPAD e-Schools initiative. *International Journal of Education and Development using ICT, 3*(1).

Faiella, F. (2012). Interactive white board and knowledge building in class. *American International Journal of Social Science, 5*(2), 345.

Fitzgerald, G. E., & Werner, J. G. (1996). The use of the computer to support cognitive-behavioral interventions for students with behavioral disorders. *Journal of Computing in Childhood Education*.

Fraser, B. (2015). Classroom learning environments *Encyclopedia of Science Education* (pp. 154-157): Springer.

Galanouli, D., Murphy, C., & Gardner, J. (2004). Teachers' perceptions of the effectiveness of ICT-competence training. *Computers & Education, 43*(1), 63-79.

Gambari, A., & Okoli, A. (2007). Availability and utilization of information and communication technology (ICT) facilities in higher institutions in Niger State, Nigeria. *Nigeria. Inform. Technol, 4*, 34-46.

Gee, J. P. (2005). Learning by design: Good video games as learning machines. *E-Learning and Digital Media, 2*(1), 5-16.

Gibbon, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., & Trow, M. (1994). The new production of knowledge. *The Dynamics of Science and Research in Contemporary Societies*.

Gillen, J., Staarman, J. K., Littleton, K., Mercer, N., & Twiner 2, A. (2007). A 'learning revolution'? Investigating pedagogic practice around interactive whiteboards in British primary classrooms 1. *Learning, Media and Technology, 32*(3), 243-256.

Glover, D., & Miller, D. (2001). Running with technology: the pedagogic impact of the large-scale introduction of interactive whiteboards in one secondary school. *Journal of Information Technology for Teacher Education, 10*(3), 257-278.

Glover, D., Miller, D., & Averis, D. (2004). *Panacea or prop: the role of the interactive whiteboard in improving teaching effectiveness.* Paper presented at the The Tenth International Congress of Mathematics Education.

Glover, D., Miller, D., Averis, D., & Door, V. (2005). The interactive whiteboard: a literature survey. *Technology, Pedagogy and Education, 14*(2), 155-170.

Glover, D., Miller, D., Averis, D., & Door, V. (2007). The evolution of an effective pedagogy for teachers using the interactive whiteboard in mathematics and modern languages: An empirical analysis from the secondary sector. *Learning, Media and Technology, 32*(1), 5-20.

Goshit, T. (2006). Nigeria's need for ICT: SP. 259 technology and policy in Africa. *Retrieved November, 23*, 2006.

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.

Guest, G., MacQueen, K. M., & Namey, E. E. (2011). *Applied thematic analysis*: Sage.

Hakkarainen, K., Ilomäki, L., Lipponen, L., Muukkonen, H., Rahikainen, M., Tuominen, T., . . . Lehtinen, E. (2000). Students' skills and practices of using ICT: Results of a national assessment in Finland. *Computers & Education, 34*(2), 103-117.

Hancock, B., Ockleford, E., & Windridge, K. (1998). *An introduction to qualitative research*.

Nottingham: Trent focus group.

Hanewald, R., & Ng, W. (2010). The Digital Revolution in Education: Digital Citizenship and Multi. *Mobile Technologies and Handheld Devices for Ubiquitous Learning: Research and Pedagogy: Research and Pedagogy*, 1.

harmonization, T. m. c. o. I. p. (2012). NATIONAL INFORMATION COMMUNICATION TECHNOLOGY (ICT) POLICY.

Harward, V. J., Del Alamo, J. A., Lerman, S. R., Bailey, P. H., Carpenter, J., DeLong, K., . . . Jabbour, I. (2008). The ilab shared architecture: A web services infrastructure to build communities of internet accessible laboratories. *Proceedings of the IEEE, 96*(6), 931-950.

Hennessy, S., Deaney, R., Ruthven, K., & Winterbottom, M. (2007). Pedagogical strategies for using the interactive whiteboard to foster learner participation in school science. *Learning, Media and Technology, 32*(3), 283-301.

Hennessy, S., Wishart, J., Whitelock, D., Deaney, R., Brawn, R., La Velle, L., . . . Winterbottom, M. (2007). Pedagogical approaches for technology-integrated science teaching. *Computers & Education, 48*(1), 137-152.

Hew, K. F., & Brush, T. (2007). Integrating technology into K-12 teaching and learning: Current knowledge gaps and recommendations for future research. *Educational Technology Research and Development, 55*(3), 223-252.

Higgins, S., Falzon, C., Hall, I., Moseley, D., Smith, F., Smith, H., & Wall, K. (2005). Embedding ICT in the literacy and numeracy strategies: final report.

Hoffman, M., & Blake, J. (2003). Computer literacy: today and tomorrow. *Journal of Computing Sciences in Colleges, 18*(5), 221-233.

Holmes, K. (2009). Planning to teach with digital tools: Introducing the interactive whiteboard to pre-service secondary mathematics teachers. *Australasian Journal of Educational Technology, 25*(3), 351-365.

Huang, Y.-H., & Chuang, T.-Y. (2012). *The Design of IWB-based DGBL Activities Model for EFL Preschoolers.* Paper presented at the Digital Game and Intelligent Toy Enhanced Learning (DIGITEL), 2012 IEEE Fourth International Conference on.

Igun, S. E. (2005). Users and Internet skills: A report from Delta State University Abraka, Nigeria. *Electronic Journal of Academic and special librarianship, 6*(3), 1-9.

Igwe, U. O. (2005). Harnessing Information Technology for the 21st century: Library education in Nigeria.

Jamshed, S. (2014). Qualitative research method-interviewing and observation. *Journal of basic and clinical pharmacy, 5*(4), 87.

Jang, S.-J. (2010). Integrating the interactive whiteboard and peer coaching to develop the TPACK of secondary science teachers. *Computers & Education, 55*(4), 1744-1751.

