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Preface

The **South Africa International Conference on Educational Technologies (SAICET)** is a scientific conference organised by African Academic Research Forum. The conference offers platform for academics and researchers across the world to network and presents a wide range of perspectives to address issues relating to educational technologies in order to promote ethical and best practices in design, development and use of educational technologies.

The Technological advances of the twenty first century are radically changing the educational landscape hence the need to design and develop educational technologies to support the learning and teaching needs of the twenty first century learner.

This book contains the full papers presented at the 2015 edition of SAICET. A total of 76 papers (48 full papers and 28 short papers) were received from participants from 12 countries. This attests to the wide range of the nature and context of the presentations and the crossbreeding of ideas at the conference.

We welcome all the participants to Pretoria and especially the international participants that are visiting Africa for the first time. SAICET will continue to be an annual event, so we look forward to seeing you and many more new participants next year at SAICET 2016.

We specially thank the keynote speaker, the reviewers of the full papers and the editors of proceedings who have worked tirelessly to make the conference a success.

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Review Process

In total, 76 manuscripts were received. Of these manuscripts, 48 were full papers while the rest were short papers. All the full manuscripts were subjected to a double blind review. The reviews were carried out by experts from different countries. They based their reviews on 19 criteria they were supplied with. They were also requested to look at the manuscripts with the aim of assisting authors to produce good quality presentations.

Following the review process, the editorial committee considered the reviewers’ comments and 34 manuscripts were found to be suitable for publication. Reports were forwarded to the authors with suggestions of what needed to be addressed. After receiving the re-worked manuscripts, the editorial committee finally accepted 21 for inclusion in the proceedings. This means that the acceptance rate was just about 44%.

Editorial Committee
D. Nwaozuzu
S. Mnisi
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Abstract
In this study, Educational Technology Department (ETD) shall be regarded as the department whereas educational instructional technologies (EITs) will be regarded as media of instruction used to train pre-service teachers in their use during teaching and learning. There are a few existing frameworks that address aspects of teachers’ knowledge for teaching using ET or EITs. This paper proposes the integration of technological pedagogical content knowledge (TPACK) with education in evaluating pre-service teachers during teaching and learning. We opinionate that TPACK is a hallmark to be considered by every teacher if education and training authorities envisage a learner who should manage information and fit well in the technologically driven work environment of the 21st century. Fifteen pre-service secondary school teachers, deployed at selected high schools in Thohoyandou for teaching practice purposes, were observed, interviewed, and document analysis was also conducted. Their two lecturers also participated in the investigation. The findings showed that these pre-service teachers were heavily exposed to the theory of EITs in their training but minimal practice or hands-on, which explained why some of them could not exploit EITs effectively during their teaching practice. Little time devoted to their training and the use of EITs compounded this ineffectiveness. Therefore, these pre-service teachers may be referred to as limited users of EITs. Thus, this study wants to probe into the EITs training that pre-service teachers received as it plays itself out in their teaching practice.

Keywords: Educational Technology (ET), educational instructional technologies (EITs), pre-service teachers, technological pedagogical content knowledge (TPACK), teaching and learning.

Introduction
Pre-service secondary school teachers coming from universities come for teaching practice in schools with limited hands-on experience in the use of EITs. There are some, however, who are talented and seem to be very conversant in the use of EITs. These identify themselves as extreme users of EITs or extreme users of technology. They use multiple technologies regularly as an integral part of their daily lesson planning and actual teaching. It can thus be argued that the non-use of EITs during lesson presentations totally inhibits the teacher from fully realising his/her potential in presenting his subject content. Gerlach and Ely (1971)note that teaching without media in today’s schools is a distinct handicap and that teaching with media can extend opportunities for learning. Teaching without EITs militates against the total acquisition and assimilation of knowledge on the part of learners. But we have noted that technological knowledge varies among pre-service teachers for several reasons, which are
compounded by factors that influence pre-service teachers’ choice and use of EITs during teaching and learning. Pre-service teachers develop lesson plans that normally integrate technology with education. But one may ask: Do these teachers demonstrate good knowledge about the integration of IETs in their lessons? To answer this question, this paper attempts to evaluate pre-service secondary school teachers’ use of EITs during their teaching practice at selected high schools in Mvudi Circuit of Vhembe District in Limpopo Province.

This paper integrates relevant literature on technology for teaching in general. However, the frameworks identified in this paper are predominantly those applied in mathematics whose scope can be generalised to any learning area or subject. Specifically, this paper focuses on the TPACK framework which is attached to the work of Koehler and Mishra (2006), Niess, Suwarwoto, Lee and Sadri (2006) and Mishra and Koehler (2007). TPACK framework was proposed by Mishra and Koehler (2007). Following Mishra’ and Koehler’s framework, Ball, Thames and Phelps (2008) proposed the domains of mathematical knowledge for teaching (MKT) and framework. These are not the subject of discussion in this paper. At the end of this paper we provide certain recommendations.

Some frameworks and relevant theories on technology, pedagogy and content knowledge
Teachers’ content knowledge supported by technological knowledge is critical when presenting a lesson to learners. If pre-service teachers are confident in the knowledge which they have in the subject of their specialisation, then they will create classroom environments that will also allow learners to use technology confidently and freely (Doerr & Zangor, 2000). On the contrary, if their technology and content knowledge is weak or if they do not clearly understand the effect and impact of technology, they might be hesitant to use technology in teaching and learning, hence learners will not benefit (Monagahan, 2004) from the non-use of technology. Ultimately, under such a scenario the learners suffer. Kurz, Middleton and Yanik (2004) studied pre-service teachers who were engaged in activities in which they were introduced to the technology tools for mathematical learning and subsequently classified the tools according to five different categories. These categories include PowerPoint, word processing, excel, internet and java programs. The pre-service teachers in this study not only identified the features of the tool, but went further to be able to explain how these features could benefit learner learning.

There are several theoretical frameworks used to explain relationships among technology knowledge, pedagogical knowledge and content knowledge. One such framework is TPACK. TPACK for a specific subject is defined as “the intersection of the subject specific area with the knowledge of technology and with the knowledge of teaching and learning” (Niess et al., 2006). On the other hand, Mishra and Koehler (2007) illustrate this intersection of knowledge through a venn diagram, where the three circles contain pedagogical knowledge, technological knowledge and content knowledge respectively. The three circles intersect each other to indicate the synergy between the knowledge dimensions and building to the TPACK package indicated in the centre where the three circles touch each other.
Figure 1: TPACK depicting the multiple knowledge domains and their intersections (Source: Ronau, Rakes & Niees, 2012, p. 4)

Figure 1 illuminates the idea propagated by Williams and Gumbo (2012), even though they did not research on TPACK, but on pedagogical content knowledge (PCK), in which they emphasise PCK reflects the notion that expert teachers’ knowledge is a unique integration of their pedagogical teaching and their understanding of technology content as applied in a particular instance. The same idea is echoed by Williams and Gumbo (2011), Gumbo, Makgato and Muller (2012) and Ronau, Rakes and Niess (2012). Figure 1 is aptly summarised by Mishra and Koehler (2009), when they state that the three components of TPACK, i.e. technology, pedagogy and content, exist in a state of dynamic equilibrium or as alternatively stated by Kuka (1977), exist in a different context in a state of ‘essential tension’. In other words, all scholars subscribe to the idea that all these three (technology, pedagogy and content) should be present for good teaching to be realised. All what Mishra and Koehler (2009) are stressing is how equally important the three components in a TPACK framework mix are in preparing a teacher in the teaching and learning environment.

Mishra’s and Koehler’s (2009) demonstrate concurrence with Williams and Gumbo (2012), that TPACK is the basis of good teaching with technologies. Mishra and Koehler stress that this requires an understanding of the representation of concepts using technologies, and pedagogical techniques that use technologies in a constructive way to teach content. Teachers should display knowledge of what makes concepts easy to learn and how technology can help address some of the problems that learners face. TPACK undergirds EITs which help teachers to overcome the difficult verbal explanations; the EITs teachers simply show the class the model about how EITs can simplify subject matter.

A similar but complex model for understanding teachers’ knowledge for teaching is the MKT. It is a graphical framework described by Ball, Thames and Phelps (2008). As they described the framework they noted that, content knowledge for teaching is multidimensional. It is
imperative to note that all the two frameworks identified in this study may be used to any subject area as long as teachers stick religiously to the underpinning principles of these frameworks. It should be stressed also that in as much as we might have many frameworks to show the importance of teachers’ knowledge for teaching, they all appear to revolve around TPACK. It might not be a far-fetched idea to say all the upcoming frameworks may be there now as each one of them was borne of TPACK. Some are now subject-specific as a development from their ‘mother’, TPACK.

**Method**

This is a qualitative case study with very minimal simplified version of quantitative data collection and analysis methods to compensate the qualitative version. Therefore, predominantly, qualitative research methods were employed. To try to get to the bottom of the case, we employed multiple method strategy and focused only on teachers and two of their lecturers. The first method is observation. Since teachers were on practice teaching, it was a given that the main aim was for them to teach. Hence, it was ideal to observe their supposedly acquired TPACK in order to evaluate their abilities to integrate EITs in their teaching. The second method was document analysis. We were interested to get an idea from their training materials and the materials they used in their teaching so we could be clear about the suitability of the EITs for the content they taught. Structured interviews were also used as a follow up mechanism particularly on the observations done to help clarify certain issues that warranted following on. These methods were used to answer three research questions which are stated as follows:

- How much time is devoted to theory and practical work (hands-on) when pre-service teachers integrate EITs in their lessons?
- What are some of the EITs that pre-service teachers were exposed to during their training in the ET Department?
- How effective are the EIT courses offered to pre-service teachers?

According to Tashakkori and Teddlie (2003, p. 715), sampling involves selecting units of analysis (people, groups, artifacts, settings) in a manner that maximises the researcher’s ability to answer the research question. The selected participants formed a homogeneous group (Maree & Pietersen, 2010, p. 176) in that they all were pre-service secondary school teacher trainees from Unique University. For this reason it was relatively easy to select fifteen teachers conveniently through cluster sampling technique (McMillan & Schumacher, 1989, p. 164) to participate in the study. Two lecturers teaching EITs were added to make a total of seventeen participants. One teacher taught Computer Aided Technology (female) as a subject, four (male) teachers taught Mathematics and ten (male) teachers taught Science. These teachers were deployed to four schools in categories of 4, 5, 3 and 3 per school respectively. All four schools were a walking distance from the university. Unique University deployed them to these neighbouring schools in order to cut down on transport costs for lecturers as they were visiting these teachers in schools. This arrangement also favoured these teacher-trainees because they were resident on Unique University’s campus.
All fifteen pre-service teachers were observed during their teaching. The observation per teacher lasted about 60 minutes. We asked for the documents they used in their teaching, i.e. textbooks, lesson plans, and any teaching and learning support materials, so we could understand their choice and ability in the use of EITs. We also made an effort to look into the syllabus documents used for the training of these teachers at Unique University. This was compared with what pre-service teachers were practically doing in their classrooms teaching. Particular attention was given to how EITs were used during the lessons. We followed the observations with interviews.

We recorded the unfolding of events as the pre-service teachers gave their classes and how they employed the EITs. Check-lists were used during interviews and lesson observations particularly to ascertain points of EITs usage, type, interaction with EITs, and so on.

An integrated approach to presenting the findings was adopted guided by the research questions posed, hence they were triangulated (Anderson, 1993, p. 175; Kerlinger, 1986, p. 479).

Results
The research questions were answered in the following manner by the results of the study:

**How much time is devoted to theory and practical work (hands on) when pre-service teachers integrate EITs in their lessons?**
This question was directed to pre-service teachers on how much time during their training at the university was dedicated to theory learning on how to use EITs. One male pre-service teacher smiled and scratched his head as he responded: “Aaaa yah we are taught two hours of theory and only one hour of practical work...huuum a thing I think is not enough for us to master the skills.” The same question demanded pre-service teachers to show how much time was dedicated to practical learning in using EITs while at the university. The same question was asked to the lecturers teaching EITs at Unique University. Amazingly, similar answers came from the lecturers and pre-service teachers. One of the lecturers stated in this regard that, “We dedicate two hours per week doing theory with student teachers. The remaining one hour of the time tabled for learning the EITs is dedicated to practical training on how pre-service teachers should use EITs in the actual teaching and learning situation.” This was also authenticated by the documents we checked from the Faculty of Education at Unique University, which overemphasised theory over practice. This state of affairs suggested that these pre-service teachers were good at the EITs theory but not grounded in practically integrating the same in their lessons.

**What are some of the EITs that pre-service teachers were exposed to during their training in the ETD?**
Five pre-service teachers responded similarly to this question as one of them is quoted as having said: “There are two groups of EITs; one group is known as projected aids and the other group as non-projected aids”. Yet another teacher responded: “There are audio visual EITs and visual EITs”. These answers demonstrate the availability of varied EITs, which, if
effectively used in the training of pre-service teachers, they (pre-service teachers) could make good use of to accommodate different learning styles.

The pre-service teachers and lecturers stated that firstly ETD was divided into two main groups of projected media and non-projected media or audio visual and visual aids. The pre-service teaching programme equips the teachers in theoretical and some practical training in the use of:

- a computer in preparing their documents for teaching through using Microsoft Word, PowerPoint and Microsoft Excel;
- a computer with a projector and a projector screen for the practical presentation of a lesson;
- videos and DVDs connected to a laptop and using motion pictures in teaching and learning;
- the making and use of posters in teaching and learning;
- the making and use of different types of charts for teaching and learning;
- the effective use of models and relevant apparatus in teaching subjects that need practical demonstrations like the sciences, technology and geography;
- the effective use of chalkboard using different types of chalk colours; and
- magnetic boards used in conjunction with magnetized papers.

Pre-service teachers should be introduced to, and subsequently design, lessons that integrate technology in meaningful ways (Hardy, 2010; Mistretta, 2005). It should be stressed that the identification and naming of an EIT depends upon its makeup and how it is used in teaching and learning. There are some EITs which apply to both audiovisual and visual. For example, a computer can be both an audiovisual medium as well as a visual medium. If the teacher decides to use a computer in conjunction with a projector, then it suits to be referred to as an audiovisual medium since learners will learn through hearing and seeing at the same time. However, if the same EIT is used to produce visual material like handouts or pamphlets to be distributed to learners, or pictures only then the products are only for visual purposes.

In all cases the observed teachers were found using visual EITs. When asked as to why they did not engage audio visual EITs, they indicated, “we were partially taught and we were afraid to make mistakes in front of the learners and thereby eroding their confidence in us”. One pre-service teacher confidently replied “yes, I could have used my laptop connected to the projector but there is no projector at the school I am doing practice teaching at”. Our observation was confirmed this CAT struggled in her delivering of lessons because of lack of this equipment.

**How effective are the EIT courses offered to pre-service teachers?**

All except two pre-service teachers unanimously stated that doing EITs as a course and using EITs in a lesson was an eye opener to them: “We now know how to use EITs and also when to use them especially when you want to attract the attention of learners to a specific point which you feel is important for learners to remember”.
The majority of teachers stated that EIT is a professional course that equips them with how to teach and what to use to teach. This response confirms the fact that TPACK is the basis of good teaching (Mishra & Koehler, 2009; Williams & Gumbo, 2012). However two pre-service teachers were unsure whether EIT is a necessary course to be taken by teachers. Two pre-service teachers responded as follows: “If EITs were that important why are some of our lecturers not having that qualification component in their profiles? They engage a technician to help them operate these EITs, meaning they see the importance but they do not take the initiative to get that qualification”. What informed their stance is that they wondered as to why is it that most of university lecturers did not hold an EIT qualification as a prerequisite to be employed as university lecturers. Our observation of these teachers confirmed their disposition towards EIT – they did not integrate any form of EIT in their lessons, but resorted to chalkboard only. These are the lessons where we noticed some learners sleeping during the lesson as the teachers were teaching. These teachers used verbal exposition as their only means of transmitting information to the learners for the whole 60 minutes allocated to one lesson. We want to believe that the use of EIT in teaching enliven the lesson and dispels boredom on the part of learners. Mishra and Koehler (2009) write in this regard that, EITs help teachers to overcome difficult verbal explanations by simply showing the model or by demonstrating to the class how the EIT simplifies subject matter.

The teachers also responded to this question with some degree of despondency related to how they were being serviced. Their responses indicated that much of their EIT training was theoretical, which was exacerbated by a dire shortage of training equipment. This finding seems to support the teachers’ reluctance to integrate EITs in their teaching as indicated in above question about their views on EITs. One pre-service teacher actually shouted: “The University does not have those equipment they mention in their theory lessons for us to touch them, know them and use them practically!” Another participant also stressed: “Practice makes perfect and so how does one get the much needed practical experience without the necessary equipment?” It would appear that the unavailability of training equipment impacted negatively on the creation of a positive attitude in some pre-service teachers in as far as their liking of the EIT course.

On the contrary the lecturers made an attempt to defend their position. They argued that, “the ETD was very effective because of the solid theoretical base it gave its students”. Albeit they lamented the EITs shortage in the department to afford students the manipulative skills to be able to competently use EITs in their lessons. They however pointed out that the pre-service teachers should be innovative and resourceful by using appropriate technologies and improvising when demanded to by the situation. These lecturers stressed that pre-service teachers should be sensitive and alert to the environment around them so that they become innovative teachers and use the environment to their advantage. They seemed shortsighted with the fact that it was still their responsibility to show these teachers how to improvise creatively without incurring costs. One lecturer gave an example of using the nearby bushes to teach about the eco-systems when one is teaching such a topic rather than depending on examples from
textbooks when the surrounding environment is pregnant with relevant examples. Whilst this fact is a welcome suggestion, it is misplaced because it is not really about EITs.

This finding left us with an impression that there was inadequate equipment at the disposal of the pre-service teachers during their training while offered by Unique University, which explains why they were exposed more to theory rather than practical work in the use of EITs. The fact that this situation affected their attitude towards the EIT course in turn affected their performance in the use of EITs during their teaching practice period ultimately.

The EIT course offered to the pre-service teachers at Unique University seems to be ineffective in producing the envisaged teacher who should master the EITs integration in teaching. It should be borne in mind that EIT training molds a pre-service teacher into a professionally competent teacher. A teacher who knows when to start a lesson, how to start a lesson and how to maintain interest and keep learners wanting more through the use of captivating EITs makes learning enjoyable (Rwambiwa, 1992; Mishra & Koehler, 2006; Hixon, 2009). Furthermore, Koehler and Mishra (2005) claim that teachers who learn by designing EITs tend to develop deeper understandings of the relationships among technology, pedagogy and content. The introduction of technology in teaching makes the representation of new concepts easier to understand; this requires developing sensitivity to the dynamic, transactional relationship between the three knowledge domains (technology, pedagogy and content) of TPACK (Koehler & Mishra, 2005, p. 134).

Conclusion and recommendations

In concluding this study, it has been revealed that teaching with EITs is progressive and beneficial to learners and indeed to the teachers themselves. An important finding revealed in the study is the pre-service teachers’ lack of practical skills in the use of EITs in teaching as explained by the lack of equipment at Unique University.

In order to effectively develop the TPACK of pre-service teachers the training institutions should be equipment-rich to expose teachers appropriately to the EITs. Once this has been taken care of experiences for pre-service teachers’ learning to teach with EITs can be based on tasks that are integrated and are multi-dimensional. We believe that this constructivist approach affords teachers the opportunity to do more than simply add technology to the curriculum, and for this to be realised they should be well equipped with the EITs knowledge and skills. Finally, this study recommends that pre-service teachers’ training be taken and treated seriously by the authorities who are in charge of teachers training who can hold training institutions duly accountable. More practical training sessions should be scheduled to pre-service teachers so that they do not shy away from using EITs in their classes. We hope that our efforts to illuminate the complexities of teacher training through integrating TPACK in teaching highlights the very important aspect to consider in our work with teachers across the curriculum as they develop the multiple dimensions of their knowledge of TPACK.
The study was limited to secondary schools with particular reference to pre-service teachers. The study would have illuminated a bigger scope of findings had it also explored in-service teachers’ use of EITs. It was also geographically limited, i.e. within the Mvudi Circuit Vhembe District only.

References


Discipline and gender as determinants of ICT usage in higher institutions: a case study of Federal College of Education, Abeokuta

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Abstract
The study probed into the effects of discipline and gender on the ICT usage of college students. The population of the study comprised all 300 level students in the College. Stratified random sampling technique was used to sample 200 students, 50 students from each school of Art and Social Science, Languages, Sciences and Vocational Education. ICT Usage Questionnaire (ICTUQ) which was developed by the researcher was used to collect data from the subjects. The ICTUQ was face and content validated with K-R20 reliability value of 0.81. ‘F’ test and post hoc test were used to analyze the data. The results showed that (i) there was a significant main effect of discipline on the ICT usage of College students [F (3, 200) = 2.318, P < 0.05]; (ii) ICT usage of the College students is not significantly affected by gender [F (1, 200) = 0.345, P > 0.05] (iii) There was no significant interaction effect of discipline and gender on the ICT usage of College students [F (3, 200) = 2.287, P > 0.05]. It was recommended that staff and student of the school of Languages, Art and Social Sciences should be orientated towards the use of ICT.

Introduction
Information and Communication Technology (ICT) became household a name practically in Nigeria during the era of President Olusegun Obasanjo when he launched GSM in the country around year 2000. Though the price was so high but every literate and illiterate person began to acquire GSM at least to call or text messages to their loved ones and family. Since that time ICT has been growing in the country, transforming life in some areas like communication, banking, business etc; not only in Nigeria but in other nations (World Bank 2011). Some researchers (e.g. Watson, 2005) perceived ICT as a catalyst for change especially in the area of education – in teaching styles, learning approaches and access to information. According to FME (2010), integration of ICT in education should lead to speedy transformation of the teaching, learning and administration of education. The importance of ICT was highlighted by Wolff and Mackunom (2002) where they stressed that “to compete successfully in a competitive global economic environment, a highly skilled and educated workforce with aptitude and skills in the application of ICT is very essential.

The knowledge and use of ICT is therefore central to education in the 21st century. Crown (2010) explained that ICT can be used to find, develop, analyse and present information, as well as to model situation and solve problems. ICT enables rapid access to ideas and experiences from a wide range of people, communities and cultures and allows pupils to collaborate and exchange information on a wide scale. Studies (e.g. Adedoyin, Akinnuwesi and
Adegoke, 2008) established the role of ICT in achieving quality education at all levels of school system as key tools in acquiring, processing and disseminating knowledge. It offers increasing possibilities for codification of knowledge about teaching activities through being able to deliver learning cognitive activities anywhere and anytime. Other researchers (e.g. Pelgrum, 1996; Bottins, 2001; Haddad, 2002) argued that ICT has the potential to transform learning environments and improve the quality of learning, by making learning more situated, providing access to richer environment, increasing opportunities for active learning, interconnectivity and feedback, enhancing motivation to learn, offering varieties of new possibilities to learn and having a positive effect on students’ achievement in different subject areas.

Despite the robust benefits of ICT in education and effort of Nigerian Government, implementation of ICT has some challenges (FME, 2010). Some of which are:

- Although capacity building of teachers on ICT is ongoing, a higher percentage of teachers are largely non-ICT literate and there is also, a highly insufficient pool of ICT professionals in the sector.
- Teacher educators and teachers are concerned more with efficiency rather than effectiveness. Thus, ICT is used to make their job easier instead of making learning more effective.
- There is little or no research on ICT generally and on ICT in education in particular. Thus, policy-makers are not able to know the implications of ICT and its impact on the education system.

In Nigeria, the traditional attitude of parents to the education of their children to invest more in the education of boys (Okpala, 1995) has a fall out effect on the use of ICT by female students. This traditional attitude is not limited to Nigeria as it cuts cross some nations like China, Hong Kong, India, and Indonesia etc. According to World Bank (2011), the gender proportion of internet users in July 1999 was 79 percent for men and 21 percent for women, though it rose to 39.8 in 2001. Also in Hong Kong, men outnumbered women in the use of internet by 58 to 42 in the year 2000.

The United Nations Commission on Science and Technology for Development (UNCSTD) identified significant gender differences in level of access to, control of and advantages accruing from a wide range of technological development (UNSCO, 2005). It was also concluded that the information revolution appeared to be by-passing women. In consequence, the researcher considers it a worthwhile exercise to determine the extent to which gender and its interaction with discipline would affect the ICT usage of College students. The study therefore seeks to probe into the usage and effect of information and communication technology on different disciplines and gender in a College of Education system.

**Theoretical Framework**

This study is based on activity theory proposed by Professor Cher Ping Lim. He proposed that ICT should not be studied in isolation but be seen in socio-cultural approach. Schools have to enculturate students to be lifelong learners. Students should learn how to seek out new
information, think critically and show initiative to meet up with the challenges of the fast changing world. The theory therefore supports a shift in attention towards the whole configuration of events, activities, contents and interpersonal processes taking place in the context that ICT is used (Lim 2002).

**Aim and Objectives of the Study**
The main aim of the study was to analyze pattern of ICT usage by the College students. Specifically the objectives were to investigate the:
- the discipline that most utilize ICT
- the gender difference on use of ICT

**Research Questions**
Does students’ discipline affect their ICT usage?

Does students’ gender affect their ICT usage?

Is there interaction effect between gender and discipline of students on ICT usage?

**Hypotheses**

H$_{01}$: ICT usage of College students is not significantly affected by students’ disciplines;

H$_{02}$: ICT usage of College students is not significantly affected by students’ gender;

H$_{03}$: ICT usage of College students is not significantly affected by interaction of discipline and gender.

**Methodology**

**Population and Sample of the Study**
The population of the study consisted all N.C.E III students of Federal College of Education, Abeokuta, Ogun State of Nigeria. N.C.E III students were chosen because they have stayed in the College for more than two years, have acquired the basis of ICT and are aware of the ICT facilities in the College. Stratified random sample technique was used to select fifty (50) subjects from each academic school – Art and Social Science, Languages, Science and Vocational Education. Two hundred (200) students participated in the study.

**Instrumentation**

ICT Usage Questionnaire (ICTUQ) was developed by the researcher. It has two sections A and B. Section A solicited for personal information while Section B consists of items on use of computer, use of internet, access to computer, internet and educational use of ICT.

The researcher followed the techniques of test construction recommended by Okpala, Onacha and Oyedoji (1993) i.e. planning, items development, field testing for item analysis, selecting the final items, field testing for validity and reliability. The researcher established the validity
of ICTUQ using five lecturers from computer department with ICT background. The instrument has a K – R20 reliability value of 0.81.

Findings and Discussion:

Table I: Descriptive Statistics of Discipline and Gender

<table>
<thead>
<tr>
<th>DISCIPLINE</th>
<th>GENDER</th>
<th>N</th>
<th>MEAN</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARTS &amp; SOCIAL SCIENCE</td>
<td>MALE</td>
<td>21</td>
<td>78.81</td>
<td>8.99</td>
</tr>
<tr>
<td></td>
<td>FEMALE</td>
<td>54</td>
<td>81.00</td>
<td>11.63</td>
</tr>
<tr>
<td>LANGUAGES</td>
<td>MALE</td>
<td>12</td>
<td>77.25</td>
<td>7.14</td>
</tr>
<tr>
<td></td>
<td>FEMALE</td>
<td>15</td>
<td>79.07</td>
<td>7.50</td>
</tr>
<tr>
<td>SCIENCES</td>
<td>MALE</td>
<td>18</td>
<td>86.33</td>
<td>5.64</td>
</tr>
<tr>
<td></td>
<td>FEMALE</td>
<td>31</td>
<td>81.03</td>
<td>8.80</td>
</tr>
<tr>
<td>VOCATIONAL</td>
<td>MALE</td>
<td>25</td>
<td>81.40</td>
<td>11.52</td>
</tr>
<tr>
<td>EDUCATION</td>
<td>FEMALE</td>
<td>25</td>
<td>86.28</td>
<td>10.31</td>
</tr>
<tr>
<td>TOTAL</td>
<td>MALE</td>
<td>76</td>
<td>81.21</td>
<td>9.44</td>
</tr>
<tr>
<td></td>
<td>FEMALE</td>
<td>125</td>
<td>81.83</td>
<td>10.43</td>
</tr>
<tr>
<td>TOTAL</td>
<td>201</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1 shows the descriptive statistics of discipline and gender. It reveals the number of subjects, mean of male and female in each of the discipline and their respective standard deviations. The table shows that the total male subjects that participated in the study is 76 while 125 subjects are female. The average mean for male is 81.21 while the female has an average mean of 81.83 with mean difference of 0.62. The standard deviation for male and female are 9.44 and 10.43 respectively.

Ho1:- ICT usage of College students is not significantly affected by discipline.

Table II: ANCOVA of ICT Scores

<table>
<thead>
<tr>
<th>Variables</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>110437.349</td>
<td>1</td>
<td>1104371.349</td>
<td>11375.896</td>
<td>0.000</td>
</tr>
<tr>
<td>Discipline</td>
<td>937.295</td>
<td>3</td>
<td>312.432</td>
<td>3.218</td>
<td>0.024</td>
</tr>
<tr>
<td>Gender</td>
<td>33.494</td>
<td>1</td>
<td>33.494</td>
<td>0.345</td>
<td>0.558</td>
</tr>
<tr>
<td>School*Gender</td>
<td>666.185</td>
<td>3</td>
<td>222.063</td>
<td>2.287</td>
<td>0.080</td>
</tr>
</tbody>
</table>
α = 0.05; R² = 0.073

<table>
<thead>
<tr>
<th>DISCIPLINE</th>
<th>LANGUAGES</th>
<th>ART &amp; SOCIAL SCIENCES</th>
<th>SCIENCES</th>
<th>VOCATIONAL EDUCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Languages</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Art &amp; Social Science</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sciences</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vocational</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

α = 0.05

Table II shows that there was a significant effect of discipline on the ICT usage of College students, [F (3, 200) = 3.218, P<0.05]. Thus, hypothesis H01 was rejected; this shows that there was statistically significant main effect of discipline on ICT usage of College students. In order to determine the order of ICT usage associated to various disciplines, Duncan Post Hoc Test was conducted. Table III shows that the significance lies among Languages, Science and Vocational discipline. The result shows that discipline account for 7.3 percent of the variation. It therefore implies that there is significant difference between students of Languages and Science students. There also exists significant difference between Language and Vocational students in the use of ICT. It therefore means the significant main effect of discipline comes from Science and Vocational discipline.

H02: ICT usage of College students is not significantly affected by gender.

Table II further reveals that the main effect of gender on College students’ ICT usage was not significant [F (1, 200) = 0.345, P > 0.05]. Therefore hypothesis HO2 was rejected. It implies that there was no variation in the use of ICT by gender. It therefore shows that gender cannot be used to determine ICT usage of College students.

H03: ICT usage of College students is not significantly affected by the interaction of discipline and gender.

Table II reveals that there was no significant interaction effect of discipline and gender on the ICT usage of College students. [F (3, 200) = 2.287, P > 0.05]. Therefore, hypothesis H03 was rejected. This means the impact on ICT usage of College students is not sensitive to gender. This shows that the ICT usage of College students as a result of different students’ discipline does not vary among male and female students. This result when viewed against the
background of significant main effect on student ICT usage, tend to suggest that College teacher of various disciplines should expose students to ICT usage irrespective of students’ gender.

Implication and Conclusion
The significant effect of discipline is an indication that there was variation in the use of ICT by the College students. It implies that some students in Sciences and Vocational Education used ICT more than students of Languages, Art and Social Sciences. This difference may be as a result of the nature of their disciplines. The Science and Vocational may not have option but to use computer and ICT in some of their courses. It therefore shows that students of non–computer related discipline still shy away from the use of ICT. Lecturers and Management should therefore intensify efforts on training of staff especially staff of School of Languages, Arts and Social Sciences on the use of ICT in education and encourage them to give ICT based assignment to their students.

The non significant effect of gender is an indication that there was no variation in the use of ICT between male and female. ICT trainers and managers should treat both male and female equally when training students for ICT usage. The use of ICT is not gender sensitive. Furthermore, the non significant interaction effect of discipline and gender shows that managers and trainers of ICT should expose students of all discipline to the same ICT training irrespective of their gender.

References


Hadaad, W.D (2002). Information and Communication Technology (ICT) in Education Toolkit for Policy Makers, Planners and Practitioners. UNESCO.


Investigating post graduate students attitude towards adopting web 2.0 technologies for collaborative learning

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Abstract
The study investigated post graduate students attitude towards adopting web 2.0 technologies for collaborative learning. The research design was survey research. The sample size was thirty postgraduate students from the Department of Curriculum studies and Educational Technology, Faculty of Education, University of Port Harcourt, Nigeria. One instrument was used to collect data from the samples namely: Post Graduate Students Readiness for Web 2.0 (POGSTR WEB 2.0). The instrument was subjected to face and content validity by two experts in test and measurement and three experts in information and communication technology. The estimated value of the reliability coefficient was.713. Three research questions and one hypothesis were used for the study. Simple percentages were used to answer the research questions while Pearson moment correlation was used to test the hypothesis. The findings revealed that android phone is the most common technology device owned by post graduate students with a percentage of (53.3%), followed by laptop and desktop with percentages of 33.3% and 26.7% respectively. Also 50% of the sampled students possess high technology competencies and the other 50% had low technology competencies. The correlation coefficient of 0.51 showed a positive but weak correlation between postgraduate students’ technology competencies and their attitude towards the adoption of web 2.0 technologies for collaborative learning, which implied that post graduate students with high technology competencies, would have a near tendency towards adopting web 2.0 technologies and vice-versa.

Keywords: Web 2.0 Technologies, Collaborative Learning

Introduction
Internet technologies today have totally transformed every sphere of human life. In the area of health care, technology is used to diagnose several ailments, treat and also prevent illnesses (Moran, 2013). In business, use of Internet technologies provides network for business partners to communicate, for companies to advertise and even market their products. In education, Internet technologies have transformed the traditional classroom. Information and Communication Technologies (ICTs) have created a knowledge-based global society which has changed the status of education. They have equally transformed the roles of students and teachers in the learning process creating a shift from teacher-centered to learner-centered learning environments. Web 2.0 happens to be a new wave of Internet technologies that have emerged. They have added value to the traditional delivery system and have enhanced collaboration among students. Web 2.0 technologies have made the learning environments more interactive and engaging for teachers and learners.
Collaborative learning

This refers to an instructional method where students are required to work together on solving a problem or completing a learning task. Students are mutually engaged in a coordinated effort to solve a problem together or to acquire new knowledge (Lehtinen, Hakkarainen, Lipponen, Rahikainen, and Muukkonen 1999). Education Portal (2003-2014) defines collaborative learning as an educational method where two or more students work together to learn. It is generally believed that when students work in groups, they can learn more from each other through sharing and social interaction than if they learned individually (Education Portal, 2003-2014). Smith and Macgregor (1992:1) see collaborative learning as “an umbrella term for a variety of educational approaches involving joint intellectual effort by students, or students and teachers together. Usually, students are working in groups of two or more, mutually searching for understanding, solutions, or meanings, or creating a product”. In collaborative learning students take full responsibility for their learning. They work together, and build knowledge together, which results in increased knowledge and improved development of the learner (Dooly, 2008).

The similarity between these definitions is that collaborative learning involves students working in groups so as to promote social interaction and increase knowledge. Thus for this study we would define collaborative learning as an instructional method which involves small groups of students working cooperatively to achieve a learning outcome or complete a task. This type of learning promotes communication and interdependence between students, which is compliant with today’s 21st century knowledge sharing and distribution. Web 2.0 technologies serve as a good platform for such knowledge sharing.

Web 2.0 Technologies

Dictionary.com (2014) defines web 2.0 as “a second generation in the development of the World Wide Web, conceived as a combination of concepts, trends, and technologies that focus on user collaboration, sharing of user-generated content, and social networking”. It is characterized by more interactivity, communication and collaboration, which stands in sharp contrast with the earlier version of the World Wide Web, known as Web 1.0. The latter was known as the static web because it only allowed users to read, receive and research information. Users were passive. They could only read from such web pages and consume the information in it but could not make valuable contributions. Web 2.0 however, transformed the World Wide Web and made users not passive but active participants of the web. Communication on the web became more interactive. Users could now develop the 4 Cs (contributing, collaborating, creating and critical thinking) (Eteokleous-Grigoriou and Ktoridou 2013). Anderson, (2012) posits that there are over 3000 free to use flexible applications that are described as Web 2.0. Because these applications are flexible, different users can use them in different ways. They utilize individual and group contributions to create value. Web 2.0 technologies are very effective in education because they allow group collaboration through open communication with an emphasis on Web-based communities of users, and more open sharing of information. Users are able to add value to their team work through comments posted on relevant sites. Thus learners are able to acquire skills and attitudes by creating and offering content to the open
Web 2.0 technologies open learning beyond the closed doors of the classroom (Anderson, 2012). User-generated sites such as Wikipedia and other Open Educational Resources (OERs) have created opportunities for students and learners to share intellectual contributions. Because interaction plays a major function in education, Web 2.0 technologies become very necessary. Examples of Web 2.0 technologies include blogs, forum, wikis, media sharing sites and social networking sites just to mention few.

Two theories serve as a basis for this study. These are Vygotsky’s sociocultural theory and Siemens’ theory of connectivism.

Socio-cultural theory is associated with Vygotsky (1978). This theory is relevant for this study because it emphasizes cognitive development through social interactions and the use of web 2.0 technologies provides a platform for such social interactions. Vygotsky used the term MKO to refer to anyone who has a better understanding or a higher ability level than the learner, with respect to a particular task, process, or concept. It could be a teacher, coach, or older adult, but the MKO could also be peers, a younger person, or even computers (Drew, 2012). The zone of proximal development (ZPD) is the difference between an individual’s current level of development and his or her potential level of development. It is considered to be the distance between a student’s ability to perform a task under adult guidance and/or with peer collaboration and the student’s ability to solve problems independently. Vygotsky believes that there are two levels of learning. The first level (blue area) is the level of development the learner has already reached – the level at which he/she can solve problems independently (see fig 1). At this level, the learner can accomplish any task given to him without help from any one. The second level (Purple area) is the level where a learner has the potential to accomplish a task or solve a problem if he gets help from others (see fig 1). At this level, what the learner needs is structure, clues, reminders, help with remembering details, encouragement etc. This is the level that Vygotsky calls the ZPD. Under the guidance of teachers or in collaboration with peers, learners can solve problems and accomplish tasks in the ZPD. This collaboration continues until the learner can solve that problem independently.
Web 2.0 technologies support collaborative learning in order to help students develop social skills that would be very effective. ICTs can provide the necessary tools that can be used to scaffold students’ cognitive development. Thus the three themes that make up Vygotsky’s socio-cultural theory namely social interaction, more knowledgeable other (MKO) and the zone of proximal development (ZPD) can be fully addressed with the application of Web 2.0 technologies.

Connectivism is a theory developed by Siemens in 2005. It is called the learning theory for the digital age. It is a theory that integrates social learning with social media technologies. This theory is very important for this study because connectivism relies on sharing (connection) and web 2.0 technologies provide a platform for such sharing. These technologies enhance connections between people and ideas. The central theme of connectivism is that knowledge is formed by creating connections between various nodes in a network. The idea of networks is derived from computer networks where a node usually refers to computers, cables, hubs and other accessories that are interconnected to form a local area network (LAN) (see fig 2).

For the LAN to function properly, all these nodes must be properly connected and work together as one unit. If the connection between nodes is well established, this enhances the performance outcome of each node which turns out better than when the device is used.
independently. Importing the idea of networks into education implies that learning is no longer an internal, individualistic activity. Rather, learners gather information from connecting to other people’s knowledge using Web 2.0 technologies and other similar applications (Chen and Bryer, 2013). Connectivism emphasizes the idea that knowing where to find knowledge is as important as the knowledge itself as knowledge is always evolving with concepts being born or becoming obsolete (PBworks, n.d.). It asserts that knowledge and learning are not about content, but connection. For the learner to be connected to this outside knowledge is more important than his or her existing state of knowing.

Since connectivism as a theory relies on sharing (connection), then any form of technology that allows for sharing becomes very vital. Web 2.0 technologies come in handy in this regard because they allow users to make connections and convey knowledge using social networks such as Twitter, Facebook, and others. With Web 2.0 applications, students can connect to different pieces of information and create new information that could be shared with others (Maloney, 2007 cited in Ajjan and Hartshorne 2008). Connectivism as a theory would be best applied in the classroom through group work and class discussion. The teacher would need to act as a facilitator allowing students to acquire knowledge and determine between facts and fiction through their interactions with one another. One of the principles of connectivism is that capacity to learn is more critical than what is currently known (Siemens, 2004 cited in Chen and Bryer, 2013). The responsibility of a teacher is not just to define, generate, or assign content, but it is to help learners build learning paths and make connections with existing and new knowledge resources (Anderson and Dron, 2011 cited in Chen and Bryer, 2013). Web 2.0 provides the right instructional platform that allows learners to connect to others and explore educational resources. The theory of connectivism provides insight on the roles of educators in a social networked environment (Chen and Bryer, 2013). The proliferation of social networks have caused teachers and learners to embrace this new technology to connect to knowledge for use in the classroom (Duke, Harper and Johnston, 2013).

**Problem of the Study**
The researchers have observed that most post graduate students do not use Web 2.0 technologies for academic work. They only use it for entertainment and socializing. Thus the researchers sought to investigate the attitude of post graduate students towards the use of Web 2.0 technologies for collaborative learning.

**Purpose of the Study**
The purpose of this study is to investigate post graduate students attitude towards adopting web 2.0 technologies for collaborative learning. The study specifically aims to:

1. Determine the type of technology devices owned by post graduate students that support the use of web 2.0 technologies for collaborative learning.
2. Determine the technology competencies possessed by post graduate students for the adoption of web 2.0 technologies for collaborative learning.
3. Determine the attitude of post graduate students towards adopting web 2.0 technologies for collaborative learning.
Research Questions

1. What type of technology devices that support web 2.0 technologies are owned by post graduate students?
2. What technology competencies are possessed by post graduate students for the adoption of web 2.0 technologies for collaborative learning?
3. What is the attitude of post graduate students towards adopting web 2.0 technologies for collaborative learning?

Hypothesis

The following research Hypothesis guided this study.

