MOBILE LEARNING: PERCEPTION OF SECONDARY SCHOOL TEACHERS IN NIGERIA TO THE USE OF MOBILE LEARNING FOR CAPACITY BUILDING

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Declaration:

I, Yakub Olanrewaju Quadir, declare that this research is my original work and that it has never been presented to any institution or university for the award of Degree or Diploma. In addition, I have referenced correctly all literature and sources used in this work and this work is fully compliant with the Dublin Business School’s academic honesty policy.

Signed: _____YAKUB OLANREWAJU QUADIR____

Date: _____August 21, 2016________________
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ABSTRACT

The blame on the state of the Nigerian education system has always been an issue of debate, with the most controversial part been the portion of blame to accord to which actor (students or teachers) or stake holder (authorities; public and private). Nevertheless, as discussed in Chapter 1, this study looked at a deeper analysis of events leading up to the current state of things in the education sector of Nigeria. It introduced the eLearning concept, in any attempt to use mobile learning technologies for capacity building for teachers, and ultimately to improve the quality of education in Nigeria.

With factors (in Chapter 2) affecting successful implementation of ICT for schools in Nigeria, this research idea seems herculean. But findings of this research showed the narrowing gap between the digital literacy skills and effective phone usage among secondary school teachers, with an emerging pattern pointing at improved digital literacy skills of teachers, acquired perhaps, through the use of their mobile devices.

Meanwhile, research findings (in chapter 4 - 6) showed that with the continued encroachment of Nokia’s phone market share by android based devices, the race for affordable mobile phone devices is rife. So much that competitors are aiming for bigger screens and better configuration, a race that evolved into the introduction of Phablets.

Using teachers’ perception of electronic learning as measurement, this dissertation work (in chapter 3) demonstrated how an open source implementation of mobile learning for secondary school teachers can successfully improve teachers’ understanding of their subject areas, in Nigeria.

While acknowledging the existence of better proprietary learning content management systems for schools in Africa, the artefact in this dissertation (in Chapters 4) was designed as an ecosystem to provide open sourced learning content that allows peer to peer interactions between and among educators and teachers alike.
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1. Introduction

1.1 BACKGROUND

The quality of Nigeria’s education system has been on a continual free fall, and while this is a general knowledge, the rate at which it is declining can be quiet hard to measure. In order to understand the causes of the decline, it is necessary to visit the background of the education system, which will likely yield the starting point of the decline. Nigeria practices a 6-3-3-4 system with the first 6 years spent in primary school. A further two 3-year periods are spent in junior and senior secondary, and on the completion of which Senior School Certificate Exams (SSCE) are administered. An SSCE success (5 credit passes in most cases) forms a prerequisite for admission into a higher institution (college of education, polytechnic or university), where the last 4 years (with some exceptions) spent.

While there exists a preschool education system in the private education sector of Nigeria, it still streamlines with the standard system, thereby enforcing the stipulated entrance age of students at 3 to 5-years old. According to Piaget’s classification of intellectual development, at the concrete operational stage, where logical thinking and social interaction is first observed, there is a gradual change in how children thinks about the world, and this is often associated with children between 7 and 11 years old (Cherry, 2015). For the purpose of this research, the Piaget stage theory’s is therefore used to determine students’ life stage critical for cognitive ability, hence the choice of secondary school.

The West African Examination Council (Nigeria) has published annual exam results for the Senior School Certificate Exams (2016), with statistics showing a 47 per cent (approx. 13 per cent decrease from previous year) failure rate among graduating students of senior secondary schools across the nation (Adesulu, 2016; Punch Nigeria, 2016). With over 1.5million students participating annually in the exam this year, the impact of the continual failure can not be overemphasized (Edukugho, 2009; Ogunsaju, 2004). While there is a general consensus on the fact that the declining quality of education at the secondary school level is the major factor causing mass failure among students, the argument emanating relates to what proportion of blame to attribute to the several actors involved in the Nigerian Secondary School education sector.
1.2 STATEMENT OF THE PROBLEM

Several factors are contributing to the lacklustre performance of secondary school students in Nigeria, and with dwindling level of income, coupled with meagre allocation for capital expenditure on education in the 2016 Appropriation Bill, it is certain that Nigeria is in a situation where “battle of Homeric proportions is fought with Lilliputian resources” (Ministry of Budget and National Planning, 2016). According to National Union of Teachers (NUT), the poor reading culture among students is a major cause of mass failure among students. Reading being an activity that is suppose not only to be carried out for passing exams, but to improve their intellect and provide relaxation, can not be neglected. Furthermore, (Aina, Ogungbeni, Adigun, & Ogundipe, 2011) observed the rising cost of books in relation to leisure related materials e.g. Compact Disc, DVD Disc etc., as providing incentive for students to shy away from reading, suggests the need to associate reading with pleasure, such that the eagerness to read will be imbibed in students, as a possible remedy for improving the reading culture among students. Though students are blamed for the poor attitude towards study, it is also important to note that students are increasingly getting tired of the traditional method of memorizing and surface learning which yields boredom, and bares no correlation to reality, hence the urge for a more practical, interactive, collaborative method for developing cognitive ability (Charbonneau-Gowdy, 2015). (Charbonneau-Gowdy, 2015) posits the need to understand the “21ST Century” generation of students as a way to identifying possible solutions to the declining quality of education. There is a fundamental change in the way learning is taking place in this century, pointing out the one sided process of transferring knowledge, and memorization, which diminishes self belief among learners, as a source of boredom for the new generation of learners. Fazed with the advent and continual explosive growth rate of computer and mobile technologies usage, the new generation of students have grown beyond passive learning, and the need to chart a new course for participatory learning, a learning that envisages that a subject’s topic may draw the attention of students but the process of learning will keep them engaged (Erskine, Leenders, & Mauffette-Leenders, 1998).
(Rambe, 2011, p. 395) weighed in that integration of ICT in education is necessary to achieve “deep learning”; a step that creates a pathway to the construction of knowledge among learners. Electronic learning, as such integration may therefore be
called, defies traditional face to face, classroom based, chalk and blackboard form of learning, to deliver learning material with the use of an adapted pedagogy through an electronic means. Even in Nigeria, there is a growing demand by education stakeholders for the introduction of electronic learning as a viable means to bridge the gap between the ever increasing population of school students, and the available learning infrastructures across Nigeria (Orakpo, 2015).

According to the dean, School of Education, National Open University of Nigeria (NOUN), Professor Salawu Ibrahim Olatunde, teachers who are non-IT compliant are easily deceived by students, who are more exposed to operating computing gadgets and social media, a situation attributed to the considerably low level of ICT literacy among teachers (Omilani, 2015). This gap in ICT knowledge between the teachers and students can be attributed to non-incorporation of ICT during the course of training secondary school teachers in Nigeria.

Not surprising that WAEC, in its annual examiners’ report, continues to reiterate the need for “Qualified Teachers” and mastery of concepts and meaning among students, as a panacea for mass failure in exams (WAEC, 2010). Therefore, as a way of building capacity among secondary school teachers in Nigeria, there is a need to institute professional development among others, training for teachers (Egbo, 2011). Such training should include but not limited to the integration of ICT in teaching curriculum.

Capacity building in the context of this research work, is therefore aimed at creating awareness among these teachers, to the opportunities that abound the use of ICT in improving skills and knowledge, while also providing insight for planners into building cheap ICT infrastructures through the use of mobile learning (Uchendu, 2015).

1.3 PURPOSE AND DESIGN OF THE STUDY

With recent advancement in mobile technologies vis-a-vis explosive growth rate of mobile users (UNESCO.org, 2016), continuous invention of cheap and affordable smart phones and tablets, and the continuing effort by the National Union of Teachers (NUT) to ensure the acquisition of Information Communication Technology (ICT) Skills by secondary school teachers, this research implemented a mobile learning solution aimed at fast tracking the retraining of secondary school teachers, with a vision to facilitate blended learning by streamlining electronic learning with the existing traditional teaching practices and policies, suited for the purpose of re-
training teachers. The software artefact was also concerned about improving digital literacy skills of secondary school teachers, achievable through participatory and collaborative learning, in order to take up the challenge of the “21st century” students, and deliver quality teaching.

1.4 RESEARCH QUESTION

“Can implementation of android based open source mobile learning platform improve teachers’ current perception of eLearning as a tool for capacity building in their subject area?”

Having highlighted the factors contributing to the current perception of eLearning among secondary school teachers in Nigeria, in the Literature Review, this research seeks to probe the current level of digital literacy skills among these teachers, in order to make a case for the need to deploy mobile learning solution for regular re-training of teachers in Nigeria.

1.5 RESEARCH BENEFITS

(Pachler & Daly, 2011, p. 19) aver that “the popularity of eLearning is associated with the perceived benefits”. One major benefit of empowering secondary school teachers with ICT skills through mobile learning will therefore be the possible change in current perception among teachers towards the use of technology for educational purposes. Also, research works has shown that teachers lack the incentive to acquire ICT skills (Mingaine, 2013; Wakhu, 2013), but with facts showing the explosive rate of growth of GSM Internet Users in Nigeria (Osuagwu, 2015), this study will benefit policy makers by providing insight into considering integration of ICT in education through the use of cheaper, more sustainable and effective mobile computing gadgets.

Another practical benefit is the capacity building among teachers through streamlining of pedagogy and the learning content. Teachers will be able to present content in a clearer manner using narratives, real life cases to teach, as well as collaborate with colleagues in order to further propagate learning (Schell & Janicki, 2013). Teachers will be able to assess progress and monitor goals, and also be monitored (by school administrators) for performance and assessment. Also, Pedagogical changes will reflect the transformation of teachers from their traditional
surface knowledge, to a deep knowledge achievable through collaboration with more learned teacher colleagues, and the national education community at large. With regulated and constantly reviewed learning content that is available at all times, teachers will be better equipped to handle the new generation of students (Pachler & Daly, 2011, p. 21 & 111).