Jick, T. D. (1979). Mixing qualitative and quantitative methods: Triangulation in action. *Administrative science quarterly, 24*(4), 602-611.

Johnson, B., & Christensen, L. (2008). *Educational research: Quantitative, qualitative, and mixed approaches*: Sage.

Jonassen, D. H., Peck, K. L., & Wilson, B. G. (1999). Learning with technology: A constructivist perspective.

Jones, P., Beynon-Davies, P., Apulu, I., Latham, A., & Moreton, R. (2011). Factors affecting the effective utilisation and adoption of sophisticated ICT solutions: Case studies of SMEs in Lagos, Nigeria. *Journal of Systems and Information Technology, 13*(2), 125-143.

Kearney, M., & Schuck, S. (2008). Exploring Pedagogy with Interactive Whiteboards in Australian Schools. *Australian Educational Computing, 23*(1), 8-13.

Kennewell, S., & Beauchamp, G. (2007). The features of interactive whiteboards and their influence on learning. *Learning, Media and Technology, 32*(3), 227-241.

Kennewell, S., Tanner, H., Jones, S., & Beauchamp, G. (2008). Analysing the use of interactive technology to implement interactive teaching. *Journal of Computer Assisted Learning, 24*(1), 61-73.

Kershner, R., Mercer, N., Warwick, P., & Staarman, J. K. (2010). Can the interactive whiteboard support young children's collaborative communication and thinking in classroom science activities? *International Journal of Computer-Supported Collaborative Learning, 5*(4), 359-383.

Khan, M., Hossain, S., Hasan, M., & Clement, C. K. (2012). Barriers to the Introduction of ICT into Education in Developing Countries: The Example of Bangladesh. *Online Submission, 5*(2), 61-80.

Kivunja, C. (2015). Innovative Methodologies for 21st century learning, teaching and assessment: A convenience sampling investigation into the use of social media technologies in Higher Education. *International Journal of Higher Education, 4*(2), p1.

Knight, P., Pennant, J., & Piggott, J. (2004). What does it mean to" Use the Interactive Whiteboard" in the daily mathematics lesson? *Micromath, 20*(2), 14.

Koehler, M. J., & Mishra, P. (2008). Introducing tpck. *Handbook of technological pedagogical content knowledge (TPCK) for educators*, 3-29.

Koehler, M. J., & Mishra, P. (2009). What is technological pedagogical content knowledge. *Contemporary issues in technology and teacher education, 9*(1), 60-70.

Koh, J. H. L., & Divaharan, S. (2013). Towards a TPACK-fostering ICT instructional process for teachers: Lessons from the implementation of interactive whiteboard instruction. *Australasian Journal of Educational Technology, 29*(2), 233-247.

Kreijns, K., Vermeulen, M., Kirschner, P. A., Buuren, H. v., & Acker, F. V. (2013). Adopting the Integrative Model of Behaviour Prediction to explain teachers' willingness to use ICT: a perspective for research on teachers' ICT usage in pedagogical practices. *Technology, Pedagogy and Education, 22*(1), 55-71.

Kress, G. (2001). *Multimodal teaching and learning: The rhetorics of the science classroom*: A&C Black.

Kwache, P. Z. (2007). The imperatives of information and communication technology for teachers in Nigeria Higher Education. *MERLOT Journal of Online learning and teaching, 3*(4), 395-399.

Lai, H.-J. (2010). Secondary school teachers' perceptions of interactive whiteboard training workshops: A case study from Taiwan. *Australasian Journal of Educational Technology, 26*(4), 511-522.

Lal, K. (2007). Globalization and the Adoption of ICTs in Nigerian SMEs *Information and Communication Technologies in the Context of Globalization* (pp. 151-207): Springer.

Lee, M. (2010). Interactive whiteboards and schooling: the context. *Technology, Pedagogy and Education, 19*(2), 133-141.

Lee, M., & Finger, G. (2010). Schools and the digital technology: An overview. *Developing a Networked School Community: A Guide to Realising the Vision*, 33.

Lee, M., & Winzenried, A. (2009). *The use of instructional technology in schools: Lessons to be learned*: Aust Council for Ed Research.

Leidner, D. E., & Jarvenpaa, S. L. (1995). The use of information technology to enhance management school education: A theoretical view. *MIS quarterly*, 265-291.

Levin, T., & Wadmany, R. (2008). Teachers' views on factors affecting effective integration of information technology in the classroom: Developmental scenery. *Journal of technology and teacher education, 16*(2), 233.

Liang, T.-H., Huang, Y.-M., & Tsai, C.-C. (2012). An Investigation of Teaching and Learning Interaction Factors for the Use of the Interactive Whiteboard Technology. *Educational Technology & Society, 15*(4), 356-367.

Littleton, K. (2010). Research into teaching with whole-class interactive technologies: emergent themes. *Technology, Pedagogy and Education, 19*(2), 285-292.

Manny-Ikan, E., Dagan, O., Tikochinski, T. B., & Zorman, R. (2011). Using the interactive white board in teaching and learning–An evaluation of the SMART CLASSROOM pilot project. *Interdisciplinary Journal of E-Learning and Learning Objects, 7*(1), 249-273.

McLoughlin, C., & Lee, M. J. (2010). Personalised and self regulated learning in the Web 2.0 era: International exemplars of innovative pedagogy using social software. *Australasian Journal of Educational Technology, 26*(1), 28-43.

Mercer, N., Hennessy, S., & Warwick, P. (2010). Using interactive whiteboards to orchestrate classroom dialogue. *Technology, Pedagogy and Education, 19*(2), 195-209.

Min, K., & Siegel, C. (2011). Integration of Smart Board technology and effective teaching. *i-Manager's Journal on School Educational Technology, 7*(1), 38.

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers college record, 108*(6), 1017.

Monge, P. R., & Contractor, N. S. (2003). *Theories of communication networks*: Oxford University Press, USA.