H0:1 there is no significant relationship between post graduate students technology competencies and their attitude towards the use of web 2.0 technologies for collaborative learning.

Methodology

The sample of the study comprised 30 post graduate students from the Department of Curriculum Studies and Educational Technology, Faculty of Education, University of Port Harcourt, Nigeria who have offered the course Computer in Education. The instrument for data collection was a questionnaire titled “Post Graduate Students Readiness for Web 2.0 (POGSTR WEB 2.0)” This was designed by the authors. The face and content validity of the instrument was established by giving the instruments to two experts in test and measurement and three experts in information and communication technology. The internal consistency of the instrument was established using the split half method and the reliability coefficient obtained was .713. Research questions one and two were answered using simple percentages while research question three along with its corresponding hypothesis was analysed using correlation.

Results/Findings

Research Question 1: What type of technology devices that support web 2.0 technologies are owned by post graduate students?

Table 1: Technology devices owned by post-graduate students

<table>
<thead>
<tr>
<th>S/N</th>
<th>DEVICES</th>
<th>FREQUENCY</th>
<th>PERCENTAGE (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Android phone</td>
<td>16</td>
<td>53.3</td>
</tr>
<tr>
<td>2</td>
<td>Windows Phone</td>
<td>3</td>
<td>10.0</td>
</tr>
<tr>
<td>3</td>
<td>Nokia Smart Phone</td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>Ipad</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>Iphone</td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td>6</td>
<td>Tablet</td>
<td>2</td>
<td>6.7</td>
</tr>
<tr>
<td>7</td>
<td>Blackberry</td>
<td>1</td>
<td>3.3</td>
</tr>
<tr>
<td>8</td>
<td>Laptop</td>
<td>10</td>
<td>33.3</td>
</tr>
</tbody>
</table>
The table above shows that android phone is the most common technology device owned by post graduate students with a percentage of (53.3). This is followed by laptop with a percentage of 33.3% and desktop with a percentage of 26.7%. Nokia smartphone and Iphone both have a percentage of 20%. Other devices are less than 20%.

Research Question 2: What technology competencies are possessed by post graduate students for the adoption of web 2.0 technologies for collaborative learning?

Table 2: Technology devices owned by post-graduate students

<table>
<thead>
<tr>
<th>S/N</th>
<th>COMPETENCE SCORE</th>
<th>FREQUENCY</th>
<th>PERCENTAGE (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6-9 (low competence)</td>
<td>15</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>10-12 (high competence)</td>
<td>15</td>
<td>50</td>
</tr>
</tbody>
</table>

The table above shows that fifty percent (50%) of the post graduate students possess the technology competencies needed for the adoption of web 2.0 technologies for collaborative learning while 50% of the students have low technology competencies.

Research Question 3: What is the attitude of post graduate students towards adopting web 2.0 technologies for collaborative learning?

Research hypothesis: There is no significant relationship between post graduate students technology competencies and their attitude towards the use of web 2.0 technologies for collaborative learning.

Table 3: Correlations of the relationship between postgraduate students’ attitude and their competencies

<table>
<thead>
<tr>
<th>ATTITUDE</th>
<th>COMPETENCIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Correlation</td>
<td>1</td>
</tr>
<tr>
<td>Attitude Sig. (2-tailed)</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>30</td>
</tr>
<tr>
<td>Competencies Pearson Correlation</td>
<td></td>
</tr>
<tr>
<td>Compentencies Sig. (2-tailed)</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>30</td>
</tr>
</tbody>
</table>
The table above shows that the result is significant. However the correlation coefficient of 0.51 shows that there is a positive but weak correlation between postgraduate students’ technology competencies and their attitude towards the adoption of web 2.0 technologies for collaborative learning. This implies that post graduate students with high technology competencies would have a near tendency towards adopting web 2.0 technologies and those with low competencies would likely not want to adopt web 2.0 technologies for collaborative learning. The probable reason for the result above could be that the use of web 2.0 for academic learning is still a novel idea among these students. Most post graduate students use these technologies for social interactions with their family, friends, and colleagues; but have not been using it for collaboration in academic work. This could explain the weak correlation between the variables analysed above.

Conclusion
Web 2.0 technologies enable the development of a skill set that is compliant with 21st century knowledge sharing and distribution and should be encouraged among students. There should be an awareness campaign organized for students to intimate them with the advantages of adopting these technologies for their academic development. This would motivate them to enhance their technology competencies and join the ICT train.

Recommendations
School Administrators and other stakeholders should organize training sessions and workshops to intimate teachers on various instructional pedagogies especially those that are compliant with the digital world we live in.

References


How far are we with the implementation of blended learning? Implementation guidelines on offer

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Abstract
Higher education institutions (HEIs) strive to use learning approaches that develop graduates into critical thinkers. Whilst some HEIs employ traditional approaches, namely, student-centered learning approaches and problem-based learning, others implement blended or online learning. Blended learning is an approach that combines the use of face-to-face teaching, multimedia technologies and online materials. Studies indicate that academic staff acknowledge the importance of blended learning but perceive barriers that prevent the implementation of blended learning. In its attempt to follow the example of other HEIs who have implemented blended learning, University A is struggling to implement blended learning. Despite the establishment of an E-learning Implementation Strategy and Plan at the University, the Faculty of Education has not implemented blended learning due to perceived barriers. The study sought to track progress in implementing blended learning at the University A, thus guidelines were developed to overcome the perceived barriers to implementation. The investigation made use of focus-group interviews with lecturers, individual interviews with heads of academic departments, and the dean of the faculty. Findings revealed that obstacles hindered progress in the implementation of blended learning in the Faculty. Nonetheless, recommendations from participants informed the compilation of an integrated blended learning implementation framework based on Khan’s Octagonal Framework, the PESTER Plan, and Stages and Categories. Consequently, the Faculty of Education Blended Learning Guidelines (FEBLG) were developed to support university management and staff in implementing blended learning in the Faculty of Education at University A. This paper only describes the development of the guidelines.

Keywords: blended learning, implementation, barriers, academic staff, framework, guidelines

Introduction
Most higher education institutions (HEIs) have adopted and implemented blended learning to improve teaching and learning in and outside the classroom (De George-Walker & Keeffe 2010; Garrison & Vaughan 2013). This paper acknowledges that most HEIs are striving to meet the diverse needs of students through online learning or blended learning, but some are experiencing implementation barriers. These barriers include a lack of policy to guide implementation; a lack of faculty support to ensure effective implementation of newly introduced approaches; a low level of technological and computer skills among both students and lecturers; and inadequate technological resources, such as computers for use by students, thus making the proper practice of blended learning elusive (Tshabalala, Ndeya-Ndereya &
Recommendations by lecturers on how to overcome these implementation barriers include the need to establish a policy on blended learning, upgrading computer laboratories, skills development for staff through blended learning workshops and the establishment of a unit to coordinate blended learning and all related activities (Tshabalala et al. 2014). Tshabalala et al. (2014) express a need to formulate guidelines for implementing blended learning. Hence, this paper is a follow-up to the study by Tshabalala et al. (2014), and it explores literature on implementing blended learning, and offers guidelines for successful implementation of blended learning.

Blended learning in context

Blended learning is an approach that combines the use of face-to-face teaching, multimedia technologies and online materials (Precel, Eshet-Alkalai & Alberton 2009; Hoic-Bozic, Mornar & Boticki 2009). Through the use of blended learning some lecturers and students enjoy improved pedagogy, continuous information access, and the cost effectiveness provided by both synchronous and asynchronous communication (Mishra & Panda 2007; Sivakumar, Namasivayam, Al-Atabi & Ramesh 2013). However, some studies acknowledge that there are challenges relating to the implementation of blended learning, such as negative attitudes towards blended learning among staff, lack of blended learning policy in the faculty, low levels of computer literacy, socio-cultural factors, and students’ lack of access to computers and online environments (Brown 2002; Prinsloo & Van Rooyen 2007; Gutteridge 2009; Alebaikan 2010; Tshabalala et al. 2014).

Following the trend of perceived impact of blended learning on HEIs worldwide, University A (pseudonym of the host university of this study), developed a strategic document and infrastructure in an attempt to integrate blended learning in its teaching and learning processes. University A is a comprehensive traditional university in South Africa and comprises faculties for the Arts, Education, Science and Agriculture, and Commerce. It is situated in a rural setting with a student population of 16 118, which is made up of 14 819 undergraduate and 1 299 postgraduate students. Most of the students originate from southern African countries, with a few others from Asia, South America and Australia. With regard to the use of technology in course delivery, the E-learning Implementation Strategy and Plan was approved by the university’s senate in 2009 (University of Zululand 2013; Tshabalala et al. 2014). However, at the time of the study, only three out of 32 academic staff members in the Faculty of Education were making use of a blended learning approach. This indicates a discrepancy between the university’s vision, strategies and policies and the faculty’s implementation of blended learning.

Theoretical framework for blended learning implementation

Blended learning is destined to be the “new traditional model” (Graham, Woodfield & Harrison 2013) of teaching and learning at HEIs. However, few HEIs have developed coordinated guidelines to implement blended learning, even though individual faculties have blended learning offerings. Nonetheless, some frameworks have been developed to overcome barriers to the adoption or implementation of educational technology in particular educational environments. Three such frameworks were considered for this study, namely, Khan’s...
Octagonal Framework (Khan 2009, 42), the PESTER Plan (Jones 2008 458) and Stages and Categories (Graham et al. 2013: 7). Details about these frameworks are provided below.

Khan’s Octagonal Framework
In an effort to create an environment conducive to learning, this framework has eight systemically interrelated and interdependent dimensions, and each dimension has a sub-dimension. To cite an example under the institutional dimension, sub-dimensions of administrative and academic affairs could be considered. The eight dimensions are the following: Institutional dimension focuses on support for staff, students, administrative affairs, academic affairs, peer mentors and e-learning experts.

- **Management** deals with the management of e-learning-related resources.
- **Technological dimension** attends to technological aspects, such as infrastructure, planning, hardware and software.
- **Pedagogical dimension** refers to matters relating to pedagogy, such as students, course delivery, approach, and content suitability.

Ethical dimension focuses on inclusive education and diversity. Interface design considers whether the programme sites are user-friendly and accessible. Resource support ensures that there is continuous online expert support. Evaluation assesses learners and the whole programme (Mishra 2009).

Khan’s octagonal framework covers all the basic aspects of e-learning implementation. Its supplementary review checklist questions are useful, both for guiding the implementation and reviewing an e-learning system. However, this framework does not emphasise the prerequisite of an effective implementation, namely, “planning and promotion” (Jones 2008, 459) of the system. It also overlooks the matter of motivation of staff, which the PESTER Plan identifies as Encouragement and Recognition and reward.

PESTER Plan
Jones (2008) developed an integrated six-stage plan for the implementation of online learning. The name PESTER is derived from the first letter of each element. Significantly, Jones (2008) recommends that, for effective implementation, the plan starts at a faculty level, with committed support from the faculty and university management. The elements of the plan are listed below.

Planning and promotion involves implementing a comprehensive plan in marketing online learning as a teaching and learning strategy to all stakeholders.

Education involves management of the faculty and the university explaining to academic staff the rationale behind the implementation of online learning. Experts and innovators in the faculty are encouraged to instill programme ownership.

Support relates to provision of continuous assistance to students and staff, including programme designers, mentors, peers, multimedia experts and academic experts.

Training may take the form of workshops, one-to-one training, or online training for students and staff so that they keep abreast of the latest developments in online learning.

Encouragement of students and staff involves providing adequate time to prepare and interact with online activities, such as design, development and maintenance of online learning materials.
Recognition and reward entails acknowledging and honouring the innovators and staff members who display commitment to online teaching and learning activities (Jones 2008). The strength of the PESTER Plan lies in the inclusion of a comprehensive plan for promoting online learning as a critical strategy in preparing to implement a teaching and learning approach. However, it makes no reference to technology, ethics or evaluation.

Stages and Categories Plan
In 2012, a study was conducted at Brigham Young University to observe six institutions at three varying degrees of blended learning implementation. Graham et al. (2013) explain that the HEIs at Stage 1, namely, Awareness/exploration, appreciated the importance of blended learning but had not implemented it; those at Stage 2, Adoption/early implementation, were at an early implementation stage and were still introducing policies; and those HEIs at Stage 3, Mature implementation/growth, had a mature, coordinated implementation of blended learning. Notably, in all the Brigham Young University case studies, blended learning was initially adopted by an individual faculty (Graham et al. 2013; Owston 2013; Porter, Graham, Spring, & Welch 2014).

From these case studies it is evident that implementation of blended learning does not happen overnight – implementation passes through stages characterised by careful planning, design and development.

This study, therefore, integrated elements of the three frameworks in order to create comprehensive guidelines that meet the contextual factors present in the Faculty of Education at University A. Tshabalala et al. (2014) reported that knowledge gained from literature contributed to the design of guidelines for supporting the implementation of blended learning.

Methodology
The case study employed a qualitative exploratory research design (McMillan & Schumacher 2010). The investigation made use of focus-group interviews with lecturers, individual interviews with heads of academic departments (HoDs), and the dean of the faculty. The interview questions were based on the Technology Acceptance Model (TAM) including the perceived ease of use (PEOU) and the perceived usefulness (PU) of the technology (Davis 1993) (See Tshabalala et al. 2014). The investigation explored what the academic staff perceived as barriers to the implementation of blended learning in the Faculty of Education at University A and how to overcome those barriers.

Findings
The perception held by all the research participants was that blended learning had never been implemented by the faculty, because the environment was not enabling. Evidently, there was a gap between the Blended Learning Strategic Plan of the university and its implementation in the Faculty of Education. Based on literature, the researchers concluded that University A was in Stage 1, Awareness/exploration of blended learning implementation (Graham et al. 2013). The academic staff acknowledged the importance of blended learning but had not implemented it. Consequently, academic staff members were unanimous in advocating for the establishment of a unit to coordinate blended learning and all related activities. In accordance with the literature, a lack of an enabling environment prevents staff from implementing blended learning (Brown 2002; Prinsloo & Van Rooyen 2007; Gutteridge 2009; Alebaikan 2010; Tshabalala et al. 2014). All lecturers, HoDs and the dean agreed that blended learning provides benefits to students and lecturers alike. Blended
learning was also seen as a time-saver because lecturers would be able to communicate with large classes online. Participants also indicated that blended learning provided networking opportunities through communities of practice. Academic staff members, in the main, were in favour of blended learning should it be implemented in the faculty. Consequently, the participants demanded that the faculty sets processes in motion to implement blended learning. The preceding findings and discussion indicate that there existed a need for guidelines to implement blended learning at University A.

Guidelines on offer
The researchers crafted the Faculty of Education Blended Learning Guidelines (FEBLG) in an effort to enhance the implementation of blended learning innovation in the Faculty of Education at University A. The FEBLG was derived from the three frameworks outlined earlier. In designing the FEBLG, the researchers considered contextual factors, the literature, the data they had collected, and the research findings.

The FEBLG comprises 10 steps, which are described in detail below. Each step outlines the action to be performed, the rationale behind the action and the role people will play in each step. By virtue of his role as the driver of this process, one of the researchers is involved in every step of the framework. The guidelines are summarised in Table 1 and a detailed explanation is presented after the table.

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
<th>Rationale</th>
<th>Persons responsible</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Discussion of research findings (Graham et al. 20013)</td>
<td>To inform faculty members of and familiarise them with the research findings</td>
<td>Researcher</td>
</tr>
<tr>
<td>2.</td>
<td>Constitution of a Blended Learning Committee (BLC) (Carbonell, Dailey-Hebert &amp; Gijselaers 2013; Graham et al. 2013; Owston 2013)</td>
<td>To create a driving force for blended learning (BL) in the Faculty of Education at University A</td>
<td>Dean, HoDs and the researcher</td>
</tr>
<tr>
<td>3.</td>
<td>Faculty needs analysis (Khan 2005; Jones 2008)</td>
<td>To determine teaching and learning needs of academic staff and students</td>
<td>BLC</td>
</tr>
<tr>
<td>4.</td>
<td>Faculty Blended Learning Policy formulation (Jones 2008; Khan 2009; Carbonell et al 2013)</td>
<td>To design principles to guide blended learning implementation in the Faculty of Education</td>
<td>Dean, HoDs and BLC</td>
</tr>
</tbody>
</table>
5. Education of lecturers (Jones 2008; Khan 2009; Graham et al. 2013)  
To share knowledge on blended learning  
BLC and HoDs

6. Training lecturers and students (Jones 2008; Khan 2009; Carbonell et al 2013)  
To empower academic staff and students in implementation of blended learning  
BLC and HoDs

7. Implementation of blended learning (Graham et al. 2013)  
To put the blended learning implementation plan into action  
BLC and HODs

8. Supporting lecturers and students (Khan 2009; Jones 2008)  
To ensure successful implementation of blended learning  
BLC and HoDs

9. Recognition of best practices (Jones 2008)  
To acknowledge excellence and to reward successful innovation  
Dean, HoDs & BLC

10. Evaluation of Blended Learning (BL) in the Faculty of Education (Khan 2009)  
To determine usability and effectiveness of BL in the Faculty (BLC)  
To identify strengths and weaknesses of the FEBLG (researcher)  
BLC, researcher

**Step 1: Dissemination of research findings**
- **Action**: Inform faculty members about and familiarise them with the findings of the research.
- **Rationale**: This step is meant to acknowledge the critical role academic staff played in the study that culminated in the research findings.
- **Person responsible**: Researcher

**Step 2: Constitution of a Blended Learning Committee (BLC)**
- **Action**: Organise a faculty workshop to discuss and plan with academic staff the implementation of blended learning in the faculty. A Faculty Blended Learning Committee (BLC) representative of all departments should be formed during this workshop.
- **Rationale**: Involvement of all the academic staff at this workshop will instill a sense of ownership (Carbonell et al 2013; Graham et al. 2013; Owston 2013) of the process by academic staff and the BLC will be the driving force for blended learning implementation in the faculty.
- **Persons responsible**: Dean, HoDs and the researcher
Step 3: Faculty needs analysis
- **Action**: A thorough needs analysis should be conducted in the faculty by the BLC and the researcher.
- **Rationale**: The aim of this activity is to determine the teaching and learning needs of academic staff and students, and should include needs relating to human and physical resources; discipline content; learning outcomes; and personnel capacity. The results of the process will inform subsequent steps.
- **Persons responsible**: BLC and HoDs

Step 4: Blended learning policy formulation
- **Action**: Policy-formulation ideas should be solicited from academic staff through emails, meetings and forums in the academic departments.
- **Rationale**: The findings concluded that a lack of policy on blended learning was the main barrier to implementation in the faculty. HoDs and the dean recommended that the first step of implementation should be the establishment of a policy on blended learning for the faculty, which should be aligned with the university policy on blended learning (Carbonell et al. 2013).
- **Persons responsible**: BLC, HoDs and the dean

Step 5: Education of lecturers
- **Action**: It is at this stage that information about blended learning should be shared with all academic staff by specialists, innovators and experts on blended learning.
- **Rationale**: The knowledge shared will provide academic staff with the rationale behind blended learning and provide information on how to use it in their teaching and learning practice.
- **Persons responsible**: BLC and faculty blended learning innovators (champions)

Step 6: Training of lecturers and students
- **Action**: Faculty of Education academic staff should be trained in aspects of implementing blended learning, including course design. Students should also be trained in the use of digital tools for learning.
- **Rationale**: The training serves as hands-on experience and it contextualises blended learning for implementation by individual academic staff members and students (Jones 2008; Carbonell et al. 2013).
- **Persons responsible**: BLC and HoDs

Step 7: Implementation of blended learning
- **Action**: At this stage academic staff should conduct teaching and learning according to blended learning requirements agreed upon in the stages above. Teaching and learning should be informed by factors, such as the academic level of students, the availability of computers, learning outcomes and the timetable. Support should be provided to individuals to assist them to overcome their uncertainties.
• **Rationale:** The aim of this step is to put the plans into action.

• **Persons responsible:** BLC and HoDs

**Step 8: Support**

• **Action:** It is anticipated that, at this stage, every lecturer or HoD who is implementing blended learning for the first time will be apprehensive and anxious. Consistent with the literature (Jones 2008), academic staff should be encouraged to form communities of practice for academic and professional support.

• **Rationale:** All possible support should be provided by colleagues, friends, peers, web designers, blended learning course designers and developers, and multimedia specialists (Khan 2009; Jones 2008). Coordination and liaison among support service units are very important to ensure efficient and effective support to academic staff and students.

• **Persons responsible:** BLC and HoDs

**Step 9: Recognition of best practice**

• **Action:** Academic staff members who successfully implement blended learning in their teaching and learning should be acknowledged and rewarded.

• **Rationale:** The best examples of blended learning should be publicised, with the aim of motivating other academic staff to adopt blended learning and/or improve their performance (Jones 2008).

• **Persons responsible:** Dean, HoDs and BLC

**Step 10: Evaluation of blended learning in the Faculty of Education**

• **Action:** After a predetermined period of implementation, an evaluation exercise should be conducted to assess progress with implementation, and to determine the success or failure of blended learning in the faculty. External evaluators could be invited to carry out part of this exercise.

• **Rationale:** This will be twofold: 1) The purpose of the exercise will be to assess the usability and effectiveness of blended learning in the faculty; and 2) The evaluation will determine the weaknesses and strengths of the FEBLG (Khan 2009).

Persons responsible: BLC

The main purpose of the implementation of the FEBLG is meeting the needs of academic staff and improving the quality of the educational experiences of all students in the faculty. It is therefore imperative that every academic staff member in the faculty cooperates in a team effort to implement blended learning successfully.

Practical implications

This study is significant because it explores barriers encountered in the implementation of blended learning in a faculty of education, and ways overcome them. The study has created awareness of blended learning among the research participants, most of whom were not even familiar with the concept prior to participation in the study. Participants were inspired to implement blended learning in their teaching and learning practices. From the findings, the
The study has given birth to a framework that will support the implementation of blended learning within the Faculty of Education at University A.

Theoretical implications
The study applies known knowledge to the new context of a South African, historically black university and, therefore, it is hoped that the study will make a contribution in the field of higher education. For the Faculty of Education at University A, the study generated knowledge that is worth interrogating and subsequently considering for implementation to improve the quality of teaching and learning at the university. The study has also equipped the researchers with knowledge regarding the implementation of blended learning, as well as research skills to undertake further research in the area of blended learning implementation.

Conclusion
The paper responded to one of the recommendations of a paper by Tshabalala et al. (2014) to develop guidelines that would support the implementation of blended learning in the Faculty of Education at University A. Recommendations from participants formed the basis of an extensive literature review on the different frameworks used in the implementation of blended learning. Literature provided several frameworks, but this study integrated three frameworks: Khan’s Octagonal Framework, the PESTER Plan, and Stages and Categories – these frameworks were considered to be most suitable for the Faculty of Education at University A. The FEBLG was developed to support university management and staff in implementing blended learning in the Faculty of Education at the University A. Although these guidelines are contextualised for University A, developing universities are likely to find that some aspects of the process of blended learning implementation apply to their contexts too.

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Educational Technologies for an ICT4D MOOC in the 21st Century

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Abstract
This paper describes the author’s e-learning project experiences of being involved in the development and management of e-content for an introductory Information and Communication Technologies for Development (ICT4D) Massive Open Online Course (MOOC). The paper introduces the design of this course over a period of three semesters using a team approach, to shed some light onto how to teach such a MOOC successfully. The literature review documents concepts related to ICT4D and MOOCs and aspects relating to what the teaching philosophy underlying this course had been, as well as how the course had been adapted for a flexible distance learning MOOC environment. This is followed by a section that describes the research methodology in terms of the research design that was used, as well as the data, enabled by a wealth of information that had been collected in a technology-enhanced evaluation and assessment of the MOOC by students. A discussion of the findings starts with demographic details for the sample of 1573 respondents from fifteen countries. The author describes which educational technologies had been used for by students, e.g. to communicate with their course leader and e-tutors. Details are further provided on the feedback students received on their assignments and what their experience of the course had been. Highlights from qualitative findings, detailing what students enjoyed about this course with regard to the ICT4D aspect of it, are also provided. The paper discusses key aspects of this course that contributed to it being highly popular amongst students and successful, and enabled this course to provide a valuable learning experience using educational technologies for an ICT4D MOOC in the 21st century, thus validating the design decisions taken with regard to the MOOC version of the course. A section on possible further work and a summary of findings concludes the paper.

Keywords - Educational technologies, ICT for Development, Massive Open Online Course

1. Purpose and Objectives of the Paper
Huan, Shehane and Ali (2011) warned that as the success of distance learning drives higher education institutions to increase the number of courses accessible online, particular challenges stem from teaching computing courses to students who are not together physically, with different learning programs - teaching computing courses entails high levels of interactive demonstrations between course leaders and students. Especially in distance learning, Huan et al. (2011) also pointed out that drop-out and failure rates are elevated for entry-level computing courses.

Introductory computing courses such as discussed in this paper are confronted with additional challenges. Van Hentenryck and Coffrin (2014, p. 677) agreed that teaching “such skills is challenging: Students must learn, not only the core technical skills, but also an ability to think
creatively in order to select and adapt a paradigm to solve the problem at hand.” In line with what was described by these authors, this paper attempts to shed “light on how to teach problem-solving skills in” such an environment.

Cant and Bothma (2010) considered the educational technologies conundrum from course leaders’ perspectives. Similarly, and in light of the context as described in the preceding paragraphs, the purpose of this paper is for the author to consider her e-learning project experiences while involved in the development and management of e-content for an introductory Information and Communication Technologies for Development (ICT4D) Massive Open Online Course (MOOC). To reach related objectives, the paper will introduce the design of this course over a period of three semesters using a team approach.

The literature review documents concepts related to ICT4D and MOOCs and aspects related to “the teaching philosophy behind this” course, and how the course had been adapted, by using emerging educational technologies, including online assessment using virtual laboratories, for a flexible distance learning MOOC environment. This is followed by a section describing the research methodology relating to the research design used, and the data, “enabled by the wealth of information” collected in a technology-enhanced evaluation and assessment of the MOOC by students for the Directorate of Institutional Research in September/October of 2014.

A discussion of the findings starts with demographic details for the sample of 1573 respondents from fifteen countries. The author describes which educational technologies had been used for by students, e.g. to communicate with their course leader and e-tutors. Details are further provided on the feedback students received on their assignments and what their experience of the course had been. Highlights from qualitative findings, detailing what students enjoyed about this course with regard to the ICT4D aspect of it, are also provided. The paper indicates “key ingredients to the success of the MOOC” contributing to it being highly popular amongst the students involved in the survey, reported in this paper. These enabled a course providing a valuable learning experience using educational technologies for an ICT4D MOOC in the 21st century, “to validate the design decisions” taken regarding the MOOC version of the course. A section on possible further work and a summary of findings concludes the paper.

2. Conceptual and theoretical background and frameworks
The introductory course discussed in this paper and for which the author is the course leader, focuses on ICT for Development and covers concepts including, but not restricted to, agriculture and poverty alleviation, education, health and gender. According to Laws (2013, p. 46), one of the keys “to facilitating active learning is to take advantage of” emerging educational technologies in ways that facilitate learning about computing by using computing. MOOCs utilising emerging (distance learning) educational technologies are currently in the news: In e.g. the United States of America, “people are talking about MOOCs”, with the proponents of such MOOCs seemingly being “excited about the idea that a wide number of emerging educational technologies can be used in education. Emerging technologies in
education such as those being implemented in the MOOC discussed in this paper “have generated interest in new models for knowledge delivery.” Sahami, Guzdial and Martin (2013, p. 457) pointed to MOOCs as a way of enhancing students’ “learning, including models for making online instruction more effective”.

Sahami et al. (2013, p. 458) also pointed out that MOOCs represent exciting emerging forms of educational technologies “that have advantages of scale that previous systems have not had.” MOOCs enable immediate feedback to students, are fun and practical, and keep students engaged in the content, by, for instance, “providing material to students in a more engaging way than a before-class reading.” Laws (2013, p. 47) agreed that one cannot “ignore a large body of research findings about the importance of active engagement” to motivate students, as had also been reported by Tang, Rixner and Warren (2014).

As described by Garcia, Campbell, Dovi and Horstmann (2014) and Tang et al. (2014, p. 671), around the start of the second semester of 2011, the author committed to becoming involved in the development and management of e-content for a Massive Open Online Course, including introductory ICT skills education and basic ICT for Development concepts, hosted on myUNISA, “for tens of thousands of students.” Over the course of the second semester of 2011 and all through 2012, the author therefore co-developed as course leader with an international team such a Massive Open Online Course. The design of the course embodied several important choices, which are believed to have a significant influence on the success of the MOOC as discussed in this paper.

A team approach was implemented in the development and management of e-content for the course as set out in the institutional framework for the implementation of a team approach to curriculum and learning development, with, for example:

- A distinguished professor of Mathematical Sciences, Decision Sciences and Engineering Systems from a leading institute in the USA, who acted as external expert as part of a US team consulting on the development and management of e-content for the course.
- An academic support staff member specifically from the Centre for Continued Professional Development in the Directorate: Curriculum and Learning Development (DCLD) and another staff member from DCLD itself were the main representatives on the course design and development team in terms of internal support departments.

As had similarly been described by Garcia et al. (2014), the author has co-taught the course with the assistance of a team of secondary lecturers and e-tutors. An initial offering of the Massive Open Online Course during the first semester of 2013 has since been repeated during the second semester of 2013 and the first and second semesters of 2014. There had been 66,961 registrations across these four offerings of the course, with an average enrolment of 16,490 students per semester. Like Sahami et al. (2013), not only is the author very optimistic about this MOOC, but the four terms of the MOOC, called Ethical Information and Communication Technologies for Development Solutions, which had been offered for the last four semesters, were substantially successful, receiving more than 500 positive reviews in the survey reported on in this paper (see e.g. Table 10 of the findings). Although students’ experiences were not all positive, and some of them did express confusion and frustration, as was also admitted by
Garcia et al. (2014, p. 273), for many other students, their MOOC experience was one of “Passion, Beauty, Joy and Awe”, with the course leader and e-tutors witnessing “that on the discussion forums” ‘Aha!’ moments were celebrated, mentor-mentee relationships were fostered and gratitude was expressed. The latter authors, however, emphasised that students needed “the right support at the right times” - research such as that carried out by Gatsha and Evans (2010), on the perceptions and experiences of distance learning students in Botswana in terms of learning support, is therefore essential.

Garcia et al. (2014, p. 273) also stressed that opportunities for such experiences hinged “largely on community and communication.” Nel and Ndeya-Ndereya (2011) similarly highlighted the role of communication in enhancing online social presence, while Van Hentenryck and Coffrin (2014, p. 679) pointed out that “the buzz and community, which motivates students in” a face-to-face classroom “is fostered by a combination of challenging problems, encouragement of teamwork, and iterative,” continuous “assignment feedback. In an attempt to build a similar sense of community in the MOOC, several feedback” mechanisms were employed for communicating the outcome of assessments to students. In terms of some of the educational technologies used to support this course, Cant and Bothma (2010) indicated that the frequently-asked questions (FAQs) educational technology can be used to answer the typical questions that often students ask. In an example of a facilitation plan provided by Nel and Ndeya-Ndereya (2011), these authors listed the FAQ section on the virtual learning environment as a resource for students’ introduction to learning. If the FAQs educational technology is available on their course toolbar, students are advised to check whether their question is not answered there before they contact their e-tutor - e-tutors were trained to act as coaches for the students, with “a grade book interface to monitor student progress” (Garcia et al., 2014, p. 274). With about 200 registered students allocated to each e-tutor, a good auto-grader that allowed fast assessment of hundreds of assignments was also essential.

In an article by De Hart et al., (2011, p. 171), factors affecting the academic performance of entry-level “undergraduate taxation students at a South African” distance learning higher institution were analysed towards increasing throughput. Both De Hart et al. (2011) and Cant and Bothma (2010) pointed out that the self-assessment technology allows students to answer mostly multiple-choice questions, and then obtain immediate answers as to whether they got it right or wrong. Like Garcia et al. (2014, p. 274), the educational technologies and course materials used were also structured with the ‘Digital Generation’ “age group in mind, with each lesson containing” a number of “video lectures, graded multiple choice” questions and independent practice assignments. Also in agreement with what was detailed by Schofield, Erlinger and Dodds (2014, p. 341), in terms of the video content and other educational technologies, in contrast to many other Massive Open Online Courses, these were supplemental and not central “to the curriculum in this” MOOC.

According to Cant and Bothma (2010), the blog educational technology can be used by course leaders for a variety of purposes: Blogs are usually utilised to provide commentary or news on a particular topic, such as student news or activities around the course material. In this MOOC,
it was used more personally as an online diary for reflection on what was learnt.

3. Research Methods and Techniques
A mixed-methods study was used, with a triangulation research design followed, combining both qualitative and quantitative modes of inquiry (McMillan & Schumacher, 2010). Quantitative research designs put emphasis on objectivity in identifying, measuring and describing the characteristics of phenomena. One of the two sub-classifications within quantitative research is non-experimental research designs, with the two non-experimental designs applicable to this project being descriptive and survey (McMillan & Schumacher, 2010). Research using a descriptive design offers a review of a current phenomenon that uses numbers to characterise, in the case of this project, particular schools, by assessing the features of current circumstances.

In terms of the data collection instrument, quantitative research was mainly be used in a form of a survey questionnaire. When using a survey research design, investigators select a sample of participants for administering a questionnaire, to collect data about these participants’ opinions, attitudes, beliefs and other types of information, by asking them certain questions. Surveys are regularly used in educational research for describing attitudes and information as described in the previous sentence. Typically, research is designed in order to obtain information regarding a sizeable quantity of individuals (the population), by inferring based on the replies acquired from a reduced collection of subjects (the sample) (McMillan & Schumacher, 2010). The sampling technique consisted of inviting all students registered for the module at the time of the survey (5458) to participate, resulting in a 29% response rate. In terms of the research methods and techniques previously employed by others, Gatsha and Evans (2010) used a survey to evaluate which student needs, expectations and aspirations are critical for the development, management and improvement of quality learning support.

When using qualitative designs, most data take the form of words, as opposed to figures, and generally, researchers search through and explore these until they develop a deeper understanding. A case study research design studies a restricted system (the so-called ‘case’), that employs numerous sources of data located in the situation. In this project, each case is represented by a particular school, with a collection of persons limited by time and location. Each case is selected for use as an example of a particular instance. In this project, the focus will be on several entities (schools), making this a multi-site study (McMillan & Schumacher, 2010). Research sites in this paper consist of schools from a specific district in SA. Aspects of an interactive qualitative research design are also used in the form of a phenomenological study, attempting to describe participants’ perceptions, perspectives and understandings. The use of multi-method strategies allow for data triangulation across inquiry techniques and provide the mechanisms for mutual support between qualitative and quantitative research - enabling researchers to verify the degree to which assumptions based on e.g. quantitative information are reinforced by qualitative perspectives. McMillan and Schumacher (2010) indicated such triangulation as being critical for facilitating validity and issues of reliability - establishing the validity and reliability of instruments also adds to credible data analysis.
The use of a variety of strategies to enhance validity is required in especially qualitative research, since the validity of such designs include the extent to which perceptions and interpretations made had shared meaning between participants and the researcher. Decisions were therefore made on how to ensure that the data collected was valid, for example by obtaining advice from expert researchers on the questions used, to ensure internal validity in terms of causal inferences, and by obtaining detailed descriptions of participants and their environments for the facilitation of external validation (McMillan & Schumacher, 2010). In agreement with suggestions by McMillan and Schumacher (2010), researchers can have their data analysed independently by another researcher, who had not been involved in obtaining the data - this provides another method for enhancing validity. Then, once agreement had been reached on the data collection, data analysis and integration can take place to obtain a full representation of the applicable participants and their opinions.

4. Discussion of Findings
Although the overwhelming majority of respondents (1 506; 96%) were from South Africa - reflecting the composition of the course population - respondents from other Southern African and African countries, as well as from across the world, participated in this survey - see Table 1 for the full list of fifteen countries.

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of Responses</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Africa</td>
<td>1 506</td>
<td>95.9%</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>26</td>
<td>1.65%</td>
</tr>
<tr>
<td>Botswana</td>
<td>9</td>
<td>0.57%</td>
</tr>
<tr>
<td>Swaziland</td>
<td>8</td>
<td>0.51%</td>
</tr>
<tr>
<td>Namibia</td>
<td>6</td>
<td>0.38%</td>
</tr>
<tr>
<td>Malawi, Zambia</td>
<td>3</td>
<td>0.19%</td>
</tr>
<tr>
<td>Angola, Ethiopia, Kenya, Lesotho</td>
<td>2</td>
<td>0.13%</td>
</tr>
<tr>
<td>Canada, Germany, Saudi Arabia, United Arab Emirates</td>
<td>1</td>
<td>0.06%</td>
</tr>
</tbody>
</table>

The majority of respondents (1230; 83%) studied part-time for this course, while less than a quarter of them (334; 23%) were repeating the course during the second semester of 2014. Especially in a distance learning environment, the question from Warren, Rixner, Greiner and Wong (2014) is highly relevant: How can students be successful if they can never interact with their course leader? Table 2 displays that at least four different technologies were implemented by participants for communicating with their course leader, with the most popular technology being the Discussions, which was selected by less than half of participants (561; 42%). Please note that students were encouraged to select all options that applied - the total number of responses therefore exceeds the number of participants.

<table>
<thead>
<tr>
<th>Options</th>
<th>Number of Responses</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 2 Which technologies did you use to communicate with your course leader?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The fact that two-fifths of participants (530; 40%) never tried to contact the course leader could be attributed to the fact that students were encouraged to consult with their e-tutor as first port of call (see Table 3), and assume that their queries were dealt with fittingly by their e-tutors. This interpretation of the data also corresponds with the fact that the Discussions technology was the one most used by students to communicate with their e-tutors: another guideline given to students is that they should contact their e-tutors via this technology.

<table>
<thead>
<tr>
<th>Options</th>
<th>Number of Responses</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discussions</td>
<td>747</td>
<td>52%</td>
</tr>
<tr>
<td>Never tried to contact my e-tutor</td>
<td>422</td>
<td>29%</td>
</tr>
<tr>
<td>Email</td>
<td>224</td>
<td>16%</td>
</tr>
<tr>
<td>Telephone</td>
<td>53</td>
<td>4%</td>
</tr>
<tr>
<td>Social media (e.g. Facebook, Twitter, etc.)</td>
<td>14</td>
<td>1%</td>
</tr>
<tr>
<td>Other</td>
<td>36</td>
<td>3%</td>
</tr>
</tbody>
</table>

**Table 3** Which technologies did you use to communicate with your e-tutor?

<table>
<thead>
<tr>
<th>Options</th>
<th>Number of Responses</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>To participate in discussion forums</td>
<td>1 140</td>
<td>85%</td>
</tr>
<tr>
<td>To view announcements</td>
<td>1 116</td>
<td>83%</td>
</tr>
<tr>
<td>To download resources and study materials</td>
<td>1 056</td>
<td>79%</td>
</tr>
<tr>
<td>To engage with the learning units</td>
<td>956</td>
<td>72%</td>
</tr>
<tr>
<td>To participate in blogs</td>
<td>938</td>
<td>70%</td>
</tr>
<tr>
<td>To view my schedule</td>
<td>805</td>
<td>60%</td>
</tr>
<tr>
<td>To view the overall syllabus</td>
<td>617</td>
<td>46%</td>
</tr>
<tr>
<td>To contact your course leader or e-tutor</td>
<td>553</td>
<td>41%</td>
</tr>
<tr>
<td>To find my prescribed books</td>
<td>532</td>
<td>40%</td>
</tr>
<tr>
<td>To find answers to Frequently Asked Questions (FAQs)</td>
<td>426</td>
<td>32%</td>
</tr>
<tr>
<td>To view podcasts</td>
<td>83</td>
<td>6%</td>
</tr>
</tbody>
</table>

While Garcia et al. (2014) indicated that in the courses they were referring to, participants on the discussion forums represented only between five and ten percent of the students enrolled, Table 4 shows that for the course that forms the basis of this paper, far more than three-quarters of respondents (1 140; 85%) had used myUNISA to participate in the discussions!
Reflecting the fact that this course is offered fully online, 1 383 (99%) of respondents used myUNISA for this course. Correspondingly, only 20 (1%) of respondents did not use myUNISA while completing this course. In a similar vein, only 15 (2%) of respondents did not submit their assignments and/or activities online (on myUNISA) for this course.

Warren et al. (2014, p. 665) raised issues related to the availability “of timely and relevant feedback”. Table 5 shows that only just more than a third of respondents (438; 37%) either disagreed or strongly disagreed that they received feedback on their marked assignments and/or activities promptly. Similarly, only just over a third of respondents (399; 34%) either disagreed or strongly disagreed that the feedback they received on their marked assignments and/or activities was useful.

Comparable to findings reported by Van Hentenryck and Coffrin (2014), regarding assignment grading being fair, only a quarter of the surveyed students (275; 25%) either disagreed or strongly disagreed that the marking process had been fair (see Table 7).