Overall, teaching the teachers, who happens to be the creator and source of knowledge for students, will go a long way in improving the quality of education in Nigeria. Aside from the immediate improvement in exam results that may manifest in a short timeframe, there will be a significant improvement in the human development index of the country. All these, translates to poverty alleviation for the more learned secondary school students, and a right direction towards economic success for the country.
2. Literature Review

2.1 Literature Introduction

When discussing education, and most importantly learning, the primary elements that come to mind are the producer and consumer of knowledge, the material, and the environment. Also, the assumption of the producer only role by the teachers is an unchallengeable authority, coupled with the fixation on the learning location, best describes what traditional face to face learning is all about.

Whereas (Pachler & Daly, 2011) defined learning as a two process event, a combination of “coming to know” through conceptual understanding, with the ability to apply such knowledge in any given situation, the first process of “coming to know” continues to generate debates regarding the actual focus of learning (CHILIVUMBO, 2015, p. 3). The elements constituting the focus of learning as aforementioned are limited to the teacher or learning material, for learners. Having realised the lacking quality of learner’s both choices, the attention shifts to a more favoured object, that is reputed for capturing the attention of learners, Technology!

2.1.1 EVOLUTION OF E-LEARNING

E-learning is a breakaway from the learning propagated by the use of traditional chalk and board class room environment to a learning propagated by the use of computing and information communication technology, with such ICT technology comprising mobile phones, computers, networks, etc., and may not require physical presence (Pachler & Daly, 2011, p. 15).

There are several implementations of eLearning, all spanning over time and in different dimensions. One of the most earliest is the use of Computer Based Training (CBT). CBT is the use of computers to enhance learning through the one or more of such computing capabilities as audio, video, and programs, within a physical space. While CBT is easy to manage, it is quite rigid. Web based Training is a later implementation of eLearning, that premises the use of internet, as a medium for training. With wide coverage, internet is perceived to be more flexible and quite easy to maintain.

While there is a general consensus regarding the definition of eLearning as an
electronic mode of study, the arguments continue to linger on the context, distance, and extent to which it can span (Pachler & Daly, 2011, pp. 11-15). With availability, coverage, portability, and reliability, online learning is arguably the most successful implementation of eLearning. As more devices are getting connected over the internet, it is the ultimate goal of any eLearning solution to be able to interact with multiple devices across different locations, via the internet. To further add to this claim, research has shown that social-media based tools have more potential than electronic learning practice tools in meeting the educational demand of the 21st century (Charbonneau-Gowdy, 2015).

BLENDING LEARNING
Blended Learning is an attempt to infuse different types of ICT Technologies, to several aspects of learning and teaching (Allan, 2007). It represents a proportional mix of traditional face to face and eLearning practices, in such a way as to reflect the context for which it is to be implemented. In this case study, workplace learning considerations are to be made when integrating ICT Technologies such as internet and networks, hardware and software, pedagogy and focus, etc., with existing teaching practices. Considering the lack of infrastructural facilities in Nigeria amongst other factors, and the numerous demands for serialised implementation of electronic learning, the most noticeably ICT Technology will therefore be mobile devices, hence the decision to use mobile learning.

MOBILE LEARNING
(Chuck, 2013) opined that “with mobile, the consumer (of knowledge) is more, well, mobile, on the go, always connected, and absorbing information in bite-sized pieces”. Being on the go, highlights the major advantage in the choice of mobile learning, because it miniaturizes the physical learning space. More so, (Pachler & Daly, 2011, p. 27) views mobile devices as a tool for “social interaction and communication” among youth, with a view to making a better understanding of their environment. With the advent of fourth generation internet, even though there is noticeably poor coverage across Nigeria, mobile platform’s portability makes it ideal for delivering learning over a less reliable internet connection. Based on world wide trending usage of affordable mobile devices, and especially smart phones, mobile platform is fast becoming the learning environment for learners.
2.1.2 BENEFITS OF MOBILE LEARNING
In mobile learning, learning is not confined to the physical learning environment, rather, it can take place anytime and anywhere. This is evident in the example of South African based Mxit, a social networking site that offers a live tutoring session for learners. With a record 50 million accumulated users in 2015, Mxit has proven the efficacy of mobile learning solution in terms of flexibility (Shezi, 2015).

Technology mounts pressure on learners by challenging what they know and how they come about the knowledge. Learners are often disorientated when confronted with “epistemological challenges” during first encounter with eLearning (Pachler & Daly, 2011, p. 29). Because the existing pedagogy is traditional based, often characterized by memorization, teachers will be constructively challenged on application of acquired knowledge. A typical example is Khan academy software, which uses a combination of animated videos and interactive text, to teach subject topics on a case by case basis.

With persistency and continual collaboration with colleagues, teachers may indulge in secret learning in order to be able to reconstruct theoretical knowledge into a substantive deep and practical knowledge of subject area. Using mobile learning collaborative tools, teachers will be able to interact with content providers, their peers, in order to share views and ask questions.

As Mobile Technologies keeps pushing cost of devices down, while providing more feature, the explosive growth rate will never stop anytime soon, because not only has technology become an integral part of our individual life, it is having a profound influence in the society, and the various institutions therein. In addition, with the pace of development of mobile technologies, the existing ecosystem for mobile software development vis-à-vis android, iOS, etc., will continue to ensure the relevance of mobile learning solution, by providing framework support, for a long period of time to come.

2.1.3 CRITICISM OF ELEARNING
One major criticism of eLearning is the huge cost associated with procuring and supporting it. In criticizing electronic learning, (Pachler & Daly, 2011) opined that “technology is sold on the premises of inflated benefit”. Quantifying the benefits of eLearning solution may be easily realized using the goals achieved from implementation, but in a developing country with dwindling economic resources, the costs notwithstanding is a major factor hindering mass implementation of eLearning.
Critics also argued that the idea of technology as a focus of learning is technocentric, drawing a line between technical limitations of mobile learning and any potentially pedagogy that may be unique to it. Besides intimating the teachers with quality content and provoking critical thinking, any successful implementation of electronic learning will not attempt to sideline the traditional learning settings. Because mobile learning means learning anywhere and everywhere, flexibility and convenience in learning is unmatched. Critics of eLearning expresses pessimism regarding the ability of eLearning technologies to enhance focus and formality of learning.

Because learners will rather avoid their fears with the freedom associated with electronic learning, critics observe issues regarding direct communication, a bond linking the student and the teacher. Learning environment virtualization brings about some issues, some of which includes the ability to think in special circumstances, and ability to speak before the crowd (Pachler & Daly, 2011, p. 31).

2.1.4 THE NIGERIAN FACTOR

INFRASTRUCTURE

Technological infrastructure is tantamount to a successful implementation of eLearning (Pachler & Daly, 2011, p. 34). With lack of infrastructural facilities such as electricity and fast internet in Nigeria, this dissertation work refrains from interchanging electronic learning with online learning, as all the internet features in the software artefact will be striped down to the barest minimum, to reflect a workable solution, while giving room for upscaling.

DIGITAL DIVIDE

Digital divide is synonymous with poor countries, and explains why the rich countries are much more technologically advance. Every once in a while, we wake up to the news of Companies, as part of corporate social responsibility, providing free ICT equipment to selected schools across Nigeria, but as a developing nation, the non-accessibility of these few expensive equipment to the majority of teachers and students, and sometimes stealing of the equipment, emphasizes the digital divide between the rich and the poor (United States White House, 1998).

COST

The huge costs associated with ICT training for teachers, procurement of ICT equipment, transformation of traditional learning pedagogy, cultural and ethical
implication etc., towards the implementation of eLearning, is an institutional factor which is evidently hard to overlook, considering the current federal allocation for education in the 2016 appropriation bill (Ministry of Budget and National Planning, 2016, p. 5).

With almost all teachers having mobile phones, and according to NCC records, over 45% of the Nigerian population using internet (Osuagwu, 2015), it will be safe to assume that the teachers are subconsciously developing affinity for mobile technology. It is therefore important to build on this, to make conscious effort to deliver learning to them via mobile platform.

According to Dr. Sharehu, Director-General of the National Teachers’ Institute, constantly training teachers to upgrade qualification and build capacity is a way of ensuring the best quality of education is achieved in Nigeria (Vanguardngr.com, 2014). Even though training will continue to offer face lifting for the secondary school teachers across all demography, there is a noticeable difference in the attitude of teachers across the age divide, towards acquiring new knowledge (Alazzam, Bakar, Hamzah, & Asimiran, 2012). Observation has shown that younger secondary school teachers possess more information literacy and social networking skills than their senior colleagues. With a significantly higher population of secondary school teachers perceived to be beyond 30 years, there continues to be a noticeable reluctance towards the acquisition of new knowledge among senior teachers. Perhaps with the use of mobile devices cutting across all demography, the implementation of any electronic learning through mobile platform might go a long way in changing this.

2.2 LEARNING CONTENT

Deep approach is one of the many approaches to learning, and characterized by students understanding the underlying principle and useful application of knowledge to emerging situations. Another approach is surface approach, which is characterized by memorization, often easily forgotten, and will eventually lead to limited knowledge about subject (Pachler & Daly, 2011, p. 30).

The software artefact provides a mechanism for delivering learning content that is not only peer reviewed, but also aimed at achieving deep learning. These learning contents may be sourced from reputable open learning sites that is internationally
accredited, or by the Ministry of Education in collaboration with the Teachers’ Union (NUT).

**SOFTWARE EVOLUTION: CLOSED VS OPEN SYSTEM**

Closed or Proprietary systems are well rounded systems from reputable companies, with additional benefit of technical support. Due to the rapid rate of obsolescence of technology nowadays, it is practical impossible for countries with meagre financial resources to keep up with procurements. Cost benefit analysis of closed system portrays mobile learning solutions as an expensive solution with an inflated benefit. The advent of open source projects (rasperrypi.org, k12science.org), is changing the orientation and perception of people when considering electronic learning as a viable means to achieving quality education. The software artefact in this dissertation work implements an open source system with derived contents from Khan Academy, ck12 etc., so as to increase the volume of quality learning material while also ensuring collaborative effort among teachers to localize such learning material.

**2.3 PEDAGOGY**

**CASE STUDY APPROACH**

Pedagogy is a set of activities that is directed at achieving learning, through teaching. For a traditional face to face approach, the difference between the process of learning and teaching can simply be put as passive and active respectively. The use of cases, a factual description of a situation, or a set of event, to reinforce the process of construction of knowledge explores the aspect of careful thinking, intellectual intensity, personal commitment, and time management. It affords the chance for students to participate in analysing and solution finding. It also ensures theories are applied to practice, as against learning by memory (Erskine et al., 1998) This research aims to highlight pedagogical approach that will streamline classroom practices, rather than disrupt it. With the software artefact, each subject topic will be using case study visual material to further enlighten the teachers, in such a way as to challenge their previous understanding of subject topic, thereby eliciting critical thinking.