Moreno, R., & Mayer, R. (2007). Interactive multimodal learning environments. *Educational Psychology Review, 19*(3), 309-326.

Morgan, H. (2010). Teaching with the interactive whiteboard: an engaging way to provide instruction. *Focus on Elementary, 22*(3), 3-7.

Moursund, D., & Bielefeldt, T. (1999). Will new teachers be prepared to teach in a digital age? A national survey on information technology in teacher education.

Mustapha, B. A., & Gabasa, A. J. (2010). BENEFITS OF INTEGRATING COMPUTER TECHNOLOGY AS INSTRUCTIONAL REFORMS IN TO CLASSROOM TEACHING AT JUNIOR SECONDARY SCHOOLS AND TECHNICAL COLLEGES IN BORNO STATE.

Mustapha, M. A., Wali, Y. S., & Ali, H. K. (2015). AVAILABILITY AND UTILIZATION OF ICT FACILITIES FOR ENGLISH LANGUAGE TEACHING AND LEARNING IN SENIOR SECONDARY SCHOOLS IN MAIDUGURI METROPOLIS. *Education and Science Journal of Policy Review and Curriculum Development, 5*(2), 107 - 113.

Nickerson, R. S., & Zodhiates, P. P. (2013). *Technology in education: Looking toward 2020*: Routledge.

Northcote, M., Mildenhall, P., Marshall, L., & Swan, P. (2010). Interactive whiteboards: Interactive or just whiteboards? *Australasian Journal of Educational Technology, 26*(4).

Nwabuzor, A. (2005). Corruption and development: new initiatives in economic openness and strengthened rule of law. *Journal of business ethics, 59*(1-2), 121-138.

Nwaocha, V. O. (2014). Incorporating ICTs in Schools for Effective Education: Challenges and Prospects *ICTs and the Millennium Development Goals* (pp. 127-137): Springer.

Okoli, N. (2011). Towards a Revolutionary Education and Teacher Development in Some Selected African Countries. *Lwati: A Journal of Contemporary Research, 8*(1).

Olakulehin, F. K. (2007). Information and communication technologies in teacher training and professional development in Nigeria. *Turkish Online Journal of Distance Education, 8*(1).

Olalere, M., & Taiwo, H. (2009). Educational reforms in Nigeria: The potentials of information and communication technology (ICT). *Educational Research and Reviews, 4*(5), 225.

Olatokun, W. M. (2006). National Information Technology Policy in Nigeria: Prospects, Challenges and a Framework for Implementation. *African Journal of Library, Archives & Information Science, 16*(1).

Olofsson, A. D., Lindberg, J. O., Fransson, G., & Hauge, T. E. (2011). Uptake and use of digital technologies in primary and secondary schools–a thematic review of research. *Nordic Journal of Digital Literacy, 6*(04), 207-225.

Onasanya, S., Shehu, R., Oduwaiye, R., & Shehu, L. (2010). Higher institutions lecturers' attitudes towards integration of ICT into teaching and research in Nigeria. *Research Journal of Information Technology, 2*(1), 1-10.

Onwe, S. O., & Ezekwe, E. A. (2014). Handling Digital Divide among Students in Nigerian Tertiary Institutions: A Discourse. *Public Administration Research, 3*(1), 98.

Orlando, J. (2013). ICT-mediated practice and constructivist practices: is this still the best plan for teachers' uses of ICT? *Technology, Pedagogy and Education, 22*(2), 231-246.

Orr, M. (2008). Learner perceptions of interactive whiteboards in EFL classrooms. *CALL-EJ Online, 9*(2), 9-2.

Ostovar-Namaghi, S. A., & Alinejad, J. The Impact of the Interactive Whiteboard on EFL Learners' Vocabulary Development. *Volume 12, Number, 12*(1), 229.

Oyelaran-Oyeyinka, B., & Adeya, C. N. (2004). Internet access in Africa: empirical evidence from Kenya and Nigeria. *Telematics and Informatics, 21*(1), 67-81.

Parkay, F. W., Stanford, B. H., & Gougeon, T. D. (2010). *Becoming a teacher*: Pearson/Merrill.

Passey, D., Rogers, C., Machell, J., McHugh, G., & Allaway, D. (2004). The motivational effect of ICT on pupils. *Department of Educational Research*.

Poole, G. A. (1996). A new gulf in American education, the digital divide. *New York Times, 29*, D3.

Ramsden, P. (2003). *Learning to teach in higher education*: Routledge.

Reynolds, D., Treharne, D., & Tripp, H. (2003). ICT—the hopes and the reality. *British journal of educational technology, 34*(2), 151-167.

Richardson, L., Denzin, N., & Lincoln, Y. (2000). Handbook of qualitative research. *Writing: A method of inquiry*, 923-948.

Robin, B. R. (2008). Digital Storytelling: A Powerful Technology Tool for the 21st Century Classroom. *Book, 47*(3), 220-228.

Roco, M. C., & Bainbridge, W. S. (2003). Overview Converging Technologies for Improving Human Performance *Converging technologies for improving human performance* (pp. 1-27): Springer.

Rose, G., & Straub, D. (1998). Predicting general IT use: Applying TAM to the Arabic world. *Journal of Global Information Management (JGIM), 6*(3), 39-46.

Rosen, L. D., & Weil, M. M. (1995). Computer availability, computer experience and technophobia among public school teachers. *Computers in human behavior, 11*(1), 9-31.

Russell, G., & Bradley, G. (1997). Teachers' computer anxiety: Implications for professional development. *Education and information Technologies, 2*(1), 17-30.

Säljö, R. (2010). Digital tools and challenges to institutional traditions of learning: technologies, social memory and the performative nature of learning. *Journal of Computer Assisted Learning, 26*(1), 53-64.

Scheffler, F. L., & Logan, J. P. (1999). Computer technology in schools: What teachers should know and be able to do. *Journal of research on computing in education, 31*(3), 305-326.