### Table 5 I received feedback on my marked assignments and/or activities promptly

<table>
<thead>
<tr>
<th>Options</th>
<th>Number of Responses</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Disagree</td>
<td>178</td>
<td>15%</td>
</tr>
<tr>
<td>Disagree</td>
<td>260</td>
<td>22%</td>
</tr>
<tr>
<td>Neither Agree nor Disagree</td>
<td>177</td>
<td>15%</td>
</tr>
<tr>
<td>Agree</td>
<td>414</td>
<td>35%</td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>153</td>
<td>13%</td>
</tr>
</tbody>
</table>

### Table 6 The feedback I received on my marked assignments and/or activities was useful

<table>
<thead>
<tr>
<th>Options</th>
<th>Number of Responses</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Disagree</td>
<td>174</td>
<td>15%</td>
</tr>
<tr>
<td>Disagree</td>
<td>225</td>
<td>19%</td>
</tr>
<tr>
<td>Neither Agree nor Disagree</td>
<td>251</td>
<td>21%</td>
</tr>
<tr>
<td>Agree</td>
<td>362</td>
<td>31%</td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>148</td>
<td>13%</td>
</tr>
</tbody>
</table>

### Table 7 The marking process was fair

<table>
<thead>
<tr>
<th>Options</th>
<th>Number of Responses</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Disagree</td>
<td>121</td>
<td>11%</td>
</tr>
<tr>
<td>Disagree</td>
<td>154</td>
<td>14%</td>
</tr>
<tr>
<td>Neither Agree nor Disagree</td>
<td>317</td>
<td>29%</td>
</tr>
<tr>
<td>Agree</td>
<td>374</td>
<td>34%</td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>132</td>
<td>12%</td>
</tr>
</tbody>
</table>
Table 8 The course provided a valuable learning experience

<table>
<thead>
<tr>
<th>Options</th>
<th>Number of Responses</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Disagree</td>
<td>101</td>
<td>8%</td>
</tr>
<tr>
<td>Disagree</td>
<td>99</td>
<td>8%</td>
</tr>
<tr>
<td>Neither Agree nor Disagree</td>
<td>113</td>
<td>9%</td>
</tr>
<tr>
<td>Agree</td>
<td>540</td>
<td>43%</td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>391</td>
<td>31%</td>
</tr>
</tbody>
</table>

Similar to what was described by Van Hentenryck and Coffrin (2014), the course discussed here was highly popular: when asked whether they would recommend this course to other students, more than two-thirds of all students surveyed (782; 68%) replied ‘Yes’. According to Van Hentenryck and Coffrin (2014, p. 682), 94.5% of their “students said that they learned a significant amount from” that course - exactly three-quarters (931; 75%) of respondents in this research survey either agreed or strongly agreed that this course provided a valuable learning experience.

The percentage of participants in the study by Schofield et al. (2014, p. 340) who agreed with the statement “I feel confident about my ability to accomplish my goals in the MyCS program” after their workshop was similar to those of the students in this evaluation who agreed with the statement “I have met the stated objectives and learning outcomes for the course” in this study (46.9% compared to 48.4% respectively). The percentage of participants in the study by Schofield et al. (2014) who strongly agreed with their statement was, however, considerably higher at 53.8 percent.

Table 9 I have met the stated objectives and learning outcomes for the course

<table>
<thead>
<tr>
<th>Options</th>
<th>Number of Responses</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Disagree</td>
<td>81</td>
<td>7%</td>
</tr>
<tr>
<td>Disagree</td>
<td>122</td>
<td>10%</td>
</tr>
<tr>
<td>Neither Agree nor Disagree</td>
<td>199</td>
<td>16%</td>
</tr>
<tr>
<td>Agree</td>
<td>574</td>
<td>47%</td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>247</td>
<td>20%</td>
</tr>
</tbody>
</table>

Students in the study reported on by Van Hentenryck and Coffrin (2014, p. 679) learned a lot (see comments related to Table 8) and their “overall experience was very positive.” Similar to what the latter authors (Van Hentenryck & Coffrin, 2014, p. 682) related, more than half of the students (646; 57%) in this study either agreed or strongly agreed that “they had a positive overall experience in the course” - see Table 10 - with 16.4% of them strongly agreeing.

Table 10 My overall experience of the course was positive

<table>
<thead>
<tr>
<th>Options</th>
<th>Number of Responses</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Disagree</td>
<td>101</td>
<td>8%</td>
</tr>
<tr>
<td>Disagree</td>
<td>99</td>
<td>8%</td>
</tr>
<tr>
<td>Neither Agree nor Disagree</td>
<td>113</td>
<td>9%</td>
</tr>
<tr>
<td>Agree</td>
<td>540</td>
<td>43%</td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>391</td>
<td>31%</td>
</tr>
</tbody>
</table>
The findings portrayed in Tables 8 and 10 are underscored by common statements captured via students’ comments in response to open-ended questions, similar to what was reported on by Van Hentenryck and Coffrin (2014), in a section at the end of the survey, where they could provide further comments, one such comment included: “This module was very useful and I thoroughly enjoyed it, was a very good learning experience.” In the study described by Van Hentenryck and Coffrin (2014, p. 682), when “the students were asked the open ended question”: My favourite “part of this this course is ...” many aspects of that course were discussed. Similar to that question, participants in the current study were asked: What did you enjoy most about the course? Two students respectively referred to “Critical analysis of ICT4D; practical exercises for Office 2013” and learning “critically about issues of development”.

Two more illustrative examples of students’ replies to this question included “To be ‘dared’ to apply the knowledge you are busy acquiring (applications of ICTs in rural development); it was a refreshing way to look at what could have been a very boring course” and “The thing I enjoyed most about this course was learning about” the Millennium Development Goals (MDGs) “and what actually goes on in the world regarding the process of trying to get technological developments to rural parts of the world to better their daily lives. I also enjoyed learning more about Microsoft.”

Similar to what was outlined by Garcia et al. (2014), the learning period for this Massive Open Online Course corresponded to a 15-week semester. Schofield et al. (2014, p. 341) reported that several respondents in their study “recommended extending the length of” their workshop to double the original duration, for example to “allow more time to experience” the learning units and curriculum. In response to the question “Would you prefer if this course was presented as a year course?”, as opposed to being presented over a semester in the current format, slightly less than two-thirds of all participants in the survey of the course discussed in this paper (670; 59%) replied negatively (No). As an instance of the kind of validations provided, and continuing with the ICT for Development theme of this paper, one student replied: “As far as I can tell, the content is more semester-like; a year course may require more content - not ICT4D only.”

In order to provide another illustration of the open-ended questions that was provided for in the survey, and in line with improvement intentions of the survey, as detailed in the research methodology section of this paper, students were queried on how the course could be improved. One student responded that the course “should be adjusted”(more so than is currently the case)
“to law particulars for law students, education particulars for B.Ed. students and so forth.” This student was of the opinion that (s) he could “do nothing with cell phone details or ICT4D. I can’t even use it for my personal purposes.” The student finally also did not like that a lot the assignments were “all opinion based.”

5. Conclusion
The author agrees with Brown, Kölling, McCall and Utting (2014, p. 225) that “there remain many technical challenges in the automated analysis of large-scale data such as findings from the numbers of students involved in this Massive Open Online Course. “The scale of the data does not make the analysis impossible, but it does prevent any manual intervention; any analysis must typically be completely automatic.” Finally, as also suggested by the latter authors, more detailed demographic information about the participants in the surveys such as the one discussed in this paper, and the MOOC in general, may also be collected. This ICT for Development MOOC has already started serving “as an opportunity to develop and test” educational technologies, which will provide, as described by Warren et al. (2014, p. 670) and discussed in this paper, online students with enhanced, valuable learning experiences. Numerous opportunities, however, for further work in related fields are evident.

Similar to the summary of the panel discussion by Sahami et al. (2013, p. 457), relating to perspectives on massive open online education, this paper discussed issues “and lessons learned from preparing and teaching a” Massive Open Online Course to almost 66 000 students, including the challenges involved “in delivering such a course”. This paper also similarly provided guidance to “those who might be considering doing the same”. Related to what was described by Warren et al. (2014, p. 670), students’ views of this ICT4D MOOC were extremely positive: Out of the 1573 survey respondents for the second semester of 2014, sixteen percent strongly agreed with the statement “My overall experience of the course was positive”, 40% (459 responders) agreed, twelve percent neither agreed nor disagreed, 11% disagreed and twenty percent strongly disagreed (See Table 10). “Students actively engaged with each other to learn and teach themselves”, as advised by Laws (2013).

Acknowledgement
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6. References
undergraduate taxation students at an ODL institution in South Africa. Progressio, 33(1), 171 - 188.


Educational Technologies for Growing Innovative e-Schools in the 21st Century: A Community Engagement Project

L. Goosen
University of South Africa

Abstract
The aim of the study that this paper reports on is the investigation of research questions around educational technologies for growing innovative e-schools in the 21st century. The study is located within a relevant conceptual framework that clarifies issues around Information and Communication Technologies (ICTs) and what it means to be ICT capable. The study draws on the latest, most relevant research findings available, in a literature review covering applicable aspects related to the South African context; pertinent perspectives from further afield are, however, also considered. The literature study firstly investigates e-schools in terms of implementation progress made with regard to achieving the policy goal of the White Paper on e-Education in South Africa. The policy goal, together with strategic objectives to structure the implementation thereof is then presented, before challenges with regard to the implementation of the policy goal are explored. Main arguments in terms of educator support through human resource development in terms of using educational technologies at these schools are also considered.

This is followed by a section that describes how the empirical research was undertaken: the general research methodology that was used is described, including consideration of issues related to reliability and validity for the quantitative research design. A discussion of the findings starts with some demographic details in terms of the characteristics for the sample of respondents from different South African schools. It provides details on the extent to which schools are characterised as institutions that exhibit:

- e-student characteristics with regard to utilising educational technologies;
- the adoption of educational technologies by qualified and competent educators who use these to enhance teaching and learning; and
- qualified and competent management using educational technologies for the planning, management and administration of their educational environments.

The value of the findings provided in this research study is illustrated in terms of filling gaps identified in literature to make original contributions towards scholarly debate in the field. These findings could therefore be of use to educational technology educators and leaders at e-schools across South Africa, the rest of the continent and even further afield. A section on possible further work and a concise summary of the findings concludes the paper.

Keywords - Educational technologies, e-Schools, Community Engagement.

7. Introduction, Purpose and Objectives of the Paper
Information and communication technologies (ICTs) are increasingly playing a significantly meaningful role at local, national and global levels, where the use of these emerging
technologies is affecting everyday life (Terzoli, Dalvit, Murray, Mini, & Zhao, 2005). ICTs generally also affect government policies, as well as worldwide commercial and economic growth (Whelan, 2008). These are also specifically improving aspects of South African (SA) culture, together with citizens’ sense of democracy, employment and economic growth within an information society (Mpehle, 2011). There appears to be “a deep grasp of the urgency, particularly for developing countries, to bridge the digital divide to achieve developmental goals and improve people’s lives” (Surty, 2010).

Surty (2010) pointed out that various national departments provided legislative and policy frameworks that enable government strategies for improving and supporting the integration of ICT tools into teaching and learning - these are key catalysts in the process of transforming education systems and public sector schools to equip their students with 21st century skills. As in many other countries, educational technologies have had a revolutionary effect on the development of the curriculum, and the delivery of school practice, in South Africa (Whelan, 2008). Many policy makers tend to understand ICTs as being limited to only “computers, satellite and internet technologies” (Evoh, 2007, p. 94). However, that author pointed out that more ‘traditional’ technologies such as radio and television also form part of the educational technologies that can be used for supporting pedagogical curriculum delivery to improve effective and efficient teaching and learning practices (Blignaut & Els, 2010).

An e-education policy, however, has a key role in the effectiveness of educational reform (Evoh, 2007). Fortunately, South Africa has already developed an own structured and focused e-education policy, including strategies for using educational technologies to transform school teaching and learning. These were set out in White Paper 7 on e-Education that appeared in 2004 (Surty, 2010). Although Blignaut and Els (2010) pointed out that this is currently the lone e-education policy in South Africa, Wilson-Strydom, Thomson and Hodgkinson-Williams (2005) believe that the integration of e-education into teaching has ascended on the educational agenda in South Africa with the release of this White Paper. The White Paper on e-Education for transforming learning and teaching through educational technologies responded to the forces and questions imposed by the information revolution on behalf of the education and training system in South Africa by setting out the following e-education policy goal (Department of Education, 2004, p. 17): All South African students “in the General and Further Education and Training bands will be ICT capable (that is, use ICT confidently and creatively to help develop the skills and knowledge they need to achieve personal goals and to be full participants in the global community) by 2013.”

Two problems have been identified in this regard, with the purpose of the project reported on in this paper being to make a significant and substantial contribution towards solving: (1) To what extent had the e-education policy goal been achieved, since the ‘due date’ (2013) has come and gone? (2) Ten years have passed since the publication of the White Paper on e-Education. Referring to Donner and Escobari, Heeks (2010, p. 632) commented on “the issue of working in an area of fast-moving change. As such”, the validity and continued relevance of assumptions and claims made in a ten year old document in the fields of ICTs and
educational technologies may very well be time-contingent and need to be investigated. Additionally, also mentioned was “the continuing paucity of the” associated research base. The next section, which sets out the conceptual and theoretical background and frameworks in terms of describing the details of this research will supply additional information in terms of discussions underpinning this study - specifically, another objective of the research is to fill a major gap in knowledge identified in the literature.

8. Conceptual and theoretical background and frameworks

In existing research, a number of concepts/terminology relevant to this research are being confused, are used interchangeably and/or no clear distinction is drawn between certain terms. It is therefore necessary to not only clarify what these definitions refer to in education in general, but also to specify the way in which these will be understood in this research. The e-education policy document fairly abstractly and technically defines ICTs as representing “the convergence of information technology and communication technology. ICTs are the combination of networks, hardware and software, as well as the means of communication, collaboration and engagement that enable the processing, management and exchange of data, information and knowledge” (Department of Education, 2004, p. 15). ICTs as a resource for reorganising curriculum integration are also embraced.

Wilson-Strydom et al. (2005, p. 81) believe that e-education “is about integrating technology into one’s lessons to support and enhance learning”. In accord with the e-education policy document, they see e-education as being about more than just developing computer literacy and learning the skills needed to use different ICTs (Department of Education, 2004, p. 14). The policy explanation of e-education further highlights tool/s and communication aspects, by envisioning ICTs as communication and collaborative tools for educators and students, as well as for management, to contribute to development. Finally, parallels with a quotation from Bill Gates are brought up when e-education is perceived as presenting “a learning environment that advances” not only creativity, but also engagement. In the White Paper on e-Education (Department of Education, 2004, p. 18), e-schools are characterised as institutions that have students who utilise ICTs to enhance learning, qualified and competent leaders using ICTs for planning, management and administration and qualified and competent educators using educational technologies “to enhance teaching and learning”.

The years since the advent of a new democracy in South Africa in 1994 has seen the development of dramatic changes “throughout the education and training system as part of the democratisation process” (Blignaut & Els, 2010, p. 109). These aim to redress inequalities and provide access to new learning opportunities (Department of Education, 2004, p. 19). Both Park and Van der Merwe (2009, pp. 356 - 357) and Surty (2010) therefore find it imperative to understand the contribution that advances in e-education could make towards demonstrating Government’s unflinching commitment to education transformation. Mouyabi (2011, p. 1178) believes that the introduction of educational technologies into the higher education community has necessitated new approaches, such as the creation and implementation of supple platforms and tools, being adopted as an alternate system towards improving the quality of teaching and
learning (Sesemane, 2007, p. 643). The latter author, however, also warned that the implementation of educational technology policies “is a highly contested domain within the South African Higher Education landscape.” Although the abstract of that author’s article indicated that an analysis of the South African government’s e-policy and the impact thereof on higher education would be provided, that indication was not realised. The current research project will therefore aim to provide an analysis of the progress being made on the implementation of the e-education policy in South Africa.

Due to the magnitude of the task of implementing the e-education policy goal, the White Paper acknowledged the massive investment required (Blignaut & Els, 2010), calling for a long-term implementation “strategy that will provide a framework for specific priorities and actions” set out in a multiyear programme (Department of Education, 2004, p. 38). Strategic objectives for using educational technologies to turn “schools into centres of quality learning and teaching for the 21st century” was thus established (Department of Education, 2004, p. 6).

In order for educators to respond to these changing workplace requirements, they must develop the necessary skills “to maximise the usefulness of computers for education purposes” (Dagada, 2004, p. 110). It is therefore of the utmost importance that increased access to educational technologies for teaching and learning and the provision of software must go hand-in-hand with adequate professional development of educators and the actual implementation of e-education (Department of Education, 2004, p. 13). If educators do not make use of e-education and/or are not trained to effectively handle the challenges that having educational technologies in their classrooms might present, it is highly unlikely that any significant improvements will be obtained.

Thomen (2005, p. 820) found that educators “viewed professional development as a broad concept that encompasses their practice, the community and the teaching profession within a global context”. All leaders, educators and administrators in schools should have access to the knowledge, skills and support needed for creating opportunities to integrate e-education into the curriculum (Surty, 2010). Thomen (2005, p. 813), however, also warned that the “process of implementing educational change to improve the quality of professional practice” can be difficult. Higher education institutions are therefore encouraged to strengthen educator training, as well as their participation in other education events with regard to education pedagogy, for application in educational contexts. The school curriculum should be supported by ensuring that a comprehensive set of effective, engaging and sustained software, electronic content, “resources, tools and information across all grade levels and “subjects in multiple South African languages are freely” accessible online (Mpehle, 2011, p. 714). Students, educators, administrators and content developers are encouraged to re-use, adapt and contribute effectively to such resources.

A great contribution towards improving the quality of teaching and learning needs to be made by expanding the access of all educators and students to Internet “connectivity in both primary and secondary schools” (Surty, 2010). All students, educators, leaders and administrators also need access to educational technology infrastructure. One of the major challenges for the
success of educational technologies involves institutions being able to allow educators and students to have increased regular access to reliable educational technology infrastructure “that is specifically suited to Africa” (Department of Education, 2004, p. 10). Accountability mechanisms, however, also have to be put in place to properly maintain such infrastructure (Evoh, 2007). Schools should work in partnership with families and the wider community in ensuring shared knowledge about educational technologies and creating extended opportunities for community member e-education and development through ICTs (Mpehle, 2011).

The best way to learn and understand how to improve practice is through research, evaluation and collaboration. To this end, Government aims to bring together educators, researchers and the ICT industry in action-oriented research, to evaluate and develop leading-edge applications for e-education. Research and development communities, as specifically represented by higher education institutions, can support education departments by sharing the e-education knowledge and research produced at South African universities (Terzoli et al. 2005). This can be achieved by continuously assessing current practices, and exploring and experimenting “with new technologies, methodologies and techniques that are reliable and will support” educators and administrators in e-learning and e-administration (Department of Education, 2004, p. 33). Research on e-education should not only “be closely linked to other general research on learning”, but also to practice. Since the education “profession has an obligation to play an important role in generating ideas, testing prototypes and implementing strategies”, they, in collaboration with the Departments of Higher Education and Training,

Basic Education, “Communications and Science and Technology, higher education institutions and research agencies, will” need to “formulate a research agenda on” e-learning.

These objectives from the e-education policy provide a strategic framework within which different governmental departments, provincial education departments, business and industry, non-profit organisations, higher education institutions, general and further education and training institutions, local communities and other stakeholders can collaborate to respond to the challenge of providing emerging educational technologies. This could be achieved by ensuring “those institutions are supported to meet the needs and interests of” students and communities to implement educational technologies (Department of Education, 2004, p. 37).

9. Research Methods and Techniques

A mixed-methods study was decided upon, with a triangulation design being followed, combining both qualitative and quantitative modes of inquiry or approaches to research for collecting data (McMillan & Schumacher, 2010). According to McMillan and Schumacher (2010), quantitative research designs put emphasis on objectivity in identifying, measuring and describing the characteristics of phenomena. One of the two sub-classifications within quantitative research is non-experimental research designs, that explain events and observe relationships between various phenomena without directly influencing circumstances, which are experienced – two of these non-experimental designs will be applicable in this project, descriptive and survey (McMillan & Schumacher, 2010). Research that uses a descriptive design offers a review of a current phenomenon that uses numbers to characterise, in the case
of this project, particular schools, by assessing the features of current circumstances. The purpose, however, of the majority of descriptive research is restricted to describing something as it is.

Quantitative research will mainly be used in a form of a survey questionnaire. When using a survey research design, investigators select a sample of participants for administering a questionnaire, to collect data about these participants’ opinions, attitudes, beliefs and other types of information, by asking them certain questions. Surveys are regularly used in educational research for describing attitudes and information as described in the previous sentence. Typically, research is designed in order to obtain information regarding a sizeable quantity of individuals (the population), by inferring based on the replies acquired from a reduced collection of subjects (the sample) (McMillan & Schumacher, 2010). In the structured queries (also termed reduced options questions) used, participants are provided with a suitable list of choices (McMillan & Schumacher, 2010).

On the other hand, when using qualitative designs, most data take the form of words, as opposed to figures, and generally, researchers search through and explore these until they develop a deeper understanding. A case study research design studies a restricted system (the so-called ‘case’), that employs numerous sources of data located in the situation. In this project, each case is represented by a particular school, with a collection of persons limited by time and location. Each case is selected for use as an example of a particular instance. In this project, the focus will be on several entities (schools), making this a multi-site study (McMillan & Schumacher, 2010). Research sites in this paper will mainly consist of primary schools across South Africa. Aspects of an interactive qualitative research design will also be used in the form of a phenomenological study (McMillan & Schumacher, 2010), attempting to describe participants’ perceptions, perspectives and understandings.

The use of multi-method strategies could produce diverse insights regarding topics of interest and augment results’ credibility (McMillan & Schumacher, 2010). These strategies also allow for data triangulation across inquiry techniques and provide the mechanisms for mutual support between qualitative and quantitative research - enabling researchers to verify the degree to which assumptions based on qualitative information are reinforced by quantitative perspectives, or the other way around. McMillan and Schumacher (2010) indicated such triangulation as being critical for the facilitation of interpretive validity. The use a variety of strategies to enhance validity is required in especially qualitative research, since the validity of such designs include the extent to which perceptions and interpretations made had shared meaning between respondents and the researcher. Several resources ought to be employed for comparing results with each other, for ensuring the internal validity of qualitative research. As suggested by McMillan and Schumacher (2010), decisions were therefore made on how to ensure that the data collected was valid, for example by obtaining advice from expert researchers on the questions used, to ensure internal validity in terms of causal inferences, and by obtaining detailed descriptions of participants and their environments for the facilitation of external validation and generalizability.
In agreement with suggestions by McMillan and Schumacher (2010), less experienced researchers can have their qualitative data analysed independently by another more experienced researcher, who had not been involved in obtaining the data - this provides another method for enhancing validity. Then, once agreement had been reached on the descriptive data collected, results can be compared and integrated to obtain a full representation of the applicable participants and their environments.

10. Discussion of Findings

The composition of respondents in this study reflect the fact that there are many more female educators in South African schools than male, with only 17% of the latter - although a bit extreme, this might be a better representation than in Wilson-Strydom et al. (2005, p. 76), where the “survey sample was made up of 48.5% men and 51.5% women”.

A third (33%) of the schools in this study were from urban areas, comparable to those in the study by Wilson-Strydom et al. (2005), which had 31% ; the district on which this seminar focuses, however, had no schools from rural areas, with the remainder located in townships. All respondents were from primary schools, with one exception, from a special school.

<p>| Table 1: Age Distribution of Respondents |</p>
<table>
<thead>
<tr>
<th>Age</th>
<th>Number of Respondents</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 - 39 years</td>
<td>1</td>
<td>8%</td>
</tr>
<tr>
<td>40 - 49 years</td>
<td>3</td>
<td>25%</td>
</tr>
<tr>
<td>50 - 59 years</td>
<td>8</td>
<td>67%</td>
</tr>
</tbody>
</table>

Because of the focus of this community engagement seminar towards leadership, two-thirds of respondents were between the ages of fifty and 59, with no-one less than thirty years of age, or over 59 - in the study by Wilson-Strydom et al. (2005, p. 76), the majority of the sample (45%) “fell in the 30-39 years age category”, while the current study had only one.

<p>| Table 2: Number of Years Teaching Experience |</p>
<table>
<thead>
<tr>
<th>Options</th>
<th>Number of Respondents</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 5 years</td>
<td>1</td>
<td>8%</td>
</tr>
<tr>
<td>6 - 10 years</td>
<td>1</td>
<td>8%</td>
</tr>
<tr>
<td>11 - 15 years</td>
<td>1</td>
<td>8%</td>
</tr>
<tr>
<td>16 - 20 years</td>
<td>3</td>
<td>25%</td>
</tr>
<tr>
<td>More than 20 years</td>
<td>6</td>
<td>50%</td>
</tr>
</tbody>
</table>

In line with the findings in Table 1, the distribution of respondents’ number of years teaching experience is also skewed toward the higher ranges, with three-quarters (75%) of all respondents having sixteen years or more experience - comparatively, in the study by Wilson-Strydom et al. (2005), this experience grouping only accounted for 38% of respondents.
Table 3: Participants’ roles in their respective schools

<table>
<thead>
<tr>
<th>Role</th>
<th>Number of Respondents</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principal</td>
<td>7</td>
<td>58%</td>
</tr>
<tr>
<td>Deputy Principal</td>
<td>1</td>
<td>8%</td>
</tr>
<tr>
<td>Head of Department</td>
<td>2</td>
<td>17%</td>
</tr>
<tr>
<td>Educator</td>
<td>2</td>
<td>17%</td>
</tr>
</tbody>
</table>

Reflecting an invitation to school leaders to attend this specific seminar, three-quarters (67%) of all respondents were either the principal or deputy principal of their respective schools.

Table 4: This institution has students who utilise educational technologies to enhance learning

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1) Students at this institution respond to lessons integrating educational technologies by helping each other</td>
<td>4 (33%)</td>
<td>6 (50%)</td>
<td>2 (17%)</td>
<td>0</td>
</tr>
<tr>
<td>1.2) Students at this institution respond to lessons integrating educational technologies by producing work that is more creative</td>
<td>3 (25%)</td>
<td>4 (33%)</td>
<td>5 (42%)</td>
<td>0</td>
</tr>
<tr>
<td>1.3) Students at this institution respond to lessons integrating educational technologies by working together</td>
<td>2 (17%)</td>
<td>8 (67%)</td>
<td>2 (17%)</td>
<td>0</td>
</tr>
<tr>
<td>1.4) Students at this institution respond to lessons integrating educational technologies by becoming actively involved</td>
<td>5 (42%)</td>
<td>6 (50%)</td>
<td>1 (8%)</td>
<td>0</td>
</tr>
<tr>
<td>1.5) Student activities at this institution are changing towards increasingly working on group projects</td>
<td>2 (17%)</td>
<td>4 (33%)</td>
<td>4 (33%)</td>
<td>2 (17%)</td>
</tr>
<tr>
<td>1.6) Student activities at this institution are changing towards increasingly presenting their work to the class</td>
<td>0</td>
<td>5 (45%)</td>
<td>2 (18%)</td>
<td>4 (36%)</td>
</tr>
<tr>
<td>1.7) Students at this institution are learning about educational technologies (exploring what can be done with educational technologies)</td>
<td>2 (17%)</td>
<td>6 (50%)</td>
<td>4 (33%)</td>
<td>0</td>
</tr>
<tr>
<td>1.8) Students at this institution are learning with educational technologies (using educational technologies to supplement normal processes or resources)</td>
<td>2 (17%)</td>
<td>4 (33%)</td>
<td>3 (25%)</td>
<td>3 (25%)</td>
</tr>
</tbody>
</table>
1.9) Students at this institution are learning through the use of educational technologies (using educational technologies to support new ways of teaching and learning)

<table>
<thead>
<tr>
<th>Options</th>
<th>Number of Respondents</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than once a month</td>
<td>7</td>
<td>58%</td>
</tr>
<tr>
<td>About once a month</td>
<td>1</td>
<td>8%</td>
</tr>
<tr>
<td>Less than once a month</td>
<td>4</td>
<td>33%</td>
</tr>
</tbody>
</table>

1.10) All students are ICT capable (that is, use educational technology confidently and creatively to help develop the skills and knowledge they need to achieve personal goals and to be full participants in the global community)

<table>
<thead>
<tr>
<th>Options</th>
<th>Number of Respondents</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than once a month</td>
<td>2</td>
<td>(17%)</td>
</tr>
<tr>
<td>About once a month</td>
<td>2</td>
<td>(17%)</td>
</tr>
<tr>
<td>Less than once a month</td>
<td>4</td>
<td>(33%)</td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>4</td>
<td>(33%)</td>
</tr>
</tbody>
</table>

- More than three-quarters of respondents (83%) agreed or strongly agreed that students at their institutions responded to lessons integrating educational technologies by helping each other, compared to 91% of those in the study by Wilson-Strydom et al. (2005).
- Although more than half of respondents (58%) agreed or strongly agreed that students at their institutions responded to lessons integrating educational technologies by producing work that is more creative, the largest segment (42%) disagreed with this statement.
- Two-thirds of respondents (67%) agreed that students at their institutions responded to lessons integrating educational technologies by working together.
- Comparable to findings in the study by Wilson-Strydom et al. (2005), 92% of respondents agreed or strongly agreed that students at their institutions responded to lessons integrating educational technologies by becoming actively involved.
- Respondents’ opinions regarding student activities at their institutions changing towards increasingly working on group projects were split exactly down the middle.
- Although the largest segment of respondents (45%) agreed that student activities at their institutions were changing towards increasingly presenting their work to the class, more than half of respondents either disagreed or strongly disagreed with this statement.

**Table 5: Frequency of lessons integrating educational technologies**

<table>
<thead>
<tr>
<th>Options</th>
<th>Number of Respondents</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than once a month</td>
<td>7</td>
<td>58%</td>
</tr>
<tr>
<td>About once a month</td>
<td>1</td>
<td>8%</td>
</tr>
<tr>
<td>Less than once a month</td>
<td>4</td>
<td>33%</td>
</tr>
</tbody>
</table>

Note that although an option of ‘Never’ was available, none of the respondents selected this.

**Table 6: This institution has leaders who use educational technologies for management**

<table>
<thead>
<tr>
<th>Options</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1) On-going support to leaders is provided at different levels of the system</td>
<td>3 (25%)</td>
<td>2 (17%)</td>
<td>3 (25%)</td>
<td>4 (33%)</td>
</tr>
</tbody>
</table>
Two-thirds of respondents (67%) agreed that every leader had the means to obtain a personal computer for personal use, administration and preparation of lessons, and the largest segment of respondents (33%) agreed that institutional leaders have access to in-service training on how to integrate educational technologies in management and administration. The same number of respondents, however, strongly disagreed that on-going support to leaders was provided at different levels of the system, while two-thirds of respondents (67%) either disagreed or strongly disagreed that a set of case studies and examples was available to leaders on how to integrate educational technologies in management, teaching and learning.

**Table 7**: This institution has qualified and competent educators who use educational technologies to enhance teaching and learning

<table>
<thead>
<tr>
<th></th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1) Every educator has the means to obtain a personal computer for personal use, administration and preparation of lessons</td>
<td>2 (17%)</td>
<td>3 (25%)</td>
<td>6 (50%)</td>
<td>1 (8%)</td>
</tr>
<tr>
<td>3.2) Every educator has access to basic training in the use of educational technologies</td>
<td>3 (25%)</td>
<td>4 (33%)</td>
<td>2 (17%)</td>
<td>3 (25%)</td>
</tr>
</tbody>
</table>
Two-thirds of respondents (67%) either agreed or strongly agreed that these institutions had a dedicated educator to manage the facility and to champion the use of educational technologies in the institutions. Exactly half of the respondents disagreed that every educator has the means to obtain a personal computer for personal use, administration and preparation of lessons, while just slightly less (45%) respectively disagreed that technology incentives for institutions and educators to use educational technologies are installed through the “Most Improved Schools Award” program and other schemes, and strongly disagreed that educators have access to educational technology technical support training.

11. Conclusion
This paper worked“in an area of fast-moving change”with the aim of investigating the validity and continued relevance of assumptions and claims made in a ten year old document in the fields of ICTs and educational technologies(Heeks, 2010, p. 632). Regarding achievement of the e-education goal, two-thirds of respondents in this study disagreed or strongly disagreed that the institutions they represented had students who utilise educational technologies to enhance learning. Most respondents tended to agree with the majority of statements regarding these institutions having students who utilise educational technologies to enhance learning and qualified and competent educators who use educational technologies to enhance teaching and learning. Most of these leaders, however, disagreed that they were able to use educational
technologies for management purposes. With these findings, the paper contributed towards alleviating “the continuing paucity of the” associated research base.

Acknowledgement
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12. References
Computer competences among academic staff and students in relation to the use of blended learning: The case of Mountains of the Moon University in Western Uganda.

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¹Mountains of the Moon University, Uganda
²Vrije Universiteit Brussel, Belgium

Abstract
Blended learning, which is the combination of the traditional face to face teaching with online delivery technologies, has been applied in many geographical locations world over with various design models but rural settings of the developing world have also adopted models to suit their environments. Mountains of the Moon University in Western Uganda is in the process of applying technology in teaching and learning through a blended learning approach to strengthen technological applications in education. The challenge however, is in levels of computer competence among staff and students in this rural area of Western Uganda. This study was carried out to investigate the levels of competence and confidence in these aspects that are pre-requisites for blended learning design in this area in Uganda so that blended learning intervention can be made possible. Students from three schools and one directorate (n=292) and academic staff from five schools and one directorate (n=76) filled a survey aimed at investigating the ICT competence and confidence levels, extent of ICT usage, accessibility to ICT communication technologies and ICT infrastructure. Results show that academic staff ICT competence levels are good enough (78.7%) for a blended learning environment, extent of usage is at 75% in terms of possession of ICT at home and university. The accessibility to internet for staff is good enough with 71.1% accessing it at home. Students’ ICT competence was found to be good enough in word processing at 67% and was below average in e-mail packages, spreadsheets, web browsing and html tools though their confidence levels are good at 63.9%. Many challenges still exist in the use of a learning management system, publishing and authoring tools for online teaching and course design for online learning. The results are good indicators for blended learning but further training for students is needed in the aspects found to be below average for successful blended learning.

Key words: Blended learning, ICT competence, ICT confidence, Rural setting

1. Introduction
In Uganda and the Albertine region in particular, there is a growing need to engage in teaching and learning with the use of modern technology. Online learning approaches have gained global recognition as teaching and learning approaches and are known to ease teaching and learning processes (Kahigi, Ekenberg, Hanson, Danielson & Tusubira, 2008). However, these online approaches may not be possible entirely without some aspects of face to face since there are still setbacks to do with technology and internet availability in many developing countries as well as technical know-how by teachers and learners. For this, the Albertine region in Uganda has had practices of distance education in few of the higher institutions but employ the use of paper based modules which are given to students to take home after face to face sessions. The only small scale areas where computers have been used has been in the teaching by use of
Power Point presentations and for the Post Graduate programs, to send teaching material on the e-mail for students to download and use. Some lower levels of blended learning have been taking place since students report for face to face sessions to go through modules and have interactions with lecturers. With the growing establishments of higher institutions in the region, there is need to transform the current practices into a supportive and motivating blended learning environment on the way towards full incorporation of technology in teaching and learning.

The Albertine region that forms part of the catchment area for students who join higher institutions of learning including Mountains of the Moon University is forced to embrace new education instructional strategies as a result of increasing student needs to acquire knowledge and skills in the context of their learning characteristics in rural settings. In addition, university education in Uganda and Albertine region in particular is increasingly characterised by knowledge seekers who prefer to study while keeping their employment. The pre-service entrants into university education also look for part time jobs that can support their study and living. In order to meet their learning needs, a motivating and supportive blended learning environment needs to be established whereby students’ computer competences and confidence as well as instructor ICT competence, extent of usage and accessibility to ICT technologies are examined as a pre-requisite for blended learning environments and this is the concern of the present study. The need for ICT in blended learning cannot be underestimated since the search for course content by students on a learning management system needs to be done as well as the preparation and uploading of course content by course instructors.

1.1 Justification for blended learning in the Albertine region

There are quite a number of reasons as to why learners in the Albertine region should adopt blended learning. Among the immediate ones we have blended learning experiments having yielded promising results elsewhere especially in terms of student achievement, retention and satisfaction which have been equal to or superior to traditional classes (Kim, Chamberlain & Reynold, 2007). Blended learning environments are also meant to reduce the time spent inside a classroom and seeking to maximize the potentials of both environments (Martins, 2011). E-learning, which forms part of the blend, is known for allowing learners to learn at their own pace and is independent of time and place (Zhu, 2008) as well as allowing teachers to prepare and deliver the required content with ease and convenience in the face of modern technology.

Studies again show that with the quick development of internet as well as information system technologies, online learning shows great improvements on the way of learning and its importance in higher education has to be emphasised in order for higher education to continue progressing as it has even become a main research stream (Wang & Wang, 2009). Much as pure online learning provides flexible scheduling, access to world class programs as well as self-paced instruction, it also has its own shortcomings as well. It has been found to lack in learning experiences of field training, observation, and initial group collaboration meetings and, in some instances, laboratory exercises that may be better experienced in face to face teaching (Napier, Dekhame, & Smith, 2011). It is therefore feasible to have a blended
learning environment where online learning advantages remain relevant at the same time not neglecting face to face environments at least for its positives. A purely e-learning environment can be plausible in rural settings but may not be possible in a situation of adversity. In addition, the situation in this study is one where computer literacy levels are still a challenge and this makes it difficult for the students to navigate purely online courses. We therefore need to capture the strengths of both online and face to face instructional delivery modes in blended learning through establishing ICT competence and confidence levels of the main players in such innovative pedagogies of blending the teaching and learning experiences.

It is further noted by Dzivban, Hartman and Moskal, (2004), cited in Kaleta, Skibba and Joosten (2007), that hybrid courses do have an integration of pedagogical strategies that are found in both face to face and online environments and that these have potential to increase student learning outcomes. It is also noted that more learning takes place within hybrid environments than it is in traditional class practices, (Garham & Kaleta, 2002), and that many institutions have taken on hybrid solutions due to their potential to improve learning, (Skill & Young, (2002), cited in Kaleta, Skibba & Joosten, 2007). There has already been some attempt to develop learning materials for students doing distance education through paper based modules that are given to students after the face to face sessions at Mountains of the Moon University. The method has had its weaknesses such as slow pace of production, at times they are not availed to students on time, quality of the materials (Basaza, 2006), as well as the slow pace at which learners follow the reading materials. The activities in the materials have to be done by learners and submitted towards the time when learners are about to report for face to face sessions and for this reason, many do not follow the work given in the materials while in their localities, places of work or residence. A blended learning environment would therefore make learners continually follow the activities on line and submit accordingly so that teaching and learning are followed with ease by both learners and teachers. This would however require knowledge of ICT, accessibility, extent of usage and establishing whether the levels can potentially facilitate design and adoption of blended learning within the rural settings of the Albertine region in Western Uganda.

1.2 Blended Learning and its potential in Uganda

The demand for higher education in Uganda is on the increase and educational institutions are overwhelmed by a growing number of knowledge seekers, (Kahiigi, et al, 2008). Many knowledge seekers would like to study and keep their employment or even seek employment to work as they get knowledge and skills in high institutions of learning. This then means that adopting blended learning where such knowledge seekers can keep at places of work or residences and take off some time to attend class for face to face sessions is high on the agenda of many educational institutions in the country to enable large numbers of students to get necessary skills and knowledge. In terms of ICT development, the country has a separate ministry of ICT and it is currently rolling out a national data backbone with the aim of linking all districts and major towns in order to create a suitable ICT environment which can enable the implementation of blended learning in higher institutions of learning. Kahiigi, et al (2008) noted that “available ICT infrastructure provides an environment that can support e-learning.”
The Research and Education Network of Uganda (RENU) has emphasised acquisition of affordable bandwidth which shows that there is an enabling environment that can facilitate aspects of online learning in the country together with face to face teaching in a blended learning design.

We however note that the traditional teaching-learning approaches in Uganda does not encourage self directed research and learning. Students are more interested in what is provided in lecture notes which they capitalize on to pass in the course evaluation examinations. Out of such a situation, many graduates have come out as surface learners encouraged by the system of teacher centeredness (Kahiigi et al., 2008). This is the reason for blended learning and possibly adopting a blended approach where knowledge construction by learners will be enhanced.

1.3 Online learning in rural settings

There have been attempts to define e-learning and online learning in different ways. For this study, Odunaike, Olugbara and Ojo’s (2011) definition in their abstract is considered. They define it thus: “E-learning is a form of computer mediated teaching and learning pedagogy that utilizes electronic media such as web/internet, television, consumer devices and distributed resources to improve the quality of teaching and learning” p1. The study examined a situation whereby computer vendors installed and dumped high costs learning management systems in schools in rural areas without studying the viability; which led to disastrous endings. The study went ahead to examine how e-learning technology offerings in South African urban communities could be practically extended to serve the rural communities of South Africa. It however did not assess the ICT levels of course instructors and students as pre-requisites for the effective use of the learning management systems and this study therefore lays out such pre-requisites in order to avoid the South African scenario taking place in Uganda’s Western region where this study has been done. It agrees with this study about the rural environment concerns in relation to blended learning but is not exhaustive in the aspects of ICT competences.

A lot of research carried out in various contexts notes that blended learning is faced with quite a number of challenges more especially in the developing world and particularly in the rural areas. The main challenges are noted in infrastructure and pedagogical skills in conducting efficient online learning programs (Mpofu, (2012) cited in Nyerere, Gravenir & Mse 2012). Sikwibele and Mungoo (2009) cited in Nyerere, 2012) reveals that there was a challenge of learner support in Botswana. Though such a challenge can easily be overcome by provision of internet connectivity, the connectivity also remains a major challenge in many rural areas of the African continent, Uganda inclusive. A major challenge noted by Bhalalusesa (2001); Bollag (2001) and Simpson (2004), is the support and guidance from the tutor and other staff to assist in improving learning. In an empirical study by Anderson (2008), a student is quoted in a response to a questionnaire question thus, “I think it is very helpful if someone gave me descriptive instructions about every activity in LMS moodle……I didn’t find any place that helps the novice students in this matter.” In addition, Anderson (2008) notes that the major
challenges that are salient in e-learning or online learning include flexibility, teaching and learning activities, access, academic confidence, localization and attitudes but did not assess the extent of usage of ICT as determinants of successful blended learning.

1.4 General research problem
The need for people in rural areas to come out and embrace modern methods of teaching and learning such as blended learning should be high on the agenda of the developing world especially the Albertine region of Uganda. Efficient pedagogies should be the concern for the teachers and learners in the Albertine region and Mountains of the Moon University needs to follow suit by adopting blended learning in the region. The most commonly used method of content delivery is the paper based modules that are printed and given to students at the end of a face to face session of study. This lower form of blending needs to be upgraded to include use of modern technology. There is therefore a need to address issues of blended learning to reach out to students as well as university staff to design learning materials for this learning practice.