**2.4 MOBILE APP FOR LEARNING**

According to (Helge & McKinnon, 2013, p. 86), mobile app is an implementation of software program, to be deployed on devices that offers access on the go. Such devices are characterized by smaller screen sizes, portability and longer battery life.
In deciding the type of mobile app to build, it is important to know the three types of mobile application are Native apps, HTML5 apps, and Hybrid apps (Korf & Oksman, 2016). Native apps are specific to a given mobile platform and they are designed to take advantage of the inbuilt functionalities provided by the platform on which they are built. HTML5 apps are written with the aim of providing web development on smaller screens using a combination of JavaScript, html5, and CSS. Hybrid apps combine the features of native and HTML5 to benefit the app. Hybrid apps are made using hybrid tools. For example, (Microsoft Inc, 2015) touts its hybrid tools Visual Studio and Xamarin IDE, as “one of the options for creating rich native and web apps. By using C# or C++, these IDEs create cross platform applications for iOS, Android and Windows, all in addition to the possibility of code reuse”.

While the flexibility of the hybrid IDEs gives them commercial advantage in terms of wider market reach, over the choice of native tool such as android studio (java based) IDE, it runs counter to the system requirement of this dissertation, caved out from the influence of several Nigerian factors as discussed in the literature review.

In recent times, one of the popular mobile learning applications in Africa is Ukufunda Teacher app. It is a digital classroom initiative by Mxit S.A. Designed to bridge the gap between the rich and the poor by providing quality education, the mobile app provides educational resources, social interaction resources and utilities. One major advantage of this software over other proprietary systems is in its implementation approach. Rather than focus on profitability, the software is directed at addressing
the need of the poor, who are known to have limited financial resources (UNICEF, 2015).

With a lower internet penetration rate and digital literacy skills, the Ukufunda Teacher app may not be good enough for Nigeria’s secondary school teachers. While the app requires only a minimum 2g internet connection for some of its features, the probability of getting any internet connection in large portions of secondary schools in Nigeria is low, and where present, expensive, hence the need for a solution that is only dependent on internet to perform few functions such as updates and social interaction.

Also, like every other proprietary system, the Ukufunda teacher app pre-empts the teachers’ need through information gathered from interactions with the educators. The teachers’ note will rather create an ecosystem to be grown by the educators (stakeholders), through active engagement in production of learning content, in order to ensure unprejudiced reception of the learning platform and accommodate a mix of trusted world class learning contents with localized ones.

**OPON IMO**

In Nigeria, one of the widely publicized and indigenized implementation of mobile learning, directed at school students, is the Opon Imo initiative. Translated literarily as tablet of knowledge, the tablet initiative was facilitated by Osun State government of Nigeria. The tablet was implemented using customized open source learning technologies, but the sustainability is highly contentious. For example, while the specification states it has a 512MB RAM and 32GB Storage Capacity, with a price between $30 and $50 (Alibaba.com), and over 47000 students in Senior Class 3 alone (Eze, 2014), the sustainability of this initiative is doubted, considering the total budget for the state.

Similarly, despite the acclaimed UNESCO accreditation of this Opon Imo initiative (osun.gov.ng, 2016), there was no significant improvement in the success rate (18.3%) of students in Osun state compared to other states where no such initiative was ever implemented (PUNCHNG, 2016). More details of the failure of this initiative to yield the required results, was revealed in the implementation, distribution, and support plan, as outlined on the state government’s website.
Unlike Ukufunda app, the Opon Imo initiative was more techno-centric, with more emphasis on the mobile gadget than the contents it offers. Perhaps for political gains, the implementation of this vital initiative did not take into consideration, perception of its intended users, to the use of such device, for learning. Finally, just like Ukufunda app, the Opon Imo initiative usurped the educators’ role of providing guidelines (curriculum materials) for teaching pedagogy and practices, an unintended attempt to derail existing traditional curriculum guided learning, hence, becoming judges in their own case.

2.5 LITERATURE CONCLUSION

The core issues relating to electronic learning are divided into Pedagogical, Technical, and Operational (Pachler & Daly, 2011, p. 131), pointing out therefore that a perfect blend of technology, pedagogy and learning content forms the trinity for delivering an electronic learning solution geared towards improving the quality of education in Nigeria.

Having identified the multifaceted nature of issues surrounding the implementation of eLearning, there is therefore a need to understand that there is no “silver bullet” solution to a successful implementation of eLearning. A pragmatic approach to “grow the ecosystem” through flexibility of approach to pedagogy, technology, and policies regarding the learning content, must be adopted. Therefore, the choice of Case Based Pedagogy, Constructivism Learning Model, and Mobile Based Technology for the purpose of this research may be modified to enhance the success rate in any given context.

While discussions were continually extended to all aspects of eLearning, for the purpose of this research, the technical aspect, comprising of the ICT Technological mix, will have more focus, because a proper blending of technology with traditional approach will lead to better understanding among teachers.
Finally, as (Balfe, 1998) would rightly put the words of John Naisbitt, “the new source of power is not the money in the hands of a few, but the information in the hands of many”. With a platform to deliver quality learning content to teachers, coupled with control mechanism to ensure studying activities are carried out, will further fuel the emergence of better quality of education in secondary schools of Nigeria.
3. RESEARCH METHODOLOGY

3.1 INTRODUCTION

The research objectives were to investigate and provide valuable insight into secondary school teachers’ digital skills, their perception of mobile learning, and capacity building between and among them. In order to combine these objectives, findings were implemented in phases comprising of Questionnaires and Email Interview.

Relying on the cost effectiveness, and considering the need to ensure the privacy of respondents involved, hence the choice of questionnaire for primary data collection. Phase one of the data collection used a questionnaire targeting a total population of 120 secondary school teachers in Oyo state of Nigeria, the researcher was only able to get 51 respondents representing 43% of questionnaires given out. Phase two used Email Interview with an umbrella body for science teachers STAN, to inquire about any existing effort regarding the integration of ICT in teaching for its members. Data collected from the questionnaires was analysed using Microsoft Excel.

Understanding the perception of the major actors in mobile learning implementation is key to the success of this research. Using a combination of demographic, technical, Financial, and sociology related questions, in the form of a questionnaire, this research was able to determine current level of digit skills, as well as current perception of eLearning among secondary school teachers.

Finally, due to the ongoing state strike by public school teachers in Oyo State, the use of stratified sampling technique for segmenting schools into private and public, was dropped. Notwithstanding, considering the significance of public secondary schools in any attempt to nationalize ICT development, the researcher was able to get more than 10% of respondents from public secondary schools.

3.2 RESEARCH DESIGN

3.2.1 RESEARCH PHILOSOPHY

Subjectivists sees reality from within their mind, as an imagination (Holden & Lynch, 2000). With an intention to redefine information systems research as “what may be” rather than “what is”, the choice of subjectivism as a research philosophy was therefore borne out of imagination of a successful implementation of mobile learning
based on existing understanding of perception and skills of secondary school teachers, regarding ICT and its use in Education (Cornford & Smithson, 2006, p. 56). While a great amount of time is dedicated to the technical development of the software artefact, the concern of usability should not be left without been catered for. The decision to choose this hybrid research philosophy hinges on the fact that while a quantitative analysis was done using questionnaire to probe the level of digital skills among secondary school teachers, the other part of this research work was qualitative as the contents of email interview and examiner’s reports were dissected to further highlight the need for this research and effectively answer the research question.

3.2.2 Research Approach
This study has chosen to approach with a constructive top down model of looking at the genesis of problems in education, role of ICT in education, before narrowing it down to the prospects of mobile induced blended learning. This choice is further borne out of the desire to develop an ecosystem that through technical development, will yield something unique, while relying on existing initiatives as a source of inspiration (Cornford & Smithson, 2006).

Having elicited respondents’ opinion regarding the use of mobile learning for capacity building and understanding their current level of digital skills, a deductive approach is used to portray possible reactions to the introduction of T.N 1.0, as a step towards changing the educational landscape of secondary schools in Nigeria.

3.2.3 RESEARCH STRATEGY

QUESTIONNAIRE

Directed towards the primary actors, the teachers, the questionnaires (copy available in Appendix) are administered in person. Questions one and two are “category questions” type, and they sought to collect basic demographic information of respondents, the age, gender and marital status, respectively. These were to categorise the teachers along gender and age lines. Question three is a “category question” type, which sought to collect information regarding the teaching work experience of respondents. This is to better understand the experience demography of the respondents. Question four is a “open question” type, which requests for information regarding the subjects taught by respondents. Question five is also a “open question” type, which sought information regarding the various teaching
materials used by respondents aside from their subject text books. Having understood that teachers rely on their teaching notes to relate and teach in class, Question six is a “category questions” type, which sought to ask of the frequency of respondents to update their teaching notes. Question seven is a “category questions” type, which sought information on how often are the respondents’ teaching material updated. Question eight is a “list questions” type, which sought information regarding the educational qualifications of respondents in order to classify and categorise them. Question nine is a “list questions” type, which sought information regarding the various ICT equipment available in respondents’ schools. Question ten is a “list questions” type, which sought information regarding respondents’ use of the aforementioned ICT equipment to which they have access. Question eleven is a “category questions” type, which sought information regarding the type of software used by respondents to question 10 that uses ICT equipment for teaching and training students. Question twelve is a “list questions” type, which sought information from respondents regarding history of capacity building programs attended since joining the profession. Question thirteen is a “list questions” type, which sought information regarding the respondents’ use of mobile phone. Question fourteen is a “list questions” type, which probes respondents’ response to questions unknown to them that are asked by their students. Question fifteen is a “open questions” type, which sought information regarding online resources used by respondents who chose “Search Online” as one of their options to question fourteen. Question sixteen and seventeen are a “category questions” type, which sought information regarding the type and price range, respectively, of mobile phones used by respondents. Question eighteen is a “category questions” type, which sought information regarding knowledge sharing request from respondents’ colleagues. Question nineteen is a “list questions” type, which sought further information about knowledge sharing by asking the type of colleague that requested such assistance from respondents. Question twenty is a “category questions” type, which sought information regarding the frequency of capacity building program for respondents. Question twenty one is a “category questions” type, which goes back to ask question eighteen in a reversed order. Question twenty two is a “ranking questions” type, sought to measure respondents’ perception of factors that relates to the “Nigerian Factors” highlighted in the literature review, in their purchase of a choice computer gadget. Question twenty three is a “rating questions” type, which sought information relating to the current
perception of eLearning technologies for updating respondents skills and quality of teaching.