Schiller, J. (2003). Working with ICT: Perceptions of Australian principals. *Journal of Educational Administration, 41*(2), 171-185.

Schmid, E. C. (2008). Potential pedagogical benefits and drawbacks of multimedia use in the English language classroom equipped with interactive whiteboard technology. *Computers & Education, 51*(4), 1553-1568.

Schmidt, D. A., Baran, E., Thompson, A. D., Mishra, P., Koehler, M. J., & Shin, T. S. (2009). Technological pedagogical content knowledge (TPACK) the development and validation of an assessment instrument for preservice teachers. *Journal of Research on Technology in Education, 42*(2), 123-149.

Serin, H. (2016). Investigating the Role of Interactive Whiteboard Technology in Learner Engagement and Achievement in the Mathematics Classroom. *Journal of Education in Black Sea Region, 1*(2).

Shapiro, J. J., & Hughes, S. K. (1996). Information literacy as a liberal art? *Educom review, 31*, 31-35.

Sharma, P., & Barrett, B. (2011). *Blended learning: Using technology in and beyond the language classroom*: Macmillan.

Shi, Y., Yang, Z., Yang, H. H., & Liu, S. (2012). *The impact of interactive whiteboards on education.* Paper presented at the Proceedings of the 4th International Conference on Internet Multimedia Computing and Service.

Siemens, G. (2014). Connectivism: A learning theory for the digital age.

Slay, H., Sieborger, I., & Hodgkinson-Williams, C. (2007). *An investigation into the use of interactive whiteboards in South African schools.* Paper presented at the IADIS interfaces and human–computer interaction conference (IHCI'07), Portugal.

Slay, H., Siebörger, I., & Hodgkinson-Williams, C. (2008). Interactive whiteboards: Real beauty or just "lipstick"? *Computers & Education, 51*(3), 1321-1341.

Smaldino, S. E., Lowther, D. L., & Russell, J. D. (2008). Instructional technology and media for learning.

Smith, F., Hardman, F., & Higgins, S. (2006). The impact of interactive whiteboards on teacher–pupil interaction in the National Literacy and Numeracy Strategies. *British educational research journal, 32*(3), 443-457.

Smith, H. J., Higgins, S., Wall, K., & Miller, J. (2005). Interactive whiteboards: boon or bandwagon? A critical review of the literature. *Journal of Computer Assisted Learning, 21*(2), 91-101.

Suman, S., & Sinha, R. (2013). Interactive Board: A Revolution in the Teaching-Learning Process. *Educational Technology in Teaching and Learning: Prospects and Challenges*, 38.

Taylor, P. C., Fraser, B. J., & Fisher, D. L. (1997). Monitoring constructivist classroom learning environments. *International journal of educational research, 27*(4), 293-302.

Tella, A., Tella, A., Toyobo, O. M., Adika, L. O., & Adewuyi, A. A. (2007). An assessment of secondary school teachers uses of ICT's: Implications for further development of ICT's use in Nigerian secondary schools. *TOJET: The Turkish Online Journal of Educational Technology, 6*(3).

Thierer, A. (2000). Divided over the digital divide. *Washington, DC: Heritage Foundation*.

Torff, B., & Tirotta, R. (2010). Interactive whiteboards produce small gains in elementary students' self-reported motivation in mathematics. *Computers & Education, 54*(2), 379-383.

Türel, Y. K., & Johnson, T. E. (2012). Teachers' Belief and Use of Interactive Whiteboards for Teaching and Learning. *Educational Technology & Society, 15*(1), 381-394.

Ugochukwu, E. S. (2014). Practical Knowledge Acquisition Through Internet Technology in Nigerian Secondary Education System. *International Journal of Computer Science and Telecommunications, 5*(9), 29-34.

Verenikina, I. M. (2010). Vygotsky in twenty-first-century research.

Vygotsky, L. S. (1978). Mind in society (M. Cole, V. John-Steiner, S. Scribner, & E. Souberman, Eds.): Cambridge, MA: Harvard University Press.

Walker, D. (2002a). White enlightening. *Times Educational Supplement, 13*, 19.

Walker, D. (2002b). White enlightening. Times Educational Supplement, 13 September 2002.

Wall, K., Higgins, S., & Smith, H. (2005). 'The visual helps me understand the complicated things': pupil views of teaching and learning with interactive whiteboards. *British journal of educational technology, 36*(5), 851-867.

Warschauer, M., & Healey, D. (1998). Computers and language learning: An overview. *Language teaching, 31*(02), 57-71.

Weigel, V. B. (2002). *Deep Learning for a Digital Age: Technology's Untapped Potential To Enrich Higher Education*: ERIC.

Whitby, P. J., Leininger, M. L., & Grillo, K. (2012). Tips for using interactive whiteboards to increase participation of students with disabilities. *Teaching Exceptional Children, 44*(6), 50-57.

Whyte, S., Beauchamp, G., & Hillier, E. (2012). *Perceptions of the IWB for second language teaching and learning: the iTILT project.* Paper presented at the CALL: Using, Learning, Knowing, EUROCALL conference proceedings.

Winzenried, A., Dalgarno, B., & Tinkler, J. (2010). The interactive whiteboard: A transitional technology supporting diverse teaching practices. *Australasian Journal of Educational Technology, 26*(4), 534-552.

Wood, R., & Ashfield, J. (2008). The use of the interactive whiteboard for creative teaching and learning in literacy and mathematics: a case study. *British journal of educational technology, 39*(1), 84-96.

Yildirim, S. (2000). Effects of an educational computing course on preservice and inservice teachers: A discussion and analysis of attitudes and use. *Journal of research on computing in education, 32*(4), 479-495.

Yusuf, M. O. (2005a). Information and Communication Technology and Education: Analysing the Nigerian National Policy for Information Technology. *International Education Journal, 6*(3), 316-321.