It would be appropriate for distance education to follow sound instructional approaches for it to achieve its purpose (Basaza, 2006). It is however a big challenge to develop online learning in a rural setting where there is little computer accessibility and computer knowledge, internet connection is poor or even non-existent and power connections are limited. Studies have shown that there are technological barriers involved in rural communities for accessing distance education and online education (Colleen, 2012). Whereas some of the findings from these studies show that it may not be so much about online learning delivery but about onsite resources, this study will examine the possibility of a supportive and motivating blended learning environment in the Albertine region of Western Uganda where both online learning delivery and onsite resources are a big challenge. The study should establish the readiness of course instructors and students in regard to ICT usage and competence for blended learning interventions.

If we must adopt a blended learning environment in the region, we need to take into account the typical characteristics of the rural areas within the context of blended learning so that an appropriate blend can be worked out to address the needs of the ever increasing number of knowledge seekers within the region. Studies have shown that the integration of ICT in education faces a number of barriers like access to ICT, environmental supports and teacher ICT literacy as well as issues to do with teacher cognitions (Sang, 2010). It would be important therefore to understand how blended learning can take place within a rural setting characterised by low application of internet and minimal knowledge in the use of computers. This brings in the present research’s conceptual base and questions to be answered by this study.

Fig: 1 Conceptual Framework for the present study

<table>
<thead>
<tr>
<th>Teacher competences</th>
<th>Student competences</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICT knowledge</td>
<td>Basic ICT knowledge</td>
</tr>
<tr>
<td>Extent of ICT usage</td>
<td>ICT confidence</td>
</tr>
</tbody>
</table>
The teacher and student ICT competences are investigated in their levels as pre-requisites towards innovative pedagogy through blended learning in the rural settings of the Albertine region.

**Research questions**
1. What are the levels of ICT competence among course instructors in relation to blended learning at Mountains of the Moon University?
2. What is the extent of ICT usage among course instructors and how does this facilitate blended learning in rural settings?
3. What are the ICT confidence and competence levels and accessibility to ICT facilities among students of MMU for successful blended learning?

**1.5 Purpose of the study**
The study was aimed at investigating the levels of computer competences among students and teachers and their influence towards blended learning in rural settings.

**1.6 Specific objectives**
1. Investigating the levels of computer competences among course instructors and students at Mountains of the Moon University and relating them to potentials of blended learning.
2. Examining the extent of ICT usage as a way of ensuring success of blended learning design in rural settings.
3. Examining computer confidence levels and accessibility among students of Mountains of the Moon University.

**2. Method**
**2.1 Research setting**
The study focused on examining the levels of computer competence and confidence among course instructors and students as pre-requisites for the design of blended learning in typical rural settings of the developing world taking Mountains of the Moon University in Western Uganda as a case study. As a matter of procedure, a survey was made to establish computer competence and confidence levels, extent of ICT usage, internet accessibility as well as possession of computers by staff and selected students. A total of 76 staff members and 291 students filled a survey questionnaire detailing various aspects of computer applications and
how each participant rated himself or herself on a five point likert scale ranging from agree, strongly agree, neutral, disagree and strongly disagree.

2.2 Participants
For this survey, 291 students were selected from the schools of education, informatics and computing, business and management studies and the directorate of postgraduate studies. These schools and directorate were selected because they have had practices of distance learning by the use of paper based modules and e-mail attachments of study materials sent to students. From the school of business and management studies (n=202), Informatics and Computing (n=50), and Postgraduate Directorate (n=21). These are three schools with one directorate out of the five schools in the whole university. The choice was based on the schools’ prior experiences with distance learning through the use of paper based modules and particularly sophomores due to their initial training in ICT skills during their first year studies in the university. The choice of course instructors was done across the board for all fulltime staff from all the five schools and the directorate in the university. From the school of Business and Management Studies (n=25), Education (n=19), Informatics and Computing (n=08), Agriculture and Environmental Sciences (n=10), Health Sciences (n=04) and the Directorate (n=07).

2.3 Procedure and instruments
A survey questionnaire was administered to the participants in the months of July, August, and September, 2014. This was part of a larger study which is about the design of blended learning in the Albertine region in Uganda. Participants were required to fill in a questionnaire rating their computer competences in regard to word processing programs, email packages, spreadsheets, web browsers and HTML tools. On their computer confidence levels, they were to show on a five point likert scale if they were good with the use of computers or if they were comfortable with the use of computers and finally if they were in possession of a computer at home. The course instructors were required to rate their computer competences on the use of MS word, power point, excel, use of a learning management system, publishing and authoring tools, web browsers, e-mail packages, operations on a computer like changing file names, creating new folders, installing printers and scanners, and using search engines. The extent of ICT usage was tested on where they access a computer, internet, time of use and generally rating themselves on computer usage.

2.3.1 Instrument reliability
The reliability of the instrument items was tested using Cronbach’s alpha and the results indicated .90 and .87 for teacher ICT knowledge and extent of usage respectively while the student basic ICT knowledge scored .83 and .50 for confidence. The initial reliability test showed lower results than the .70 rule of thumb especially in the students’ instrument for items on ICT competence because they were negatively constructed. These items were re-coded and some items removed in order to make it a reliable instrument.

2.4 Statistical analysis
A statistical analysis using SPSS version 20 was carried out regarding computer competences and confidence as well as internet accessibility and usage for a successful design of blended learning in the rural settings of the Albertine region in Uganda. Descriptive statistics were used to determine the computer competences and confidence among the staff and students from the respective schools of the university. Cross tabulations were carried out to establish the possession of ICT among the various schools in the university.

3. Results

3.1 Instructors’ Computer Competences (RQ1)

Generally, computer competence levels for the University staff can be seen to be above average (Table 1). For adopting blended learning however, the challenge is big in the use of a learning management system (Moodle) which is good at only 26.4% and 73.7% is not conversant with learning management systems. As such, knowledge of authoring and publishing tools for facilitating blended teaching and learning is low (57.9%) though some instructors have some knowledge at 42.1%. The percentage of those who can design and upload a course for online learning is only 38.1% as compared to those who cannot do much in that regard (61.9).

Table 1: Percentage of ICT competence for instructors in the University (n=76)

<table>
<thead>
<tr>
<th>Aspect of ICT usage</th>
<th>Good (%)</th>
<th>Poor (%)</th>
<th>Not sure (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word processing</td>
<td>94.8</td>
<td>5.3</td>
<td>-</td>
</tr>
<tr>
<td>Power point</td>
<td>88.2</td>
<td>6.6</td>
<td>5.3</td>
</tr>
<tr>
<td>Spreadsheets</td>
<td>76.4</td>
<td>11.8</td>
<td>11.8</td>
</tr>
<tr>
<td>Moodle system</td>
<td>26.4</td>
<td>15.8</td>
<td>57.9</td>
</tr>
<tr>
<td>Authoring &amp; publishing tools</td>
<td>42.1</td>
<td>27.6</td>
<td>30.3</td>
</tr>
<tr>
<td>Web browsing</td>
<td>76.3</td>
<td>10.5</td>
<td>11.8</td>
</tr>
<tr>
<td>e-mail packages</td>
<td>86.8</td>
<td>9.2</td>
<td>3.9</td>
</tr>
<tr>
<td>Starting and shutting a computer</td>
<td>98.6</td>
<td>-</td>
<td>1.3</td>
</tr>
<tr>
<td>Creating a new folder</td>
<td>98.7</td>
<td>1.3</td>
<td>-</td>
</tr>
<tr>
<td>Changing a file name</td>
<td>97.4</td>
<td>1.3</td>
<td>1.3</td>
</tr>
<tr>
<td>Adding an Icon to a desk top</td>
<td>90.8</td>
<td>1.3</td>
<td>7.9</td>
</tr>
<tr>
<td>Copying a file to a flash disk</td>
<td>96.1</td>
<td>1.3</td>
<td>2.6</td>
</tr>
<tr>
<td>Installing printers and scanners</td>
<td>78.9</td>
<td>6.6</td>
<td>14.5</td>
</tr>
<tr>
<td>Designing and uploading a course on Moodle</td>
<td>38.1</td>
<td>15.8</td>
<td>46.1</td>
</tr>
<tr>
<td>Use of search engines as google, yahoo, etc</td>
<td>90.8</td>
<td>2.6</td>
<td>6.6</td>
</tr>
</tbody>
</table>

3.2 Extent of ICT usage by the Instructors (RQ2)

Points of ICT access by staff

ICT usage by instructors was assessed as per school in the university and the School of Informatics and Computing excels in terms of usage while at home and at the university (100%). The general trend of computer usage at home and university stands at 75% with a low percentage of usage at internet cafes (3.9%) as shown in Table 2.
Table 2: Accessibility to computers by academic staff in different schools of MMU (n=76)

<table>
<thead>
<tr>
<th>School/directorate</th>
<th>where do you access a pc</th>
<th></th>
<th></th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>at home</td>
<td>at university</td>
<td>internet cafe</td>
<td>at home and university</td>
<td></td>
</tr>
<tr>
<td>education</td>
<td>21.1%</td>
<td>15.8%</td>
<td>5.3%</td>
<td>57.9%</td>
<td>100%</td>
</tr>
<tr>
<td>Informatics</td>
<td>00%</td>
<td>00%</td>
<td>00%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Business</td>
<td>04%</td>
<td>16%</td>
<td>04%</td>
<td>76%</td>
<td>100%</td>
</tr>
<tr>
<td>Agriculture</td>
<td>18.2%</td>
<td>9.1%</td>
<td>00%</td>
<td>72%</td>
<td>100%</td>
</tr>
<tr>
<td>Health sciences</td>
<td>00%</td>
<td>16.7%</td>
<td>00%</td>
<td>83%</td>
<td>100%</td>
</tr>
<tr>
<td>Postgraduate studies</td>
<td>00%</td>
<td>00%</td>
<td>14.3%</td>
<td>85%</td>
<td>100%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>9.2%</strong></td>
<td><strong>11.8%</strong></td>
<td><strong>3.9%</strong></td>
<td><strong>75%</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Period of experience and frequency of ICT use by staff

The period of staff experience with ICT was investigated for purposes of establishing the length of time academic staff have been exposed to the use of ICT. The results show that 48.7% of the staff members have used ICT for more than 9 years. If we consider the experience with ICT at 5 years and above, the majority falls under this i.e. 77.6%. The frequency of ICT use by staff showed that 53.9% always use computers while 27.6% use it often, 14.5% sometimes use computers while 3.9% never use computers at the university.

Table 3: Period of experience with computers by academic staff (n=76)

<table>
<thead>
<tr>
<th>School/Directorate</th>
<th>for how long have you been using ICT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1-3 years</td>
</tr>
<tr>
<td>education</td>
<td>15.8%</td>
</tr>
<tr>
<td>Informatics</td>
<td>00%</td>
</tr>
<tr>
<td>Business</td>
<td>08%</td>
</tr>
<tr>
<td>Agriculture</td>
<td>00%</td>
</tr>
<tr>
<td>Health sciences</td>
<td>16.7%</td>
</tr>
<tr>
<td>Postgraduate studies</td>
<td>00%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>7.9%</strong></td>
</tr>
</tbody>
</table>

Table 4: Frequency of ICT use by staff

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>never</td>
<td>3</td>
<td>3.9</td>
</tr>
<tr>
<td>sometimes</td>
<td>11</td>
<td>14.5</td>
</tr>
<tr>
<td>often</td>
<td>21</td>
<td>27.6</td>
</tr>
<tr>
<td>always</td>
<td>41</td>
<td>53.9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>76</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Staff use of communication media

70
The use of various communication media by staff was also investigated considering use of e-mail, Facebook, Twitter and Skype. Results show that the majority of the staff members (96.1%) make use of e-mail and 80.3% use Facebook for communication. The use of Skype is above average (52.6%) and Twitter is used least by staff (23.7%).

Table 5: Staff use of ICT communication tools (n=76)

<table>
<thead>
<tr>
<th>Communication media</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>e-mail</td>
<td>96.1</td>
</tr>
<tr>
<td>Face book</td>
<td>80.3</td>
</tr>
<tr>
<td>Twitter</td>
<td>23.7</td>
</tr>
<tr>
<td>Skype</td>
<td>52.6</td>
</tr>
</tbody>
</table>

General staff rating of computer abilities and relation to BL design and adoption
The results of the general rating of ICT abilities for the staff revealed that proficiency stands at 55.3% and those who consider themselves to be expert are 17.1%. Below average staff constitute 3.9% and average ones are at 23.7%. This shows that majority of staff members have the necessary knowledge and skills in ICT for adopting the application of blended learning in teaching and learning at MMU.

Table 6: General rating of staff ICT abilities

<table>
<thead>
<tr>
<th>Rating</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>below average</td>
<td>3</td>
<td>3.9</td>
</tr>
<tr>
<td>average</td>
<td>18</td>
<td>23.7</td>
</tr>
<tr>
<td>proficient</td>
<td>42</td>
<td>55.3</td>
</tr>
<tr>
<td>expert</td>
<td>13</td>
<td>17.1</td>
</tr>
<tr>
<td>Total</td>
<td>76</td>
<td>100.0</td>
</tr>
</tbody>
</table>

3.1.3 Internet accessibility by staff
Access to internet is above average for the university staff with 65.8% accessing frequently, 26.3% accessing occasionally, 6.5% rarely access internet, and 1.3% feel internet is not needed. In terms of accessibility by schools, the School of Informatics and Computing leads in accessing internet at 100% frequent access while Education trails at 47.4% frequent accessibility.

Table 7: Internet accessibility by academic staff (n=76)

<table>
<thead>
<tr>
<th>School/directorate</th>
<th>how often do you access internet</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>very rare</td>
<td>Rare</td>
</tr>
<tr>
<td>Informatics</td>
<td>00%</td>
<td>00%</td>
</tr>
<tr>
<td>Business</td>
<td>08%</td>
<td>00%</td>
</tr>
<tr>
<td>Agriculture</td>
<td>00%</td>
<td>00%</td>
</tr>
</tbody>
</table>
Internet accessibility by staff at home
The academic staff internet accessibility at home was investigated to find out if they can use the internet while at home. Results show that 71.1% do access internet at home while 28.9% do not have internet access at their home.

Table 8: Instructors’ accessibility to internet at home

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>yes</td>
<td>54</td>
<td>71.1</td>
</tr>
<tr>
<td>no</td>
<td>22</td>
<td>28.9</td>
</tr>
<tr>
<td>Total</td>
<td>76</td>
<td>100.0</td>
</tr>
</tbody>
</table>

3.1.4 Staff ICT competence and online learning
Staff ICT competence was placed against the capacity to adopt online learning in a blended learning set up and eventual adoption. Participants were asked if they felt that the level of their ICT competence could facilitate online learning and if they feel that they can manage online teaching with their levels of competence in ICT. The results showed that 86.8% of the university academic staff feels that with or without high levels of ICT competence among staff, online learning should be adopted at MMU while only 7.9% were not sure. On the other hand, 88.2% showed they can manage online teaching and learning with their levels of ICT competence and only 10.5% were not sure as 1.3% felt they cannot manage it.

3.2.1 Students’ ICT competences, confidence and accessibility (RQ3)
Students’ ICT competence
The ICT competences of the students at MMU were investigated along with their confidence. The majority of them are between ages 21-25 representing 65.6% and those who are 36 years and above were very few at 5.2%. Female students were 45.4% while male ones were 54.6%. Their ability to use word processing programs, e-mail packages, spreadsheets, web browsers and HTML tools were analysed in the context of the University’s readiness to adopt blended learning in its teaching and learning programs. The results show that number of students who are skilled with word processing programs is above average (67%) and those with limited knowledge stand at 23.7% and 9.3% are not sure. The investigation into the students’ skills with e-mail packages showed that 41.3% are skilled, 45% are not skilled while 13.7% are not sure. The skill in spreadsheets knowledge showed that 38.9% are skilled, 42.9% are not skilled while 18.2% are not sure. The web browser skills results showed 32.6% as skilled, 51.9% not skilled and 15.5% not sure. Finally, results of their knowledge of html tools showed that 19.6% are skilled, 59.5% are not skilled and 21% are not sure. On a general note, students’ ICT
competence levels are good enough at (67%) and can be a positive aspect in the adoption of blended learning.

Students’ ICT confidence
Students were asked if they were good with ICT, felt ok when faced with a new problem with ICT, if they could be able to work with computers at an advanced level, if they were sure they could work with computers and if they felt that they were very confident when it came to working with computers. Results show that 57.8% disagree to being not good with ICT while 24.4% agree to the statement and 17.9% were neutral. 51.6% of the students do not feel ok when faced with a new problem on the computer while 37.8% feel ok and 10.7% were neutral. The majority of the students (80.1%) feel that they can work with computers at an advanced level while 13% feel they are unable and 6.9% were neutral. Again the majority of the students (83.8%) are sure they can work with computers while 9.6% are not and 6.5% showed they were neutral. 79.1% feel that using ICT would not be hard for them while 12% feel it would be hard and 8.9% were neutral. In general, students’ ICT confidence level was investigated and results show that 63.9% feel very confident when it comes to working with computers.

Student’s possession of computers at home
The results of possession of computers at home according to students in different schools of the university are shown in table 9.

Table 9: Possession of a computer at home according to schools

<table>
<thead>
<tr>
<th>School/directorate</th>
<th>has a computer at home</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>education</td>
<td>4.7%</td>
<td>20.7%</td>
</tr>
<tr>
<td>Informatics</td>
<td>15.6%</td>
<td>3.5%</td>
</tr>
<tr>
<td>Business</td>
<td>62.5%</td>
<td>71.4%</td>
</tr>
<tr>
<td>postgraduate</td>
<td>17.2%</td>
<td>4.4%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

In terms of computer possession at home, the students from the School of Business and Management Studies lead at 62.5% followed by the post graduate directorate at 17.2%, and School of Informatics and Computing at 15.6% while the School of Education is last at 4.7% computer possession at home.

4. Discussion, Implications And Conclusion
The study was designed to investigate students’ and instructors’ ICT competences, confidence, extent of usage and accessibility to ICT technologies at Mountains of the Moon University in a bid to design a blended learning environment in a typical rural setting in Western Uganda. As part of an on-going larger study, the results were meant to feed into an experimental design regarding blended learning where Moodle as a learning management system was finally installed and applied for teaching and learning in half a semester of 2014.
Results have shown that the design of a blended learning aimed at a future implementation of such an innovative pedagogical approach to teaching and learning has a high potential in this part of the developing world. ICT competence levels for course instructors was found to be good enough (78.7%) for them to participate in teaching using online methodology in a designed blended learning environment. This competence augurs well for the future implementation of blended learning at MMU. A big number of staff members do possess computers at home in addition to accessing them at the university (75%). The students’ competence and confidence levels (63.9%) are also good enough for blended learning design and eventual adoption at the university.

The challenges however, have been found in the use and application of a learning management system where 73.7% are poor and not sure, uploading course material with 61.9% poor and not sure as well as in the use of authoring and publishing tools where 57.9% are poor and not sure. This is majorly due to the use of traditional teaching methods where hard copy materials are applied in teaching and learning. The few who have some knowledge about the learning management system (26.4%) are able due to having used it as students during their studies. It was also found out that course instructors are very much willing to adopt blended learning and a high percentage (88.2%) showed that they can manage online teaching with their ICT levels of competence; which sets a fertile ground for the design and future adoption of blended learning at the university.

The study was hinged on organizational readiness as an important factor needed in the design of a blended learning environment and the need for the university’s readiness in support of a successful design (Kim & Bonk 2006). Students need more training in ICT and academic staff members require skills in the use and application of learning management systems. Kim and Bonk (2006) again are of the view that skill building for faculty members is very crucial for getting the best out of online education. Studies have shown that there may be a number of academic staff members who may not be knowledgeable in skills as well as attitudes to do pedagogy in a technology based learning course (Dukes, Waring & Koorland, 2006). There are therefore notable differences among academic staff members in regard to ICT competences as noted in this study. We therefore take Chizmar and William’s (2001) recommendation for institutions to have faculty members getting shared experiences in the use of technology which, in effect, may guarantee success in such innovative pedagogies involving the use of learning management systems in blended learning design and future adoption especially by Mountains of the Moon University.

In conclusion, insights gained from this study indicate that the design of a blended learning environment in rural settings meets challenges of ICT competences in some core aspects but also a lot of potential due to the strengths in other aspects of ICT competence by academic staff and students. The blended learning environment was eventually designed after establishing the ICT competences, confidence and extent of usage, accessibility and readiness for blended learning. The results of the larger study will come out at the end of May 2015 and will be discussed in the forthcoming study.
References


Scholars of the Dotcom Era? The Use of ICT by Undergraduate Students in Uganda Martyrs University, Uganda

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Abstract
This paper reports on a survey that sought to establish the levels of use of ICT by undergraduate students in Uganda Martyrs University (UMU) and to link the same to the performance expectancy (PE), effort expectancy (EE), social influence (SI) and facilitating conditions (FC) of ICT, as perceived by the students. The quantitative survey involved 144 students who filled a questionnaire. Data analysis involved the use of percentages, means and multiple regression. High levels of the use of ICT, and good perceptions about it, were recorded. However, of the four independent variables (PE, EE, SI & FC), only FC was a significant positive correlate of the use of ICT. It was thus recommended that the stakeholders such as the University’s ICT Department ensure that all the units in the University have the conditions facilitating the use of ICT, as a possible means of enhancing the use of ICT by the undergraduate students in the University.

Key words: Perceived characteristics, Private University, Uganda, Unified Theory of Acceptance and Use of Technology

1 Introduction
ICT is said have several benefits in all spheres of life. For example, Asabere and Enguah (2012) stipulate that the knowledge of ICT usage improves human capacity to generate process, share and make available knowledge that may be used in every field of human endeavor such as business transactions, industrial operations, educational programmes and other activities in all aspects of life in general. In particular, in the area of education, ICT has become a pedagogical tool, which is a tool for teaching; a tool for combination; a tool for record keeping; name it. Accordingly, several studies (e.g. Bakkabulindi, 2011, 2012; Bakkabulindi, Mugagga, Shopi&Kabasiita, 2013; Bakkabulindi &Oyebade, 2011; Omona, Weide&Lubega, 2010) have been done in the context of public universities in Uganda particularly Makerere, on the factors related to the acceptance and use of ICT. There are rather few studies (e.g. Bakkabulindi, Mulumba, Aluonzi, Oketch&Taibu, 2010) however, on the same issue in the context of private universities in the country. This paper therefore, relates to a study on the acceptance and use of ICT in Uganda Martyrs University (UMU), a private university. UMU is a Catholic founded institution established in 1993 under the ownership of the Uganda Episcopal Conference (UEC). The University which was officially opened on August 18, 1994, received the Civil Charter from the Government of Uganda legitimizing its existence on the April 2, 2005. The University’s mission is to develop an integral person by providing high quality education within a conducive environment in order to produce professionals of varying academic
competences with critical and creative abilities and who will contribute positively to the nation and the whole world at large while observing values of service and respect.

With the popular wave of technology across institutions of higher learning, the University has reportedly dedicated a lot effort in establishing an ICT environment that is intended to help among other stake holders, the students in their academics and other day today activities. Reijswound and Mulo (2004) noted for example, that in the academic year 2002-2003, the ICT Department together with the Office of the Vice Chancellor came up with an ICT policy which involved among other things, optimizing the access for students and staff to ICT resources. The UMU Academic Hand Book (UMU, 2012) presents among other things the continual ICT policy which emphasizes that ICT is embraced as a medium of curricular improvement and delivery. It also mentions that UMU provides 24 hours access to ICT resources including the Internet to all staff and students. However regardless of all these efforts, the levels of use of ICT in the University have been reported to be low at the University. For example, the University World Newsletter, of July 22, 2012 (Green, 2012), quoted Dr. Charles Olweny the Vice Chancellor of the University as lamenting among other challenges to his office, the poor attitude to, and hence limited utilization of innovations in the University. ICT is presumed to be among those innovations. It is upon this background that the study being reported on in this paper, sought to look into the levels of acceptance and use of ICT in UMU, using the majority constituency in the University, the undergraduates, as the units of analysis.

2 Theoretical Base
The factors related to the use of an innovation such as ICT can be suggested by a number of theories (Korpelainen, 2011). In this study, the Unified Theory of Acceptance and Use of Technology (UTAUT) will be the centre of focus. The theory advanced by Venkatesh, Morris, Davis and Davis (2003) identifies four key factors for the acceptance and use of an innovation, namely the performance expectancy, and effort expectancy of the innovation; the social influence of a potential user gets, regarding the use of the innovation; and the facilitating conditions for the use of the innovation. Venkatesh et al. defined the performance expectancy (PE) of an innovation as “the degree to which an individual believes that using the system will help him or her to attain gains in job performance” (p. 447). They define effort expectancy (EE) as the degree of ease associated with the use of an innovation. That is, the degree to which a potential adopter considers the use of an innovation to be free of effort. Social influence (SI) according to Venkatesh et al., considers “the degree to which an individual perceives that important others believe he or she should use the new system” (p. 451). In other words, SI refers to the extent to which an individual is attracted to an innovation on account of how that individual sees others in the society as benefiting from the use of the innovation.

The fourth factor that UTAUT stipulates as covariate of use of any technology (e.g. ICT) is the facilitating conditions (FC) for the technology. Venkatesh et al. (2003) defined FC as “the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system” (p. 453). UTAUT stipulates that each of PE, EE, SI and FC is a positive covariate of the use of any innovation in question. The UTAUT was adopted
because Williams, Rana, Dwiredi and Lal (2011) had lamented that most studies just cite UTAUT rather than put it to full use. They reported that out of 450 studies considered in their review, only 43 had actually put UTAUT to real use. The study reported on in this paper, was intended to fill this theoretical gap. Therefore the use of ICT in this study was related to the four constructs of UTAUT.

3 Related Literature

3.1 Performance Expectancy as a Covariate of the Use of Innovations: Quite a number of studies (e.g. Curtis, Edwards, Fraser, Gudelsky, Holmquist, Thornton & Sweetser, 2009; Kijsanayotin et al., 2009; Thomas, Singh & Gaffar, 2013; Tibenderana, Ogao, Ikoja-Odongo & Wokadala, 2010; Ummuhun & Patek, 2012) have positively related performance expectancy (PE) to the use of innovations in various study situations. Curtis et al. (2009) studied the adoption of social media for public relations by non-government organizations in the United States of America. Kijsanayotin et al. (2009) was a study on the adoption of health ICT by community health centers in Thailand. Thomas et al. (2013) was an examination of the utility of the UTAUT model in explaining mobile learning adoption in higher education in Guyana. Tibenderana et al. (2010)’s study involved academic staff in universities in Uganda with regard to their use of hybrid library services. Ummuhun and Patek (2012) compared the opinions of university students in Turkey on their usage of blogs and wikis for their courses. However studies that have not found PE to be a correlate of the acceptance and use of innovations can be found. A case in point is Bakkabulindi et al. (2013) in their application of UTAUT to the use of ICT by undergraduates in the School of Education in Makerere University. The controversial findings suggested that there was still the need to test the hypothesis to the effect that:

H1: Performance expectancy (PE) was positively related to the use of ICT.

3.2 Effort Expectancy as a Covariate of the Use of Innovations: The construct of effort expectancy (EE) has been positively related to the use of innovations by several researchers (e.g. Govender & Maistry, 2012; Kijsanayotin et al., 2009; Schaupp & Carter, 2009; van Schaik, 2009) in different contexts. Govender and Maistry (2012) looked into the teacher’s propensity for technology adoption in Business Education in the University of KwaZulu-Natal, while the study contexts of Kijsanayotin et al. and Schaupp and Carter are already given (subsection 3.1). van Schaik (2009)’s study used UTAUT on the use of websites for students in higher education in Teesside University. Thus, while empirical support for EE as a positive correlate of innovation adoption was pervasive, an occasional finding to the contrary could be found. For example Thomas et al. (2013) whose study context is already given (subsection 3.1), did not find EE to be a significant correlate. The controversial findings left room for more investigation to be done on the following hypothesis:

H2: Effort expectancy is positively related to the use of ICT.

3.3 Social Influence as a Covariate of the Use of Innovations: Several studies (e.g. Govender & Maistry, 2012; Kijsanayotin et al., 2009; Schaupp & Carter, 2009; Thomas et al., 2013; Tibenderana et al., 2013; Wu, Tao & Yang, 2008) have supported the assertion that social
influence (SI) is a positive correlate of the acceptance and use of innovations. The contexts of the above studies are already given, except for Wu et al. (2008), who used UTAUT to derive a behavioral model for 3G mobile telecommunication users in Taiwan. However, studies contrary to the above finding included Bakkabulindi et al. (2013) whose study context is already given. Thus the relationship between SI and the use of innovations was not yet clear. Hence the third hypothesis in the study to the effect that:

H3: Social influence was positively related to the use of ICT.

3.4 Facilitating Conditions as a Covariate of the Use of Innovations: Studies (e.g. Gupta, Dasgupta & Gupta, 2008; Kijsanayotin et al., 2009; Thomas et al., 2013; Wu et al., 2008) that have positively relating facilitating conditions (FC) to the use of innovations are many, and they have been in different contexts. Gupta et al. (2008) was on the adoption of ICT in a government organization in a developing country, India, while the contexts of the other studies are already given. However, studies contrary to the above finding such as Tibenderana et al. (2013) whose context is already given, could be found. Thus the relationship between FC and the use of innovations was far from clear. Hence the fourth hypothesis in the study to the effect that:

H4: Facilitating conditions were positively related to the use of ICT.

4 Method
4.1 Instrument: Using the quantitative approach in general, and the survey design in particular, data were collected using a self-administered questionnaire with items on the four independent variables, namely characteristics of, or related to, ICT, of relevance in this paper, namely its performance expectancy, PE (four items adapted from Kijsanayotin et al., 2009: α = 0.88); its effort expectancy, EE (four items adapted from the three in van Schaik, 2009: α = 0.91); social influence, SI (five items adapted from the six in Moran, Hawkes & El Gayar, 2010: α = 0.76); and facilitating conditions, FC (four items adapted from the five in Moran et al., 2010: α = 0.70). The questionnaire had six items on the use of ICT, conceptualized as the use of mobile digital devices (three items adapted from Duncan, Hoekstra & Wilcox, 2012: α = 0.800) and the use of internet facilities (three items adapted from the five in Bakkabulindi et al., 2013: α = 0.792). Thus, the sources of the items in the questionnaire were reliable for the study as all alpha coefficients were above 0.5 (Tavakol & Dennick, 2011). Also the validity was taken for granted basing on the observation that an instrument that is reliable is also likely to be valid (Tavakol & Dennick, 2011). But still after the data collection, the respective items were subjected to confirmatory reliability analysis. While the results of this analysis are given at appropriate spots in section 5 (Findings), it can suffice to point out that all the independent variables were reliable, as follows: PE (four items; α = 0.827); EE (four items; α = 0.824); SI (five items; α = 0.635); FC (four items; α = 0.761). So were the dependent variables, as follows: UMDD (three items; α = 0.723); UIF (three items; α = 0.742).

4.2 Sample: Using the questionnaire, data were collected from a campus of Uganda Martyrs University in a suburb of Kampala, called Lubaga. The Campus has two faculties, namely that of Business Administration and Management (FBAM) and the Faculty
of Humanities and Social Sciences (FHSS). The undergraduates were the respondents for the study. FBAM at the Campus offers a Bachelor of Business Administration and Management (BBAM), while the FHSS at the Campus offers a Bachelor of Social Development and Counseling (BSDC). While all the 200 BBAM students and the 100 BSDC students at the Campus were all targeted for answering the research tool, only 117 (58.5%) of the BBAM and 27 (27%) of the BBAM and BSDC students respectively, responded. Thus overall, 144 (48%) of the targeted 300 at the Campus responded.

4.3 Data Analysis: The data captured were analysed using percentages and means at the univariate descriptive level, while at the multivariate inferential level, the four study hypotheses were tested using multiple regression. The multiple regression model built was:

$$UIT = \beta_1 PE + \beta_2 EE + \beta_3 SI + \beta_4 FC$$

, where the dependent variable (DV), UIT was the use of ICT. The constants, $\beta_1$, $\beta_2$, $\beta_3$ and $\beta_4$ were coefficients of regression, each of which was postulated to be positive. The independent variables (IVs) were as follows: PE = performance expectancy; EE = effort expectancy; SI = social influence; and FC = facilitating conditions.

5 Findings
5.1 Backgrounds of Respondents: The details about the 144 respondents were as follows: in terms of the programme of study, the majority (81.3%) were doing the Bachelor of Business Administration and Management, BBAM, while the rest (18.8%) were pursuing the Bachelor of Social Development and Counseling, BSDC. In terms of the study session, those studying during the day (52.8%) dominated the sample, leaving 46.5% for those studying in the evening. Regarding the year of study, the first years (42.4%) had a simple majority, followed by the second years (35.4%), while the rest (20.8%) were third year students. In terms of age, half (50.0%) of the respondents were aged below 23 years, followed by the 37.3% who were aged between 23 and 28 years, and the rest (12.7%) were above 28 years of age. With respect to the gender, the females (53.9%) dominated the sample, leaving 46.1% for the males.

5.2 The Dependent Variable: The Use of ICT. The use of ICT was broken into two sections, namely three items on the use of mobile digital devices ($\alpha = 0.723$) and three items on the use of internet facilities ($\alpha = 0.742$), respectively. Each item was scaled in such a way that 1 = Very rarely; 2 = Rarely; 3 = Fairly; 4 = Regularly; and 5 = Very regularly. Table 1 gives the pertinent statistics:

Table 1: Statistics on the Use of ICT

<table>
<thead>
<tr>
<th>(a) Indicator of the Use of Mobile Digital Devices</th>
<th>Mean</th>
<th>Remark on Use</th>
<th>Overall Mean (Remark on Use)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laptop</td>
<td>3.78</td>
<td>Regular</td>
<td>Mean = 3.19</td>
</tr>
<tr>
<td>Smart phone</td>
<td>3.23</td>
<td>Fair</td>
<td>(Fair)</td>
</tr>
</tbody>
</table>
According to Table 1, among mobile digital devices, only the laptop recorded a regular level of use, while the other two were only fairly used. And all the internet facilities were reportedly regularly used. An average index (UIT acronym for the “use of ICT” from the six items in Table 1) had a mean = 3.62, which suggested that overall, the majority of the respondents were regular users of ICT.

5.3 The Independent Variables: The independent variables in the study, were four characteristics of, or related to, ICT, namely its performance expectancy, PE (four items: \( \alpha = 0.827 \)); its effort expectancy, EE (four items: \( \alpha = 0.824 \)); social influence, SI (five items: \( \alpha = 0.635 \)); and facilitating conditions, FC (four items: \( \alpha = 0.761 \)). All the items were Likert-scaled in such a way that 1 = Strongly disagree; 2 = Disagree; 3 = Undecided; 4 = Agree; and 5 = Strongly agree. Table 2 gives the pertinent statistics:

<table>
<thead>
<tr>
<th>(a) Indicators of the PE of ICT</th>
<th>Mean</th>
<th>Remark</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>I find ICTs useful in my studies</td>
<td>4.29</td>
<td>Agree</td>
<td>Mean = 4.05 (Agree)</td>
</tr>
<tr>
<td>Using ICTs enables me to accomplish my course works quickly</td>
<td>4.22</td>
<td>Agree</td>
<td></td>
</tr>
<tr>
<td>Using ICTs increases my creativity as a student</td>
<td>4.00</td>
<td>Agree</td>
<td></td>
</tr>
<tr>
<td>Using ICTs increases my chances of getting higher grades</td>
<td>3.69</td>
<td>Agree</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(b) Indicators of the EE of ICT</th>
<th>Mean</th>
<th>Remark</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is easy for me to use ICTs</td>
<td>3.76</td>
<td>Agree</td>
<td>Mean = 3.85</td>
</tr>
<tr>
<td>It is easy for me to become skilful at using ICTs</td>
<td>3.99</td>
<td>Agree</td>
<td>(Agree)</td>
</tr>
<tr>
<td>It is easy for me to learn to use ICTs</td>
<td>4.01</td>
<td>Agree</td>
<td></td>
</tr>
<tr>
<td>It is easy for me to operate ICTs</td>
<td>3.65</td>
<td>Agree</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(c) Indicators of the Social Influence (SI)</th>
<th>Mean</th>
<th>Remark</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>People who influence my behavior think that I should use ICTs</td>
<td>3.48</td>
<td>Undecided</td>
<td>Mean = 3.56 (Agree)</td>
</tr>
<tr>
<td>People who are important to me think that I should use ICTs</td>
<td>3.84</td>
<td>Agree</td>
<td></td>
</tr>
<tr>
<td>Administrators in this University have been helpful in the use of ICTs</td>
<td>3.49</td>
<td>Undecided</td>
<td></td>
</tr>
<tr>
<td>In general the University has influenced my use of ICTs positively</td>
<td>3.77</td>
<td>Agree</td>
<td></td>
</tr>
</tbody>
</table>
Having a laptop, smart phone or iPad is as status symbol in this University 3.24 Undecided

<table>
<thead>
<tr>
<th>Indicator of the Availability of Facilitating Conditions (FC) for ICT</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have the resources necessary to use ICTs</td>
<td>3.10</td>
</tr>
<tr>
<td>I have the knowledge necessary to use ICTs</td>
<td>3.76</td>
</tr>
<tr>
<td>The ICTs are compatible with other gargets I use in my studies</td>
<td>3.67</td>
</tr>
<tr>
<td>ICTs fit into my study style</td>
<td>4.08</td>
</tr>
</tbody>
</table>

(d) I have the knowledge necessary to use ICTs

Fair

Mean = 3.76 (Agree)

Mean = 3.65

The ICTs are compatible with other gargets I use in my studies

Agree

Mean = 3.67

ICTs fit into my study style

Agree

Mean = 4.08

From Table 2, overall aggregates (PE, EE, SI & FC) were computed from the respective item clusters and found to have means that suggested that respondents rated their respective units best in terms of its PE (Mean = 4.05); followed by its EE (Mean = 3.85); then, the availability of FC (Mean = 3.65) for ICT and lastly the SI (Mean = 3.56) on the use of ICT.

5.4 Statistical Model for Predicting the Use of ICT using the Independent Variables: Multiple regression analysis of the average use of ICT index (UIT from Table 1) on the four independent variables, IVs (PE, EE, SI & FC from Table 2), that is Expression (1), yielded the results in Expression (2):

$$UIT = 0.041PE + 0.134EE + 0.102SI + 0.544FC$$

$$\begin{pmatrix}
0.456
0.646
0.969
0.004
\end{pmatrix}$$

, with $F = 33.05$, $p = 0.000$ and Adjusted R square = 0.474. The figures below the respective coefficients in Expression (2) were the pertinent p values. The model in Expression 2 suggested that the four IVs considered, were collectively very good explanatory variables ($F = 33.05$, $p = 0.000$) of the use of ICT at the one percent level of significance ($p < 0.01$), accounting for over 47% of the variation in the aggregate use of ICT index (Adjusted R square = 0.474). Expression (2) further suggested that of the four IVs, the only one that significantly correlated with the use of ICT ($p < 0.05$ or even 0.01) was the availability of facilitating conditions, FC ($\beta = 0.544$; $p = 0.000$), leading to acceptance of the fourth research hypotheses (H4). The other hypotheses (H1 through H3) were rejected.

6 Discussion

The first three hypotheses (H1 to H3) to the effect that, performance expectancy (PE), effort expectancy (EE) and social influence (SI) were positively related to the use of ICT, were not supported. In the case of H1, this finding was contrary to several studies (e.g. Curtis et al., 2009; Kijsanayotin et al., 2009; Thomas et al., 2013; Tibenderana et al., 2010; Ummuhun & Patek, 2012) which have positively related PE to the use of innovations in various study situations. In the case of H2, the current finding was also at variance with several studies in which the construct of effort expectancy (EE) has been positively related to the use of innovations by several researchers (e.g. Govender & Maistry, 2012; Kijsanayotin et al., 2009; Schaupp & Carter, 2009; van Schaik, 2009) in different contexts. The finding on H3 also went contrary to that of several other studies (e.g. Govender & Maistry, 2012; Kijsanayotin et al., 2009; Schaupp
& Carter, 2009; Thomas et al, 2013; Tibenderana et al, 2013; Wu et al., 2008). May be these unexpected results were due to the context – undergraduate students in a private university in a developing country - used in the current that varied from the contexts of those studies. The finding on H1 in the current study joins the category of earlier studies (e.g. Bakkabulindi et al, 2013) that did not find PE to be a correlate of the acceptance and use of innovations. Similarly, the finding on H2 in the current study joins the category of earlier studies (e.g. Thomas et al, 2013) that did not find EE to be a correlate of the acceptance and use of innovations. The finding on H3 in the current study joins the category of earlier studies (e.g. Bakkabulindi et al, 2013) did not find SI to be a correlate of the acceptance and use of innovations. This implies that as of now, in their quest to enhance the use of ICT among undergraduates in UMU, especially those at the Campus studied, the relevant change agents such as the University’s ICT Department need not lay undue emphasis on enhancing the PE and EE of ICT, and SI related to ICT. Only the fourth hypothesis (H4) in the study to the effect that facilitating conditions (FC) were a positive correlate of the use of ICT was supported. This was consistent with several earlier studies (e.g. Gupta et al., 2008; Kijsanayotin et al., 2009; Thomas et al, 2013; Wu et al, 2008) that positively relating facilitating conditions (FC) to the use of innovations. The current finding thus weakens the findings of studies such as Tibenderana et al. (2013) which did not find FC to be a significant correlate. The implication of the finding on H4 is that in their quest to enhance the use of ICT among undergraduates in UMU, especially those at the Campus studied, the relevant change agents such as the University’s ICT Department need to ensure that all the units have facilities that enhance the use of ICT.