**EMAIL INTERVIEW**

**Question one** sought insight into the selection process of participants to the annual Science Teachers Association of Nigeria (STAN) conference, which may be termed as capacity building. **Question two** sought to confirm assumption in question one that classifies the annual event of STAN as a capacity building event and also, it sought to clarify the strategies in use for capacity building. **Question three** sought information regarding how STAN ensures knowledge sharing between participants on the one hand and non-participants on the other hand. **Question four** sought information regarding any ongoing or planned effort regarding the integration of ICT for the purpose of teaching and training among STAN members.

Discuss in detail alternative routes, Challenges and how they are solved.

**3.2.4 SAMPLING**

Sampling is a “process of selecting unit” from a target population, such that studying the selected unit gives a fair opportunity of generalizing the target population (Trochim, 2006). (Investopedia) further describes sampling “as a process used in statistical analysis” for picking predetermined units of observations from a target population. Therefore, considering the huge population of the secondary school teaching workforce in Nigeria, there is a need to pick samples based on probability.

![Map of Nigeria showing Oyo State](image)

**Figure 3: Map of Nigeria showing Oyo State**

Considering logistics, expenses and relatively easy access to secondary schools in Oyo State, samples were picked from locations within the state.
4. ARTEFACT DESIGN & DEVELOPMENT

4.1 DESIGN: TEACHERS’ NOTES 1.0

INTRODUCTION

This chapter begins by showing the development stages of the mobile app prototype from inception. Done using a native tool, android studio IDE, the prototype was meant to further underline the idea of creating an ecosystem, whereby learning contents can be delivered on cheap android mobile devices with fluidity and better performance.

With poor internet connection and erratic power supply, content delivery is conceived in such a way to beat the situation by ensuring contents are preloaded at the command center. Feedbacks and communications, on the other hand, are based on a client server architecture, hence the need for internet.

CONCEPTUAL DESIGN

T.N 1.0 was conceived to focus on areas such as content delivery, social interaction, and utilities, which are peculiar to existing mobile apps designed for educational purposes. Rather than becoming judge in its own case, by providing tailored solutions regarding these core areas, T.N 1.0 will offer an infrastructural platform to be used by licensed educators in delivering beneficial contents, promote moderated social interaction, on the go, while also delivering tailor made utilities based on general assumptions, to secondary school teachers.

Figure 4: Conceptual Drawing of T.N 1.0 App
FUNCTIONAL REQUIREMENTS

Defined as been identified in terms of input, outputs, processes and stored data, relating to a system, functional requirements are aimed at satisfying intended system's objectives (Whitten & Bentley, 2008, pp. 138-139).

**Learning Content:** T.N 1.0 should deliver learning contents whether sourced from open sourced or locally generated. Open Sourced learning contents in the form of images, video, audio and rich text are readily available free of charge on the internet e.g. Khan Academy, ck12.org etc., but there is also a need for locally generated content, in order to facilitate deep learning. Finally, such learning contents must be streamlined to reflect cased based and constructivist approach to achieving deep learning.

**Social Interaction:** provision of a mechanism at the end of every topic to rate and make suggestions, this aims to defy the traditional Producer-Consumer model of learning. Through this feature of T.N 1.0, teachers can rate contents to show how helpful they are, while also making suggestion based on what they will like to be improved, hence a peer to peer model.

**Utilities:** Designed to ensure T.N 1.0 users are enshrined in using the artefact. This deploys several tools that may facilitate the daily routine of a secondary school.
teachers. For the purpose of this dissertation, the news application should be integrated.

**NON-FUNCTIONAL REQUIREMENTS**

**Performance:** using mobile tablet made of cheap technologies, the performance of T.N 1.0 is critical in terms of usage of resources vis-à-vis storage capacity, CPU, memory consumption etc. For example, with each topic of any subject having a combination of videos and several pages of texts, T.N 1.0 must devise a means to deliver lightweight contents.

![Map Showing the states in Nigeria](image)

**Figure 6: Map Showing the states in Nigeria**

**Scalability:** With an average of over 12000 secondary school teaching workforce in each of the 36 states across Nigeria, as shown above, the intention of this dissertation artefact is to accommodate communication. By representing each state as a node, T.N 1.0 should facilitate communication between up to 20,000 on a single node. This is used for intra and inter state communication with others e.g. Educators, Colleagues.

**Security and Privacy:** one of the fine lines in the T.N 1.0 should be in the decision to persist software usage data. While giving educators assurance regarding the administering of learning to retrain teachers, it may invariably lead to breach of privacy as the report statistics on artefact usage should accurately determine if T.N 1.0 is indeed used satisfactorily. Encryption of teachers’ sensitive data using a synchronous encryption method, in order to avoid possible data breach.
Maintainability: as T.N 1.0 is modelled as an “ecosystem”, the maintenance should be relatively easy for the educators. With the ability to mix open sourced and locally generated content

Usability: Taking cue from concepts displayed on numerous websites like Apple news app, khan academy mobile app, ck12 website, GCSE website, etc., T.N 1.0 should ensure ease of use by making use of the features that are presumed to be familiar with end users. Also with dynamic learning content, social interaction and other utilities such as subject based dictionary, task scheduler etc., delivered on a user friendly mobile tablet, the usability of T.N 1.0 artefact should be relatively easy.

Availability: T.N 1.0 should be preloaded on devices, and should rely on the internet only when there is a need for communication between the teachers, their peers, and the educators. This represents a loose coupling solution, that gives other functionality such as access to Learning Contents and utilities. While the internet reliant features like the report statistics are persisted in local storage till an internet access is detected.

Affordability: Price checks as of the time of writing this research work shows the price range of mobile device (phablets) that meets the basic requirement for the software artefact, to be between N20000 – N30000 (₦57 – ₦86). Therefore, T.N 1.0 should be lightweight enough to work with the basic requirement of the cheapest and affordable configuration of mobile devices (Tablet).

At such price, policy makers should be able to tap into the opportunities provided by this relatively cheap devices to implement a comprehensive and sustainable capacity building for secondary school teachers nationwide.

4.2 ROLE OF ARTEFACT

The primary role of T.N 1.0 is to deliver online and offline, quality learning contents and utilities, using the features of web 2.0 vis-à-vis rich text, images, and multimedia capability, on cheap mobile devices, to the targeted audience; secondary school teachers.

One of the secondary roles of T.N 1.0 was to address the shortcomings of typical traditional face to face training. While teachers been trained may not find the comfort in asking question during a F2F training session, the idea of mobile learning gives them the chance to communicate questions, suggestions, and ideas, with other teachers, as well as educators uploading the contents.
Another secondary role of T.N 1.0 is to avail the users, information literacy and awareness, through the provision of up to date news from several sources, in order to eradicate ignorance about happenings in the internal and external environments.

4.3 SOFTWARE DEVELOPMENT

DEVELOPMENT LIFE CYCLE

The choice of prototype modelling for the development of this software artefact was born out of two factors. First is the gradual acquisition of android programming knowledge, by the researcher. This runs parallel to the length of time required to complete this research work, hence the need for a continual draw down on design and implementation. Second is the non participation of actors in the requirements analysis at this stage. Rather than provide design sketches and paper drawings, which may be time consuming, prototyping is an iterative modern engineering based approach to design, that can be used as a starting point to forge relationship between the designer and the users of any system (Whitten & Bentley, 2008).

Use case model diagram shown above, shows the T.N 1.0 as a collection of processes (use cases), actors and the relationship between the actors (Whitten & Bentley, 2008, p. 184).
HIGH LEVEL USER STORY SUMMARY

- There are three actors, the teachers, admins, and the educators.
- A subject is made up of many topics.
- Topic contains a mixture of text and visual contents.
- A teacher teaches using a teaching note
- A teacher teaches one or more subjects.
- A teaching note is exclusive to a subject.
- A teaching note is made up of topic contents
- An educator is enrolled by the admin.
- A teacher is enrolled by the admin.
- An educator uploads one or more topics

Figure 8: Class Diagram for Teachers’ Note 1.0
The objects and their associations are represented graphically above, using a class diagram. For example, the subject is composed of topics, whereas a Person is specialized as an Educator, if they contributed one or more topics (Aggregation). Similarly, news as a class object forms an Aggregation relationship with the Teacher class object, because the teacher may or may not view one or more news.

Figure 9: Sequence Diagram for T.N 1.0 Notes Component

Sequence diagram shows how objects interact with one another, and in what order they do so. As shown above, the series of interactions between identified objects are laid out.

IDE ENVIRONMENT

According to its documentation, Android studio “provides the fastest tools for building apps on every type of Android device” (Google, 2016). The IDE provides facilities for writing and editing code (IntelliJ), optimization, instant build and deploy system (Gradle), and highly flexible build system.

Android java classes are crafted to include an OnCreate() method that serves as a constructor for each Activity linked java class. Therefore, most classes, and methods that requires to run when an activity is loaded, are to be instantiated in the this protected method.

XML is simple and flexible way of representing data, and most importantly for large-scale electronic publishing (W3C, 2015). In designing the graphical user interface part of the artefact, XML integrated into the Android Studio IDE is used.
The android resource folder hierarchy also stores different media type and format in different folders. Using layout sub folder to store layouts or fragments, drawable sub folder to store images, raw sub folder to store videos, values to store string attributes etc.

In bridging the XML and java classes, all design elements in XML, are to be mapped to an android data types (e.g. ListView, ImageButton, LinearLayout), called “Type Casting”.

**Implementation**

**TEACHERS’ NOTE 1.0**

**Video View:** In ensuring a proper mix of text and visual content, a video view widget was used to play a list of videos, to be prescribed based on chosen topic.