Yusuf, M. O. (2005b). Integrating information and communication technologies (ICTs) in Nigerian tertiary education. *Volume Five, Number Two June 2005*, 43.

Yusuf, M. O. (2005c). An investigation into teachers' self-efficacy in implementing computer education in Nigerian secondary schools. *Meridian: A Middle School Computer Technologies Journal, 8*(2), 4.

Zevenbergen, R., & Lerman, S. (2007). Pedagogy and interactive whiteboards: Using an activity theory approach to understand tensions in practice. *Mathematics: Essential research, essential practice, 2*, 853-862.

Zhao, Y., & Cziko, G. A. (2001). Teacher adoption of technology: A perceptual control theory perspective. *Journal of technology and teacher education, 9*(1), 5-30.

Zheng, Y. Z. (2002). SMART Technology Inc.

Appendices

How Teachers' Use of IWB in Teaching Secondary School Students

S/N	Classroom Observation checklist	Always	Often	Rarely	Seldom	Never
1.	Accessing internet					
2.	Student-student interaction					
3.	Provide real pictures					
4.	Provide audio sound					
5.	Provide video					
6.	Internet failure					
7.	Difficulty in uploading pictures					
8.	Difficulty in playing video					
9.	Difficulty in playing audio					
10.	Life animation triggers student interest					
11.	How frequent the teacher use the IWB					
12.	Power failure					

S/N	OBSERVATION CHECKLIST	YES	NO
1.	IWB is used when questioning		
2.	Teacher use IWB in direct questioning		
3.	Teacher employ IWB in repeat questions		
4.	Teacher use IWB for individual discussion.		
5.	Teacher use IWB for whole class discussion.		
6.	The Teacher use IWB for illustration		
7.	The Teacher use IWB for pictorial topics		
8.	IWB is used during lesson		
9.	Teachers employ IWB for presentation of lesson		
10.	IWB is used when summarizing		

11.	Teacher employ IWB for evaluation of lesson		
12.	IWB is used at the end of the lesson		
13.	Help the teacher manage time		
14.	The teacher seems motivated when he use IWB		
15.	The learners seem motivated when IWB is used		
16.	Enhances collaboration between the teacher and learners		
17.	Enhance interaction between the teachers and students		

APPENDIX 2

Focus group Interview questions

1. Have you had ICT training before?
    a. For how long have you been teaching?
    b. Did your ICT experience have any influence in your teaching?
    c. If yes, how do you think this experience have influence on your teaching?
2. Have you ever use IWB for teaching your students?
    a. Why do you think the use of IWB is important in your teaching?
    b. How do you think the use of IWB affect your class teaching?
    c. Can you employ IWB in your future class and why?

Appendix 3

13th June, 2016

The Director,
Staff Model School,
Kashim Ibrahim College of Education,
Maiduguri,
Borno State - Nigeria.

Sir/Madam

APPLICATION OF CONSENT LETTER TO CONDUCT A RESEARCH

I wish to apply for the above subject matter. I am a student of University of Nottingham, in the department of Learning, Technology and Education, School of Education, United Kingdom requesting for permission to conduct a research on the topic 'Uptake of Educational Technology Device by Secondary School Teachers'. Which lead to the award of Masters of Arts (MA).

I hereby submit my application to your humble office for consideration and approval, please.

Thank you.

Alhaji Modu Mustapha

Appendix 4

A.K. BENSHEIKH STAFF MODEL SCHOOL
KASHIM IBRAHIM COLLEGE OF EDUCATION
P.M.B. 1469,
MAIDUGURI, BORNO STATE

Tel: 076-232086

13th July, 2016

Alhaji Modu Mustapha,
Learning, Technology and Education,
School of Education,
University of Nottingham,
United Kingdom.

RE-CONSENT LETTER

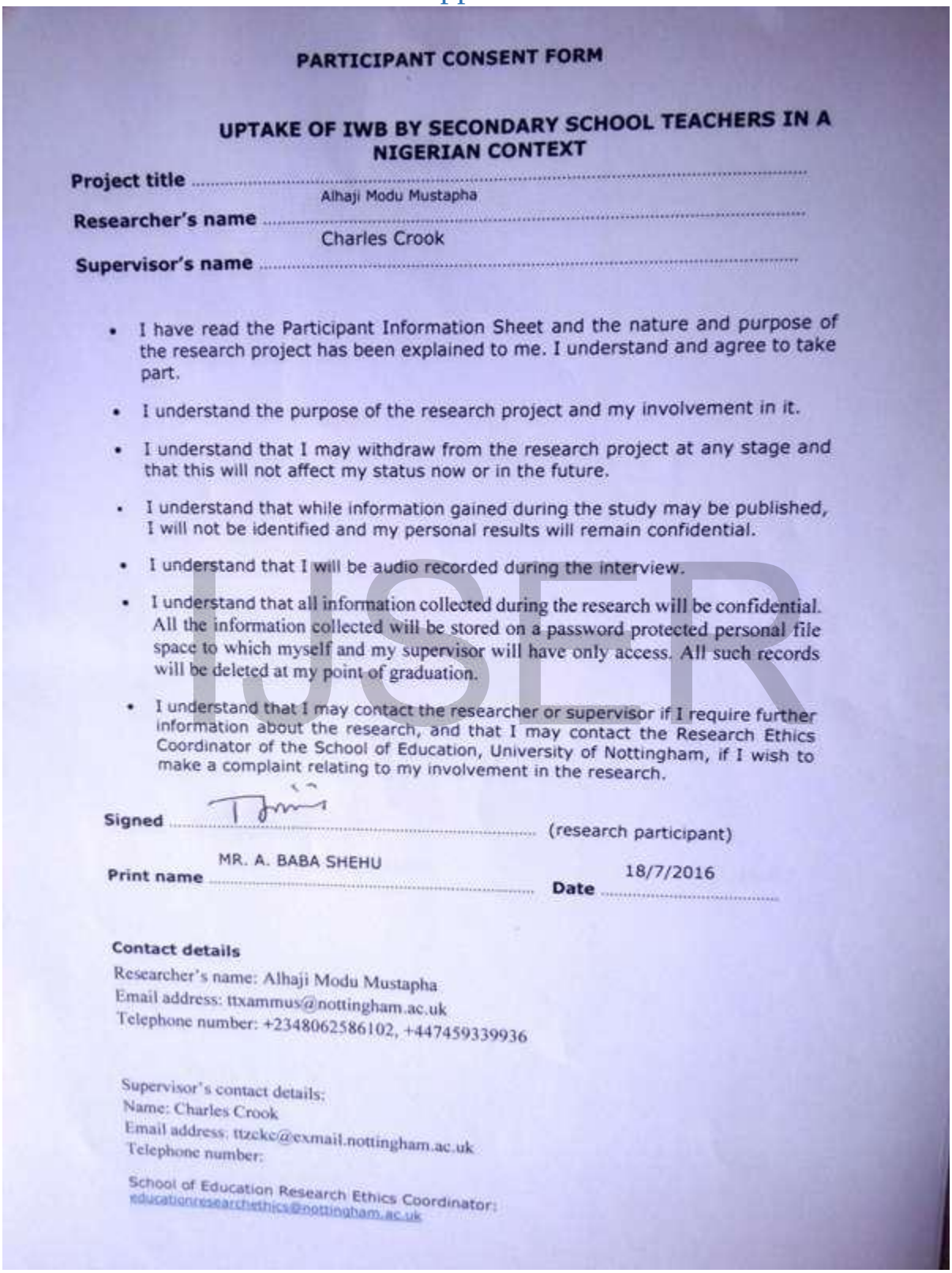
With reference to your letter dated 13th June, 2016, seeking permission to conduct a research in Staff Model School, on the topic 'Uptake of Educational Technology Devices by Secondary School Teachers'.