7 Conclusion
The knowledge of ICT usage improves human capacity to generate process, share and make available knowledge that may be used in every field of human endeavor, inclusive of education (Asabere & Enguah, 2012). In particular, in the area of education, ICT has become a pedagogical tool, which is a tool for teaching; a tool for combination; a tool for record keeping; name it. This study sought to build a statistical model that could predict the levels of use of ICT by undergraduates in Uganda Martyrs University (UMU) using the independent variables suggested by the Unified Theory of the Acceptance and Use of Technology (UTAUT), that is characteristics of ICT, in terms of its performance expectancy (PE), effort expectancy (EE), social influence (SI) and facilitating conditions (FC). In so doing the study closed several gaps. For example, the study was the pioneer in relating these characteristics to use of ICT in UMU. Multiple regression model revealed that while the four independent variables were collectively good predictors of the use of ICT, only FC significantly related to the DV. In particular, PE, EE and SI were not correlates of the DV, implying that the relevant change agents (e.g. the ICT Department) in the University should not lay undue emphasis on enhancing the PE, EE and SI of, or related to, ICT as avenues for enhancing the use of ICT among the undergraduates. Instead, they should ensure that all units in the University have conditions facilitating the use of ICT. Despite the contribution of the study, it had limitations too. For example this study only used undergraduate students, moreover in only one campus. The study thus excluded graduate students and those in other campuses of the University, hence undermining the generalizability
of the research findings to the whole University. However despite the above shortcomings, the study has contributed something on which future researchers on the acceptance and use of innovations will build.

References


Reference management software analysis: endnote and zotero

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Abstract
This paper aimed to present a comparative analysis of two reference management software EndNote and Zotero. This is achieved by comparing EndNote and Zotero reference management software. The results of this paper were drawn based on an experiment of EndNote and Zotero. The novelty of this paper is the comparison of two referencing software. It has been clearly shown from the results that EndNote imports more fields as compared to Zotero. The findings of this study contribute to the body of knowledge about reference management software.

Keywords—EndNote; Zotero; referencing software

Introduction
Reference management is one of the most complicated aspects for researchers and formatting references based on variety of citation styles which made reference manager is an important tool for research scholars. There are many reference managers in the market for the analysis, namely CiteULike, RefWorks, Mendeley, and Zotero. These all the reference managers are well known in the scientific community (Hull et al. 2008; Norman 2010; Duong 2010; Mead & Berryman 2010). The importance of proper citation is being emphasized today because of awareness of copyright, plagiarism, scientific integrity, and honesty in the academic community (Howard & Davies, 2009; Auer & Krupar, 2001; Blum, 2009). Researchers used reference management software to manage their records and to utilize their bibliographic citation and it is popularly known as bibliographic software, personal bibliographic file manager or the citation management software (Nashelsky & Earley, 1991). According to Steele (2008), reference management software existed since 1980s to till today and it is widely used by researchers. According to Gilmour and Cobus-Kuo (2001), reference management software is the most important aspect that is essential for all levels of researchers. A study by Fitzgibbons and Meert (2010) indicated that reference management software or bibliographic software is established as a time saving tool to write researchers academic papers. Reference management software decreases researchers workload in terms of edit, proofread and avoid formatting errors (Aronsksy et al. 2005). There are more than 25 reference management software in the market for researchers, but among them, very few are free, some have high registration fees and some are very difficult to download and install on the PC (Mead & Berryman, 2010). Using reference management software researchers can easily compile their records and relevant topics for the personal or for the group of publications (Rohmann, 1999).
Problem Statement
Mohta and Mohta (2003) indicated that incorrect reference always frustrates researchers in terms of searching specific articles. A study conducted by Evans et al. (1990) found that the overall error rate in three major surgical journals of 36% and 27% respectively in terms of citation and quotation. According to Gupta et al. (2005), Eichorn and Yankauer (1987), and Vargas-Origel et al. (2001), 3% to 60% error rate in the published medical journals. Gatten (2010) examined three fashion journals (217 articles), each reference was compared with main source in six fields, namely article title, author name(s), journal title, pagination, volume and the year. His or her research results indicated that 49.3% errors were in 107 articles, yielding a total number of errors was one hundred and forty two (142). A study conducted by Wager and Middleton (2002) found that accuracy in terms of citation and quotation errors in medical journals is 20% of the quotation errors and 36% of the citation errors. According to Faunce and Soames-Job (2001), error rate in five psychology journals are 15% in the title, 12% in the authors, 6% in the page numbers, 3% in the volume numbers and finally 2% in the journal title. Adhikari and Acharya (2010) found after examining few journals, namely Journal of Nepal Paediatric Society, Nepal Journal of Obstetrics and Gynaecology, Nepalese Journal of Ophthalmology and their results indicated error rate are followed by 33.3%, 43.3%, and 50% respectively.

Aim And Research Questions
The aim of this paper is to analyze two reference management software EndNote and Zotero in order to import fields (data) from Google Scholar. The following research questions were used to guide with which to accomplish the above-stated aim of this study.
How to examine importing fields (data) for each of the software in terms of citations, reference, and ease of use for researchers?
How to identify similarities imported fields for each of the software in terms of citations, reference, and ease of use for researchers?

Literature Review
This section aims is to present existing literature for reference management software was first developed in 1980s and for researchers it was marketed to create online indexes of personal print-article collection (Garfield et al. 1989; Gilmour & Cobus-Kuo, 2011; Wachtel, 1987). A study conducted by Lorenzetti and Ghali (2013) on 78 respondents and found that researchers use their reference management software for systematic review. King et al. (2011) concluded reference management software not only appraises and code search results, but also organizes and stores search results. Several researchers indicated that it is very important tool for researchers to maintain their large amount of references in order to search (Egger et al. 2008; Reeves et al. 2002; BEME, 2009; Haig & Dozier, 2003a; Haig & Dozier 2003b; Dornan et al. 2006; Buckley et al. 2009; Hammick et al. 2010).
Zotero (Product Information)
According to Tomaiuolo (2007), in 2006, Zotero was released at the George Mason University as a Firefox browser extension and it is usually focused to collect, save webpages and metadata to create bibliographies. The Zotero reference management software is an open source and it has extensive user community up to 100MB free storage (Zotero, n. d). A study was conducted by Hensley(n. d) indicated that Zotero reference management software can easily recognize, import PDF data, and finally researchers can cite and write applications namely Microsoft Word, Mac Word and Open Office. Farkas (2006) conducted a study, cited in Marino (2012), indicated that free, open source is the main cause that has made popularity Zotero reference management software furthermore it is also an alternative to EndNote reference management software. Dingemanse (2008) indicated that Zotero reference management software originated from Albanian language “to master to acquire”. Several researchers indicated that many websites, namely Web of Science, Google Scholar, PubMed, PubMed Central, Science Direct, Amazon and so on are supported by the Zotero reference management software (Kern & Hensley, 2011; Ahmed & Dhubaib, 2011; Hull et al. 2008; Gilmour & Cobus-Kuo, 2011).

EndNote (Product Information)
EndNote is commercial bibliographic software that can be used for site-licensed by any institution or by any individuals. It was produced in 1988 by the Thomson Reuters (Valentin, 2009). According to Valentin (2009), EndNote is a software that is widely used by researchers, faculty and students to collect, manage, store, images, PDFs, in the manuscripts inserting references, figures and tables placing in the word document and other documents. In a study by Hensley (2011) indicated that EndNote is the desktop application and can easily be accessed offline and online through EndNote Web. A study was conducted by Rapp (2011) indicated that EndNote is a software that is used by millions of researchers to download full text articles and it has more than 5000 bibliographic output styles.

Research Design
The study was designed and implemented with an interest for the correct citation using the software. The study occurs in December 2014 and represents EndNote and Zotero reference management software. The journals were imported either in the EndNote and Zotero reference management software. One of the purposes of this paper is to disseminate selected results from imported articles (from Google Scholar, https://scholar.google.com). A total of 20 articles displayed per page and only first page articles were considered in the experiment. Academic Workload and Quality keywords have used to search articles from Google Scholar. EndNote and Zotero reference management software was downloaded and installed on the desktop PC in order to import data from Google Scholar. The evaluation is conducted by means of the excel spreadsheet. In order to ensure reliability, different articles were imported from page one and the 15 key elements were examined in this study:

- Author;
- Title;
- Journal;
- Year;
Results
Table 1 shows that some of the fields are very similar in terms of importing fields using both software (EndNote and Zotero) namely author, title, journal, year, volume, number (issue), page number, DOI, URL, keywords, language, publisher, date added, and modified whereas there is only one field which is not similar in terms importing fields namely ISSN. EndNote imports the ISSN number, whereas Zotero does not import the ISSN number. These two software used to import data from Google Scholar without any customizing or changing the application or selecting an option of these two software. Summarization of the above description is given below in Table 1.

Table 1: Imported and Non Imported Fields from Google Scholar Using EndNote and Zotero

<table>
<thead>
<tr>
<th>Fields</th>
<th>EndNote (Google Scholar)</th>
<th>Zotero (Google Scholar)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Author</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Title</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Journal</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Year</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Volume</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Number (Issue)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Pages</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>DOI</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>URL</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ISSN</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Keywords</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Language</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Publisher</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Date added</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Modified</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

1 represents fields imported, 2 represents fields did not import
Table 1 shows that 15 fields were used and each field was compared and contrasted using two software. Furthermore, the table also shows that, one (1) represents a field that imported from Google Scholar either EndNote or Zotero reference management software. On the other hand, zero (0) represents a field that did not import from Google Scholar either using EndNote or Zotero.

![Figure 1: Comparison of two reference management software: EndNote and Zotero](image1)

Figure 1 graphical presentation of the comparison of EndNote and Zotero reference management software.

![Figure 2: Fields imported using EndNotereference management software from Google Scholar](image2)

Figure 2: Fields imported using EndNote reference management software from Google Scholar

The figure 2 shows that EndNote reference management software imported fields from Google Scholar are namely author, title, journal, year, volume, issue, pages, and ISSN number. On the
other hand, the EndNote reference management software did not import fields from Google Scholar namely DOI, URL, keywords, language, publisher, date added and modified.

![Zotero Fields](image)

Figure 3: Fields imported using Zotero reference management software from Google Scholar

The figure 3 shows that Zotero reference management software imported following fields such as author, title, journal, year, volume, issue, and pages. On the other hand, the Zotero reference management software did not import from Google Scholar the following fields such as DOI, URL, ISSN, keywords, language, publisher, date added, and modified.

**Conclusion and Recommendation**

This study, however, has revealed that EndNote imports more fields than Zotero from Google Scholar. It also clearly showed that almost all the fields are very similar in terms of importing fields from Google Scholar using these two reference management software apart from ISSN number. This finding of this result helps researchers to know about software which can import more fields from Google Scholar. Finally, this study also recommends researchers must use reference management software to avoid unnecessary errors for citation references.

**References**


Hensley, M. K. (n. d). Citation management software features and futures. *References and User Services Quarterly, 204*-208.


Flipped Classroom versus a Conventional Classroom in the Learning of Mathematics

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Abstract
The study was carried out to confirm the advantage of a flipped classroom over a conventional one in terms of students, academic achievement. To carry out the study, 100 mathematics students in senior secondary school Hallmark Academy, in Rivers State, Nigeria were used in the study. There were two groups; an experimental and a control group used in the study. A videoCD offline mathematics lesson recorded by the teacher was the ICT instrument in this approach. The t-test was used to analyze the data. Hence a major finding was that the experimental group had a mean gain of 28.60 as against 16.62 of those in a conventional class in their pretest-posttest scores. A major recommendation is that teachers should incorporate flipped classroom approach as it encourages direct involvement of students in the learning process.

keywords: Inverted, reversed  Bloom’s taxonomy, peer instruction

Background of the Study
School work at home and home work at school courtesy of information and communication technology (ICT) is what has gained attention among educators in the most recent. The reason is that classroom teachers have gone digital (Fitzpatrick, 2012). This belief is in sharp response to the paradigm shift from the teacher-centred learning environment to the student-centred environment, which modern educators and instructional designers advocate. In the former, teachers do the teaching or more appropriately are sage on stage while in the former they are guide on the side. This constructivist approach to learning has it that the teacher’s role is less that of transmitting knowledge, more that of facilitating learning in less directive ways (Alison, 1993).

Flipped classroom is a classroom where home works are done at school and school works done at home. This approach affords learners the opportunity to gain a firsthand experience and exposure to novel materials ordinarily outside the classroom using such technologies as hardcopies, softcopies, video tapes or web based lectures, and PowerPoint presentations with voice-over.

The protagonists of flipped classroom, maintain that the use of this approach enables students to gain first-exposure learning prior to class and focus on the processing part of learning (synthesizing, analyzing), problem-solving, etc in class (Walvoord & Anderson,1998). In other words, this is a revised or inverted form of Bloom’s taxonomy.
In this new taxonomy, students are doing the lower levels of cognitive work, gaining knowledge and comprehension outside of class and focusing on the higher forms of cognitive assignment in class, assisted and peers by the teacher or instructor (Anderson & Krathwohl, 2001). The teacher’s role here is more or less that of a facilitator to also qualify the meaning of a true flipped classroom.

An assignment based model is proposed by Walvoord and Anderson (1998). This model of a flipped classroom has it that students are required to do all necessary preparations for productive class session in which they produce works, solve problems prior to class sessions, class sessions in this wise are used to providing feedback to students on works.

On turning the traditional classroom on its head, Lage, Platt and Treglia (2000), maintain that this approach is informed by the incompatibility between the conventional classroom and learners’ varied learning preferences. Literature is replete with differences in learners’ learning styles. In the academic lens of Kolb’s (1948), there are convergers, divergers, assimilators and accommodators. The convergers are more comfortable with a uni source of information while divergers prefer multiple sources of information. On the other hand the assimilators prefer theoretical presentations while the accommodators would opt for hands-on-experience. A succinct look at the above will corroborate the positions of Lage, Platt and Treglia (2000) on their distaste for the traditional classroom in favour of the flipped. Evidence abounds on the strength of flipped classroom over a conventional one. Mazur of Harrard University has published results to support his peer instruction method of a flipped classroom. The physicist made his students work in small groups to answer conceptual questions on the use of force concept inventory, which predates the calculus concept inventory, and which tests understanding of the foundations of Newtonian. In his submission, he maintains
that simply transmitting introduction should not be the focus of teaching, rather helping students to assimilate that information (Mazur, 2009).

**Fig 2:** Key elements of a flipped classroom (Strayer)

The flipped classroom of Hake (1998) corroborates the strength of this approach over the conventional classroom. The 4458 students that took part in 48 physics courses had different results. The researcher reported that students taught with interactive engagement methods

**Fig 3:** Learning opportunities of the flipped classroom (adapted from Gerstein)

The flipped classroom of Hake (1998) corroborates the strength of this approach over the conventional classroom. The 4458 students that took part in 48 physics courses had different results. The researcher reported that students taught with interactive engagement methods
exhibited learning gains almost two standard deviations higher than those observed in the traditional courses (0.48 +/- 0.14 vs 0.23 +/- 0.004). Assessment of classes taught by the peer instruction (P1) method provides evidence of even greater learning gains, with students in P1 courses exhibiting learning gains ranging from 0.49 to 0.74 over eight years of assessment (Crouch & Mazur, 2001).

The work of Deslauriers, Schelew and Wieman (2011) in their physics class is also another evidence of the relevance of a flipped classroom over the traditional classroom. The experimental group taught via flipped performed better than their conventional counterparts. They reported that during the experiment, students’ engagement increased in the experimental section (from 45 +/- 5% to 85 +/- 5% as assessed by four trained observers) but did not change in their control section. At the end of the study, students completed a multiple choice test, resulting in an average score of 41 +/- 1% in the control classroom and 74 +/- 1% in the flipped classroom with an effect size of 2.5 standard deviation. These findings also agree with that of Berret (2012) on how flipping the classroom can improve the traditional lecture.

**Statement of the Problem**

The need to improve students’ achievement in mathematics has been a thing of concern to all stakeholders in the education sector; teachers, parents, counselors, instructional designers, and administrators. Mathematics is the hub of the science and so poor performance of students in the subject is bound to have a negative effect in the scientific age of today driven by technology in which we find ourselves. The reason is that a nation that cannot boast of the needed scientific and technological advancement cannot truly compete among comity of nations.

**Purpose of Study**

The study sets to ascertain:

if there is any difference in the mean achievement gain of flipped classroom mathematics students and their conventional counterparts.

If there is any difference in the mean achievement gain of flipped classroom male mathematics students and their female counterparts.

**Research Questions.**

Research Question 1. What are the mean achievement of mathematics education students taught via the flipped classroom approach (FCA) and those taught via the conventional approach (conA)?

Research Question 2. What are the mean achievement of mathematics education male students and their female counterparts taught via the flipped classroom approach (FCA)?

**Methodology**

The pre-test/post-test quasi-experimental design was used in the study. The reason was to ascertain if the treatment had any resultant effect on the experimental group. The mean $\bar{x}$ achievement scores of mathematics students taught via the flipped approach (FCA) were compared and their conventional counterparts (ConA). The t-test was used to test the two $H_0$
hypotheses used in the study. On the whole, one hundred (100) students in intact classes were used comparing fifty (55) in flipped classroom and forty five (45) in conventional classroom. Also, out of the control group, thirty (35) males achievement was compared with that of their twenty (20) female counterparts.

**Data analysis and discussion of findings.**

**Research Question 1:** What are the mean of mathematics education students taught via the flipped classroom approach (FCA) and those taught via the conventional approach (conA)?

Table 1: Mean Achievement score of FCA Vs ConA.

<table>
<thead>
<tr>
<th>Measures of central Tendency</th>
<th>FCA</th>
<th>Group</th>
<th>ConA</th>
<th>Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\bar{x}$</td>
<td>S.D</td>
<td>$\bar{x}$</td>
<td>S.D</td>
</tr>
<tr>
<td>Pre-test</td>
<td>31.60</td>
<td>6.48</td>
<td>27.38</td>
<td>9.02</td>
</tr>
<tr>
<td>Post-test</td>
<td>60.20</td>
<td>10.36</td>
<td>44.00</td>
<td>8.60</td>
</tr>
<tr>
<td>Gain score</td>
<td>28.60</td>
<td></td>
<td>16.62</td>
<td></td>
</tr>
</tbody>
</table>

The pre-test mean value for FCA group from table 1 is 36.60 as against 27.38 of the ConA group. Also their post test mean are 60.20 and 44.00 respectively. Hence the gain score mean are 28.40 for the FCA group and 16.62 for the conA group.

**Research Question 2:** What are the mean achievements of mathematics education male students and their female counterparts taught via the flipped classroom approach (FCA)?

Table 2: mean achievement scores of male and female groups with FCA.

<table>
<thead>
<tr>
<th>Measures of central Tendency</th>
<th>FCA</th>
<th>Group (Male)</th>
<th>Of FCA crap (male)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\bar{x}$</td>
<td>S.D</td>
<td>$\bar{x}$</td>
</tr>
<tr>
<td>Pretest</td>
<td>33.91</td>
<td>9.41</td>
<td>29.11</td>
</tr>
<tr>
<td>post test</td>
<td>60.00</td>
<td>12.59</td>
<td>58.56</td>
</tr>
<tr>
<td>gain score</td>
<td>28.09</td>
<td></td>
<td>29.45</td>
</tr>
</tbody>
</table>

Table 2 above shows a pretest mean of 33.91 and 29.11 for male and female groups respectively. It also shows a post test mean of 60.00 and 58.56 for the different sexes respectively, hence a gain mean of 28.09 and 29.45 in like manner.

$H_01$. There is no significant difference between the mean achievement of mathematics education students taught via FCA and their conventional counterpart (conA).

Table 3: Mean Values (Post Tests), t-values of FCA & ConA group.

<table>
<thead>
<tr>
<th>Category</th>
<th>N</th>
<th>$\bar{x}$</th>
<th>S.D</th>
<th>t-cal</th>
<th>t-lab</th>
<th>$\alpha$ level</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCA</td>
<td>55</td>
<td>60.20</td>
<td>10.36</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ConA</td>
<td>45</td>
<td>44.00</td>
<td>8.60</td>
<td>11.25</td>
<td>2.02</td>
<td>0.05</td>
</tr>
</tbody>
</table>
Table 3 shows that $\text{t-cal} > \text{t-tab}$ (11.25 >2.02) at $\alpha$ level of 0.05, and so the $H_0$ is thereby rejected which means that there is a significant difference between the mean achievement of both categories and groups.

Tables 1 and 3 show that mathematics students taught via the FCA had a mean gain advantage over their conventional counterparts. This major findings is in line with the findings of (Crouch and Mazur (2001), Mazur (2009); Deslauriers, Schelew and Wieman (2011) and Bennet (2012). These findings agree that the flipped classroom approach engages students and makes them to be directly involved in the learning processes than those the conventional approach. And it is obvious that when one is personally involved in a thing that mastery and improvement in performance is guaranteed.

$H_0$ There is no significant different between the mean achievement of mathematics education male students and their female counterparts taught via the FCA.

Table 4: Mean values (post tests), t-values of male and female groups.

<table>
<thead>
<tr>
<th>Category</th>
<th>N</th>
<th>$\bar{x}$</th>
<th>S.D</th>
<th>$t$-cal</th>
<th>$t$-lab</th>
<th>$\alpha$ level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>35</td>
<td>62.00</td>
<td>12.59</td>
<td>1.56</td>
<td>2.02</td>
<td>0.05</td>
</tr>
<tr>
<td>Female</td>
<td>20</td>
<td>58.56</td>
<td>8.67</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4 shows that $t$-cal < $t$-tab (1.56<2.02) at $\alpha$ - level of 0.05, and so the $H_0$ is thereby accepted, which means that there is no significant difference between the mean achievement of both sexes.

Table 2 and 4 above did not implication sex as a variable in a flipped classroom. In other words performance of the students in the flipped classroom was not influenced by the sex to which they belong. That means both male and female students’ performance was not related to their sexes. Both sexes enjoyed a flipped lesson and a flipped classroom which provided them ample opportunity to have a first-hand experience (Barbara & Virginia, 1998), making them to be fully involved in the learning process (Walvoord & Anderson, 1998) and meeting their divergent learning styles (Lage, Platt & Treglia, 2000).

**Conclusion**

The flipped classroom encourages peer instruction, provides an opportunity for students to gain first exposure prior to class, provides incentives for students to prepare for class, provides a mechanism to assess students’ comprehension and also provides activities that focus on higher-level cognitive activities. Hence the advantages of the flipped classroom approach surpass that of the conventional, which informed the gain in mean scores of students taught mathematics via the flipped classroom approach, over their conventional counterparts.

**Recommendations**

Based on the outcome of the study, the following recommendations are made:
1. Teachers who are the main persons that implement the curriculum should adopt this flipped classroom approach because it engages the students rather than waiting to be sponged.

2. The flipped classroom is a technology-driven hence it is expected that teachers of the present age should embrace technology if they must use this approach with all amount of expertise

References
African classrooms: the divide and the bridge in technology use

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Abstract
The Generational cohort (born 1980’s – present day) is now being overtly represented in the higher institutions of learning in Africa, due to higher rate of intakes we are now experiencing. This has caused an interest in the field to study the impact which the millennial cohorts have on the educational system. The expectations of the Millennial will inadvertently cause major changes in the instructional approach that is being used to teach in the university environment. The scope of higher education has drastically changed with the presence of a new set of higher learning students know as the Gen Y or Millennials. Previous studies have researched the current trend of this set of generational students but have not related it to the African context, this research review examined the extent to which there have been digital technological divide between the teaches and the new set of students which they have in their classrooms. An extensive body of literature was reviewed providing insights into understanding the motivations and perceptions of these students and these are affecting the institution of learning. The research method used in this investigation was qualitative. This study based its contents on previous research conducted, relating it to present day problems being faced in the classrooms of higher learning institutions in Africa with a situational analysis. It may be argued that change is important for the African higher educational system as meaningful learning is necessary. Bridging the digital divide will enable such digitalized learning be transferred to the leaders of tomorrow, the millennial generation. With millennial generation, we will be able to build the capability and capacity for students to compete in the global market place. Accepting change now rather than later will benefit our system, as we are already behind with the integration of technology in our classrooms.

Keywords: Digital technology, millennial generation, higher education

Introduction
In today's world, digital technology has advanced so rapidly and has integrated into our system and society at such an accelerated rate that it is hard to keep up with this trend. Let alone to reflect on the impact that it has on our lives. Increasingly, more teaching and delivering of knowledge seems to depend on the new systems of technology. Students these days are inherently different from pass students. School systems, and ways in which children were educated, has changed significantly in order to keep up with new teaching technology and its ever-evolving learning styles (Bynum, 2011). In the present environment, technology, computers and social media dominate young people’s world.

To acquire technology skills has become key competencies that students will require when faced with global competition. Some studies found that infusing technology into classrooms
while teaching the 21st century students is more effective than using traditional methods (Lin, 2005; Mehre & Mital, 2007) which promotes students learning attitude and achievement (Lin, 2005; Mehra & Mital, 2007; Yeh, Chang & Chang, 2011). Similarly, other scholars have illustrated the importance of integrating technology into teaching and learning process which will help transform a teacher's role from the traditional to the modern (Alley, 1996; Mehra & Mittal, 2007). By encouraging this movement, the students’ role changes from being a passive content knowledge receiver to that of an active participant. This allows the student to be leading a positive respond towards the infusion of technology in the teaching system (Alley, 1996; Lin, 2005; Mehra & Mital, 2007; Yeh, Chang & Chang, 2011). The importance of infusing technology in our classrooms cannot be over emphasised. Students these days are used to processing vast amounts of information at a time, which leads to them requiring higher level of brain stimulation far beyond was required by teachers a decade ago (Bynum, 2011).

In Africa, presently, the higher education system is facing challenges. These challenges are the increase in enrolment of students, the challenges of inadequate facilities and shortage of financial resources. These have of recent been coupled with an overwhelming need for accessing digital technology which is a necessary factor in face of global economic development (Sunday, 2010). Higher educational institutions in Africa have now assumed an important and positive role to improve the entire educational system by redesigning a pattern that will prepare young adults, also called the Millennial, at all levels for a positively improved and commendable citizenship (Sunday, 2010).

Researchers and administrators are now faced with a problem of how to communicate effectively with the 21st century generation, commonly known as millenial generation. This generation of digitally swerve individuals are the generation that were born after the 1980's (Howe & Strauss, 2000). Previous generation, known as Baby Boomers were born between1940's-1960's and Generation X were born in 1960's-1980's (Howe & Strauss, 2000), Generation Z were born between 2000 to present (Lancaster & Stillman, 2002). They are the generation that were born in times of information technology, where most things have been digitalised. Generation Z prefer to multi-task instead of focusing on one certain aspect at a time. This generation tend to be more attracted to the ideas of their peers than what their instructors have to offer (Reilly, 2012).

Unlike the previous generational cohorts the millennial are not rule breakers, distrustful pessimists or self-absorbed individuals. They, are high achievers rule followers and optimist. They rely on having structures in their lives (Howe & Strauss, 2003; Debard, 2004; Bowen, 2011). Even though Howe & Strauss (2003) made several generalised claims in their research about changing learning styles and expectations of this new cohort, they however did not discuss how or if the expectations should be accommodated, they unfortunately left that to the educators in the field. If these generalization about the millennial is to be believed, this new generation will undoubtedly defy all conventional theory regarding youths (Bowen et al., 2011). While Generation Y (Gen Y) receives an armful amount of attention in different professional literatures, it is not quite so in educational journals of higher learning. The lack
thereof is quite unfortunate as most higher education students are of this cohort and will be the futures leaders. Educators should embrace this new technology and find ways to integrate it into their classrooms, as they will be able to connect better with their students as they utilize the use of technology every day; increasing the level of engagement in classrooms (Bynum, 2011).

This articles specific purpose is to understand the importance of integrating technology into today's higher learning educational environment and to develop a best practices guide by finding ways in which teachers will find the transition of suing this new medium of teaching easy and useful. This article also intends to address this gap by reviewing existing body of literature on this cohort with the intention of informing higher learning educators about the nature of Generation Y and presenting a few strategies designed to engage this cohort in the classrooms. Educators will need to embrace this technology as it does not appear to be a passing fad, but a system that is here to stay and will continue to shape and evolve the way in which teachers and students interact (Bynum, 2011).

Theoretical Framework
Educators now have to be careful so as not to fall under the danger of ignoring individual differences, stereotyping students or treating them in a manner which is designed to reinforce behavioural attitude which is part of normative general expectation. It is quite important that educators get to understand the effects that generalization of characteristics may have on students' motivation and expectations (Bowen et al., 2011). As regrettably, the students in this cohort have not all been afforded the same level of financial, social and personal support, educators should be careful as they will be often challenged on issues of social inequalities by segregating the “haves” and the “have-nots”. With proper understanding of each individual difference, proper understanding might lead to sensitisation of students need and facilitate better teaching and learning environment process in present day classrooms.

The clearest characteristics of this cohort are the comfort they possess with technology. Prensky (2001; Reilly, 2012) referred to this generation as Generation Y the digital natives, people who were born into a world of technology. Today’s students are growing up in a world of computers and access to the internet, which has made them see information technology as an important part of their lives. Oblinger (2003) stated that this cohort seeks instant information and understanding from the web and not through books. They are a reflection of the ever shifting socio-recreational activities of a growing group of young people, which is also reflecting the impact of digital technologies on a knowledge driving economy in which economic prosperity is being linked to a population with the digital skill to operate within digital environment (Gabriel, et al, 2012).

Though the conventional methods of literacy, writing and reading, are not obsolete, they unfortunately are not adequate enough for today's students and must be extended by using an extended broader range of electronic technologies which will require skills common to print and media literacy, but at the same are distinct (Leu et al, 2004; Coiro & Dobler, 2007). These
distinct skills still remain debatable and are being often referred to as, multi literacies (New London Group, 2000), new literacies (Lankshear & Knoble, 2006; Coiro, et al., 2008; Cope & Kalantzis, 2009) or currently the 21st Century Skill Set (Partnership for 21st Century Learning, 2007; Trilling & Fadel, 2009; Bellanca & Brandt, 2010). Despite all the positive qualities mentioned above on this generational cohort, the millennial students have presented their teachers, counsellors and school administration with adverse challenges. Researches now fear that the millennial students are over reliant on digital technology, which has lead them to stunt interpersonal skill, face to face interaction (Elam, Stratton & Gibson, 2007). Educators have also expressed the same concern on the ease at which the millennial student engages routinely in multitasking activities. This action has shorten their re-collective attention span and may lead them to lack the necessary skills to be critical thinkers and demonstrate self-reflection and introspection (Murray, 1997; Elam, Stratton & Gibson, 2007).

Generation Y: Digital Technology and Learning
More than fifty years ago behavioural psychologist Skinner (1954) stated that the human race was on the brink of an inevitable change which will lead to an extensive revision of present day educational practices (Black, 2010). He went further to suggest that testing machines and programmed learning will form a great part of an overall improvement in teaching techniques. Due to this change in environment and the huge volume it has created in interactions with technology, this generational cohort processes and thinks differently from previous generations. Some researchers have even suggested that there is a physiological difference between the brains of this generational cohort and that of the previous generations. This is as a result to early exposure of young children to various stimuli which has showed an extensive effect on the neurological development on these young individuals (Black, 2010). Therefore, in view of this, children that were brought up in an interactive digital and media rich environment tend to learn and think differently due to the fact that they were reared physiologically different from their predecessors, the Baby Boomer’s, who grew up in a non-digital environment (Fausto-Sterling, 2000; Black, 2010).

These cohorts have a different learning style that is not the same with the generation that came before them. Their way of thinking is being shaped by a digital technology that is transforming the way their brain works and the way think. The sheer extend of verbal, auditory and visual information in today’s world is making these cohorts filter, edit and sift through information more and faster than their predecessors (Woods, 2006). But unfortunately it has made their recall rate less impressive (Woods, 2006). This trend has made them look for the shortest possible way to communicate with each other, by using narrative imaging, which is supplemented by visuals and symbols. They have virtually a non-existing patience for face to face, step to step instruction, traditional testing and thinking. Which when compared to the captivating and engaging experience they have with social media and digital technology has lead them to think of the traditional method as of teaching as dull. They want the traditional methods of teaching to be supplemented with a more familiar system of technology content (Mills & Sharman, 2005).
Even though the generation Y adapt in informal knowledge and technical expertise, they may be offset by lack of depth in learning and a shorter attention span. Similarly, they are adept in obtaining information but lack the understanding and sophistication to actually evaluate the data which they retrieved (Franklin, 2005; Hall, 2006; CIBER, 2008; Black, 2010). They heavily relay on search engines when in search of information. They prefer pictorial representation rather than read information which has lead to a lack of critical analytical skill which one might need to evaluate information (CIBER, 2008; Black, 2010).

**The Gap and the Change**

The economic, social and cultural changes in the world over are driving the change in present day institutions of higher education around the world. The daily onslaught of these new medium of interactions has to be addressed in our educational system as students are spending so much of their time utilizing technologies (Bynum, 2011). Many educators are now starting to become aware of this change in the higher education system together with its implications on the changing characteristics of today's student, but are still teaching in ways which they been for years past.

Throughout the 20th to the 21st century researchers have consistently shown that the most important factor to a student's success is the level of quality education he/she receives. There have been advocacies for educators to be involved in using technology. This can be achieved by becoming more involved and incorporating the social-media-digital trend while teaching, as the only way in empowering students is by being an empowered educator. But in other for that to happen, it will require an open and willing attitude on the part of the educators. There is an existing gap of technical skill and knowledge between the Gen Y student and their digitally deficient teachers that creates a disconnect in participation and understanding of each other. Such issues like teacher training, professional development access to resources and delivery methods must be addressed (Collier, Burkholder & Branum, 2012). Henry Jenkins (2009) states that “...A focus on expanding access to new technologies carries us only so far if we do not also foster the skills and cultural knowledge necessary to deploy those tools towards our own ends”

With the present day expansion of digital technology and learning in the classroom, teacher training and development must transition to adequately realize the potentials of using these resources in fostering student learning. This will encompass the use of technology as tools to guide, instruct, evaluate measure and understand the learning capacity of students through data-driven instructional methods (Collier, Burkholder & Branum, 2012). It is important to note that teachers need guidance and encouragement on how to use these new technologies such as PowerPoint. This is a popular software that is easy to learn and integrate during classes. Once a teacher learns the basics of using the software, it can be used to create presentation and lecture notes.

The above mentioned gaps, teacher technology skills and their role in digital learning environments, have been acting as barriers in digital learning and effective use of technologies
by the teacher to encourage students analyse and evaluate materials presented to them, to create new ideas and apply that knowledge to previous academic experiences (McCoog, 2008). Even though the foundation of this skill is technology, it serves only as a guideline to success. With the change in environment towards an output oriented work force and economy the above mentioned skill set will be useful to students as to help them reach their greatest potential. And for this to be achieved methods of instruction will have to change. Instead of delivering message content, teachers are advised to engage students in the taught content, which means a faster pace of delivering instructions. The methodology of “one size fits all” approach should also be replaced with affording the students different options while learning.

The end product of learning still remains impacting of information, but the vehicle which is needed to gain access to it have changed drastically. These century student works well with an inductive type of reasoning, desiring frequent quick interactions with content while possessing exceptional visual-literacy skills. These skills are very essential when it comes to navigating the digital technology being used in today's growing workforce.

**The strategy to bridge the gap**

There are a lot of problems currently presenting themselves when it comes to the realm of education and the use of technology, mutually and independently. This research review focused primarily on the apparent divide between the teacher and the student in the higher education system of Africa. It focuses on how this divide can be bridged to provide a well rounded quality of education for the millennial student. Many educational institutions unfortunately do not have the capable manpower, technical know-how or focus needed to institute a social and digital technology induced policy which will lay out a model of best practices of which to follow that will properly guide an institution and the teachers (Woods, 2006). This gap, of the technologically haves and the have not’s has to be addressed in all forms of discussion with regards to technology implementation. This might probably be the biggest challenge when it comes to implementation of any type of technology infused system. This topic is filled with complex issues because of technology which will have quite the impact on educating children as well as teachers in the educational system.

Throughout the literature, researchers are intent on the fact that digital media and technology are already changing the way these young adults are interacting, learning and executing activities in every aspect of their daily lives (Bynum, 2011). This change in life style has not only affected the higher learning educational system, but will continue to affect it with grave ramifications if changes are not implemented soon. While those refusing change will be left behind, especially in Africa as we are already left behind (Ives, 2012). Discussion on changes during the implementation of the digital technology in higher institutions of learning will involve several stakeholders, of which the most important and largest group is society as it encompasses all the other groups. The effects which these change will have on society is huge, especially to a societies economy, because as technology becomes more ingrained into our everyday lives and human experiences of the students today will have to need the skills that will enable them make use of these types of technologies in the future.
Without the proper and necessary programs, teachers won’t be willing to embrace and integrate digitalised technologies into present day classrooms. Our students will be at a great disadvantage when thrown into the future global economy to compete for jobs (Sunday, 2010). This will have significant negative impact on our immediate society. Furthermore, the African community, as other countries that had embraced and integrated this system will have surpassed our students who will be competing with other national and international on a global platform (Sunday, 2010). Some ways in which this change can start occurring is by teacher training and development.

With the present expansion and development of digital learning and technology in classrooms, professional training and development of teachers has to transition to become fully realised. In order for the potential of using these resources to foster students are achieved (Collier, Burkholder & Branum, 2012). For teachers to make a smooth transition from the traditional methods to that of instructional design application and discovery of information, significant investment of time to learn will be required (Jenkins et al, 2006). From previous studies, other teachers have cited professional development to be an important component (Collier, Burkholder & Branum, 2012). The professional development has helped them in making the transition using of technology effectively in instruction (Collier, Burkholder & Branum, 2012). For the effective scaling of professional development for teachers on the use of technology as an instruction guide will have to involve accountability and the ongoing support of school administrators and policy makers. Some key ideas and skills that might help in teacher development as indicated by (Burkholder, 2012) will include:

- Teachers be provided with multiple opportunities to attend workshops and classes on professional development. This should be designed with a face to face development content delivery. It should be offered at various times and intervals to help accommodate the teachers schedule.
- At the discretion of workshop facilitators on progress made by attendees, the workshops can be moved and adapted to an online environment. This will help teachers interact with technology on a one on one base.
- There should be experts to follow up on instructional technology support for teachers to assist them in mastering and implementation of activities and strategies learned during the professional development classes/workshops.
- Professional learning communities should be set up that host instructional technology support group sessions for training in digital technology teaching strategies. Such sessions will include time set aside for teachers to have face to face instructions on a smaller scale and with individual attention.
- There should be an effective monitoring and evaluation system set in place by school administrators and policy makers to better evaluate the effectiveness of the effort the teacher are putting into the programmes.

Change will not only fall on the shoulders of the teachers alone. Other stakeholders will have
an impact in creating the needed change such as, business leaders in our communities together with community leaders. In order for the importance or proper integration of such set skills and the impact it will have on the students (future leaders). Community and business leaders should encourage the teachers’ effectiveness through support by:

- Working in collaboration with teachers in providing real world experiences to create lecture content connections to classroom learning, such as intern-ship opportunities.
- Developing effective and strategic mentoring communities for students and teachers.
- Providing much needed expertise facilities and funds focused on the effectiveness teaching and use of the technologies.

At the State level, policy plays an important and integral role in establishing the standards and expectations of the teachers and schools, through increase in teacher effectiveness in the digital environment by:

- Using this mean to determine teacher accountability and effectiveness in recognition of the changing role of teaching and learning in this new digital era. This will include multiple assessments and monitoring of progress.
- Providing support through organising technology development programs, as the most important thing to teachers is to be a designer of academic rigour for students. The Policy makers need to ensure that teachers have access to the best high quality professional development opportunities which will help in ensuring the proper utilization of technological instruction for student learning (Burkholder, 2012). This can be achieved by articulating expectations and standards for teacher training programs.
- Providing ways to support and fund state of the art technology for all public higher institutions of learning that will meet the need of underprivileged students and teachers to help them compete with the demands of digital economy.

Research has clearly shown that “...effective learning is the most important school related factor in student achievement, yet access to effective teaching remains widely uneven and inequitable distributed” (Alliance for Excellent Education, 2012).

The ultimate and far reaching goal of education is to help students to acquire skills necessary for them to learn, live and work successfully within a society. For the millennial student today that means becoming information seekers, analytical thinkers and evaluators as well as good decision makers and problem solvers. The ability to overcome the constraints of this digital divide will serve as a tool of empowerment for the student. If we are to move forward and have a chance at competing with the international community, the bulk of the challenge will fall on educators to embrace change, support and utilize this extraordinary technology to meet the learning needs of the Generation Y and those that will follow.
Conclusion
In conclusion, Marc Prensky (2007) a technologist said “Technology helps the millennial students learn because manipulation of digital technology comes easy for them and they can make it do what they need”. The 21st first century learner is enthralled with digital technology which can be used for instructional and teaching purposes. Giving the opportunity, teachers can tap into this excitement and channel it towards engaging their students in the classrooms, at the same time knowing that the students are genuinely interested and engaged. This change is important for the African higher educational system as meaningful learning more than ever is necessary, bridging the digital divide will enable such to be transferred to the leaders of tomorrow, the Millennial. As this skill set will be able to build the capability and capacity for students to compete in the global market place.

Recommendation
The teacher is a central figure who enables learning to take place, which makes it a necessity to invest more towards teachers professional development schemes. The importance to invest on this front cannot be over emphasised as the lack thereof will have a cascading impact on which will last for a long period of time. For a standard procedure of quality to be achieved, control regulatory bodies should be put in place to in other to ensure standard favourable competitiveness and comparison with foreign counterparts.

A shift in paradigm from the above discussion may look difficult on paper and complex; however, it is one of the easier things that can be practised. The researcher recommends an increase in budgetary allocations to all higher education institutions in order to help bridge the gap of emerging digital divide that higher institutions are facing.

Another recommendation that will help teachers is that of professional development which will directly have an influence by enabling the teachers acquire the necessary skills to help in passing across knowledge to the student effectively.

Infusion of digital technologies into teaching will help in creating a stimulating enabling environment that will help in capturing the minds of students during classes, as this is a method/system that they are used to, so relating to it will be more interesting and interactive.

References
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Evaluation of the use of e-learning systems in Poland - empirical research results

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Abstract
The article is the result of the authors' empirical research on the assessment of use of LMS (Learning Management System) and LCMS (Learning Content Management System) systems, supporting management in different types of organizations. The main goal of research was to complete the existing research gap by collecting and analyzing data, enabling a level of implementation and use of e-learning platforms and tools to be assessed in business and academic environments in Poland. Research was directed at people who have direct influence on creating e-learning, are often decision makers in the field, and/or are responsible for leading distance learning teaching in a given unit. Multi-phase research has been made in order to diagnose the use of Internet teaching in Poland. This enabled to obtain numeric data. Two basic methods of research were used: interview and questionnaire, which allowed gathering of qualitative and quantitative data of the given area. Research lasted 15 months and was conducted from October 2013 to December 2014 in 203 polish companies. The companies were classified according to two sectors: companies and education. The results have been presented in graphic form with a short summary of characteristics and comments. The article concludes with the most important observations, which have been grouped according to two key areas regarding: technology and the didactic process (training).