**Fragment and Adapters:** in an attempt to make use of the small screen size available for the Teaching Notes, the fragment was used as a mechanism for bringing into an activity, layouts defined elsewhere. It provides the flexibility of a more professional UI, because there can be multiple fragments with different interface and behavior in a single activity.

With multiple pages (mock pages in prototype) in each topic, the Teachers’ Note uses fragment to represent each of these pages, and managed by a fragment manager to ensure the user keeps a track of position at any one time.

**View Pager:** used in conjunction with the fragment and fragment pager adapter, to provide a carousel-like changing content pages. This ensures that rather than scrolling down to the bottom of the page, users can swipe left or right to navigate pages.

**PERSISTING DATA**

In fulfilling one of the user requirements of Teachers’ Notes 1.0, there was a need to persist data for vital components of the app such as session, subjects, topics, rating etc. In android, persisting locally can be done using either shared preferences, internal or external storage, or SQLLite database. Even though shared preferences offer a key-value pairs of primitive times, and SQLLite offering relational database access to stored tables, the need to access data from remote location was put into consideration.
Fire Base is described as a platform for building web and mobile application with its real use of JSON Database for CRUD operations (FireBase, 2016). Rather than use entity relationship and database design patterns, Fire Base, a key-pair implementation of document based NoSQL was used to provide super fast and persistent CRUD operations.

UTILITY: NEWS APP

This research artefact implemented a news application as a component of the T.N 1.0. With the aim of endearing users to the software, and also provide quality information from variety of sources, the news application captures news headlines from five major newspapers in Nigeria.
Using grid layout in XML as a container, five image buttons, each representing a newspaper, were created and placed inside. The intention is to mimic a tab host/tab layout setting, to relive a familiar user experience as used by vast majority of respondents in their android phone books. After this, a list view widget was created to hold news titles that are skimmed from each of the five newspapers represented by the image buttons.

Coding
After designing the graphic part and assigning identifiers to each elements and widgets, the coding is done in the class “NewsToday.java”.

JSOUP

JSoup library is “a java API library for extracting and manipulating data using Document Object Model (DOM), Cross Site Scripting (CSS), and jQuery-like methods” (JSOUP, 2016).

As stated in JSoup introductory notes, Documents consist of Elements, while an Element contains a list of children Nodes with a single parent Elements. JSoup uses an abstract class Document, which allows objects to access the connect() and get() methods. For example, document as an object of class Document can be used get a web URL directly from the API by:
Document document = JSoup.connect(myURL).get();
Using a filtering criteria, which in the case of this research work, were the precise div elements holding the newspaper titles, on the newspaper websites, it was then possible to parse to a JSoup Elements object, using the select() method by:

Elements newsTitles = document.select(filtering criteria);
With the possibilities of more than one news titles in the case of this research work, a For Loop is then used to traverse the elements in the holder (newsTitles) by:

For (Element link : newsTitles)
Where link is the object of the Element class, used to hold every children of the newsTitles.
As written in the actual code (available in appendix A), the skimmed content of newsTitles comprises of the newsTitle and the newsLinks. For the purpose of illustration, variable names are not tracked. Therefore, using separate arraylists for the title and link, the following were used to enlist the elements:

    newsHeadings.add(link.text()+"\n");
the method .text() identifies the text related children and enlists them using the arraylist newsHeadings with the add(children) method.
With JSoup API Library’s ability to manipulate DOM, the news links were enlisted in the array using a select method on the child link, with more focus on the tag “href”, which was then converted to string.

    newsLink.add(link.select("a").attr("href").toString() + "\n");
ASYNCTASK
According to its design specification, Asynctask provides “proper and easy use of UI thread”. With background processing and publishing of results on the UI thread without interfering with the thread or handler, it is meant to be used for a short period of time (Google, 2016). For the purpose of retrieving news from the newspaper websites, this research artefact implemented a class myClass that uses Asynctask. The AsynTask interface implements several methods, but for the purpose of this research work’s specification, three of the methods were used:
OnPreExecute{}: explains what should be done before processing gets underway. The artefact implements a progress dialog to provide animation only.
doInBackGround(String… params){}: implements the jsoup API to fetch and return the news.
onPostExecute(): implements a post execution action. This artefact adds the result of the “doInBackground” to the list view widget.

**GO TO NEWS DETAILS**

Passing data when navigating between one activity and another can be implemented using several methods, but this research used an intent. Briefly described as “an abstraction of an operation to be performed”, the intent was used to hold the corresponding links to each news title in the list view.

![Figure 13: News Titles from a News Website](image)

The putExtra stores the link at each position of the newsLink list view, while the listener on the list view listens for any possible tap from user on a title position. On tapping a news title, the startActivity method implements the newsIntent which plans to take the movement to a new destination, with all the stored (putExtra) details.

**NEWS DETAILS**

By implementing a web view, the sole aim of this new activity is to display any link tapped on the newsToday activity. With the help of the stored link variable, the XML designed webView implements a loadURL method on the stored link to display the chosen news details.
5. DATA ANALYSIS AND FINDINGS

Results

Of a total of 100 questionnaires distributed to schools in Oyo state, only 51 were returned representing a response rate of 51%.

Age Segmentation of Respondents

<table>
<thead>
<tr>
<th>Years</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 30 years</td>
<td>9</td>
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<tr>
<td>31 - 40 years</td>
<td>29</td>
</tr>
<tr>
<td>41 - 50 years</td>
<td>9</td>
</tr>
<tr>
<td>51 - 60 years</td>
<td>2</td>
</tr>
<tr>
<td>&gt; 60 years</td>
<td>0</td>
</tr>
<tr>
<td>unknown</td>
<td>2</td>
</tr>
</tbody>
</table>

Results from the study identified that nine participants representing 18% of respondents, each belong to the age brackets “below 30 years” and “41 and 50 years”. Two participants representing 4% are between 51 and 60 years, while the majority of respondents, twenty-nine participants representing 57%, are between 31 and 40 years. With this promising age bracket, there are greater chances for sustainable development which will manifest in the quality of education, for decades to come.

Gender

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>male</td>
<td>47%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>female</td>
<td></td>
<td>49%</td>
<td></td>
</tr>
<tr>
<td>unknown</td>
<td></td>
<td></td>
<td>4%</td>
</tr>
</tbody>
</table>

Based on this study, 49% of respondents, representing twenty-five participants, are females, while 47% representing twenty-four participants, are males. Coincidentally, (WorldBank, 2010) revealed the number of female teachers in secondary schools of
Nigeria to be 46%. With a slightly balanced gender mix in the work force, it will be interesting to understand the perception of secondary school teachers, from a holistic point of view, rather than stereotyping a particular gender.

**Years of Experience**

<table>
<thead>
<tr>
<th>Years of Experience</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 5 years</td>
<td>12</td>
</tr>
<tr>
<td>5 - 10 years</td>
<td>25</td>
</tr>
<tr>
<td>11 - 20 years</td>
<td>9</td>
</tr>
<tr>
<td>21 - 30 years</td>
<td>2</td>
</tr>
<tr>
<td>&gt; 30 years</td>
<td>1</td>
</tr>
<tr>
<td>Unknown</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 3: Overview of Years of Experience of Respondents

Result shows that 49% representing twenty-five participants, and 24% representing twelve participants, were having “5 to 10 years” and “Less than 5 years” working experiences, respectively. Also, 17% representing nine participants, and 4% representing two participants, belong to “11 to 20 years” and “21 to 30 years” working experience category respectively. Finally, 2% representing a participant, has over 30 years of experience, while a participant did not disclose years of experience.

**Subject(s) Taught Per Teacher**

<table>
<thead>
<tr>
<th>Number of Subjects taught per Respondent</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>ONE</td>
<td>45%</td>
</tr>
<tr>
<td>TWO</td>
<td>35%</td>
</tr>
<tr>
<td>THREE</td>
<td>20%</td>
</tr>
</tbody>
</table>

Table 4: Subjects taught Per Respondent

45% of respondents, representing twenty-three participants teaches three subjects. 35% representing eighteen participants teaches two subjects while 20% representing ten participants teaches only a subject.
Teaching Material References

63% of respondents, representing thirty-two participants uses electronic sources for teaching material references. These electronic sources are based on the computer and internet. The remaining 37% representing nineteen participants rely on text books and other non electronic sources for their teaching materials.

Updating Teaching Notes and Materials

Research findings on Teaching notes update shows that in a population of fifty-one participants, seventeen respondents update their teaching notes every few months, while twenty-seven update theirs every academic session. Also, three participants each updates their teaching notes in “few years” and “irregularly”. One participant decline to state.

Findings on how often teaching material that are used to update respondent’s Teaching Notes, are updated, shows that nineteen participants update theirs every few months, while twenty-two participants update theirs each academic session. Also, five participants each updates theirs in “few years” and “irregularly”.

Table 5: Teaching Material Statistics

Table 6: How Often Respondents Update Teaching Notes and Materials
In a population of fifty-one respondents, 59% representing thirty participants are bachelor’s degree holders. Also, 23% representing twelve participants have master’s degrees, while 12% representing four participants are holders of Higher Diploma. One participant (2% of respondents) has Post Graduate Diploma of Education while two participants (4% of respondents) are college graduates.

### Access to ICT Facilities in Schools

A total of forty-nine responded in the affirmative when asked about access to ICT facilities in their schools. Sixteen participants (33% of respondents) stated they have access to the use of only computers in their schools. Of this, only seven participants use computers for teaching their students. Asked separately, thirty-three (67% of respondents) stated that they have access to internet facilities. And when asked about their use of ICT facilities for training
students, nineteen of the thirty-three participants (57%) use computers for teaching students.

Affordability: Choice of Software

The total population of respondents that teaches with computer and internet stood at twenty-six. Of this, six participants (23% of respondents) stated that they use paid software to teach students. While two participants (11% of respondents) are undecided, eighteen participants (69% of respondents) stated that they use free software to teach students.