After duly consultation of the Parents Teachers Association (PTA) of the school and the school management, I hereby convey an approval for your letter to grant you access to the school, teachers, students and including facilities in the school that will help you to carry-out your project, please accept my assurances of all the staff and they are willing to participate as participant in your project.

Thank you.

Mairo Babagana Waziri
Director

Appendix 5



PARTICIPANT CONSENT FORM

UPTAKE OF IWB BY SECONDARY SCHOOL TEACHERS IN A NIGERIAN CONTEXT

Project title .....

Researcher's name Alhaji Modu Mustapha

Supervisor's name Charles Crook

- I have read the Participant Information Sheet and the nature and purpose of the research project has been explained to me. I understand and agree to take part.
- I understand the purpose of the research project and my involvement in it.
- I understand that I may withdraw from the research project at any stage and that this will not affect my status now or in the future.
- I understand that while information gained during the study may be published, I will not be identified and my personal results will remain confidential.
- I understand that I will be audio recorded during the interview.
- I understand that all information collected during the research will be confidential. All the information collected will be stored on a password protected personal file space to which myself and my supervisor will have only access. All such records will be deleted at my point of graduation.
- I understand that I may contact the researcher or supervisor if I require further information about the research, and that I may contact the Research Ethics Coordinator of the School of Education, University of Nottingham, if I wish to make a complaint relating to my involvement in the research.

Signed ..... (research participant)

Print name MR. A. BABA SHEHU **Date** 18/7/2016

Contact details

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Telephone number: +2348062586102, +447459339936

Supervisor's contact details:
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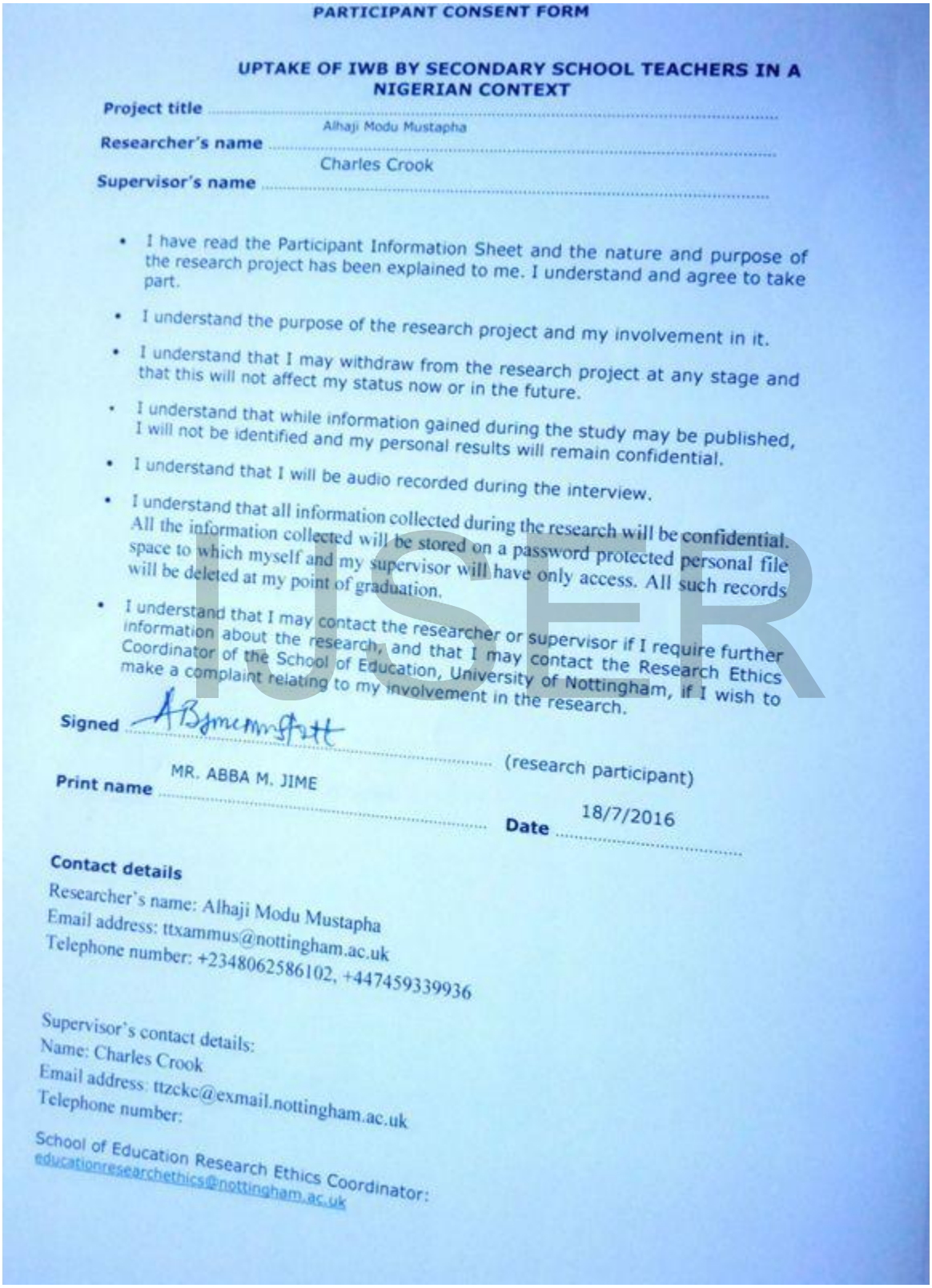
Telephone number:

School of Education Research Ethics Coordinator:
educationresearchethics@nottingham.ac.uk



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Signed ..... (research participant)

Print name MR. ABBA M. JIME **Date** 18/7/2016

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School of Education Research Ethics Coordinator:
educationresearchethics@nottingham.ac.uk

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UPTAKE OF IWB BY SECONDARY SCHOOL TEACHERS IN A NIGERIAN CONTEXT

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Supervisor's name Charles Crook .....

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Signed ..... (research participant)

Print name MR. TIJJANI IBRAHIM ..... **Date** 18/7/2016 .....

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PARTICIPANT CONSENT FORM

UPTAKE OF IWB BY SECONDARY SCHOOL TEACHERS IN A NIGERIAN CONTEXT

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- I understand that I may contact the researcher or supervisor if I require further information about the research, and that I may contact the Research Ethics Coordinator of the School of Education, University of Nottingham, if I wish to make a complaint relating to my involvement in the research.

Signed ..... (research participant)

Print name SUNDAY LONGE **Date** 18/7/2016

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Supervisor's name Charles Crook

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Signed ..... (research participant)

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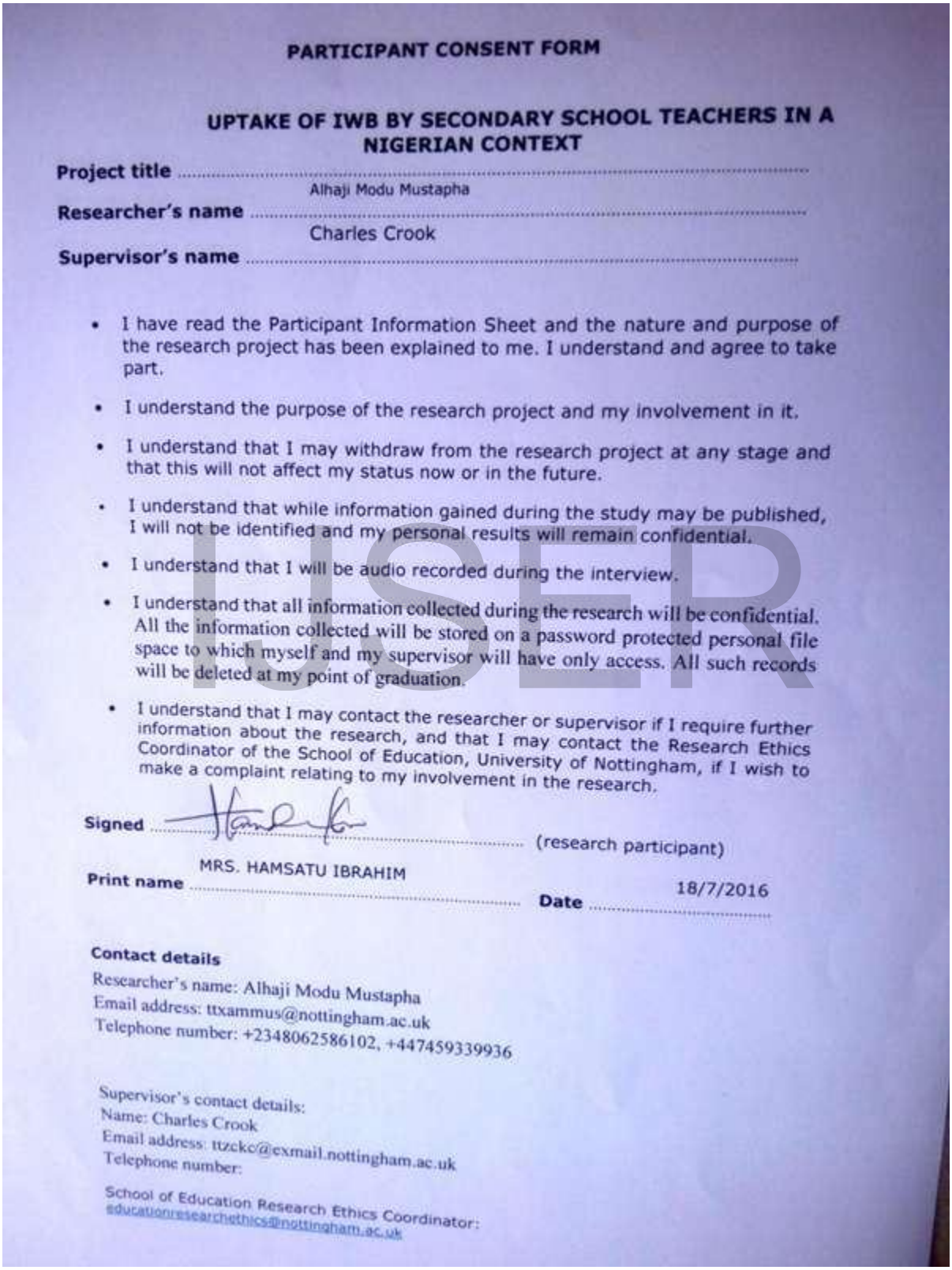
School of Education Research Eth...
educationresearch...