Keywords: e-learning, LMS/LCMS, IT, research, education.

Introduction
In the numerous publications written the on subject, e-learning is defined as a method of acquiring knowledge (technique of teaching or method of learning) using electronic media. This can supplement traditional forms of teaching or education, as well as be a basic form of training. Understood in this form, e-learning covers almost every type and path of learning via internet using IT tools. In the context given, a broader definition of e-learning covers different forms of e-education: academic, school and corporate e-learning. E-learning is currently used in almost every aspect of social life, business, and politics but also in the private lives of many people around the world. We can observe its steady growth in use as well as the number of applied e-learning systems. The world’s greatest economic powers have long-term strategies of economic growth in which an important part is played by education backed by information technologies.

The first e-learning courses in Poland started in the mid 1990's. Currently, the development level of broadly understood e-learning solutions in Poland is no different than that of other European countries, such as Germany, France, Great Britain or Spain. E-learning is still not, however, as popular as in the USA or Canada, where it is used by millions of students and faculty members (2013d).
The economic crisis touching European countries seems to have enhanced the growth of electronic education. The reason behind this is: optimizing costs in implementing e-learning and the necessity of quick response in the face of operational and tactical changes. A similar tendency can be observed in Poland, where providers of LMS platforms and management systems implement large, often spectacular projects. Combining different methods of teaching - traditional and electronic (so called blended learning) - has become very popular (2008b). E-education is not a temporary fashion for electronic schooling but a strong educational trend. We can say that the polish e-learning market has reached a stable phase, since an optimistic level of growth of interest in courses using different schooling techniques has been observed in the last years. Distance learning systems supporting the learning process, are more frequently adapted in polish companies, schools and higher education. Using information technology in distance learning is a direct consequence of the challenges that has been brought by the information society in the field of Life Long Learning. This is the reason why research on the use of systemic, organizational and technical solutions and communication processes in e-learning plays such an important role.

As mentioned earlier, the Polish e-learning market is relatively young. This being the case, broad research efforts has not yet been undertaken, which could present the use of modern solutions in the scope of teaching via the Internet. In recent times only single research projects have been undergone which point to the forming of tendencies in given theme areas.

In view of the presented conceptual frame and the above mentioned notes, empirical research has been made regarding the use of e-learning in polish companies (n=203). Research was directed at people who have direct influence on creating e-learning, are often decision makers in the field, and/or are responsible for leading distance learning teaching in a given unit.

The main goal of research was to complete the existing research gap by collecting and analyzing data, enabling a level of implementation and use of e-learning platforms and tools to be assessed. To achieve the main goal, a specially designed questionnaire was used, which gave answers to the following research problems:

- **RP1**: Which e-learning platforms dominate in polish companies?
- **RP2**: Which forms of transmitting educational content dominate in polish companies?
- **RP3**: Which communication tools are most commonly used in training processes in polish companies?
- **RP4**: Is the quality of e-learning monitored in polish companies?
- **RP5**: Are the didactic processes supported in polish companies?

### Methodology

Multi-phase research has been made in order to diagnose the use of Internet teaching in Poland. This enabled to obtain numeric data. The research procedure has been presented in Table 1.

### Table 1: Research Procedure.

<table>
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<tr>
<th>No.</th>
<th>Researchphase</th>
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<tbody>
<tr>
<td>1.</td>
<td>Analysis of knowledge in the area of use of e-learning in Poland. Research method: desk research</td>
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</table>

115
2. Verification and selection of companies using e-learning.
Choosing experts and/or people connected to implementing/coordinating e-learning in a given unit.
Research method: telephone interview

3. Collection of numeric data regarding functioning of e-learning in given research units.
Research method: questionnaire in electronic form

4. Research data analysis, comparison of implementation effects.

The choice of researched units was made from on a database, which was formed based on information from secondary sources (Polish Agency for Enterprise Development, Ministry of Science and Higher Education, Central Statistics Office of Poland, Public Information Bulletin of Ministry of Economy) - phase 1. The research sample had a purposeful character and regarded only companies which declared using e-learning platforms for at least 3 years - phase 2.

The next phase of the research procedure (phase 3) concerned primary data accumulation of the functioning of e-learning in specific units. To achieve this a questionnaire was used. A questionnaire was used during research containing 10 questions enabling gathering of numerical data (attachment). Also an anonymous informative questionnaire was conducted via internet. The research was directed towards workers of polish companies and higher level educational representatives, which had previously been engaged in e-learning using LMS and/or LCMS systems.

The factual state of e-learning level of functioning was researched in polish companies from October 2013 to December 2014 (2013a). 326 organizations were surveyed yielding a number of 203 answers (general return indicator was 62%).

The companies were classified according to two sectors:
- S1 - small and medium sized companies (SMSC);
- S2 - education (including institutions linked with education and training).

In accordance to current European regulations, we can define a medium sized company as that, which:
- employs less than 250 people and
- has an annual overturn not exceeding 50 million euro or the annual balance sum is no larger than 43 million euro;

and a small company, which:
- employs less than 50 people and
- has an annual overturn not exceeding 10 million euro or the annual balance sum is no larger than 10 million euro.

Despite the diversity in functioning of the companies and institutions in the Sectors mentioned, a comparison has been attempted.

116 companies from sector S1 (57,1%) took part, as did 87 companies from sector S2 (42,8%).

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<th>No.</th>
<th>Researchphase</th>
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<tbody>
<tr>
<td>2.</td>
<td>Verification and selection of companies using e-learning. Choosing experts and/or people connected to implementing/coordinating e-learning in a given unit. Research method: telephone interview</td>
</tr>
<tr>
<td>3.</td>
<td>Collection of numeric data regarding functioning of e-learning in given research units. Research method: questionnaire in electronic form</td>
</tr>
<tr>
<td>4.</td>
<td>Research data analysis, comparison of implementation effects.</td>
</tr>
</tbody>
</table>
In Sector S1, research was conducted on companies from fields such as: Finance and Insurance (35 companies), Medical-Pharmaceutical (26), Publishing (12), Transport and Logistics (15), Tourism (14), Cosmetics (6), Telecommunications (3) and others (5). Sector S2 was compiled of Training companies (31), Graduate Schools (26), Language Schools (22) and Medium and High-schools (8).

Figure 1. Researched companies with reference to sector.

Aims and Objectives of Study
The aim of research was the assessment of the level of use of e-learning tools in the education process. Additionally, two detailed aims were targeted, which are as follows:
   A1: learning the scale of use of e-learning in Poland,
   A2: diagnosis of leading trends in the area of computer assisted training.

The research was aimed at people, who had direct influence on e-learning in their companies, and were the decision makers in that field. The research emphasized two key groups of respondents:
   • managers responsible for making decisions in implementing e-learning; i.e. training managers, HR and knowledge management;
   • specialists in the field of e-learning in a given school or higher level graduation school.

Results and Discussion
The first question in the questionnaire referred to type of e-learning platform used. Use of e-learning platforms has been presented in Table 2, according to percentage of platform type.

Table2. Use of e-learning platforms in relation to sector.
Among the companies in Sector S1 (small and medium sized companies SMSC) commercial platforms dominated (56%), on the other hand in the companies from the Schooling and Education Sector (S2), open-source platforms were most readily used (70%). Whiten the companies researched, a strong domination of LMS (Learning Management System) class platforms was observed, set on managing the training process (158 companies - 78%). Just 18% of the companies researched pointed to using LCMS Learning Content Management System) class software, aimed at composing training content, which was mainly used by Medical-Pharmaceutical and Telecommunications companies as well as Higher Education. We can additionally observe, that most of the companies from S1 SMSC sector uses LCMS class software (59%), on the other hand the companies from Sector S2 predominantly use LMS class platforms (85%) - this is most likely a result of identifying with the Moodle platform with LMS software. Seven companies (S1) and two language companies (S2) declared using the LCS (Life Communication System - remote communications system), which is 4% of the total response.

There wasn't a significant advantage in implementing e-learning platforms (Question 3), although we can detect a correlation between using commercial platforms and outsourcing. Methods of implementing e-learning platforms by percentage have been presented in Table 3.

<table>
<thead>
<tr>
<th>Method of platform implementation</th>
<th>Sector</th>
<th>externally sourced</th>
<th>internally sourced</th>
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<tbody>
<tr>
<td>S1</td>
<td>56%</td>
<td>44%</td>
<td></td>
</tr>
<tr>
<td>S2</td>
<td>37%</td>
<td>63%</td>
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Most of the companies from Sector 2 answered that the platform is sustained by inside resources of the organization (63%). Just over half of the companies from Sector 1 (56%) declared outside implementation of platforms, which in turn usually meant using commercial platforms.

The next question was in regard of didactic materials within a specific organization. Most of the companies (65% - 132 companies) declared owning a standardized material base (e.g. courses, training, seminars).

Chart 1 and 2 presents the frequency of use of didactic materials for S1 and S2. A scale of 1 to 4 was used, 1 meaning lack of use of given form of didactic materials, and 4 meaning very often used.
Among the important conclusions derived from this part of research we should mention that the dominant method of distribution of e-learning content (answer: “use very often”) in the business sector is the multimedia presentation and PDF textbook (94% altogether), while in the
education sector - the printed textbook and multimedia presentation (together 86%). Analogically, most of the S1 companies that took part in the questionnaire seldom use the HTML format (alltogether 72%) or not at all as well as the printed textbook (96%).

Presented in Chart 3, are the answers regarding the frequency of use of communications tools in the distance learning process in sector SMSC (S1). Similar to the analysis of the previous question the grading was from one to four, where one signifies a total lack of use of tools, and 4 represents its very frequent used.

**Chart 3: Level of use of communications tools - sector 1.**

The analysis of the results confirmed earlier suspicions that the most frequently used communications medium is electronic mail, which is used by all companies (66% of respondents use it very often). It is clear that the less popular communications medium is the videoconference, which is not used by over half of the companies researched. Chat type tools are often used (44%), communicators (voice and/or text) - 39%, and discussion forums - 42%. Often and very often use of virtual classes was declared by most of the subjects in this company sector (together 65%).

Chart 4, presents detailed data regarding the frequency of use of different communications tools in sector S2. Among the synchronized communications tools the most frequently used are as follows: external communicators (often or very often 78%), chat 68 %, and virtual class 65%. Just over half of the researched companies in this sector also used videoconference (55%). When it comes to asynchronic communications tools, in this case electronic mail predominates, however almost 20% of respondents use it seldom or not at all.
The next question treated the monitoring of the didactic training process, understood as verification of implemented training programs through participant activity reports (teachers and students). Most of the companies from sector S1 declared that the activity of implemented trainings in the e-learning form was constantly monitored (59%). Answers from certain business groups presented to be interesting. A very high level of monitoring was observed in the Medical-Pharmaceutical companies (89%), Finance-Insurance (82%) and Transport and Logistics (75%), with a very low level in Tourist and Publishing Companies (23% altogether). A similar disproportion can be seen in sector 2, although the use of monitoring indicator here is definitely low (38%). Despite the fact that most Training (54%) and Educational (51%) companies in this sector declared monitoring, when it comes to Language Companies and Secondary and High Schools it stands a little below 20%. In other areas the answers were on a similar level.

The next stage of research was the evaluation of e-training regarding grading learning assessment (Question 8). Over half of the companies from S1 confirmed systematically examining the value of distance training (56%) and just over 50% from S2. Answers regarding questions referring to monitoring and evaluation of e-learning training generally overlapped in most questionnaires. The assumption comes to mind that the similarities in answers are due to treating the above mentioned concepts as identical, despite giving respondents clear differences in terminology. In some questionnaires a side note was printed informing that the evaluation was the result of passing a specific subject with the Institution financing or co-financing the implemented e-learning project.
The last two questions in the questionnaire treated the use of mentoring in training processes in organizations (Question 9) and the backup of these processes via helpdesk (Question 10). Most of the questioned companies from the SMSC sector support didactic processes implemented within the e-learning framework both through mentoring (86 companies - 74%) and helpdesk (72 companies - 62%). It's a different matter when it comes to institutions connected to education and training companies from Sector 2, where mentoring is used at a level of 47% (41 companies), and helpdesk 40% (35 companies).

Conclusions

The elaboration is an attempt of presenting the level of use of information systems supporting management in organizations and examining the factual state of functioning of e-learning in companies and schools operating in the whole of Poland. The data obtained allowed to establish comparisons and determine regularities regarding not only the new dimension of management and communications, but also in the approach to training and transferring education and managing it within a company.

The most important observations have been grouped according to two key areas regarding: technology and the didactic process (training) divided into sector S1 and S2 (table 4).

Table 4. Observation summary according to sector.

<table>
<thead>
<tr>
<th>Area</th>
<th>Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>for sector S1</td>
</tr>
<tr>
<td>Technology and communications tools</td>
<td>• Domination of commercial platforms;</td>
</tr>
<tr>
<td></td>
<td>• Main use of LCMS class software (Learning Content Management System);</td>
</tr>
<tr>
<td></td>
<td>• Prevailing of outside implemented platforms (outsourcing);</td>
</tr>
<tr>
<td></td>
<td>• Least used synchronic communications tool is videoconference, most</td>
</tr>
<tr>
<td></td>
<td>frequently used is chat;</td>
</tr>
<tr>
<td></td>
<td>• All of the respondents use virtual classes to some extent;</td>
</tr>
<tr>
<td></td>
<td>• Electronic mail is very often used in asynchrinic communication.</td>
</tr>
<tr>
<td>Educational materials and the didactic</td>
<td>• Main form of distribution of content is multimedia presentation;</td>
</tr>
<tr>
<td>process</td>
<td></td>
</tr>
</tbody>
</table>
The accumulated research material constitutes a study of different approaches to e-learning in the context of training areas and educational companies from sector SMSC and institutes related to education. This fragmented review of the research is also an attempt at finding answers concerning the level of use of e-learning tools.

At the same time, the author hopes that the conducted pilot research will be a starting point for an in-depth analysis of the state of e-learning in polish companies and schools.

References


Attachment

Survey research

1. Which type of platform has been implemented in your organization?
   - Open Source
   - Commercial

2. Which class platform has been implemented in your organization?
   - LMS
   - LCMS
   - other, which ........................................................... ......................................................

3. By which method was the e-learning platform introduced?
   - Internally
   - Externally (outsourcing)

4. What is the form of the didactic materials in your organization?
   - Organization creates standardized base didactic materials
   - Organization does not have standardized didactic materials (each training is created according to need)

5. Please mark on the scale below the frequency of use of didactic materials:
   1.                             2.                                       3.                                           4.
   Lack of user rarely used often used very often used
   - Multimedia presentation (1---2---3---4)
   - PDF textbook (1---2---3---4)
   - HTML textbook (1---2---3---4)
   - Printed textbook (1---2---3---4)

6. Please mark on the scale below the frequency of use of communication tools:
   1.                             2.                                       3.                                           4.
   Lack of user rarely used often used very often used
   - E-mail (1---2---3---4)
   - Discussion forum (1---2---3---4)
   - Chat (1---2---3---4)
   - Communicators (voice and/ortext) (1---2---3---4)
   - Virtual classes (1---2---3---4)
   - Videoconference (1---2---3---4)

7. Is the didactic process monitored in your organization using periodical training activity reports of the users (workers/trainees)?
   - Yes
   - No

8. Is the e-learning training constantly evaluated in your organization?
   - Yes
   - No

9. Is the training process supported by mentoring in your organization?
   - Yes
   - No

10. Is the training process supported by helpdesk in your organization?
    - Yes
    - No
The use of technology to enhance administration of schools in Kgetleng river area office: is it really beneficial to school administration?

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Abstract
In this paper I describe the views of administrative assistants (AAs), principals and educators of schools in a village in the Kgetleng River Area office on the use South African School Administration and Management System (SA-SAMS) as a means of enhancing administration in school. SA-SAMS serve various administration needs. The targeted population comprised of educators, administrative assistants and principals of schools in Kgetleng River Area Office (AO) of the North West province. Participants were 40 administration assistants, educators and principals of schools with ages ranging between 21 years and 55 years. This research was done to see whether the use of information and communication technologies (ICT) have improved the administration of schools. The results revealed that participants saw SA-SAMS as a good tool but lack of skills makes it too difficult. Respondents indicated that most of the people who operate computers in schools did not have required skills and there is no consistency in SA-SAMS. It is recommended that the department of basic education should train principals and educators on how SA-SAMS is utilised so that schools administration can run smoothly.

Keywords: South African School Administration and Management System, educators, administrative assistants and principals

Introduction
The introduction of SA-SAMS was aimed at making things easier for the administration in schools. There is a lot of administration work and SA-SAMS was introduced to help minimise and streamline the administration in schools (Department of Basic Education, 2011). School administration amongst other include learner information, parents or guardian information, class statistics, school report forms, subject streams and all that is administrative and related to schools. All this makes the school to be seen as a well-oiled machine. Schools cannot run smoothly if it does not have good administration and management. To make schools effective, the department of education came up with SA-SAMS with the aim of solving management and administration challenges. Since the introduction of SA-SAMS it has appeared that schools are still unable to produce learner reports using ICT, AAs still are not able to do administrative duties like archiving old learners, accessing information when needed and in some cases basic typing is still problem. On the other hand, there are different ways that AAs understand SA-SAMS, as a result there is no uniformity and different schools have different understanding of SA-SAMS hence this study to see as to where are problems cropping from.
Theoretical framework on SA-SAMS
SA-SAMS is an acronym for “South African School and Administration Management System. This is an electronically integrated application that is envisioned to be cost effective and user-friendly and offers many and varied use to advantage the school (Department of Education, 2012). It is designed to assist schools with their management, administration and governance needs. The good thing about it is that it can be updated from time to time with the latest policy requirements and as a result assist schools to comply with all requirements e.g. Snap Survey or school survey (Dieltiens, 2005). For SA-SAMS to be effective and efficient in, schools there are regular maintenance and updates that are carried out by the Department of Basic Education (DBE). At the provincial level it is the competency of the Provincial Education Department (PED) to see to it that schools are supported on the use of SA-SAMS to the fullest potential (Botha, 2004). It has to be indicated that SA-SAMS is a standalone Windows that can run on Windows 98, 2003, 7 and VISTA.

For the cascading of SA-SAMS to schools, the PED has different support mechanisms that it employs to assist schools in using SA-SAMS. They are amongst others, the helpdesk, officials stationed at the district and area offices and Learner Unit System Record Information and Tracking (LURITS). For using and updating the content, patches are designed periodically to enhance and improve SA-SAMS modules and database. The common practice is that new updated versions are uploaded via the internet or CDs/memory sticks with the assistance from the district officials. For people to access the latest information on SA-SAMS, they can do so by visiting www.thutong.doe.gov.za and select the SA-SAMS link to download the latest information from that page (Department of Education, 2012). This is done to simplify things for the user and as such the aim is to make SA-SAMS user-friendly.

Some modules found in SA-SAMS
The first module deals with General School Information. This includes amongst other school details: school cycle details, classes, subjects offered by the school, names of feeder schools, discipline in the school, demerit codes, house groups, school terms, teaching and non-teaching days and a year planner (Department of Education, 2000). The information in this module is seen as the parameters for most managerial functions regarding school activities and needs that need to be updated annually. Using ICT in rural schools is a challenge (Mathevula & Uwizeyimana, 2014). This information is also utilised to complete the school surveys such as SNAP survey that is completed early in the first term.
Figure 1: Some important modules of SA-SAMS

The second module has to do with the Human Resource Information which amongst others includes educator information, staff information, development appraisal interview records, weekly staff attendance and the Integrated Quality Management Systems (IQMS) for the educators. Information gathered here can be utilised for quarterly reports. This module also helps in the school capturing and collation of the IQMS results. The next module deals with Learner and Parent Information. Here, the administrators can maintain learner enrolment information for current learners or future registration (Banda & Kirunda, 2005). Parents` information can also be added in this module. The importance of this module is that it records the weekly learner attendance and year-end learner promotions. There is also a module on Governance Information. This module is used to keep record of all issues pertaining to the school governing body (SGB), namely: members, the functions of the members, policies for the SGB and all the training records. This module can be utilised by the school to view statistics regarding learner misconduct and fee exemptions since this are areas that require decision making by the SGB (Department of Education [DoE, KZN], 2004).

There is also a module that deals with Standard Letters and Forms. This can be used to send existing or new letters to a selected group of people. From this module, blank application forms can be printed for all stakeholders including parents, educators and staff. There is a module on Export Data. This module is seen as very important since the exporting of the 10th day survey and the annual school survey data from SA-SAMS are seen as key advantages of the use of SA-SAMS. The export functionality takes all the required general school information, human resource information and the learner information within SA-SAMS and automatically populates the relevant sections of the survey to vastly reduce time and errors for schools in completing the survey. There is a module on Annual National Assessments (ANA). This module include amongst others the recording and reporting on the learners` achievement from the ANA.
assessment. It includes learner registration forms and mark schedules. The captured marks are automatically converted into percentages and levels. The marks are also analysed per subject, gender and language. SA-SAMS also have a module on Financial Assistance which is a fully integrated package that assists all schools with their accounting practices. The financial assistant includes functionalities to do daily finances such as petty cash and cheque payments, receipts and banking (Sinko & Lehtinen, 1999). The module also assists with month-end bank reconciliations and maintenance of the budget. There is a module on Curriculum related data which includes among others the recording and reporting on the academic progress of learners. Here, learners and teachers are allocated subjects and placed into class combinations. Evaluation cycles are set up with tasks needed for reporting at the end of each term. After marks were captured, schedules can be printed per subject, class and grade. There is also a functionality to assist educators with the analysis of the marks. The final product of all these is a printed report for each learner.

There is a module that deals with Timetabling; this is a new automated timetable that is aimed at solving timetable problems for both high and primary schools. There is a module on Physical Resources. This module helps to catalogue the learner support material and can be distributed to educators to assist with the school retrieval system. Reports can be printed to indicate the number of books per subject, grade and class. School’s fixed assets can be catalogued according to specifications and be available for asset management. The school’s physical resources that are captured are available for reporting. The information stated above, gives one a picture that the SA-SAMS was a well thought instrument that was to make life for educators, principals, administration assistant and the school community at large easy and make school administration and management easy. This research was done to see as to whether a good ITC instrument like SA-SAMS is able to achieve intended results. This study gives the other side of what is actually happening. One may say the intentions are very good but we will look into the practicality. This study seeks to answer a question on whether the SA-SAMS is achieving what was initially intended for it to achieve.

Method
Participants
The targeted population comprised of educators, administrative assistants and principals of schools in Kgetleng River Area Office (AO) of the North West province. The OA has three clusters named: Elands, Madikwe and Silverkrans. The total number of learners in these schools is 24,301. The AO has 26 primary schools with the total number of learners being 14,300 and 21 secondary schools with the total number of learners being 11,700. Participants were 40 administration assistants, educators and principals of schools with ages ranging between 21 years and 55 years since it was impossible to consult all people affected. The reason for having educators, administrative assistants and principals is that they are all directly affected by the use of SA-SAMS in schools. Their inputs are seen to be more relevant and informed than views of other stakeholders since they are the ones who are physically involved in the undertaking of the school management and administration. It is worth mentioning that educators serve two purposes. In this study they are seen as educators in class compiling class
lists and arranging and compiling marks, on the other hand they are seen as SGB members since some of them represent educators in the SGB meetings. Participation by all individuals was voluntary because the purpose of the study was clearly explained to all possible participants. All questions and queries were addressed to their satisfaction. Examples of questions asked included (a) “... will you put my name in your report?” (b) “... Will you report what I say to the department of education?” and so on. Following this process, it was indicated to the participants that if they so wished they could decline to participate.

**Instrument and procedure**

In this study both qualitative and quantitative methods of collecting data were utilized. In essence this was a mixed methods study. It is averred that the goal “…of mixed methods research is not to replace either of these approaches but rather to draw from the strengths and minimize the weaknesses of both in single research studies … ” (Johnson & Onwuegbuzie, 2004, pp. 14 - 15). In a similar vein, it has been pointed out that when the two methods are used in combination, the weakness of one could be balanced by the strength of the other (Breakwell& Millard, 1995). The aim of utilising both qualitative and quantitative methods here was to use these as some form of triangulating findings. This means that one method was used in some aspects of the study to verify and corroborate participants’ assertions and views in the other method. A questionnaire comprising two sections was used to collect data.

The first section requested the participants to provide biographical data in terms of age, gender, highest academic qualification and work experience. The second section determined the views of administrative assistants, educators and principals on whether the SA-SAMS really help to make administration and management of the school stress free. For example, participants were given definitions on SA-SAMS and what it entails. The definitions were obtained from SA-SAMS literature (Department of basic education). Which defined SA-SAMS as“… an acronym for South African School and Administration Management System”. The researcher was able to identify that some of respondents were not well versed and as such decided that interviews should also be used for them to be able to express their views. As a result interviews were used to corroborate information in questionnaires. Questions asked in the interviews were asked in such a way that everyone was at ease in responding. . Initially face validity was established by giving the questionnaires to two academics who informed us to change some questions. For example, an initial statement was: Do you think SA-SAMS is user friendly? This statement was changed to read: Do you think that AAs and principals should be trained and that will make SA-SAMS achieve intended outcomes?

**Results**

**Biographical data**

Participants were 15 administrative assistants, 10 educators and 15 principals.

**Table 1:** Biographical information of the participants (N = 40)

<table>
<thead>
<tr>
<th>Category</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Table 1 shows the biographical data that the participants were requested to provide. It may be observed from the table that the majority of participants were women (65%). Participants’ ages ranged between 20 years and 55 years. The table further reveals that the majority (38%) of the participants have a diploma qualification. It is worth noticing that most of the teachers (80%) had teaching experience of 10 years or more. It is also important to note that (80%) of AAs has administration experience of 5-9 years which could be seen as a contributory factor in the results received from all respondents. One other interesting issue to notice is that 80% of AAs have an experience in schools that is less than 10 years and amongst them all, there is no one who has experience that is over 15 years.

**Reflections on SA-SAMS**

Participants were requested to indicate whether they agreed with statements on SA-SAMS. Table 2 shows the frequency distribution and percentages of the participants in terms of their reflections on SA-SAMS and its importance on administration and management of schools. It is interesting to note that principals since 14 (93%) were of the opinion that they understood the value of SA-SAMS. The same can’t be said about 8 educators (80%) of them were of the
opinion that they did not understand the worth of SA-SAMS. It is important to also notice that 93% AAs are of the opinion that they always understand the SA-SAMS instructions. On the other hand 6 principals (40%) stated that they did not understand the instructions of the homework. The picture painted here is that educators know very little about SA-SAMS. What is catching is the response from educators whereby 80% of them believe that SA-SAMS is important for the management and administration of the school. From the responses, one can deduce that the respondents are in unison that SA-SAMS improve the administration.

Table 2 Frequency distribution and percentages in terms of reflections on SA-SAMS as a tool for administration and management in schools.

<table>
<thead>
<tr>
<th>SA-SAMS</th>
<th>Yes/No</th>
<th>Educator</th>
<th>Principal</th>
<th>AAs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N (%)</td>
<td>2(20)</td>
<td>14 (93)</td>
<td>15 (100)</td>
</tr>
<tr>
<td>1. I understand the value of SA-SAMS</td>
<td>No</td>
<td>8 (80)</td>
<td>1 (7)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>2. SA-SAMS is important for the management and administration</td>
<td>Yes</td>
<td>8 (80)</td>
<td>15 (100)</td>
<td>15 (100)</td>
</tr>
<tr>
<td>of the school</td>
<td>No</td>
<td>2 (20)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>3. I always understand the instructions of SA-SAMS</td>
<td>Yes</td>
<td>3 (30)</td>
<td>9 (60)</td>
<td>14 (93)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>7 (70)</td>
<td>6 (40)</td>
<td>1 (7)</td>
</tr>
<tr>
<td>4. I am capable and can help anybody on the use of SA-SAMS</td>
<td>Yes</td>
<td>1 (10)</td>
<td>4 (27)</td>
<td>13 (87)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>9 (90)</td>
<td>11 (73)</td>
<td>2 (13)</td>
</tr>
<tr>
<td>5. My school’s administration and management has improved</td>
<td>Yes</td>
<td>5 (50)</td>
<td>9 (60)</td>
<td>15 (100)</td>
</tr>
<tr>
<td>due to SA-SAMS</td>
<td>No</td>
<td>5 (50)</td>
<td>6 (40)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>6. It is my duty to know how to use SA-SAMS</td>
<td>Yes</td>
<td>4 (40)</td>
<td>13 (87)</td>
<td>15 (100)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>6 (60)</td>
<td>2 (13)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>7. SA-SAMS help the school to run smoothly</td>
<td>Yes</td>
<td>5 (50)</td>
<td>13 (87)</td>
<td>6 (40)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>5 (50)</td>
<td>2 (13)</td>
<td>9 (60)</td>
</tr>
<tr>
<td>8. SA-SAMS is a burden to those who use it at school level</td>
<td>Yes</td>
<td>9 (90)</td>
<td>10 (67)</td>
<td>14 (93)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>1 (10)</td>
<td>5 (33)</td>
<td>1 (7)</td>
</tr>
<tr>
<td>9. There is no need for SA-SAMS</td>
<td>Yes</td>
<td>7 (70)</td>
<td>2 (13)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>3 (30)</td>
<td>13 (87)</td>
<td>15 (100)</td>
</tr>
<tr>
<td>10. SA-SAMS is good for schools</td>
<td>Yes</td>
<td>5 (50)</td>
<td>13 (87)</td>
<td>10 (67)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>5 (50)</td>
<td>2 (13)</td>
<td>5 (33)</td>
</tr>
</tbody>
</table>

To corroborate the “Yes” and “No” responses interviews were utilised to get the exact views of respondents. It was during these interviews that a clear picture was painted on whether SA-
SAMS really make administration and management in the schools stress-free. During interviews, educators indicated SA-SAMS as a very good tool for enhancing administration in schools. They maintained that the good thing about it is that it is all-encompassing and if all stakeholders knew how to use it, school administration will be a very simple task (Lim, 2002). Educators indicated that they saw SA-SAMS as a very good tool since through it, the issuing of learner report forms will not be a challenge since report forms will be computerised, therefore saving educators’ time and also allowing them to catch up with their work. Principals on the other hand appreciated SA-SAMS but with reservations. Principal X from a secondary school with a large number of enrolled educators indicated that his AA always complained about the time the AAs spent at SA-SAMS workshops. He was supported by another principal from a primary school who indicated that “…my school is small and as such money supplied by the department is little…all the money for the school is used by my AA attending the workshops”. To principals, the biggest concern was that AAs attended workshops at a common place. As a result, there are expenses that the schools have to cater for. Principal C from a farm school was totally not impressed with SA-SAMS. He believed that the old order was good since there was no travelling to the circuit office as frequent as it is now happening. He indicated that “…farm schools have a very low enrolment, travelling to circuit office for a whole week at R500 per day leaves my school with no money at all; I end up using my family resources for the school”. What I gathered from principals was that the intentions of SA-SAMS are good but the way in which it is rolled-out has a strong impact of the schools’ finances.

Educators on the other hand indicated that they appreciate SA-SAMS but there are still lots of challenges with it. The biggest challenge according to educators is the mark sheets. Educators maintain that there is no communication between subject advisors and people responsible for SA-SAMS. Educators are of the view that they always go for workshops and subject advisors give them mark sheets to record the marks that will ultimately lead to the learner passing or failing. The biggest concern is that what they record does not in many instances correlate to what SA-SAMS expect and as a result learner marks are tempered with. In some instances, the SA-SAMS deny learners some marks and in other instances learners’ marks are inflated by SA-SAMS. During exam times, educators feel that SA-SAMS does them a disfavour in that ultimately they end up using the old method to make report forms for learners.

Administrative assistants on the other hand appreciate SA-SAMS as a tool for enhancing school administration. On the other hand there are concerns that they raise. Amongst others, they complain about lack of consistency. Respondent B stated that “…it is a lot of work typing class lists…it frustrates when those lists just disappear and you are expected to retype them”. These sentiments were supported by respondent V who stated that “…the patches that they sent through are always faulty because during our next meeting with them they remove them and put in new ones and the information that we had typed in is lost”.

Discussion and Recommendations
The introduction of SA-SAMS in the South African schools was done with good intentions. When one looks into all the modules that it covers, one is able to see that it was meant to make school administration easy (Singh & Manser, 2002). The unfortunate thing about its
implementation is that there are flaws that make it not to appeal to all stakeholders. An example is that at the end of the year, some schools were unable to give out learner reports because learner marks were either inflated or reduced leading to a situation whereby the marks appearing on learner reports were not the marks for that learner. There is an issue on skills in SA-SAMS. There is a doubt that even people from the district office are not well skilled in its use. This is seen in cases whereby in the workshops they are unable to help the AAs on some issues (Ndimande, 2009). One may recommend that at the end of every year, subject advisors should meet with people responsible for SA-SAMS with the aim of planning for the following year. During their meeting, they should agree on mark sheets since failure to do this leads to problems when schedules are made and marks entered into the SA-SAMS are not the same as what the SA-SAMS expects. One may also recommend that the provincial department should make SA-SAMS known to all school community members, that is, teachers, principals and AAs. This knowledge will help in instances whereby AAs are on sick leave for a long time (Jabaka & Danbala, 2014). One may also recommend that heads of departments should attend workshops with AAs so that they are able to head their departments with full knowledge of what SA-SAMS requires of educators, this will also help in encouraging good relations between educators and AAs. The workshops should not be for more than three days since travelling expenses becomes too high (Smeets, Mooij, Bamps, Bartolomé, Lowyck, Redmond, & Steffens, 1999).

Limitations
It has to be stated that even if the sample of this study was randomly selected, the results presented here are in no way meant to be generalised to all schools in the North West province for instance. This is said since we are mindful of the fact that schools may be in the same province but conditions in those schools cannot be the same. It is worth pointing out that SA-SAMS was brought about with the aim of solving the problems that has been there in the administration of schools and it is there as a solution. The best that stakeholders can do is to embrace it and make schools better administered. SA-SAMS may be seen as a new thing in our education system and as such there will be challenges when it is implemented hence this paper may not be seen as comprehensive in any way. Because of this, the researcher’ aim was to illustrate how stakeholders feel about the use of SA-SAMS and if they have knowledge of it. This research I think shed light to the use of SA-SAMS in our schools and how knowledgeable stake holders are.

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Can the interface between EndNote, Discussion Forum and Turnitin come to the rescue: students’ reflections?

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Abstract
This article presents a critical action research of university postgraduate students who used EndNote, Discussion Forum and Turnitin software to conduct their research projects. Observation of Discussion Forum and Turnitin submissions, one-to-one semi-structured interviews and reflective activities were used for data production/generation. This article concluded that although EndNote, Discussion Forum and Turnitin did not help all students to avoid poor referencing, superficial writing and the act of plagiarism but they did scare the students away from any obvious act of plagiarism and became aware of technology as the servant not master. Grounded analysis was used to generate four themes for this study. This study tried to explore the interface (relationship) between EndNote, Discussion Forum and Turnitin software from students’ reflections. Purposive and convenience samplings were used in selecting the most accessible postgraduate research projects for twenty one (21) students. The twenty one students were involved in Bachelor of Education Honours research projects. This article consequently recommends that formal training of students to use these three resources (technologies) should be conducted before the research projects begin.

Keywords: Discussion Forum, EndNote, interface, research project, students’ reflections, Turnitin.

Introduction
Students seem to be struggling with academic writing (poor referencing, superficial writing and issues of plagiarism) and most universities (higher education institutions) have introduced different resources (technologies) to address this challenge. Most of these institutions have introduced EndNote or similar software to help students with citation and referencing of their academic work. They have introduced Learning Management System (LMS) with a Discussion Forum which allows students to discuss their research projects and share their ideas with fellow students (reflections/critiques). They have also introduced Turnitin to help students to avoid the act of plagiarism which is becoming common these days because of attractive digital technologies that come with open sources of information. Therefore, it is for this reason that the next section presents and discusses issues of EndNote, Discussion Forum and Turnitin software as used for academic work by different higher education institutions.

Students’ reflections on discussion forum, turnitin and endnote
Student teachers’ reflections have been an important question in education since Zeichner and Liston (1987), Valli (1992) and others supported Dewey’s (1933) work on the importance of students’ reflections on their teaching practices and research projects/practices. The importance
became evident in a qualitative interpretive study conducted by Pedro (2005) on five student teachers who constructed their own meaning of reflective practices as they informed their teaching/research practice. The study reveals that opportunity for reflection is very important because it encourages self-reflection, verbal reflection and written reflection among other important factors that promote critical thinking. In short, these student teachers were able to involve themselves in introspection; communicate with other experienced teachers on identified problems that were affecting their teaching/research; and also record their learning to inform their future practices. The results of this study concurred with another study that was conducted by Kehdinga (2014) which revealed the importance of personal elements, social elements and political elements in any successful reflection on curriculum, especially as it encourages the theorising processes.

Yang (2009), added that if one needs an interesting platform for reflection to promote critical thinking one has to use a relevant soft-ware resource (such as a Discussion Forum) and learning theories (ideological-ware resources). The study involved forty-three student teachers who had reflected on their English lesson. This suggests the importance of a strong unit between the ideological-ware resources that need to be identified in any learning environment in order to identify relevant hard-ware/soft-ware resources (such as EndNote and Turnitin). Learning is a function of ideological-ware resources (Khoza 2013a). A resource is defined as “any person or thing that communicates learning” involves hard-ware (HW), soft-ware (SW) and ideological-ware (IW) but is dominated by IW that identifies relevant HW/SW resources (Khoza, 2012, p. 75). As a result Yang (2009) used the influence of reflection-in-action as an ongoing reflection on their practice and reflection-on-action as a planned reflection guided by education theories that support the Discussion Forum (HW/SW resources) in education. These concepts may help student teachers to reflect on their experiences before, during and after their practices. Simplifying the reflection language may help student teachers to achieve critical reflection while they are using a Discussion Forum.

**Online Discussion Forum**

Online synchronous discussion also known as an online chat or chat-room is an online resource used to conduct a real time discussion from different locations, the same location or from both of these conditions. According to Holmes and Gardner (2006) online chat promotes effective interaction and collaboration between students as well as between students and their facilitators. A study conducted by Bowler (2009) concludes that students enjoy the use of online chat in learning because their queries are answered quickly and those who are shy to contribute in the face-to-face discussion can contribute and participate in the online chat. As much as they enjoy the online chat they do not want it to replace the face-to-face discussion which has more social elements than the online chat. However, the same study reveals that the online chat is not effective if one has large groups. This suggests that online chat only supports face-to-face activities instead of trying to replace them because face-to-face discussion is not affected by the size of groups. As a result Lytras, Gasevic, De Pablos and Huang (2008) believe that online chat has to enhance face-to-face discussions. On the other hand online asynchronous discussion and online Discussion Forum is an online resource used to conduct a threaded
discussion (not real time) from different locations or the same location. A study conducted by Macdonald (2006, p. 47) concludes that online Discussion Forum “presents opportunities to develop independent self-directed learners”. Facilitators need to build students’ confidence because “learning online requires students to study more independently than they may previously have been used to” (Macdonald, 2006, p. 115). According to Shukor, Tasir, Van der Meijden, and Harun (2014), Discussion Forum sometimes promotes low-level reflection if students are allowed to only share and compare opinions. But when facilitators control the discussion by promoting argumentation it promotes high-level of knowledge construction. This suggests that facilitators have to be online in order to prepare students for online discussions that promote high-levels of knowledge construction. Training of facilitators is becoming one of the important issues so as to encourage students and help them where there is a need without sending them to technicians (Francis, & Roux, 2011). This may include using emails so that students become familiar with online discussion environments because emails work in a similar way as the online discussion. This process has to take place before students’ projects are uploaded into Turnitin.

**Turnitin**

Plagiarism problems led to the development of the Turnitin program by John M. Barrie when he was a graduate student at the University of California (Berkeley). The program was developed to discourage students from plagiarising their fellow students’ submitted ideas (Ison, 2014). By the year 2006, Turnitin was used by about six thousand academic institutions and sixty thousand students’ assignments were uploaded into the database daily (Glod, 2006). This suggests the importance of Turnitin in helping students and academic institutions become aware of issues of plagiarism as witnessed by the following studies.

A study conducted by Macdonald and Carroll (2006) on the approach to plagiarism suggests a holistic approach with three main principles to be used as a framework for Turnitin usage. The principles indicate that it is important that students receive the appropriate information and develop the necessary knowledge with skills; assessment design is such that plagiarism is reduced; and the usage has appropriate policies, procedures and guidelines in place to deal with any issues that arise. When these principles were used by Rees and Emerson (2009) in a case study that explored the extent to which the use of Turnitin transformed assessment practice at Massey University, it proved to be unclear in terms of coherence although it was useful. However, Coren (2012, p. 171) recommends the Theory of Planned Behaviour (TPB) as the solution to the usage of Turnitin in order “to predict the target behaviour of whether faculty would speak face-to-face with a student suspected of cheating”. While TPB seems to be important it has many difficult concepts to apply which many confuse most of the users who are not familiar with statistics. This suggests that there is a need for a clear and coherent framework for the usage of Turnitin by academic institutions.

While there seems to be many studies conducted on Turnitin these studies recommend further investigation in order “to understand how to use the self-service approach more effectively to improve referencing and citation, and narrow the gap between student expectations and
university standards (Rolfe, 2011, p. 701; Kiriakidis, 2013) as well as to understand how to use technology to avoid plagiarism by educating to avoid, instead of detecting to punish (Bensal, Miraflores, & Tan, 2014; Carbone, Schuhmacher, de Raadt, & Johnson, 2013). In trying to help students with referencing and citation, most education institutions have introduced EndNote.