Use of Mobile Phone

Forty-six participants (90% of respondents) use their mobile phones for all functionalities i.e. Basic, Social Networking and Other Internet Related activities. Such functionalities cover Calling and Texting, Facebook, Twitter and WhatsApp, Online News, and use of search engines. Three participants (6% of respondents) stated their use of mobile phones for two of the given purposes. Such purpose may be a combination of basic functions and social networking, or basic functions and other internet related activities.
Reaction to Unfamiliar Questions

Table 11: Respondents’ Reaction to Unfamiliar Questions

<table>
<thead>
<tr>
<th>Option</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ask Trusted Colleagues</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Internet</td>
<td>16</td>
<td>7</td>
</tr>
<tr>
<td>All Options</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Others</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

Categorized into gender based responses to unfamiliar questions from students. Two participants of each gender revealed that they will ask for help from “trusted colleagues” for answers to such questions. Whereas four female participants (15% of female respondents) revealed they will seek assistance from the internet, seven male participants (29% of male respondents) revealed they will seek assistance from the internet.

Sixteen female participants (62% of female respondents) stated that they are confident of using “all options” to seek answers for unknown questions posed by students. Such options include textbooks, asking colleagues, internet etc. Thirteen male participants (54% of male respondents) revealed they will make use of “all options”.

Online Resources Used

In responding to question fifteen, participants that chose “Search Online” were asked to list the online educational resources used in responding to unknown questions, and thirty-two responded. Twenty-six respondents (81%) stated search engines and Wikipedia as their favorites, while six respondents (19%) remaining stated mainly education websites as their choices.
Thirty-seven participants (72% of respondents) revealed their phone uses Android operating system. Whereas Blackberry is used by two participants (4%), Apple iOS and Nokia Symbian OS are used by three participants (6%) each. Finally, a participant (2%) used Windows OS while five participants (10%) decline to provide their phone OS.

Respondents’ Mobile Phone Price Range

Eight participants (nearly 16% of respondents) stated that their mobile phone is less than ₦10000 (₦28). Eighteen participants (over 35% of respondents) revealed the cost of their mobile phone to be between ₦10000 and ₦20000 (₦28 and ₦56). Also, thirteen participants (over 25% of respondents) revealed that their mobile phone cost
to be between ₦21000 and ₦30000 (₦59 and ₦84). Finally, twelve participants (approx. 24% of respondents) revealed their mobile phone cost over ₦31000 (₦86) (XE.com, 2016).

Knowledge Sharing Among Teachers

Fifty participants (98% of respondents) revealed they had been approached by colleagues for subject related assistance. While twenty-eight (56%) of these fifty participants revealed they had been asked for subject related assistance by colleagues across age, gender and hierarchy, twenty-one (44%) of them stated that even though they had been asked for subject related assistance by colleagues, there was a pattern relating to hierarchy, age or gender.

Frequency of Capacity Building Program

While answering question twelve, over 98% of respondents stated that they had undergone one or more capacity building program. When asked about the last time such program was attended, four participants (8% of respondents) said “Never”.

Table 14: Knowledge Sharing Among Teachers

<table>
<thead>
<tr>
<th>Sexs and Positions</th>
<th>None</th>
<th>Some</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>4%</td>
<td>41%</td>
<td>55%</td>
<td></td>
</tr>
</tbody>
</table>

Table 15: Frequency of Capacity Building Program

<table>
<thead>
<tr>
<th>Last Capacity Building Program</th>
<th>Never</th>
<th>&lt; 1 year</th>
<th>1 - 2 years</th>
<th>&gt; 2 years</th>
<th>Can’t Remember</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>1</td>
<td>18</td>
<td>9</td>
<td>9</td>
<td>4</td>
<td>6</td>
</tr>
</tbody>
</table>
Whereas sixteen participants (31% of respondents) said “Less than a year”, other participants are divided across the band. Nine participants (18%) said “1 – 2 years” while ten participants (19%) said “over 2 years”. Meanwhile seven participants (14%) said they can not remember the last time they had a capacity building program, while another five participants (10%) declined to provide a time frame.

**How comfortable are they with Colleagues’ assistance?**

![Comfortable with Colleagues' Assistance](image)

**Table 16: How Comfortable with Colleagues' Assistance**

Forty-nine participants (96% of respondents) said they are comfortable asking for subject related assistance from colleagues.

**Perception to the Integration of mobile learning in Education**

![Perception of Respondents to the use of mobile learning for Education](image)

**Table 17: Perception of Respondents to Mobile Learning for Teaching and Training**
When asked questions regarding perception of respondents to the use of mobile learning for teaching and training, forty-nine participants responded.

Question one sought to ask “The use of electronic teaching material helps in Improving quality of teaching?” in response, thirty-three participants (67% of respondents) said they strongly agreed. Sixteen participants (33%) said they agreed.

In response to question two “All subject teachers should have access to electronic teaching technologies?”, thirty-one participants (63% of respondents) said they strongly agreed. Eighteen other participants (37%) said they agreed.

In response to question three “The use of mobile learning technologies can help in updating my skills and knowledge?”, thirty participants (61%) said they strongly agreed. Nineteen participants (39%) said they agreed.

In response to question four, “The use of mobile learning devices can be a source of distraction and time consuming?”, five participants (10% of respondents) agreed strongly. Another fifteen participants (31% of respondents) agreed. Meanwhile, twenty-two participants (45%) disagree with the statement, while a further 16%, representing 8 participants, strongly disagreed with the statement.

In response to question five, “Mobile learning technologies can be cheap and made available to all secondary school teachers in Nigeria?”, eleven participants (22% of respondents) each said they strongly agreed and disagree. A further 57%, representing twenty-eight participants, said they agreed with the statement.
Preferences when Purchasing a PC

Table 18: Respondents’ Preferences For Making PC Purchase

There are several factors to be considered when purchasing a new computer. The respondents were asked to rank their choices, and a total of fifty respondents stated their opinion regarding this.

When asked about “Portability” as a factor, twenty-six respondents (52%) said it was “extremely important”. Twenty respondents (40%) said it was important. While four respondents (8%) said it is not important.

When asked about “Battery Life”, thirty-nine respondents (78%) said it was “extremely important”. Also, nine respondents (18%) said it was important. While two respondents said it was not important.

When asked about “Screen Size”, eleven respondents (23%) said it was “extremely important”. Thirty-one respondents (63%) said it was important. While six respondents (12%) said it was not important.

When asked about “Functions”, thirty-seven respondents (76%) said it was “extremely important”. Ten respondents (20%) said it was important. While two respondents (4%) said it was not important.

When asked about “Cost”, twenty-eight respondents (56%) said it was “extremely important”. Twenty respondents (40%) said it was important. While two respondents (4%) said it was not important.

When asked about “Ease of Use”, thirty-four respondents (69%) said it was “extremely important”. Twelve respondents (25%) said it was “important”, while three respondents (6%) said it was not important.
5.2 Interpretation of Results

Teaching Workforce Mix
This study revealed the relative gender balance in the secondary school teaching workforce of Nigeria. With majority (75%) of respondents under the age of 40, this is a positive factor for any possible long term capacity building program by stakeholders. Also, with 73% of respondents having less than 10 years of working experience, investment in such program should be worth it.

A possible indicator of the acute shortage of qualified teachers in Nigerian schools was the result of the findings regarding the number of subjects taught by each teacher. Only 20% of respondents were teaching a single subject, while the rest (80%) were teaching at least two subjects. Nigeria’s Pupil-Teacher ratio in Secondary Education is 1:40+ (Huebler, 2008) (World Bank, 2010). Whereas according to OECD, in member countries, the average number of students per class in secondary school is 24, possibly indicating the Nigerian situation as a potential disaster (OECD, 2011).

Meanwhile, majority of respondents (82%) had at least bachelor’s degree, which is indicative of the strong qualifications possessed by these respondents, although the national teachers institute mandates a conversion course for non education degree holders, and this research work did not focus in such direction (NTI-NIGERIA, 2015).

Teaching Notes and Materials
Teaching materials are meant to reinforce syllabus, a term used to define the path to be taken by teachers, in order to fulfil the secondary school curriculum. These materials are the ingredients that are further contextualized and given individual meaning by the teachers, to form their own notes, which will aid their teachings.

They are mostly sourced from text books and as revealed in the findings, minority (37%) of respondents took the pride in sourcing their teaching materials from “text books and other traditional sources” as stipulated by the curriculum. While this is in conformity with the norms, the major concern is the divergent view of respondents regarding the frequency of updates to their teaching notes. Nonetheless, majority of respondents agreed that both their teaching notes and their source of material should be up to date every academic session.
**Access to ICT Facilities in Schools**

Surprisingly, majority of respondents (96%) attest to the presence of ICT facilities in their schools. Ranging from desktop computers, visual aid equipment (projectors), laptops and other electronic gadget, the result of this findings point out to the presence of basic ICT facilities in secondary schools across the country. Though there are ICT facilities in Nigerian secondary schools, a closer look at the findings result revealed two important facts. First, the ICT equipment are not adequate to cater for the needs of the teachers, let alone the students. This is evident in the relationship between the number of respondents (49 participants) that stated they had access to computers and internet on the one hand, and the number of respondents (26 participants) that used the facilities for teaching purposes. In summary, where there are adequate ICT facilities, more respondents would be willing to train students with them.

Second, a drilled-down look at the participants that used computers and internet to teach students, revealed the fact that respondents were using unregulated sources on the internet to upgrade themselves and teach their students. When asked to list electronic sources used in upgrading their knowledge (and teaching), majority of respondents listed search engines as their electronic sources of information for upgrading (and teaching). A paltry minority (5 participants) revealed that they used educational resources over the internet as the source for their teaching material and thus update their teaching notes.

**Digital Skills**

Combination of several discussed theme revealed a mixed result. While respondents were acknowledging the presence of ICT facilities, though inadequate, there were several issues pointing to a relatively low level of digital skills among the respondents. One of such, is the failure of majority of respondents to distinguish between a search engine and online resource website. Also, there was no instance of open source initiatives been mentioned by any of the respondents, revealing that they were either not aware of such innovation or none of them has ever used it.

On a positive note, having identified that over 90% of respondents use their mobile phones for basic calling functions, social networking and online information search, and with majority of them been able to list several search engines, an indication that they can comfortably perform information search, on the internet. Also, with more than average of respondents revealing their personal use of internet for capacity
building, it will be right to assume that respondents' mobile phones played more part in their acquisition of digital skills than any other electronic devices.