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- I understand that I may withdraw from the research project at any stage and that this will not affect my status now or in the future.
- I understand that while information gained during the study may be published, I will not be identified and my personal results will remain confidential.
- I understand that I will be audio recorded during the interview.
- I understand that all information collected during the research will be confidential. All the information collected will be stored on a password protected personal file space to which myself and my supervisor will have only access. All such records will be deleted at my point of graduation.
- I understand that I may contact the researcher or supervisor if I require further information about the research, and that I may contact the Research Ethics Coordinator of the School of Education, University of Nottingham, if I wish to make a complaint relating to my involvement in the research.

Signed ..... (research participant)

Print name MRS. HAMSATU IBRAHIM **Date** 18/7/2016

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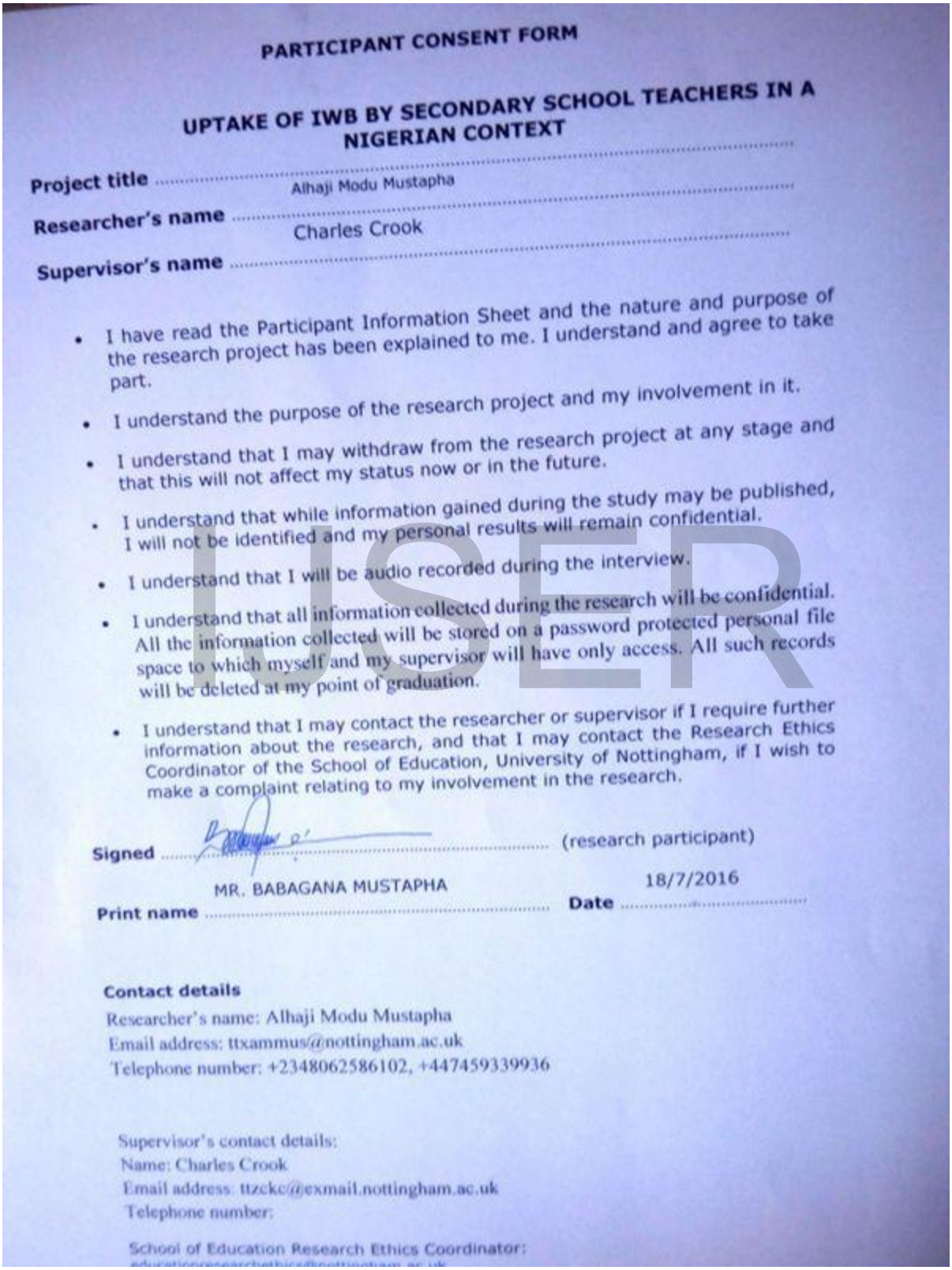

PARTICIPANT CONSENT FORM

UPTAKE OF IWB BY SECONDARY SCHOOL TEACHERS IN A NIGERIAN CONTEXT

Project title .....

Researcher's name ..... Alhaji Modu Mustapha

Supervisor's name ..... Charles Crook

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Signed ..... (research participant)

Print name ..... MR. BABAGANA MUSTAPHA **Date** 18/7/2016

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