EndNote
A study conducted by Harrison, Summerton and Peters (2005) recommends a number of EndNote advantages that serve as solutions that help students in dealing with referencing and citation. One of the advantages is that EndNote “improved management of references and the use of those references within citations and lists of references…” (p. 37). While studies are becoming advocates for EndNote, Kendall, (2005) emphasizes the need for planning and training of both facilitators and students before they use it in order to enjoy it. Today students seem to enjoy online environments where they get information faster through search engines. As a result, referencing and citation seem to challenge them and hence the need for EndNote (Brown, Dickson, Humphreys, McQuillan, & Smears, 2008). Based on these claims from different studies, I decided to conduct this study in order to provide some solutions in the use of EndNote, Discussion Forum and Turnitin from a South African context since there is no other study that was conducted in this context. The combination of the three technologies produces the interface which is the phenomenon for this study. It is also important to notice that none of the studies in the use of these three technologies used a critical paradigm, action research and a reflective activity method. This suggests a gap in the literature that needs to be addressed.

Research purpose/objective and research questions
This article intended to explore/understand postgraduate students’ reflections towards the interface (relationship) between EndNote, Discussion Forum and Turnitin software. This article may help higher education institutions to answer the question of ‘postgraduate students’ reflections towards the interface (relationship) between EndNote, Discussion Forum and Turnitin software which may address poor referencing/citation, superficial writing and the act of plagiarism.

The data production was organised to respond to the following research questions:
• What is the interface (relationship) between EndNote, Discussion Forum and Turnitin software when it is addressed from postgraduate students’ reflections?
• Why do postgraduate students have particular reflections towards the interface (relationship) between EndNote, Discussion Forum and Turnitin software?

Research design and methodology
This is a critical action research of twenty one (21) South African university postgraduate students from one university and one department. The main purpose of the critical paradigm is to change/transform the phenomenon which in turn may transform the participants. Action research deals with a specific context, which may not represent the whole population, with an aim of generalisation but transferability is possible. It is subjective but in-depth, open-ended,
exploratory and transformative in nature; it is conducted on entities in their natural settings where teachers research their practices with the aim of improving their teaching situation (McNiff, & Whitehead, 2009). A combination of the critical paradigm and action research is important for this study because it is more transformable, holistic, explorative and contextual in its nature and driven by its important main purpose to produce rich descriptions of teachers’ improvement of their practices through their reflections (Lisle, 2010). Reflective practice is the most important tool that transforms teachers if they reflect on their own practices. The study use a critical action research process in order to help the participants to learn to plan, implement, observe and reflect on their practices in order to improve their practices (McNiff, 2013; McAteer, 2013). However, Hakim (2000) feels that this process is not good in education because it may take place even without following a scientific research process and be influenced by opinions rather than facts. But, this study is following a scientific research approach.

**Sampling**

Purposive sampling was used in selecting the most accessible or qualifying twenty one students doing research projects from a South African university’s Bachelor of Education Honours (postgraduate) Curriculum Studies department to answer the research questions through observation of Discussion Forum and Turnitin submissions, one-to-one semi-structured interviews and reflective activities. Purposive sampling is good in selecting a specific group with specific unique qualities (Khoza, 2013b). The university is divided into different colleges, departments and disciplines where one of the disciplines is Curriculum Studies. Curriculum Studies is the only discipline that has a group of twenty one Honours students who were using the three technologies (resources) in question. Therefore, this group was purposively selected by default since it has all the qualities of the required group for this study. A research section of students’ proposals was selected to generate data for this study through the three research methods that are indicated in the next section. As a specialist in Curriculum Studies and Educational Technology at another South African university, this study may also help me to reflect on my practice and be able to transform/improve my practice. The names were not revealed because of ethical considerations, as suggested by Cohen, Manion, and Morrison (2007). Informed consent and ethical considerations were acquired in terms of confidentiality, voluntary participation, and withdrawal when they felt the need, benefit as well as anonymity.

**Data production/generation and analysis methods**

Methods used in this study for data generation/production (sources of data) were observation of discussion forum posts, Turnitin submissions, one-to-one semi-structured interviews and reflective activities. The literature section of the students’ research proposal was first observed online (Discussion Forum) and students were interviewed using one-to-one semi-structured interviews. The students were asked some questions to justify what they sent to the discussion forum. The observation and interviews reveal that not all students were using EndNote for references and citation. The students were also given a reflective activity with four main issues to reflect on (as the strength of action research). The four main issues were on EndNote, Discussion Forum, Turnitin and relationship between the three technologies. Observation was
used two times because it is good if one wants to get or generate first-hand information (Khoza, 2014). The one-to-one semi-structured interviews were conducted two times per student for about thirty minutes. I used the interviews because I wanted to add some sub-questions in order to probe for more data and rephrase the questions where necessary to avoid participants with a tendency of avoiding certain questions (Khoza, 2014). I use reflective activity two times in order to give them free space to reflect on their work without being observed.

The multiple sources of data were used for the purpose of enhancing authenticity of data and achieving measures of trustworthiness (Khoza, 2013b). An audio-tape was used to record the interviews for ease of transcription. This was done to verify that the data gathered was consistent across the sources of data, that triangulation (using multi-methods), transferability (findings are presented in clear method that allows the findings to be applicable in any context that is similar to that of this study), dependability (evidence including direct quotations is given to allow the readers to evaluate the findings), conformability (I described the steps in details to make sure that my position was not influencing the findings) and credibility (through conceptual framework) were supported and to ensure trustworthiness of the findings as the important process of authenticity (Ozerbas & Ucar, 2014).

In terms of data analysis, this study used guided analysis where themes that emerged from the four main issues (EndNote, Discussion Forum, Turnitin & interface) and data were modified through interaction with data (Khoza, 2013b). The findings are exploratory in nature; four themes were generated from the four main issues/technologies of this study. Both deductive and inductive reasoning approaches were used for analysis.

Results/findings
Table 1 (results/findings) shows the participants’ qualities.

<table>
<thead>
<tr>
<th>Participants</th>
<th>Years of experience</th>
<th>Subject</th>
<th>Grade</th>
<th>Age</th>
<th>Gender</th>
<th>Race</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Participant 1</td>
<td>19</td>
<td>Mathematics</td>
<td>10</td>
<td>43</td>
<td>Female</td>
<td>White</td>
</tr>
<tr>
<td>2. Participant 2</td>
<td>19</td>
<td>Business Studies</td>
<td>11</td>
<td>44</td>
<td>Female</td>
<td>White</td>
</tr>
<tr>
<td>3. Participant 3</td>
<td>10</td>
<td>English FAL</td>
<td>10</td>
<td>32</td>
<td>Female</td>
<td>White</td>
</tr>
<tr>
<td>4. Participant 4</td>
<td>05</td>
<td>Maths Literacy</td>
<td>10</td>
<td>28</td>
<td>Female</td>
<td>African</td>
</tr>
<tr>
<td>5. Participant 5</td>
<td>16</td>
<td>Mathematics</td>
<td>02</td>
<td>37</td>
<td>Female</td>
<td>White</td>
</tr>
<tr>
<td>6. Participant 6</td>
<td>10</td>
<td>Physical Science</td>
<td>12</td>
<td>33</td>
<td>Female</td>
<td>Indian</td>
</tr>
<tr>
<td>7. Participant 7</td>
<td>07</td>
<td>Natural Science</td>
<td>08</td>
<td>31</td>
<td>Male</td>
<td>African</td>
</tr>
<tr>
<td>8. Participant 8</td>
<td>08</td>
<td>Mathematics</td>
<td>08</td>
<td>30</td>
<td>Female</td>
<td>African</td>
</tr>
<tr>
<td>9. Participant 9</td>
<td>08</td>
<td>Physical Science</td>
<td>10</td>
<td>29</td>
<td>Male</td>
<td>African</td>
</tr>
<tr>
<td>10. Participant 10</td>
<td>23</td>
<td>English FAL</td>
<td>08</td>
<td>47</td>
<td>Female</td>
<td>African</td>
</tr>
<tr>
<td>11. Participant 11</td>
<td>26</td>
<td>Life Sciences</td>
<td>09</td>
<td>49</td>
<td>Female</td>
<td>African</td>
</tr>
<tr>
<td>12. Participant 12</td>
<td>10</td>
<td>Life Skills</td>
<td>06</td>
<td>35</td>
<td>Female</td>
<td>African</td>
</tr>
<tr>
<td>13. Participant 13</td>
<td>05</td>
<td>Computer A. T.</td>
<td>10</td>
<td>26</td>
<td>Female</td>
<td>White</td>
</tr>
</tbody>
</table>
Table 1 indicates participants’ given names, years of teaching experiences, subjects taught by the participants, Grades in which the participants are teaching, ages of participants, gender and race. The participants’ names start from Participant 1 to Participant 21 because they were twenty one. The years of experiences range from one year to twenty five years. The subjects taught by the participants were Mathematics, Business Studies, English First Additional Language, Mathematics Literacy, Physical Science, Natural Science, Computer Application Technology, Life Skills, Life Sciences, English Home Language, Accounting, Engineering Graphic Design (EGD) and Technology. The participants taught from Grade 2 to Grade 12. The participants’ ages range from twenty three to forty nine. The gender column indicates that there were nineteen female participants and two male participants. There were six White students; two Indian students and the rest of the students were African students.

**Theme one: EndNote**

In the beginning of the year all the participants attended a workshop on EndNote which was offered by the university through the university librarians. Of the twenty one participants only five participants (Participant 3, 4, 9, 13 & 14) used EndNote for their projects. The five of them happened to be the younger ones except Participant 3. In terms of race, one was a White female and others were African students (1 male student & 3 female students). These five participants indicated that ‘I have to force myself to learn EndNote in order to concentrate on the content of my projects and let EndNote take care of my citations and references… but it is not easy to learn this programme because even if you are willing to learn it you need to have time to create a library which also takes a long time if projects are due…’ (Participant 3 and the other four users agreed). ‘I started my EndNote library by means of manual processing where I had to spend my weekend entering/tying the references one by one (Figure 1) and later I learned to copy and paste them from my other projects and now I even download the online articles from Google Scholar straight into the library (Figure 1)... I am enjoying it now although it was difficult in the beginning but I had to tell myself that I am investing into my future...’ (Participant 9).
While the other four participant users agreed with Participant 9, Participant 14 strongly agreed and added that ‘EndNote like any other technology favours those who are prepared to invest in their future with technology... When I learned it I knew it would be difficult but together with my other four colleagues we decided to work as a team of five members whose aim was to do things for the future which is always difficult and is only managed by few individuals because most people always look for short cuts and hand-outs... I have noticed that other classmates who are avoiding technology are struggling because they get frustrated when the lecturer talks about technical errors that affect their projects... as difficult as it was when we started but today our libraries are well resourced and we are now only ending new references... it is also much easier if the references are online... but we do not just download them into the library and leave them because they may not have all the required details. We always check them after they have been downloaded…’

On the other hand those who did not use EndNote indicated that ‘EndNote is not easy for me because I do not have all relevant references that are ready for my projects but I have to search for them for each project... so to type them again to create a library will delay my submission... yes, these younger ones enjoy it because they may not have family responsibility... for us we have to do these projects in order to finish the projects and pass in order to get our qualifications... we do not need a solution for the future because projects are due now but for those who are investing for the future it means that their future is shaped by education which is not a case for us... for us it is about getting the qualifications…’ (Participant 12). While most of those who do not use EndNote agreed with Participant 12, Participant 1 and 2 even added to this where Participant 1 indicated that ‘technology is putting a pressure on us as mathematics teachers because people think that technology is in line with Mathematics, so if
you teach Mathematics you are expected to excel in using technology to do your projects where EndNote is one of them... and our lecturer used Mathematics teachers as an example where he said that he did not expect Mathematics teachers to struggle with round brackets in their citation because brackets are common in Mathematics where they always remove brackets when they do simplification... knowledge of technology is not about subjects that we teach but technology challenges even computer teachers... so it becomes unfair to us to be judged like this…’

The findings seem to agree with what Harrison, et al., (2005) indicated as the improvement of reference management in their study when one uses EndNote. The five participants indicated that their management of citation and references has improved as a result they concentrate on the content of what they are writing while EndNote is helping them with the technical part of citation and reference lists. The findings further agree with Kendall (2005) who has indicated that one of the challenges in using EndNote is that one has to plan first before the usage. The five participants who used EndNote for their studies indicated that they had to invest in EndNote in planning their future even if it was difficult at first. Planning is always about the future because one has to plan in order to implement. But if one is defining things for the present there is no time for planning because the present is always with us and it needs us to act or implement without planning if we did not plan for it in advance (Pinar, 2004). Perhaps the findings witness what Prensky (2001) termed as future content (activities that are dominated by digital technology) for digital natives (young generation – students) and legacy content (activities that are not influenced by technology) for digital immigrants (adult users of technology – older generation of teachers). His point is becoming important to be noted because the five participants who used EndNote were the five youngest of the twenty one participants. The older ones indicated that they are not worried about the future investment on technology because they still use the traditional methods of doing things for the present (pass their qualifications). It appears that when one is investing EndNote it becomes easy for one to enjoy online Discussion Forum because it connects one to people who may help one to improve one’s work.

Theme two: Discussion Forum
Discussion Forum had six active members (the five for EndNote plus Participant 15). Although the lecturer made it compulsory for students to submit to the Discussion Forum before it goes to Turnitin other members were not active. Participant 20 indicated that ‘it is difficult for us to finish our projects on time because we are working full time and study part time and lecturers do not consider this... for the Discussion Forum to be compulsory is not fair to us because we find it difficult to submit in time and becomes worse if we have to send them to the Discussion Forum first before we send them to Turnitin and then final submission... for me technology is a waste of time because we do well with book/articles only... Although it was in late 90s I completed my junior degree without it... other universities are still doing well without it...’ Participate 10 added that ‘she is right that technology should not be compulsory because when we attend other modules from other departments lecturers do not even know these technologies and they do not use them at all... it is only in this department where we have to use these
technologies…’ As a result of this attitude towards technology participants who were not active had poor results and Participant 10 even failed the research proposal because she did not send it to the Discussion Forum in order to get some contributions from fellow students and the lecturer.

However, the six active participants took advantage of the opportunity and kept both the lecturer and fellow students busy for seven days a week and twenty four hours a day because their mobile phones were always connected. ‘…Discussion Forum is one of my tools that I use if I want to get distinctions in my studies… even in my B.Ed degree none of the modules is below 75%… and for the research proposal I have 92% and I am expecting more than 80% for my final project at the end of the semester… in order to get the 92% I had to send my proposal to the Discussion Forum (Figure 2) and invite the lecturer with others lecturers who had access to the Discussion Forum and my classmates to critique my proposal before I sent it to Turnitin… I had five critiques from the lecturers and nineteen from my classmates… I have learnt to read all the comments from others and use all those that are relevant to my project in order to improve… commenting to other students’ projects have helped me to understand myself and academic work…’ (Participant 14 and the other five active students agreed her that they also do the same).

The above findings indicate that the six active students managed to use discussion Forum to their advantage in doing their projects. When they submitted their projects for the first time they came back with many comments from others (Figure 2). A second submission showed improvement as they had few comments from others and the last projects came back from others with no or very few comments. This suggests that Discussion Forum promotes active students and deeper learning. When active students check their projects through Turnitin, they
get less than 10% of similarity after they have used Discussion Forum with EndNote for the five of them. However, other comments from students did not come with any reviewed attachments except superficial comments that were praising the authors. The 6 active participants were good in getting these reviewed attachments from those students who had a tendency of avoiding the reviewing process by sending one message. This suggests that awareness of what one’s need is very important if the aim is about the future.

**Theme three: Turnitin**

On the other had students who were not active mostly had more than 10% similarity like that of Participant 10 who had 56% (Figure 3).

![Figure 3: Final project by Participant 10](image)

The findings indicate that students who were not active in taking advantage of Discussion Forum to get contributions from others in order to become aware of the gaps that needed to be addressed in their projects, produced poor projects.

**Theme four: Interface (implications with conclusion)**
The interface (relationship) between EndNote, Discussion Forum and Turnitin is the learning platform or environment created by using a combination of the three technologies or in some cases two of the three technologies (Figure 4). The interface seems to be a solution in the context of education where most students are blamed for poor referencing, superficial learning and plagiarism. The findings indicate that the interface promotes active students who are able to understand, analyse, synthesise and evaluate other studies (literature) with an awareness of creating conducive learning environments for future investment. As a result they create their own learning platform using available technologies which are divided into three categories (hard-ware, soft-ware & ideological-ware) (Khoza, 2012; Khoza, 2013a). Students take advantage of available technologies if they understand that learning is not about hard-ware (machines/tools used in teaching like computers, mobile phones and others) or soft-ware (materials used in conjunction with hard-ware to carry/display information like computer application software, OHP transparencies and others) but it is about ideology/ideological-ware resources (learning resources that one cannot see and touch like learning theories and others) (Amory, 2010; Khoza, 2013a)
Figure 5: Bloom’s cognitive levels of active students

Understanding is the students’ ability to reflect on their experiences in order to interpret and address the tasks that are given to them by their lecturers. The understanding process leads to the process of creating (Figure 5). The process: creating process is the ability of individuals to produce something new as a contribution towards his/her field as a result of his/her interpretation of the new information together with his/her reflections from his/her experiences. Other processes that help students to become active when they interrogate their past experiences are remembering, applying, analysing and evaluation (Pinar, 2004). These processes were evident when one looks at the findings that were generated from the six participants especially Participant 14 who enjoyed sharing her reflections on her experience. These students had mobile phones (hard-ware) that were always connected to the Internet (software). As a result, they were reading other studies almost every day in order to remember what they needed (frames of reference or ideological-ware) for their projects. After remembering the frames of reference they had to understand them for effective application to the projects. Applying the frames of reference in their projects helped them to become aware of doing things for the future by analysing and evaluating everything around them in order to create new things for their future. They were able to use ideological-ware resources to invite the three technologies among other technologies to become a part of their learning environment. They even have a copy of EndNote in case one needs it for one’s laptop or computer.
The findings further indicate that age was one of the factors which may have influenced the six students to use the three technologies in order to create the interface because they were the youngest in this group (Prensky, 2001). The six students were able to read both electronic copies and hard copies of different sources because they were aware of what they needed for their studies and always think about future. This suggests that the learning interface consists of hard-ware, soft-ware and ideological-ware resources that transform students if they believe in school or scientific knowledge. Scientific knowledge is about using present situations to create what one needs for the future. One becomes aware of past, present and future activities and treats them accordingly by avoiding the habit of doing things in life (Khoza, 2014b). According to Hoadley and Jansen (2013), scientific knowledge is about the absence where one has to always look for what is still missing in the interface in order to move to the next level or improve the situation. The curriculum that favours these students is a performance curriculum where students move vertically with their studies by challenging the next level of doing things all the time (Hoadley & Jansen, 2013). Therefore, the interface from this position recommends the promotion of scientific knowledge which is always about facts and not opinions. The level of doing activities is framed by international standards. Perhaps the South African government predicted well that universities may sooner have students of this caliber when the government changed the competence curriculum (National Curriculum Statement) to a performance curriculum (Curriculum and Assessment Policy Statement) (Khoza, 2014a). This type of students are fewer now, but it looks like it will be a good idea for universities to start to work towards preparing this interface which may be compulsory in future if active students increase in number.

Universities may avoid the major weaknesses poses by Turnitin (its major strength is to stop students from copying other authors’ published ideas and rather encourages integrity in academic writing) as emphasized by Bensal, Miraflores, and Tan (2014, p. 12) that “… is the inability of the software to check citation formats (e.g., APA, MLA, IEEE, and other citation styles)… its inability to challenge students to provide sources for ideas or claims that need proof to be considered credible. Turnitin basically just finds passages that match the files in their database. When comparing the software feedback and the teacher’s feedback of the argumentative essay drafts… one may easily identify comments from the teacher that were not asked or questioned by the software”. EndNote is capable of using any referencing style including the examples indicated above which suggests that the first inability is easily addressed by the interface. According to the six active students (participants), Discussion Forum is capable of addressing the second inability because Discussion Forum helped them to send their projects to other students and facilitators to critique and make sure that all the weaker parts are addressed by the time they uploaded them to Turnitin. As a result Turnitin may only be used to generate students’ reports that indicate that the students did not plagiarise.

However, findings indicate that the majority of these participants were not in favour of this interface because they were comparing their Curriculum Department with other departments or universities that were not using these technologies. The majority of participants were offended when the lecturer tried to use their subjects in giving them some practical examples.
of things that they should use as their strengths. For example, Mathematics has many different types of brackets that need to be taught by teachers in almost all chapters. It comes as a surprise if the teachers fail to position the brackets in their projects because basic issues of Mathematics start with brackets. This suggests that these participants were framed by a competence curriculum where achievement of outcomes becomes an end on its own. The standard or level of the achieved outcomes becomes immaterial. As a result the curriculum allows everyday/general knowledge, opinions and local knowledge to influence students (Hoadley & Jansen, 2013). It is clear that this interface is not effective if the majority of these students (participants) are working under the influence of people’s local opinions which always promotes habit (as opposed to awareness) in doing things and resist change. Resisting change produces many excuses (as opposed to reasons) (Khoza, 2014b).

In opening a new debate on the interface, this study recommends the following points to be considered by education institutions:

The three technologies should be used as one compulsory unit or taxonomy in order to reduce the problems of poor referencing, plagiarism and poor engagement of academic work. This should be a first week university module on its own in order to force all students to invest in technologies because the future seems to demand technology;

Certain modules should teach the difference between the competence curriculum and a performance curriculum;

Active students should be given opportunity and incentives to mentor those that need introduction to technology;

Technical support should be accessible both off-line and online all the time to motivate students to understand their needs according to their projects;

The emphasis should be helping students to understand that as much as the technologies are here to stay, learning is not about technology but about ideology;

University staff should also be trained to use these technologies in order to improve the interest of the students;

A study should be conducted to explore the project content and the comments from students and facilitators when they contribute towards the students’ projects.

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Development of an Iterative Process Model of E-Facilitation to Support Lifelong Learning

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Abstract
Technological developments have seen a rise in the use of online knowledge exchange forums in educational, organisational and community of practice settings. One of the key challenges faced by virtual communities is cultivating and maintaining vibrant and content-rich interaction where meaningful engagement and learning take place. As part of a broader study, this paper reports on the aspect of research that sought to identify facilitation strategies which affect the frequency of knowledge contribution and quality of discourse in online communities. Multiple methods of investigation were employed: interviews and content analysis of online discussions. Garrison, Anderson and Archer’s (2000) Community of Inquiry framework informed the data collection and analysis processes. Findings indicated that facilitative strategies related to preparation, engagement and ensuring value are effective in sustaining high frequencies of interaction and content-rich discussions. A methodical combination of the findings was carried out to develop an Iterative Process Model of E-Facilitation which could be a useful tool for individuals tasked with moderating online knowledge conversations.

Keywords: Knowledge exchange; online communities; quality of discourse; organisational intranets; communities of practice; online facilitation strategies; e-facilitation model

Introduction
The proliferation of technologies that support learning through online discussions in educational, organisational and community of practice settings, has given rise to research that focuses on the nature of online dialogue and strategies which are effective in facilitating meaningful interaction. The problems that have been identified regarding online knowledge exchange relate to the quantitative dimensions of knowledge sharing: that individuals are disinclined toward taking the time to share their knowledge in online spaces, often with ‘virtual’ strangers (Kankanhalli, 2005; Wasko & Faraj, 2002). Furthermore, the qualitative dimensions of dialogue, measured in terms of critical thinking and cognitive presence in online discussions, have been identified as limited, thereby impeding the value of dialogue on learning and professional development (Garrison & Cleveland-Innes, 2005). Prior research has identified role of e-moderation as pivotal in shaping the nature of dialogue in terms of frequency of knowledge contribution and quality of discourse. This research is part of a larger study which investigated the conditions under which individuals are motivated to share knowledge in professional online discussion forums and the strategies that are effective in facilitating meaningful interaction. The purpose of this paper is to outline the process that was
undertaken to develop an Iterative Process Model of E-Facilitation which aims to support practitioners involved in facilitating online knowledge conversations for lifelong learning.

The research question that this paper addresses is:

What facilitation strategies are useful in encouraging meaningful knowledge exchange in online communities?

The objectives of the investigation were:

- To identify and characterise facilitator actions that precede meaningful online interactions
- To develop a facilitation tool that might be helpful to individuals tasked with facilitating knowledge conversations in online forums.

A Review of Online Facilitation Models

Over the past two decades, different types of facilitation models, theoretical frameworks and guidelines have been designed to assist online facilitators to moderate discussions effectively. Mason (1991) was one of the early researchers to identify and characterise online tutor roles; she placed them in three main categories – organisational, social and intellectual roles. Paulsen’s (1995) three categories for moderating educational computer conferences were similar to those of Mason. To these categories, Berge (1995) suggested a fourth category – the technical role. Several online facilitation models have been derived from the community of inquiry (CoI) work reported by Lipman (1991). For example Wegerif (2007) developed a dialogic model that reflects three dimensions: reflective, creative and caring dialogue. As Swann (2010) observes, Wegerif’s conception of reflective dialogue has strong connections with Lipman’s notion of multi-dimensional thinking in that it allows for synthesis. Creative dialogue opens up a reflective space in which issues can be explored and caring dialogue aims to draw out other’s ideas with respect. Inspired by Lipman’s Col work, Asterhan and Schwartz (2010) developed tools that provide real-time support for moderators of synchronous group discussions. Atkinson (2011) developed the Student-Owned Learning Engagement, or SOLE model of facilitation, which supports learning designers to create a community of inquiry taking cognisance of social and cultural dimensions in their e-moderating work. Her work is partly inspired by the SOLO taxonomy developed by Biggs and Collis (1982).

A widely-cited model is Salmon’s (2000) 5-stage model of facilitation, which provides direct help to the facilitator through the use of online tasks. Grounded in constructivist approaches to knowledge and learning, she views learning as an active process in which learners engage with and build new ideas or concepts based upon their current or past knowledge. The first stage in her model refers to ‘access and motivation’ – in which the facilitator welcomes, encourages reassures and provides instructions for help in case of difficulty. The second stage is ‘socialisation’ which has the objective of building effective groups in which the facilitator weaves, summarises and provides feedback while encouraging students to post and respond to others. Stage 3 involves setting up practice in online cooperation by providing structured ways of working together and encouraging participants to weave and summarise. Stage 4,
‘knowledge construction’, has the objective of enabling collaboration and knowledge construction—where the facilitator encourages the group to self-manage and provides support as necessary. The fifth stage, ‘development’, promotes reflection, critical thinking and enables the application of learning. There have been positive responses by practitioners who have implemented Salmon’s model (e.g., Churchill, 2005; Daw & Riding, 2002). On the other hand, Swann and Sevelj (2005) make the case that, in practice, some of e-moderation stages tend to be revisited repeatedly throughout the life of an online discussion, therefore a non-linear model may be more realistic. Moule (2007) questions the applicability of Salmon’s model to blended learning settings.

Vlachopoulos and Cowan (2010) report a grounded theory study of the moderation of asynchronous online discussions, exploring the processes used by tutors to facilitate discussions. They conducted three sets of interviews with e-moderators: in the first stage, the aim was to identify preliminary codes, explore them and decide on key themes. In the second stage they analysed reflective protocols and analysed transcripts from moderators and students; the third stage involved constructing a paradigm framework and discussing emergent themes with interviewees. Out of the results of their study, they developed the ‘Ring-fence Framework for E-Moderating Student Learning’. Their framework suggests that moderated online learning should be contained within an enclosed learning arena—a ring-fence—which encloses the activities of the learner and moderator. They maintain that the difference between what happens inside and outside the ring-fence should keep the arena clear for all decisions in learning to be made by the learners, facilitated by the e-moderation. Positive responses to operationalising Vlachopoulos’ framework were made by Oliviera (2008) and Brown (2008). On the other hand, Brookfield and Holst (2011) provided a critique of the framework, pointing out that it emerged from only four case studies of moderated e-learning, thus bringing its generalizability into question.

Using a collaborative constructivist theoretical base, Thormann and Fidalgo (2014) conducted a study that examined student responses to questions about online interactions and community building. They conducted content analysis of the responses and tallied frequencies of common student responses to confirm recurring trends. Out of the data, emerged four categories and ten guidelines, which they have suggested can enhance instructional design and implementation of online learning. Although the work by Thormann and Fidalgo cannot be described as a model or theoretical framework, the guidelines that they developed were developed through a process of empirical investigation and on the basis of prevalent and widely-accepted constructivist pedagogy.

The review of the conceptual frameworks, models and guidelines for online facilitation indicate investigations that have predominantly been conducted in educational environments. Learning transcends the formal educational sphere and is a lifelong activity found in organisational training programmes, corporate intranets and communities of practice, among other settings. There is a paucity of facilitation models that focus on facilitative activity that is not based in formal, educational environments. While classroom settings may lend themselves to
mandatory participation by awarding marks for engagement, online communities driven by voluntary involvement necessitate a different approach. The facilitative approach needs to take into account the factors that motivate individuals to participate in online knowledge conversations as well as the legitimacy of peripheral participation, or as some would call it, ‘lurking’. It can be argued that facilitation strategies which increase knowledge sharing benefits and decrease costs, encourage meaningful interaction.

**Theoretical Base**

In this study, Garrison, Archer and Anderson’s (2000) Community of Inquiry (CoI) framework provided the order and structural elements needed to examine quality of interaction and well as facilitator actions. The CoI framework consists of three key elements: cognitive presence, social presence and teaching presence. Cognitive presence reflects the learning and inquiry process and is defined as the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse (Garrison, Anderson & Archer, 2001). Indicators of cognitive presence helped to determine the extent to which interactions showed evidence of higher-order thinking. Social presence refers to the ability of participants to identify with the community, communicate purposefully in a trusting environment and develop interpersonal relationships by projecting individual personalities (Garrison, 2009). Teaching presence is defined as the design, facilitation, and direction of cognitive and social processes for the purpose of realizing personally meaningful and educational worthwhile learning outcomes (2001). The concept of facilitating discourse, which is an element of teaching presence, was used to characterise and classify the functions carried out by moderators of online discussions.

**Research method**

Data were obtained through interviews and content analysis of online discussions. Interviews were used to investigate facilitator strategies as well as member perceptions of facilitation effectiveness. Breadth to the study was attained by obtaining viewpoints from a variety of angles – from the perspective of students, lecturers, facilitators and conveners of communities of practice. In corporate settings, data were obtained by interviewing members of online discussion groups; several of these members also took on the role of facilitating discussions either on a topical or rotational basis. The perspectives brought about by the dual roles of their involvement in discussion groups provided rich data concerning motivating factors and facilitation strategies.

Using content analysis to examine online interaction patterns provided insights on how facilitator actions influence the frequency of dialogue as well as the quality of discourse. Transcript analysis yielded data concerning actual frequency, rather than the self-reported frequency rates generated from questionnaires. Similarly, content analysis allowed for characterisation of actual facilitator actions and identification of specific indicators of discourse quality, thus adding a measure of solidity to complement the interview and questionnaire data which was predominantly self-reported and perceptual.

Mixing the data collection techniques resulted in a balanced view of self-reported versus observed strategies.
Findings
Initiating discussion on topics that members find interesting, fruitful or exciting was found to be a role that predominates the facilitator’s tasks. Acting in the role of content expert to provide intellectual leadership and/or locating subject matter experts was found pertinent in making robust commentary and focusing attention on issues that contribute to content knowledge. The availability of content expertise and the presence of thought-leadership in discussions had a positive effect on both knowledge sharing and quality of discourse. Content experts added value to the vibrancy of discussions; the more vibrant the knowledge exchange, the higher the quality of discussions. Technical support was found to occupy a small proportion of facilitator time; logistically, online spaces dedicated to support were confined to areas such as welcome screens, help desks or frequently asked questions. Evidence of reading was found to be a significant determinant of discourse quality. When facilitators engaged with specific aspects of content, higher levels of content-rich postings ensued. Similarly, interaction with content was found to be an important facilitation function, but one which needed to be balanced with factors such as time and effort. The role of facilitator also involved creating a balance by guiding the process of members engaging meaningfully with posted content.

Authenticity was found to be an effective facilitation strategy – one in which discussions were conducted in a manner that met tangible needs and where the facilitator would authentically model appropriate responses which help set the trend in the community. The facilitator’s role included attaining a healthy balance between genuine constructiveness and cohesiveness.

Drawing in discussions especially by non-participating members was found to be an important facilitation role which needed to be balanced with the principle of legitimate peripheral participation. The facilitator takes on the role of communicating the legitimacy of non-active participation yet simultaneously deciding when and how to draw in discussions. Timeliness was found to be significant in facilitating both quantity and quality of discussions and a predictor of the vibrancy of online interaction. The timeliness of responses by facilitators was complemented by the availability of explanatory feedback; timely responses helped avoid misconceptions and keep discussions on track.

Developing the E-Facilitation Model
One of the key tasks involved in developing the model was to identify the sets of interrelated concepts which contribute to facilitating meaningful interaction – specifically, quality of online discourse and frequency of knowledge contribution. These concepts were derived from the integrated results emanating from data analysis of the survey, interviews and online discussions. In order to visualise the relationship of factors that were found to have an impact on either or both quality and quantity of knowledge sharing, as well as depict how they might relate to the facilitation function, concept mapping techniques were used. The process of concept mapping led to a meta-level identification of the generic concepts entailed in the facilitation process; these processes included preparation, engagement and ensuring value. Their relationship is non-linear and has been visually presented as an iterative cycle. It supports
the argument that facilitation strategies which increase knowledge sharing benefits and decrease costs are related to knowledge contribution frequency and quality of discourse in learning communities.

![An Iterative Process Model of E-Facilitation](image)

**Figure 1: An Iterative Process Model of E-Facilitation**

Models are useful insofar as they allow concepts to be applied to practice and provide bases from which improvements can be made and process efficacy can be enhanced. The model depicted above at its meta-level, depicts an iterative process in which preparation for interaction is made, followed by actual engagement in dialogue, followed by an evaluative review stage, the results of which iteratively lead to preparation for further discussions and a repetition of the process. A discussion of each main concept follows.

**Preparation**

Preparation includes tasks that plan and prepare the ground work for meaningful interaction. These include ensuring that members all have access to the digital technology platform and are comfortable in its use. Part of the preparatory activities include providing support in navigating the online communications space by providing an ongoing help facility whose use may diminish over time. The preparation function also includes ensuring the availability of content expertise by engaging subject matter experts who are able to contribute meaningfully to ongoing discussions for a period of time. In some instances the facilitator may take on the role of subject matter expert by virtue of being an instructor, lecturer or trainer. The availability of such individuals feeds into the vibrancy of discussions and adds value to the quality of discussions. The available expertise may also help with tasks relating to identifying topical issues and seeding discussions.

**Engagement**
Engagement refers to interaction characterised by deliberate intellectual investment in participation. Evidence of reading is an indicator of engagement that is characterised by discussions that display integration, reframing and purposeful reflection. Vibrancy, synonymous with liveliness, requires timeliness of response to issues raised and is associated with drawing in discussions. Interpersonal dynamics feature strongly in engagement in that they shape the mood and tone of discussions. Sensitivity to the diversity that occupies the online space and awareness of the subtleties and nuances embedded in social interaction, impact the quality and level of engagement.

**Ensuring Value**

Ensuring value for participation is critical in facilitating online groups. It encompasses an evaluative element that justifies the existence of the online group; it is a review function that ensures that value in one form or another is added to the group. The perception that time and effort are well spent by online members is related to a high knowledge contribution frequency and quality of discussion. A range of incentives that may constitute demonstrated benefits include peer recognition and professional identity development.

Figure 2 represents a conceptual framework demonstrating the relationship of concepts in the model.
Propositions
The logical relationship between the concepts in the facilitation model is explained in the following propositions:

- Proposition 1: Preparation organises the foundation for meaningful engagement
- Proposition 2: Engagement is enhanced by ensuring value
- Proposition 3: Ensuring value may lead to further preparation
- Proposition 4: Preparation is related to meaningful interaction
- Proposition 5: Engagement is related to meaningful interaction
- Proposition 6: Ensuring value is related to meaningful interaction

Limitations and Further Research
Respondents did not reflect the national demographic of South Africa - with 77% of respondents indicating that the languages spoken in their childhood home were English or Afrikaans and 23% indicating other African languages such as TshiVenda, Setswana and IsiZulu. This suggests that the demographic spread was limited and may have an impact on results in terms of cross-cultural communication issues.

Application of the E-Facilitation Model in a variety of discussion forums with a view of assessing its usefulness and applicability, would benefit practice. Empirical testing and validation of the model would contribute to the fields of knowledge management and e-learning.

Conclusion
The development of An Iterative Process Model of E-Facilitation seeks to make a contribution to the practice of online facilitation in both formal and informal learning settings, as well as in communities of practice. It organises concepts relating to facilitating strategies in a manner which might be helpful to individuals tasked with moderating online discussions by ensuring that members gain value from their participation.

References


Beyond Policies and Programs: Contextualizing ICT Integration in South African Schools

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Abstract
In South Africa, Information and Communication Technology (ICT) integration into the education system is still at its infancy, as most of the various policies and programmes are still dominated by technical skill and infrastructure provisioning. This paper is of the assumption that ICT integration in schools should take a multidimensional approach instead of personal interests regulated by ICT vendors. The authors challenge the confusion caused by the government by equating the provisioning of ICT infrastructure [hardware] to pedagogical ICT integration in schools. A systematic review of literature enabled the authors to make a strong argument on the importance of contextualizing ICT integration in the schools in South Africa, and in the process identified key determinants for the successful integration and adoption of ICT tools in schools. The key determinants to be considered are: socio-cultural constraints, personal cognition and efficacy, professional cognition and efficacy, knowledge and skills, beliefs and assumptions, behavioral intentions, and socio-economic dynamics. This paper found sufficient evidence that the country needed to contextualize ICT integration beyond policies and programmes. Then, the paper proposed an intervention framework as a strategy for effective integration of ICTs in schools. Finally, recommendations were made to guide future policy formulation.

Keywords: ICT Integration Contextualization, ICT integration, ICT policies, ICT infrastructure in Schools

Introduction
The value of Information and Communication Technologies (ICT) in education is well documented and accepted as the game changer in the 21st century. Studies have shown world over that ICT tools open up exciting and innovative instructional techniques that may be used to overcome student passiveness and enhance critical thinking skills (Tan, 2012; Laxman, 2010; Chiu, 2009; Yang & Chou, 2008). The authors recognize the potential value of ICT tools to transform classrooms into contemporary and responsive learning spaces. Unfortunately, in the South African context the adoption and embedding of ICT tools pedagogically in the classroom have been very slow and not widespread. In most cases there is still a strong focus on hardware and software and less on broad concepts of teaching and learning.

The policy on ICT integration was first formulated in the Millennium Development Goals (MDG) Target 8.F, which states that “in cooperation with the private sector, make available the benefits of new technologies, especially information and communications” (United Nations, 2012). Therefore, a judicious adoption and utilization of ICTs in schools could play an
important role in transforming learners’ educational experience and cognitive development. In South Africa, the White Paper on e-Education (Department of Education, DoE 2004) states that the introduction of ICTs in education represents an important part of government’s strategy to improve the quality of learning and teaching across education and training environments. The National Department of Education (2003), furthermore, explains that computers will be able to improve how educators teach and learners learn. This is based on the premise that (a) pedagogical integration of ICT into teaching and learning provides a lifelong skill that is needed to sustain both the teacher and the learner and (b) mobilizing educators to use computers in their teaching will contribute to quality education. However, according to Fu (2013) quoting Tezci (2011a) “teachers should learn not only to use technology to enhance traditional teaching or increase productivity, but also should learn from a student-centered perspective how ICT can be integrated into classroom activities in order to promote student learning” (p. 116). This paper provides a descriptive and critical account of ICT adoption and integration issues in South African school systems through a systematic review of literature.

Our assumption is that meaningful ICT integration in schools is a multidimensional activity. Therefore, undermining the multidimensionality nature of the activities associated with ICT pedagogical integration could be disastrous. Thus, the provisioning of ICT infrastructure does not necessarily mean ICT adoption. There are multiple factors to be considered: socio-cultural constraints, teachers’ beliefs and assumptions, teachers’ behavioral intentions, and teachers’ efficacy. Bladergoen et al., (2012) identified personal cognition and efficacy, professional cognition and efficacy, knowledge and skills, and socio-economic dynamics as important determinants in considering the adoption and appropriation of ICT in any sphere of work, with education being no exception. Another important consideration is the context in which ICT is adopted and appropriated. Context here refers to the historical context of South Africa. The purpose and outcome of ICT adoption and appropriation further contributes to the understanding of how the context impacts ICT integration in general. Thus, the “belief in the superiority of scientific and technical knowledge over indigenous knowledge and traditional practices makes development initiatives problematic” (Dasuki, 2012, p. 2). In South Africa we have witnessed expensive intervention programs fail, due to ill-formulated strategies or “scant consideration given to the local factors that affect implementation” (Dasuki, 2012, p. 2) as they are shaped in the context of developed nations. With deeper understanding of how the key factors correlate with schooling and cognitive opportunities, a better way to provision and adoption of ICT tools can be realized.

Miller, Naidoo and van Belle (2006) suggest that there are adoption issues that impede teachers’ effective use of technology for educational purposes; particularly given that there is “much more to an ICT intervention than the technology” (Miller et al., 2006, p. 94). Even though the Department of Education, in a policy document stipulates that “Every South African learner will be information and communication technology (ICT) capable by 2013” (DoE 2003, p. 17), the statement does not necessarily reflect the reality. In order to integrate ICTs, the technical aspects are very important and yet there is more effect if they are linked with meaningful theoretical pedagogical strategies that inform appropriation and integration. Our
goal is to suggest a multidimensional approach to overcome the current limitations that are obvious in the current ICT infrastructure projects. We are convinced that any implementation programme would therefore need to take account of the societal limitations in order to develop a meaningful intervention to effectively integrate ICT tools in schools.