**Nigerian Factors**

i. **Free Software for Education**
Among the twenty-six respondents that used ICT facilities for teaching and training students, 70% of them stated they used free software to teach, while 23% said they used paid software. This may be a reflection of the perception of respondents to the use of ICT for capacity building.

ii. **Choice of Mobile Phone**
With thirty-nine participants saying it is “**Extremely Important**”, respondents are by all means conscious of “battery life”, a known Nigerian factor, when purchasing a mobile phone. Also significant is the desire for functionality. Thirty-seven participants said they will consider “**Extremely Important**”, the functionality of such phone. Interestingly, respondents were partially divided on “**Cost**” and “**Portability**”. 56% of respondents said it is “**Extremely Important**”, 40% reluctantly agreed it is “**Important**”, while two participants said they do not care about the price, which fairly represents the varying income and preferences. Also on “**Portability**”, 52% considered it “**Extremely Important**”, while 40% said it is “**Important**”. With varying screen sizes, individual choices are bound to play a part in this selection.

Overall, the choice of mobile phone is a conscious attempt to highlight the impact of the Nigerian Factors as discussed in the literature review on the perception and buying patterns of consumers in Nigeria as a country. This will further assist this research finding in positioning an open sourced android based mobile learning system as a way to improving the quality of teaching in Nigeria secondary schools.

iii. **Knowledge Sharing**
This theme is discussed under Nigerian factor because of the cultural and physiological dimension involved. With a slightly higher population of female in the sampled population, results from findings show that out of twenty-nine participants that stated that they use all available options to seek answers to unfamiliar questions asked by students, the female (55%) population shows more desire to pursue all channels in capacity building, perhaps, this may be connected to the patriarchal name of Nigeria. This is more evident in the results of participants that used internet as the means of answering unfamiliar questions. Out of eleven participants that chose “search online” as the primary way of answering unfamiliar questions, four
respondents (36%) were female, while seven respondents (64%) were male. This may further be attributed to the egocentric nature of males in the African society. Additional review of responses to questions eighteen and nineteen, on subject related assistance among respondents also shows that 44% of respondents were not comfortable asking for such assistance either from the opposite sex, or from a junior colleague.

iv. Lack of Standards
The easiest way to get information on the internet is through the use of search engines. With Google taking the largest share of the search engine market (63.8%) (Lella, 2016), and been the most frequently listed answers among majority of respondents, search engines will continue to be the pathway to information search on the internet. Also, a handful of respondents mentioned the use of Wikipedia, as one of their educational resources. While both search engines and Wikipedia cannot be outrightly disqualified for secondary school education, there is an urgent need for educators to provide alternatives to the use of these unregulated materials for the purpose of upgrading their knowledge and teaching students.

v. Capacity Building Program
In a country with over 200,000 secondary school teaching workforce, the idea of capacity building is always selective. More worrisome was the result of WAEC exams culled from ten Unity schools, showing an average of 93% pass in at least five subjects, among students (Okonkwo, 2016). These unity schools, are federal government secondary schools, represented and located, in each of the 36 states of the federation. With the quality of education leading to the yearly high success rate, there is a need to revisit the process of knowledge sharing among teachers nationwide.

As stated in the response of the interviewed STAN Coordinator, participants in seminars are selected from each state of the federation. Whereas, other capacity building programs are done in 9 out of the 36 states in the country. When asked on how STAN ensures knowledge acquired by member participants trickle down to others, the interviewee identified “Feedback and Response Systems” as indicators of success in the transfer of such knowledge from teacher to teacher(s), and teacher to students.

While giving example of the aforementioned mechanism, the interviewee mentioned the “annual quiz competition” as a way to check students’ knowledge, but failed to
mention anything regarding the teachers. The interviewee failed to give examples of statistics or effort regarding such mechanisms for tracking teachers’ performance, and even though such may be present, it does not offer any tremendous effect on the problem of mass failure among students and lack of quality teaching skills among teachers.

Finally, the interviewee mentioned the “science fairs” as a way used by STAN to transform teaching experience to a digital one. Perhaps, it is safe to assume that while all effort mentioned by the interviewee seems to be genuine and a thought-out process of revamping the educational landscape of the country, but no doubt, there is a need to replicate such on a very large scale, with the barest minimum resources.

**Choice of Android**

Aside powering the largest number of mobile phone devices in the world and cornering over 66% of the global operating system market share (Net Corporations, 2016), the use of Android for designing this research artefact was justified by the 72% of respondents using an android powered mobile phone. A prime factor associated with this is the wider spectrum of mobile phone manufacturer using this operating system. Though not captured in the questionnaire, the android operating system market shares are divided among manufacturers such as Samsung, Sony, Tecno, etc.

A follow on effect of this wider spectrum coverage is evident in the findings when, the responses to question seventeen showed respondents phone prices were scattered between ₦10000 (728) and over ₦30000 (86). While other Operating systems are designed to run on a single mobile hardware, hence a stable product price range. With the exception of Windows Mobile OS that also offer some capabilities to run on some mobile hardware platforms, the android OS is giving both the rich and the poor lifelines, through its market segmentation.

**Perception to Mobile Learning**

With 67% of respondents to question one saying they strongly agreed on the effectiveness of electronic sources to improve the quality of education in secondary schools of Nigeria, this was a clear statement that identifies with the awareness of respondents to the usefulness of electronic learning as a way to build their capacity and achieve quality learning (for students). Also, in response to question two, a majority (63%) said they strongly agreed on the need for all secondary school teachers to have access to eLearning technologies. Perhaps with further
enlightenment, the remaining 37% who reluctantly agreed to the statement, may change their current perception.

Response to question three shows 61% agreed strongly on the use of mobile learning technologies to improve skills and knowledge. While this is noteworthy, there is a need to understand further, why the remaining 39% reluctantly agreed to this statement. Perhaps the answer lies in the response to question four. In question four, whereas 44% said they disagreed that the use of mobile learning devices can be a source of distraction and time consuming, and another 16% strongly disagreeing, 30% said they agreed to the statement. Also, another 10% strongly agreed. Several possibilities may be responsible for these divergent views, but two prime factors are suggested.

The idea that the use of mobile phones, which are meant for the purpose of calling and social networking with people, should be used for learning, may sound counterproductive to respondents. This informed the use of Phone-Tablet (Phablet) as the hardware platform for this research work. Such Phablet, while offering on the go, the convenience of mobile phones, will deter regular use, as a mobile smartphone, due to its size and weight. Another factor that may have led to the position of respondents, is the lack of awareness about the potentials of using these mobile devices especially Tablets, for the purpose of capacity building.

Results from question five showed majority agreed on the need to make mobile technologies cheap and available to all secondary school teachers in Nigeria. Even though 57% shared this opinion, the question that begged for an answer is “why did they not Agreed Strongly?”. With keywords like “Cheap” and “Available to all”, not even the majority that agreed such implementation should happen believed it could be a possible task. This is a further reflection of their perception of eLearning as an expensive piece of experiment in improving the quality of education. Nonetheless, with optimism as to the benefit of such endeavor, it can be deduced that respondents reluctantly agreed in the affirmative.
Discussion

Due to the time frame for the completion of this research work, there were several abandoned implementations in the Teachers’ Note. One of such is the idea of user usage statistics for all components of the application. The idea was to track usability, by monitoring user behavior around each component of the application.

“Power without responsibility is useless” – Unknown Source

Capacity building for secondary school teachers through the use of mobile learning in Nigeria, may never be successful without the implementation of checks and balances to gauge whether learning really takes place or not, and to what extent it is improving the quality of education, for both the teachers and the students. From a technical perspective, the idea of capacity building transcends handing out some cheap mobile tablets to teachers for the purpose of training themselves, rather, there should be some mechanism to report educational use of such devices over a specified period of time.

The stability of the Teachers’ Note app prototype at the time of submitting this research work is highly doubted. With external dependencies such as Firebase add-ons, jar libraries, media files, etc., the idea of a hybrid application with standalone capabilities was partly defeated in the course of implementation. Nevertheless, the researcher was able to realize that the level of abstraction involved in the use of APIs and their dependencies, impose limitations on the control of their performance and resource usage, therefore, the decision on integration of such components will continue to therefore be either to use them or not, as they are rarely customizable.

The positioning of Teachers’ Note app’s implementation as an ecosystem, is borne out of the belief that adding a social aspect to software engineering, such as the perceived standard of living of the users, should be a contributing factor to any nationalization of ICT integration in Nigeria. Whereas better proprietary technologies are being sold to the rich few, this research idea relies on the reality of Apple vs Google in the African Market, to deduce that open sourcing can be a Win-Win situation for both IS Solutions provider and their prospective customers, through usage, licensing and support.
Conclusion

As the popular saying that “All fingers are not equal”, so are the patterns identified in the research findings regarding the availability of ICT infrastructure in schools of Nigeria. While a prioritized and well funded secondary school model (Unity Schools) is enjoying over 90% success rate in WAEC exams, the other secondary schools, both private and public, are struggling with an average success rate of slightly over 50%. Perhaps, this may be connected to the statements of WAEC examiners demanding schools to hire more qualified teachers (with up to date knowledge of concepts), to teach their students.

Having identified a possible socio-cultural barrier hindering subject related assistance between and among teachers, this research finding demystified the African proverb by revealing yet another benefit, that is, the use of mobile learning to enable knowledge sharing between and among teachers in Nigeria. Therefore, the use of an anonymous model to improve the quality of education through teachers’ capacity building is imminent.

Even though the need for a high quality ICT induced model for capacity building among secondary school teachers in Nigeria has been reiterated in this work, the alternative course of action in order to fulfill this immense task, still needs to be thought through by stakeholders. But certainly, with the level of digital skills displayed by the teachers, coupled with the growing popularity of android operating system, the need to choose mobile learning as a viable and cheap means, above any other form of electronic learning is more suitable.

Finally, this research work was able to identify that with the meagre resources available to the Education sector, the choice of secondary school teachers, rather than secondary school students, is justifiable. As the source of knowledge, and with the manageable size of teachers’ population, implementation of a well thought out mobile learning integration for teachers, may eventually lead to improved quality of education in Nigeria secondary schools.

RECOMMENDATIONS

With many proprietary learning management systems in the market, the only recommendation of this research for stakeholders is to realign the objectives of their ICT initiatives. Rather than proffer solutions out of a vacuum, a though out solution,
that involves engagements between actors and stakeholders, to identify the needs, and match with the objectives and budget, should be implemented.

**REFLECTIONS**

In all the stages of development of this research artefact, from the conceptual modelling, through the requirement specification, to the sequence diagram, the researcher has come to realize the essence of these software engineering concepts, as a master plan for building applications. Not only did the knowledge obtained from the Software Engineering module proved useful in building the artefact, it also helped in its rapid deployment.

Borne out of the desire to implement a commercial grade application, the researcher went a step further to acquire android programming skills, which was used in the implementation of the software artefact. Perhaps, this may not be possible without knowledge sharing from one of the lecturers at Dublin Business School, who took his time to enlighten us about the need to acquire new skills using additional training resources.

As an Information systems analyst, with a vision to continually solve information technology needs of business, the desire for excellence, and the urge to learn and apply something new periodically, are the driving factors contributing to the success of this program.

One of the troubling reality of information systems dawned on the researcher, during the course of completing this work. The people aspect of ICT implementation can make or break a system. While the software artefact was not presented to prospective users for testing, the motivation to learn among these prospective users is questionable. Citing economic hardship, emotional and psychological issues, the researcher realized the need to provide a prior motivation package before possible implementation of this initiative.

Going further, the knowledge and skills achieved during the course of this research work will spur the researcher to complete a pending diploma course in Android programming from a training institute in Dublin (Since 2014). Also, with the desire to acquire some working experience in an IT firm, the researcher is looking forward to collaborate with like minded people, to further investigate the possibility of implementing this research work on a commercial level.
Appendix

Definition of Terms/Acronyms

CRUD – Create, Retrieve, Update and Delete Operations
GB - Gigabyte
ICT – Information Communication Technology
IS – Information Systems
JSON – JavaScript Object Notation
MB - Megabyte
NUT – National Union of Teachers
RAM – Random Access Memory
STAN – Science Teachers’ Association of Nigeria
WAEC – West African Examination Council
XML – Extensible Markup Language

Source Code


Questionnaire:

PERCEPTION OF SECONDARY SCHOOL TEACHERS TO THE USE OF MOBILE LEARNING FOR CAPACITY BUILDING

In observing the rules and ethics of research, this questionnaire will remain and be treated as confidential and the replies contained therein anonymous.

1. Which of the following is your age range?
   - < 30 years   - 31 - 40 years   - 41 - 50 years   - 51 - 60 years   - > 60 years
2. I am a Male Female Married Single
3. As a professional teacher, my years in service is between
   - < 5 years   - 5 - 10 years   - 11 - 20 years   - 21 - 30 years   - > 31 years
4. I teach the following subject(s)?

___________________
___________________
___________________

5. Besides Textbooks (Subject Texts), What are the other materials that enables your teaching?

___________________
___________________
___________________

6. How often do you update your teaching notes?
   ○ Few Months  ○ Per Academic Session  ○ Few Years  ○ Irregularly  ○ Never

7. How often do your teaching materials e.g. Textbooks, get updated for new contents?
   ○ Few Months  ○ Per Academic Session  ○ Few Years  ○ Irregularly  ○ Never

8. Level of education attained till date?
   □ Diploma   □ Master’s Degree   □ NCE/College
   □ Bachelor’s Degree  □ Higher Diploma  □ Others. Specify____________________

9. The Information Communication Technology (ICT) equipment available in my school includes
   □ Desktop PC   □ Laptop PC  □ Printer
   □ Scanner   □ Digital Camera   □ Projector
   □ Internet Access  □ Others. Specify____________________

10. I have access to the ICT Equipment for:
    □ Printing  □ Saving, Retrieving & Updating  □ For Searching Information
    □ For teaching & training students  □ Social Media Interaction
    □ Internet Communication  □ Others. Specify____________________

**ANSWER QUESTION 11** only if one of the answers to question 10 is “For teaching and training students”.

11. I teach students using one of the following software? ○ Paid  ○ Free

12. Since I started teaching, I have attended the following capacity building program
    □ Seminar(s)  □ Conference(s)  □ College  □ Workshop(s)
    □ Vocational Training  □ Degree  □ Others. Specify ____________

13. I am comfortable using my phone for all of the following
<table>
<thead>
<tr>
<th>BASIC</th>
<th>NETWORKING</th>
<th>INTERNET RELATED USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make/Receive Calls</td>
<td>WhatsApp</td>
<td>News</td>
</tr>
<tr>
<td>Texting</td>
<td>Facebook</td>
<td>Submit &amp; Retrieve Information</td>
</tr>
<tr>
<td></td>
<td>Twitter</td>
<td>Update Information</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Research Online</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Others. Specify__________</td>
</tr>
</tbody>
</table>

14. How do I react if students ask questions that I do not have answers for?

- [ ] Search Online
- [ ] Consult text book/reading material
- [ ] Ask Trusted Colleague(s)
- [ ] Others. Specify__________

15. If one of the answers to question 14 is “Search Online”, Then answer the following:

Please state the website address of the online resources used?

___________________
___________________
___________________

Tick only the correct answer

16. My phone uses the following operating system:

- [ ] Android
- [ ] Symbian OS
- [ ] Apple iOS
- [ ] Black Berry OS
- [ ] Others. Specify__________

17. The price range of my mobile phone is

- [ ] < N10,000
- [ ] N10,000 - N20,000
- [ ] N21,000 - N30,000
- [ ] > N30,000

18. Have you ever been approached by a colleague for subject related assistance?

- [ ] Yes
- [ ] No

19. If answer to question 18 is Yes, please tick all that applies

- [ ] Opposite Sex
- [ ] Junior
- [ ] All of the above
- [ ] Same Sex
- [ ] Senior
- [ ] Others. Specify__________

20. When was the last time you attended a capacity building program?

- [ ] Never
- [ ] < 1 year
- [ ] 1 - 2 years
- [ ] Over 2 years
- [ ] Can’t Remember

21. Do you feel comfortable asking other colleague for help in your subject area?

- [ ] Yes
- [ ] No

Use the following rating scale:

1. Extremely Important
2. Important
3. Not Important

22. If I am to purchase a computer, the following factors will be considered:
### FACTORS | RATING (1 – 3)
---|---
Portability |  
Battery Life |  
Screen Size |  
Functions |  
Cost |  
Easy of Use |  

23. Tick the answers that best fits your view on the following statements:

<table>
<thead>
<tr>
<th>The use of electronic teaching material helps in Improving quality of teaching?</th>
<th>STRONG AGREE</th>
<th>AGREE</th>
<th>DISAGREE</th>
<th>STRONGLY DISAGREE</th>
</tr>
</thead>
<tbody>
<tr>
<td>All subject teachers should have access to electronic teaching technologies?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The use of mobile learning technologies can help in updating my skills and knowledge?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The use of mobile learning devices can be a source of distraction and time consuming?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobile learning technologies can be cheap and made available to all secondary school teachers in Nigeria.</td>
<td></td>
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Thank you.

**Email Interview:**

Hello Yakub,

My Answers are as follows:

1. How does STAN draw its participants from amongst secondary school teachers nationwide?
   **Answer:** STAN operate a National Headquarters in Abuja and state branches in all the 36 states of the federation where all state chairmen and state exco sensitize teachers in various institution of learning about the activities of STAN and thereby encouraging massive registration and participation in the modula workshops and annual conferences.

2. Just last year, the DG National Teacher's Institute mentioned capacity building through training workshops, is STAN also toeing the same line?
   **Answer:** Actively Yes, STAN organizes annual hands-on capacity building and modular workshops in at least 9 states of the federation which is geared towards achieving its set goals and objectives.

3. Considering the large teaching workforce of the nation(also with the expected addition of hundreds of thousand more), how does STAN ensure the knowledge gained by participants trickle down to non-participants?
   **Answer:** Feedback and response systems have been helpful in determining the transfer of knowledge gained by teachers from the workshops and conference to the students, non-participants and common society. STAN/Mobil Nigeria organizes an annual
quiz competition for all schools in the federation to ascertain that students are well equipped with the right information. Also students take part in project competition as well as teachers and such projects are introduced for use by non-participants.

4. What are the initiatives currently in progress or tried out in the past, towards the transformation of teaching (Integration of ICT) among STAN members.

Answer: STAN has adopted the use of information and communication technology tools to forster the teaching experience among teachers which is why the theme for this year's annual conference is "Communications Technologies and STEM Education".

Also by the monitoring and organizing of science fairs, STAN has adversely transformed the teaching experience not just of her members but of teachers of all level of education.

I hope this response meet you well and answer the requisite questionnaire you are working and the research.

Thank you

On Fri, Jun 10, 2016 at 1:42 PM, Olanrewaju Quadir Yakub <10044338@mydbs.ie> wrote:

Sir,

Good afternoon. Per our communication on phone, i will like to follow up with a written request for any valuable information regarding the activities of STAN.

As i said on phone, i am studying Information Systems with Computing at DBS, Ireland. My dissertation topic revolves around peer to peer capacity building for secondary school teachers in Nigeria. As such, i will like to understand the social (People) aspect of my dissertation idea.

My questions are as follows:

1. How does STAN draw its participants from amongst secondary school teachers nationwide?
2. Just last year, the DG National Teacher's Institute mentioned capacity building through training workshops, is STAN also toeing the same line?
3. Considering the large teaching workforce of the nation (also with the expected addition of hundreds of thousand more), how does STAN ensure the knowledge gained by participants trickle down to non-participants?
4. What are the initiatives currently in progress or tried out in the past, towards the transformation of teaching (Integration of ICT) among STAN members.

Thanks for your time and i appreciate the audience given.

STAN WEBADMIN <stanwebmaster14@gmail.com>

Wed 6/22/2016 2:31 PM
To: Olanrewaju Quadir Yakub <10044338@mydbs.ie>
The IMPORTANCE OF BRIDGING THE DIGITAL DIVIDE


Research Gate. (n.d.). Research Gate: Figure 1 - Map of Nigeria Showing Oyo State. Retrieved August 9, 2016, from ResearchGate: https://www.researchgate.net/figure/275495813_Fig1_Figure-1-Map-of-Nigeria-showing-Oyo-State-in-which-Bere-Community-is-located