**The Digital (Paperless) Classroom: The South African Landscape**

In view of the emergence of ICT and discovery of the potentials therein, several policies, and projects have evolved at global, continental, regional and local levels. South Africa as an independent state is not left out of the worthwhile venture towards exploiting the benefits embedded in ICT, several ICT policies, programmes and projects are put in place for advancement of Information and Communication Technology for development (ICT4D), the most recent being a pilot project launched in Gauteng province in January 2015 tagged “The Big Switch On”, the project is aimed at a paperless education system which give pupils access to learning material, workbooks and other subject matter through the use of information communications technology.

The Deputy President Honourable Cyril Ramaphosa together with the Gauteng Premier, David Makhura and the MEC for Education, Panyaza Lesufi recently launched the new digital classroom in an effort to drive paperless education system. The claim is that, the paperless education system will give learners access to digital educational resources through tablets to make the learning process more exciting, motivating and creative. However, it is not clear how ICT infrastructure provisioning alone will result in the attainment of higher levels of cognition given teachers ICT skills and curriculum limitations. To realize a paperless classroom the societal constraints must be taken into consideration. In this case, the training and retraining of teachers to capacitate them with pedagogical ICT content knowledge. Therefore, the standard of ICT development programmes must be improved given the enormous changes taking place in schools. ‘Buy-in’ from teacher is key to successfully integrate ICT tools in the classroom.

In order to realize higher levels of cognition, teachers and learners need to acquire specific technical skills and competencies in order to facilitate learning in a digital classroom.

In the Gauteng Province there is no doubt about the MEC ambition to transform learners experience through digital devices. However, in order to successfully integrate ICT in schools teacher training, curriculum structures, classroom practices, and modes of assessment must be redesigned. This will take an educational policy that is developed following a multi-sectoral approach with broad-based strategies for the paperless schools. The multi-sectoral approach will ensure affordability and sustainable access to ICT infrastructure and software. According to Condie & Munro (2007) “The evidence seems to point to an impact on attainment where ICT is an integral part of the day-to-day learning experiences of pupils, although the weight of evidence is insufficient to draw firm conclusions” (p. 24). The equivocal conclusions are not enough to justify the provisioning of computing devices with an ambition that ICT will automatically improve educational outcomes across school levels. This situation sets the scene for a critical analysis of constraints resulting in low adoption of computing devices and ICT tools in the classroom.
ICT competence among teachers is an indispensable prerequisite to the realization of ICT pedagogical integration so that learners develop critical thinking skills. According to Fu (2013) “ICT helps students focus on higher-level concepts rather than less meaningful tasks” (p. 113). The merits of ICT integration in schools are there, unfortunately teachers’ efficacy, perceptions, and competence in using ICT must be aligned with the ‘paperless projects.’ The school culture and professional capacity of teachers must be taken into consideration because ICT ubiquitous characteristics alone are not enough to the integration of ICT in schools. However, there are three important factors that enable pedagogical ICT integration: “autonomy, capability, and creativity” (Fu, 2013, p. 114). In lieu of these factors teachers role significantly change, because in an ICT integrated environment learners take charge of their learning. In autonomous environment teachers create their own educational activities and materials to support learners’ cognitive development. Thus, in the long run teachers become catalysts for the integration of ICT in an efficient and effective manner.

Need for Contextualizing ICT Integration in Schools
Long before the ‘paperless’ conversation, policies on ICT in South Africa has been geared towards promoting and understanding the role of ICTs in society in general and in education in particular. It is interesting to note that since 1994, after the demise of apartheid in South Africa several policies have been initiated and implemented and have made significant impact on the educational system and other sectors of the nation. In the quest to make education reforms, policy makers have made concerted efforts to promote ICT in education, this stems from the international community’s call for action. For example, In August, 2004, the South African National Department of Education published a white paper on e-education with the aim of consolidating previous initiatives to integrate ICT in schools. The e-education policy’s strategic objective states clearly that:

Every south African manager, educator and learner in the general and further education and training bands will be ICT capable (i.e. use ICTs confidently and creatively to help develop the skills and knowledge they need as long life pupils to achieve personal goals and to be full participants in the global community by the year 2013 (DoE,2004 p.17)

Over 20 different government initiatives and projects to integrate ICT tools in schools have been implemented including the flagship Khanya project and Gauteng Online. Interestingly the report of a national survey of information and communication technologies in South African schools (2000) observed that, of all the policy texts dealing with ICT in South Africa, the most comprehensive and thought provoking is the Technology Enhanced Learning Investigation (TELI) commissioned by the Department of Education in 1995. The reason is because the report of the investigation has made useful suggestions for promoting learning with technologies in schools.
The South African National Department of Education has focused on the importance of integrating ICTs into education and rolled out the technologies without first engaging investigations on the plausibility of its endeavors. Although studies show that ICT facilitates cognitive development of higher order thinking (HOT) skills, there is a need to examine complexities of the context in which ICT has been used. In case of South Africa with uneven distribution of ICT skills and inconsistencies in the social, cultural and economic status of the communities there is a need for a baseline research. The baseline research will provide a profile for all teachers in South Africa. It is crucial to acknowledge that ICT integration process is a social construct that lend itself in different context, perception, conceptions and resources. Therefore, the need and idea to contextualize ICT integration in South African schools is born out of the fact that every nation, people, society and communities are certainly very unique and peculiar, and South Africa as a nation is no exception to this universal reality. The communities are not equally developed in terms of social amenities like schools and Information technology infrastructure. The above presentation and analogy is succinctly captured by the report of a study conducted by Blignaut and Howie (2009), reporting on ICT in the South African education context. The report indicated that in view of the above prevailing circumstances in South Africa’s education context only 13% of the schools had at least one or more computers. Therefore only 2% of the total schools in the country can be described as highly resourced in ICT for education. Only two provinces (Gauteng and Western Cape) out of the nine are currently pursuing different ICT initiatives at a larger scale. However, this did not translate habitually into ICT integration in schools. The current scenario requires critical reasoning and consideration to embark on any pedagogical integration of ICT. The context of the nation and the communities must be put into consideration first. The integration of ICT into education is no doubt a welcome initiative owing to the fact that it will propel development in all the spheres of life of the people. Nevertheless, caution must be taken while embarking on such an important process or reform.

Researchers like Chigona, Chigona, Kausa, & Kayongo (2010) observed that, some of the ICT integration problems (in a context like South Africa) have nothing to do with technical skills but rather the “combination of ICT skills, content management skills, and an understanding of pedagogy” (p. 9). They argue that ICT skill levels are critical for the successful integration of ICT in schools. Similarly, Miller et al. (2006); Drent & Meelissen, (2008); and Davids, 2009 also point to educators feeling ill-prepared to implement ICT into teaching and learning even after training. Research to inform every level of ICT adoption and appropriation into teaching and learning is thus needed. With ICT integration being slow, it demands that teachers and learners (a) become comfortable in the use of ICT, (b) orient themselves towards the adoption of ICT for teaching and learning, and (c) build confidence in the use of ICT. The complexities in ICT adoption and integration are multi-layered given the varying levels of skills and competencies among teachers. This is particularly pertinent in a context with uneven access to ICT in the first place. Such a context includes the need for access to ICT, with a focus on efficacy, attitudes, and cognitive components in the first place as well as the need for technical skills development before adoption, appropriation and integration might be considered.
**ICT Integration intervention strategy**

It is no exaggeration to mention that, the role of both teachers and learners are changing in the classroom. There is major shift in the instructional process with a paradigm shift in theories and practices of education. Shift from teacher centeredness to learner centeredness, from passive learning to active learning, from rote learning to critical thinking with reasoning, from content based education to outcomes based education and many more. In the process of integrating ICT in the classroom a reciprocal relationship between teachers and learners is developed as learners help teachers with technical issues. Therefore, in South Africa there is a need for both orientation and trainings to usher educators in the complex digital habitat.

The reversal of the relationship between teachers and learners results in new-teaching paradigms. However, it requires teachers to be more creative in creating computer driven learning activities, thereby giving new meaning to education, teaching and learning concepts. The challenge in the adoption of ICT in schools is lack of ICT experience, pedagogical support, limited knowledge on ICT in schools, the habitual ways of conceptualizing the classroom, and excessive focus on infrastructure and technical skills (Honan, 2008; Goktas, Yildirim, and Yildirim, 2009; Fu, 2013). It is evident that there are four key interactive actors and components [teachers, learners, ICT & non-ICT tools, and school leadership] must be engaged in order to successfully integrate ICT in the school system. That will lead to re-conceptualization of classroom and learning activities.

After a careful observation and study of the South African education terrain and the school system, and not overlooking its history, economy, diversity and geography, we propose that ICT is better integrated into the school system through the Hattotuwa (2004) ICT Intervention framework as shown in figure 1:
In an effort to determine the state of ICT integration, a situational analysis must be performed in line with structural transformations, issues transformation, personal transformation, context transformation, and actor transformation. It is important to first consider the current situation with regard to ICT integration in schools to establish a wide profile of the environment. It is also important to look at the possibilities for achieving the goals of intended venture no matter how noble the venture may be. The need for creative thinking in the process of integrating ICT is important; the focus on hardware is flawed. The need for cooperation and collaboration between teachers and government officials will play an important role in the adoption and integration of ICT tools in the classroom. Government officials will have to understand the required transformative changes and pedagogical value of ICT in schools. The shift to developing ICT competencies among teachers is long overdue. The investments to both teachers and infrastructure should be happening concurrently in the current situation to enhance teachers’ confidence in their new roles.

Summary and Conclusion

The use of technology in education is becoming increasingly important for all levels of and type of education in the society. Therefore, Integrating ICT with an educational agenda could be a catalyst for its effective adoption in the classroom for instructional purposes. Computer hardware, software and other forms of communication tools are quite important for this all important venture. The South African education landscape is not completely deficient of these facilities. As a matter of fact, the national, provincial and the local governments have made concerted efforts to provide ICT infrastructures within the limit of their resources. This paper,
however observed that one important ingredient for the success of ICT integration in the schools is obviously missing. This ingredient is lack of consideration for the background of our society, i.e. the various elements (social, economic, political, cultural and historical) that constitute the South African society. The paper views these elements as primary to successful integration of ICT at any level of schooling in South Africa. In view of the above, an intervention strategy that will ensure effective adoption of ICTs in the schools must be provided.

It may interest the reader to know that in spite of the well-articulated global goals and policies on ICTs, no record has indicated the achievement of such laudable goals by any country in the global context of implementation. This implies that the global policies and programmes are mere roadmaps to be implemented within given context to succeed. The success of adoption depends on several factors, but majorly by the context in which the policies and programmes are implemented. The global vision for ICTs is that, everyone should be given the opportunity to access and use ICTs, specifically the world summit on information society (WSIS) in 2003, emphasized the need for schools and all other educational institutions in rural or urban, rich or poor to be key beneficiaries of information and communication technologies.

Drawing from the imperatives of some Countries that have recorded high level success in integrating ICTs within their education system (USA, Singapore, England, Canada), it is crucial for South Africa to consider localizing best global practices in ICT for its corporate development. There is need to evolve indigenous strategies, models and frameworks that will foster the integration of ICTs in schools based on the needs of the learners in their peculiar learning environments and putting into consideration all other variables within the South African context. The much needed transformations in various areas (context, structure, issues and actors) of South Africa’s school system are quite imperative. The provision of ICT facilities alone by the South African governments is not good enough, until it is able to translate to adoption of ICT.

Recommendations
Given a critical overview of the importance of information and communication technologies to human society, the picture of the South African ICT landscape and considering the gaps for adoption, the paper hereby make the following recommendations for getting it right with ICTs in South African schools.
1. The ICT integration intervention strategy framework suggested in this paper should be given serious consideration for the implementation of future ICT projects.
2. Research and evaluation must be conducted to ascertain needs (Needs Assessment) and barriers, prior to formulation and implementation of ICT policies and programmes in South Africa.
3. Public-Private partnership should be encouraged and adopted for both provisioning and implementation of ICTs in school.
4. The provision of ICT infrastructure should be extended to the disadvantaged schools too, in order to have a balanced ICT landscape for integration and adoption simultaneously throughout the country.

5. The government should demonstrate the political will in ensuring integration and adoption of ICTs in the school system

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Effect of digital learning instructional puzzles on kindergarten’s achievement in science and technology in Oyo State.

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Abstract
Puzzles provide entertainment and convey information that educates receivers on scientific knowledge, process and product that endure and benefit generations of scientifically developed societies. Hence, there is need to expose kids in basic classes to teaching strategy in which they will need to pay attention to relevant elements in the learning environment; to store and transform information in memory. But the strategy has not been adopted in the teaching of kindergarten pupils. This study, determined the effect of digital learning instruction puzzles on kindergarten pupils’ achievement in science and technology in basic schools in Oyo state.

The pre-test, post-test, control group, quasi-experimental design with 2x2x2 factorial matrix was adopted. In this study, 387 kindergarten pupils from nine Basic schools in Oyo State were used for the study. Five instruments used were: classroom observation (CO), kindergarten achievement test in science and technology, digital learning instruction puzzles package, teachers guide on digital learning instruction puzzles strategy (TGDSS) and teachers guide on conventional strategy (TGCS). Two null hypotheses were tested at 0.05 level of significance. Data collected were analysed using ANCOVA.

There was a significant main effect of treatment groups on students’ achievement in science and technology. (F(1,385)= 29.397, P < .05). Pupils in the digital learning instruction puzzle group had higher adjusted post-test achievement (x̄ = 9.73), with the control group trailing behind (x̄ =4.293). Digital learning instruction puzzles handed down to kids the experiences, exploits, scientific knowledge, process and product through puzzles that are considered before making decisions.

Keywords: Digital learning instruction puzzles package, conventional strategy, achievement and gender.

Introduction
Today, classroom teaching and learning is enhanced with technology. Curriculum concept are transformed into stories and supported with technologies in multimedia tools and embedded in learning channels of visual, auditory and kinaesthetic formats. Contemporary technologies in education revolve round the use of computers. Computer as used in this study is a machine that can help with many different teaching and learning tasks when it is integrated into classroom activities. The most important aspect of computers in education is that they provide drill and practice for the kids.

Teacher’s activities may be tedious at times and computers provide motivation to the kids to continue learning (Dogan, 2011). Teachers are not to be limited to the use of computer technology or understanding a computer tool. It requires knowledge of the learner, the content to be learned, as well as an understanding of how computer tools can be used to help the learners accomplish learning goals. Human beings use tools to make lives better. In education,
technologies are used in teaching and learning process. Farmer (2004), affirms that technology makes learning easy, effective and permanent. It provides children with needed information through the computer and other technological teaching and learning materials. Children have access to manipulate information at a rapid speed or rate. They equally discover creative ways of learning.

The relevance of instructional puzzles in facilitating learning has been asserted by many scholars. According to Scott (2002), a puzzle is nothing but a problem that is fun to solve. Ann (2006), advocates the use of puzzle-based instructional strategy at all educational levels premised on her experience as an educator and availability of puzzles for all ages. Ackert (2009), also suggests the use of puzzles for children of all ages. These submissions are in line with the position of (Nelson, 2011). In the view of Mezieobi, Fubara and Mezieobi (2008), puzzle based learning allows for the learning of problem solving skills by experience; imitation and reflection. The studies conducted by Kaka (2008), Falkner, Saoriamarthi and Michalewicz (2009), Alemi (2010), Adedoja, Abidoye and Afolabi (2013) reveal the effectiveness of puzzle in promoting academic achievement in different subjects.

Teaching and learning processes in the pre-primary schools are mostly done through rote learning and memorization. However, teaching science and technologies should be with excitement, using enjoyable puzzles and not just sitting still for endless periods of time. The kids need to be involved in the teaching-learning activities; so that the teaching of the subject would spur them to have a deep reflection on the learning experience they are being exposed to. This will result in effective, meaningful and enjoyable learning. The kids would then be able to imbibe the scientific knowledge given to them by their teachers, for character is far more important than knowledge. Knowledge is only a means to an end, that end being the living of a useful and honourable life.

Osokoya, (2006), found that, in the Nigerian Primary schools, girls were given less time to tasks than boys which no doubt hindered the performances of the female and girl-child and concluded in his research that, gender based education can affect standardized test score for both positive and negative outcome. This study probes into the effectiveness of Digital - learning instructional puzzles strategymodes in science and technology taught in Oyo State pre-primary schools. Furthermore, it investigated the moderating effects of gender on kids’ performances in Science and technology.

**Statement of the Problem**

Recent developments in classroom activities of teaching and learning encourage methodologies that reflect learners’ active participation, interactive patterns and inclusive learning. With the use of technology, teachers take kids beyond traditional classroom limit, ensure adequate participation in teaching and learning process and create environment for experimentation and exploration. Again, there are doubts about the science and technology instruction taught in Nigerian schools. Major stakeholders in Nigerian education sector show concern about the science and technology among kids in pre-primary school.

**Hypotheses**

The following hypotheses will be tested at 0.05 level of significance.

1. There is no significant effect of treatment on pupils learning achievement in science and technology.
2. There is no significant effect of gender on pupils learning achievement in science and technology.

Methodology
This study adopted pre-test, control-test, quasi experimental design. Participants for this study comprise of pupils from public pre-primary schools from Oyo. Oyo state is stratified into three senatorial districts: Oyo North, Oyo Central and Oyo South. One senatorial district, Oyo North was randomly selected for the study. Out of the 33 Local Government Areas in Oyo State, three Local Government Areas were randomly selected. These were Iseyin, Itesiwaju and Kajola Local Government Areas. Three schools were purposively selected from each LGA. In each school, an intact class were selected out of all the nine representative schools for the study.

The selection was based on the following criteria:

(i) Relative distance from one another to avoid contamination
(ii) Government owned schools
(iii) Availability of qualified Pre-primary teachers teaching Science and Technology in kindergarten classes. These schools were randomly assigned to experimental and control groups. Using simple random sampling,

Research instruments
Five research instruments were used in this study. These are:

1. Classroom Observation (CO)
2. Kindergarten Achievement Test in Science and Technology
4. Teachers Guide on Digital -learning instructional puzzles strategy (TGDSS)
5. Teachers Guide on Convectional Strategy (TGCS).

Classroom Observation
This is used to measure classroom processes which include specific teacher practices, holistic aspects of instructions and interactions between teachers and kids. Classroom observation is often regarded as a naturalistic method to observe those classroom practices of teachers that are affective or have positive impacts on certain kindergarten pupils’ outcomes. The scale to be used is adopted one from Consortium for Policy Research Education (1994).

Kindergarten achievement test on Science and Technology
The pupils achievement test in Science and Technology was designed and constructed by the researcher to measure pupils level of achievement in selected Science and Technology concept based on the three levels of cognition, viz remembering, understanding and thinking (Okpala, Unoche and Oyedeji, 1993).

The instrument consist of two- sections A and B. Section A; sought personal information of students while section B consists of 10 multiple choice questions with three options. For each question, one correct answer and two other distracters were provided. Questions were drawn from the concept of parts of the body. The identification of parts of simple plants and simple oral hygiene. The instrument were given to expert in the fields of childhood education,
education evaluation and educational technology for corrections and suggestions before it was used.

The achievement test has two sections with Section (A) containing demographic information such as name of school, pupil’s name, class, gender, age while section B containing the test items constructed as presented in Table 1. The options for the questions ranges from A to C. One mark was awarded for each correct option and zero for wrong option. This means that the total marks obtained is 10. The test items were generated to cover the three lower cognitive domains of knowledge, comprehension and understanding in accordance with (Yoloye 1984). Table 1 shows the specification.

**Table 1: Table of Specification**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Knowledge</th>
<th>Comprehension</th>
<th>Understanding</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parts of the body</td>
<td>(1) 1</td>
<td>(1) 4</td>
<td>(1) 3</td>
<td>3</td>
</tr>
<tr>
<td>Identification of parts of Simple plants</td>
<td>(1) 6</td>
<td>(1) 7</td>
<td>(1) 10</td>
<td>3</td>
</tr>
<tr>
<td>Simple oral Hygiene</td>
<td>(2) 5,8</td>
<td>(1) 2</td>
<td>(1) 9</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>10</td>
</tr>
</tbody>
</table>

**Validation and Determination of Reliability Coefficient Kindergarten Achievement test**
The initial draft of thirty multiple choice items were given to some lecturers in early childhood Unit of the Department of Teacher Education, Faculty of Education, University of Ibadan, as well as a doctoral degree students in the field of childhood education. This was done to ascertain the face, content and construct validity of the instrument. The thirty (30) multiple choice items were reduced to twenty (20) items while fifteen (15) items survive scrutiny which fell within the discriminating indices of 0.4 to 0.6. It was later trial-tested in a representative lower Basic school that was not part of the study. The data collected were analyzed using Kuder-Richardson formula 20 (KR20). The reliability coefficient of 0.81 and an average item difficulty index of 0.49 were obtained.

**Development of Digital -learning instructional puzzles package**
The model for the study is based on elements from Rapid Prototyping Model by (Fakokunde, 2014) was used in this research.
Figure 1 Model for the Digital-learning instructional puzzles strategy.

The model is made up of nine stages as explained below:

**Stage I: Objective**
This stage is a common element in the three models. The stage requires the statement of the behavioural objectives. The topics selected for the study are:

i. Parts of the body,

ii. Identification of parts of simple plants and

iii. Simple oral hygiene.

The behavioural objectives for each topic were derived from pre-primary basic school science and technology curriculum and incorporated into the objective menu of the package. **Stage II: Stage 11: Content**
This element is derived from the Rapid Prototyping Model of Tripp and Bichelmeyer. The content of each topic was analysed to determine the depth of coverage, sequence of information, usage of language and relevant instructional materials in accordance with the curriculum. The content for each topic was incorporated into the package content menu and the real puzzle aspect of the package.

**Stage III: Relative Advantage**
This element is derived from Technology Integration Model. The benefits inherent in this package include; active participation of the learners in the learning process, each learner can work at his/her own pace, learning in a threat-free environment with element of fun coupled with immediate knowledge of result.

**Stage IV: Development of Prototype**
The prototype of the computer-based self-learning instructional puzzle was developed and validated in stages as follows:

**Section A**
Table 1 shows that all the items have high mean scores of between 3.44 and 3.92 out of the maximum score of 4.00. This indicates the appropriateness of the package in terms of functionality and navigation since the items are positive ones. The weighted average of 3.72 lends credence to this.
### Table 1: package functionality and navigation

<table>
<thead>
<tr>
<th>S/N</th>
<th>ITEM</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>Mean</th>
<th>Std. D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The operation of the package is accurate</td>
<td>23 (92)</td>
<td>2 (8)</td>
<td>-</td>
<td>-</td>
<td>3.92</td>
<td>0.28</td>
</tr>
<tr>
<td>2</td>
<td>The information presented in the package is well arranged</td>
<td>19 (76)</td>
<td>6 (24)</td>
<td>-</td>
<td>-</td>
<td>3.76</td>
<td>0.44</td>
</tr>
<tr>
<td>3</td>
<td>The mouse can easily be used to locate information on the package</td>
<td>22 (88)</td>
<td>2 (8)</td>
<td>-</td>
<td>1 (4)</td>
<td>3.80</td>
<td>0.65</td>
</tr>
<tr>
<td>4</td>
<td>It is easy to go backward or forward making use of mouse when working on the package</td>
<td>21 (84)</td>
<td>3 (12)</td>
<td>-</td>
<td>1 (4)</td>
<td>3.76</td>
<td>0.66</td>
</tr>
<tr>
<td>5</td>
<td>It is easy to look for relevant information in the package with the use of the mouse</td>
<td>17 (68)</td>
<td>8 (32)</td>
<td>-</td>
<td>-</td>
<td>3.68</td>
<td>0.48</td>
</tr>
<tr>
<td>6</td>
<td>The information in the package can easily be got by clicking on the relevant icon</td>
<td>21 (84)</td>
<td>3 (12)</td>
<td>-</td>
<td>1 (4)</td>
<td>3.76</td>
<td>0.66</td>
</tr>
<tr>
<td>7</td>
<td>The hint and solution menu in the package help to prevent frustration when one cannot solve any of the questions in the puzzle</td>
<td>21 (84)</td>
<td>4 (16)</td>
<td>-</td>
<td>-</td>
<td>3.84</td>
<td>0.37</td>
</tr>
<tr>
<td>8</td>
<td>The grids to be filled in the puzzle can easily be identified</td>
<td>15 (60)</td>
<td>10 (40)</td>
<td>-</td>
<td>-</td>
<td>3.6</td>
<td>0.50</td>
</tr>
<tr>
<td>9</td>
<td>It is easy to open and work on the package</td>
<td>16 (64)</td>
<td>5 (20)</td>
<td>3 (12)</td>
<td>1 (4)</td>
<td>3.44</td>
<td>0.87</td>
</tr>
<tr>
<td>10</td>
<td>The information presented is well organized</td>
<td>21 (84)</td>
<td>2 (8)</td>
<td>-</td>
<td>2 (8)</td>
<td>3.68</td>
<td>0.85</td>
</tr>
</tbody>
</table>

**Weighted average**: 3.72

### SECTION B

Table 2 shows that all the items obtained high mean scores of between 3.52 and 3.84 out of a maximum score of 4.00. The mean scores show the appropriateness of the package in terms of content and graphic presentations. The weighted average of 3.66 lends support to the appropriateness.

### Table 2: content and graphic evaluation

<table>
<thead>
<tr>
<th>S/N</th>
<th>ITEM</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>Mean</th>
<th>Std. D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The display of information on the screen is appropriate</td>
<td>20 (80)</td>
<td>4 (16)</td>
<td>1 (4)</td>
<td>-</td>
<td>3.76</td>
<td>0.52</td>
</tr>
<tr>
<td>2</td>
<td>The colour used in the package is appropriate</td>
<td>21 (84)</td>
<td>4 (16)</td>
<td>-</td>
<td>-</td>
<td>3.84</td>
<td>0.37</td>
</tr>
<tr>
<td>3</td>
<td>The information presented can easily be read</td>
<td>20 (80)</td>
<td>2 (8)</td>
<td>2 (8)</td>
<td>1 (4)</td>
<td>3.64</td>
<td>0.81</td>
</tr>
<tr>
<td>4</td>
<td>The information presented is simple and clear</td>
<td>19 (76)</td>
<td>5 (20)</td>
<td>-</td>
<td>1 (4)</td>
<td>3.68</td>
<td>0.69</td>
</tr>
</tbody>
</table>
The language of presentation is appropriate

The information is well sequenced

The pictures used are appropriate

The pictures allow for better understanding of the content

The sound used in the package is appropriate

It is not difficult to understand the content of the package

Weighted average

SECTION C

Table 3 the ease in the use of the package and the disposition of the participants towards it. It shows that all the items have mean scores of between 2.92 and 3.92 out of a maximum of 4.00. The scores indicate that the package can be used to effectively facilitate learning. This position is further supported by the 3.62 weighted average obtained. The instrument was subjected to reliability test using Cronbach alpha and a reliability coefficient of 0.82 was obtained.

Table 3: usability assessment

<table>
<thead>
<tr>
<th>S/N</th>
<th>ITEM</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>Mean</th>
<th>Std.D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>It is possible to learn through the package</td>
<td>24 (96)</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>3.92</td>
<td>0.40</td>
</tr>
<tr>
<td>2</td>
<td>I can work on my own by making use of the package</td>
<td>16 (64)</td>
<td>8  (32)</td>
<td>1</td>
<td>-</td>
<td>3.60</td>
<td>0.58</td>
</tr>
<tr>
<td>3</td>
<td>Working on the package is interesting</td>
<td>22 (88)</td>
<td>3  (12)</td>
<td>-</td>
<td>-</td>
<td>3.88</td>
<td>0.33</td>
</tr>
<tr>
<td>4</td>
<td>Solving the puzzle encourages me to remember the content of the instruction</td>
<td>21 (84)</td>
<td>3  (12)</td>
<td>1</td>
<td>-</td>
<td>3.80</td>
<td>0.50</td>
</tr>
<tr>
<td>5</td>
<td>I understand the information in the package</td>
<td>18 (72)</td>
<td>6  (24)</td>
<td>1</td>
<td>-</td>
<td>3.68</td>
<td>0.56</td>
</tr>
<tr>
<td>6</td>
<td>It is not difficult to fill the grids</td>
<td>12 (48)</td>
<td>5  (20)</td>
<td>2</td>
<td>6  (24)</td>
<td>2.92</td>
<td>1.26</td>
</tr>
</tbody>
</table>
Teachers’ guide for digital -learning instructional puzzles strategy
This instrument was designed to guide the teachers in the experimental group on their expected role premised on the design of the study as a self-learning package thereby limiting the role of the teacher to that of moderator. The role of the teacher was limited to making preparation for the use of the digital machine, allotting the learners to sit conveniently and monitoring the kids to ensure that they pay attention to the package. The operational guideline was given to experienced pre-primary teachers and childhood education lecturers for face and content validity. Their observations and suggestions were taken into consideration to improve the quality of the instrument.

Operational Guideline for Conventional Group (OGCG)
This instrument was designed to guide the teachers in the control group. The lesson note on each topic was prepared by the researcher with focus on the behavioural objectives, presentation of content with the use of relevant instructional materials prepared by the researcher based on the same information incorporated in the package for the experimental group, and evaluation. The guide was also given to experienced pre-primary teachers and lecturers for face and content validity. Observations and suggestions made were incorporated to improve the quality of the instrument.

Research Procedure
The researcher made use of the regular subject teachers in administering the treatment. The treatment took 14 weeks as stated below:

<table>
<thead>
<tr>
<th>S/N</th>
<th>WEEK</th>
<th>ACTIVITIES</th>
<th>TOPIC</th>
</tr>
</thead>
</table>
| 1.  | 1st Week | (i) Took permission from the school authority  
(ii) Selected and trained the research assistants (Pre-primary Teacher) | |
2. **2nd Week**  
(i) Conducted pre-test for both experimental and control group  
Parts of the body, identification of parts of simple plants and simple oral hygiene.

3. **3rd-10th Week**  
Commenced treatment for both groups  
Parts of the body, identification of parts of simple plants and simple oral hygiene.

4. **11th Week**  
Conducted post-test for both groups  
Parts of the body, identification of parts of simple plants and simple oral hygiene.

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**Training of Teachers**  
The first week was used to train the research assistants (pre-primary teachers in the schools for the study). The researcher explained the purpose and procedure for the study to them. The teachers in the experimental group were exposed to the use of the instructional package by the researcher after which they were allowed to use it in order to assess their competence.

The teachers in the control group were also familiarised with the purpose and procedure for the study. The objectives and content of each topic was given to each of them.

**Pre-test**  
After the training of the teachers, the administration of Kindergarten Achievement Test was done in each group:

**Treatment**  
The participating teachers carried out the treatments in both groups for a period of eight weeks. However, the researcher went round the schools once a week to ascertain compliance with the operational guideline.

**Steps followed in the experimental group**  
The kids:
(i) were allotted the digital machine by the teacher.
(ii) opened the package with the supervision of research assistant,
(iii) listen and watch the stories on the digital machine.
(iv) The teacher moved round the classroom to monitor the kids.
(v) asked questions from the kids,
(vi) summarised the lesson and
(vii) gave assignment.
(viii) The teacher made sure that the kids did not spoil the machines before, during and when the lesson period was over.
Steps followed in the control group:

The teacher:
(i) wrote the topic for the lesson on the chalkboard,
(ii) stated the objectives for the lesson,
(iii) outlined the content of the topic on the chalkboard,
(iv) explained the content by making use of the information provided by the researcher in handling each of the topics
(v) asked questions from the students,
(vi) summarised the lesson and
(vii) gave assignment.

Post-test
This was administered on the eleventh week. The achievement test was administered.

Data Analysis
Analysis of Covariance (ANCOVA) of inferential statistics was used in testing the hypotheses using the pre-test scores as covariates and Estimated Marginal Mean was computed to show how the groups performed. All hypotheses were tested at 0.05 level of significance.

RESULTS

Table 3: Summary of ANCOVA of Post-test Achievement between Treatment group and Gender

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>DF</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Eta Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Effect:</td>
<td>6033.809</td>
<td>18</td>
<td>335.212</td>
<td>10.910</td>
<td>.000</td>
<td>.347</td>
</tr>
<tr>
<td>Pre-test (Achievement)</td>
<td>1198.833</td>
<td>1</td>
<td>1198.833</td>
<td>39.019</td>
<td>.000</td>
<td>.095</td>
</tr>
<tr>
<td>Treatment groups</td>
<td>1806.420</td>
<td>2</td>
<td>903.210</td>
<td>29.397</td>
<td>.000</td>
<td>.137</td>
</tr>
<tr>
<td>Gender</td>
<td>44.636</td>
<td>1</td>
<td>44.636</td>
<td>1.453</td>
<td>.229</td>
<td>.004</td>
</tr>
<tr>
<td>Explained</td>
<td>6033.809</td>
<td>18</td>
<td>335.212</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residual</td>
<td>55249.000</td>
<td>370</td>
<td>30.724</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>17401.779</td>
<td>388</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Ho 1: There is no significant main effect of treatment on pupils’ achievement in Science and technology. From table 3 it is shown that there is a significant main effect of treatment groups
on students’ achievement in science and technology. \(F(2,385)= 29.397, P < .05\). The null hypothesis is rejected.

**Table 4: Estimated Marginal Means of Treatment on Students’ Achievement in Science and Technology**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>N</th>
<th>Mean</th>
<th>Std. Error</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lower Bound</td>
<td>Upper Bound</td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>199</td>
<td>9.730</td>
<td>2.35</td>
<td>9.760 9.700</td>
</tr>
<tr>
<td>Control</td>
<td>188</td>
<td>4.293</td>
<td>1.44</td>
<td>4.290 4.296</td>
</tr>
</tbody>
</table>

Table 4 shows that pupils in the digital -learning instructional puzzles group had higher adjusted post-test achievement \(\bar{x} = 9.73\), with the control group trailing behind \(\bar{x} = 4.293\).

**Ho 2:** There is no significant main effect of gender on pupils’ achievement in science and technology. From table 4, it is shown that there is no significant main effect of gender on students’ achievement in digital- learning instructional puzzles \(F (1,386) = 1.453, P > .05\). The null hypothesis is not rejected.

**Table 5: Estimated marginal means of gender on kids’ achievement in science and technology**

<table>
<thead>
<tr>
<th>Gender</th>
<th>N</th>
<th>Mean</th>
<th>Standard Error</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lower Bound</td>
<td>Upper Bound</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>76</td>
<td>9.690</td>
<td>1.46</td>
<td>9.610 9.770</td>
</tr>
<tr>
<td>Male</td>
<td>107</td>
<td>9.740</td>
<td>1.43</td>
<td>8.740 10.740</td>
</tr>
</tbody>
</table>

Table 5 shows that male pupils in the digital -learning instructional puzzles group had higher adjusted post-test achievement \(\bar{x} = 9.740\), with the male trailing behind \(\bar{x} = 9.690\).

**Discussion**

From table 5 it is shown that there is a significant main effect of treatment groups on pupils’ achievement in science and technology. Digital-learning instructional puzzles allows pupils to share their stories outside of the traditional written form. The experimental group significantly performed better than the control group as reflected by the mean scores obtained in the post-test and delayed test. This implies that the computer-based self-learning instructional puzzle is more effective in facilitating learning and enhancing recall which lends credence to the findings of Ann (2006), Kaka (2008), Ackert (2009), Rubinstein, Dhoble and Ferenchick (2009), Awad...
and Fikry (2013) which revealed the effectiveness of instructional puzzle in facilitating academic achievement.

The study further confirmed the findings of Adedoja, Abidoye and Afolabi (2013), on the efficacy of instructional puzzles in facilitating learning outcomes in social studies. The interactivity, fun, practice, immediate knowledge of result, self-learning coupled with minimal level of anxiety which are the basic features of the instructional package could account for the significant effect of treatment on students’ achievement and retention premised on the findings of scholars such as Morris and Lim (2009), Akinleye (2008) and Dale (2011).

The significant effect of treatment on academic achievement and retention can further be explained by the theory of connectionism which posits that stimulus-response association is strengthened through repetition which implies that drill or practice enhances learning and retention. The presentation of the instruction via a medium that is acceptable to the learner coupled with the incorporation of reinforcement as stipulated by the theory could be responsible for the significant effect of the digital-learning instructional puzzles strategy on kindergarten pupils’ academic achievement.

**Educational Implications**

The exposures of the learners to digital-learning instructional puzzles strategy have been found to positively affect the pupils’ achievement in science and technology. The findings have showed the importance of using teaching strategies that are participatory and pupils-centred where their attentions are excited leading to improvement in achievement. Puzzles provide entertainment and convey information that educates kids on scientific knowledge and values that endure and benefit generations of different societies.

Digital-learning instructional puzzles handed down to kids the experiences, exploits, scientific skills, process and products through puzzle that are considered before making decisions.

**Recommendation**

Based on the results and discussion, the following recommendations are advanced. While teachers may undertake a digital-learning instructional puzzles lesson on their own, they are more likely to tackle such a project in conjunction with another educator, particularly if they feel intimidated by the technology. Since digital-learning instructional puzzles can be utilized across all subject fields, it is an important and useful tool that school library media specialists can offer to teachers as a collaborative project.

Digital-learning instructional puzzles strategy should be adapted as viable strategy for studying concepts in kindergarten classes. This will enable pupils to improve on achievement in science and technology.

The Pre-primary teacher training curriculum at all levels of education should be upgraded to education relating to the real life situation by incorporating (i.e. activity innovative pedagogical strategy base instructional strategy such as digital-learning instructional puzzles strategy).

Teaching strategies digital -learning instructional puzzles strategy learning that reduce the gender difference in kindergarten classes as recorded in this research work could be used to reduce learning anxiety for both sex (male and female) kids.
Government and other employers of labour should ensure that qualified and competent Primary teachers are engaged for teaching Science and technology in lower basic schools.

References


Feasibility studies on information and communication technologies (ICT) as a means of enhancing learning in rural schools: are computer centres in rural schools well utilised to the benefit of learners?

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genesisthabomlp@gmail.com, elliasbongani@gmail.com, mjia@tut.ac.za

Abstract
In this paper we look into how learners in Kgetleng River Area Office, a rural area in the NgakaModiriMolema district are benefitting or not from the computer centres in their schools. As a way of improving the education, the department of education with a host of sponsors have helped many rural schools to have computer centres that were aimed at enhancing the education of learners. Participants were 65 with ages ranging between 21 years and 55 years (M = 35.4; SD = 9.6). The results revealed that computer centres in schools in rural areas were white elephants since computers were not utilised. It is recommended that government should look at what governing body members do not know and offer training. Limitations of the study are also advanced.

Keywords: Computer centres, Teachers, ICT, Rural schools

Introduction
Since 1994 the South African education landscape has undergone major transformation in governance, management, curricular reform, and teacher professional development (Department of Education, 2004). Central to this transformation has been a complete policy overhaul in the form of a new national qualifications framework (NQF) and a new curriculum framework for schools based on the concept of outcomes-based education (OBE). The NQF is a key mechanism for creating an unrestricted education and training system in South Africa with redress, access, mobility, and progression as key objectives (Department of education. 2006). To achieve these objectives, some schools in the Kgetleng River Area Office (AO) have been supplied with computers. Classrooms in those schools were changed and reinforced to be utilised as computer laboratories. The Department of Basic Education (DBE) was responsible in most instances for providing schools with computers. The main aim of supplying these computers to schools was so that learners could be abreast with modern technology. Twenty-first century technologies are rapidly spreading into rural Africa, Asia and Latin America (Barr, 1999). This study aims to look into whether the computer centres in schools in rural areas of the North West province are utilised and if they do benefit learners. The term information and communication technology (ICT) includes the technologies which together support people’s ability to manage and communicate information electronically, it is a diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information. These technologies include computers, the Internet, broadcasting technologies (radio and television), and telephony. ICT includes not only computers, but also equipment or hardware such as printers and scanners as well as the software and systems needed
for communication, such as the Internet. Video recorders, television, radio and digital cameras are also included, but these technologies are less frequently used in most school contexts (Fallows & Bhanot, 2002). However, the technology that plays a key role in bringing these media together is the computer, and this study focuses on this form of ICT. One reason for the focus on computers and the Internet is the role that ICT plays in enhancing learning, especially in the context of recording, processing, storing and sharing information with others. Many studies of the impact of technology on teaching and learning conclude that technology has an important role to play in education at all levels, from Grade 0 to Grade 12, although it will not solve all educational problems (Kritzinger & Padayachee, 2010). A number of research undertakings have shown that information and communication technologies (ICT) make a significant contribution to economic growth and social development of communities. According to the 2011 General Household Survey (GHS) of Statistics South Africa, in South Africa, ICT is accessed through functional landline telephones, cellular phones and internet connections (E-learning Africa Report, 2012). This information provided a sense of household-level access to the basic ICT devices across rural South Africa. In line with the national policy the Strategy Framework is based on two strategic pillars: The development of eLearning in schools through effective use of ICT for education. The development of eAdministration through the use of ICT was aimed to improve management, administration and professional practice between head office, districts and schools. Most developed economies have very good ICT infrastructure, suggesting that ICT platforms provide a foundation for, and contribute to, development. In some urban areas, South Africa’s ICT infrastructure is good, but the opposite is true for most rural areas.

**Theoretical framework on ICT**

In 1999, the South African government established the State Information Technology Agency (SITA), which serves as a public sector ICT company focused on the effective and efficient provision of ICT services with government at national, provincial, and local levels. Its range of services includes the setting of technology standards for the use of refurbished PCs in public education institutions. ICTs is an umbrella term that includes any communication device or application, encompassing: radio, television, cellular phones, computers and network hardware and software, satellite systems, as well as the various services and applications associated with them, such as videoconferencing and distance learning (Barr, 1999). The South African government saw the importance of ICT and as a result it recognised the important role that ICT can play in the development of the economy, society in general and in education and training. The Presidential International Advisory Council on Information Society and Development therefore identified three focus areas for developing ICTs, namely education, health and small and medium enterprises (Department of Education, 2006). Consequently, following a draft and consultation, the Department of Education had finalised a White Paper on eEducation which sets out a policy framework for the implementation of a strategy to expand the use of ICTs to increase the effectiveness of development interventions, improve the quality of teaching and learning and to produce a pool of ICT engineers, programmers and software developers in order to compete in the global economy. eEducation is about connecting learners and teachers to
each other and to professional support services for schools, providing more effective platforms for learning (Department of education, 2006).

The government’s eEducation Policy provides the framework for the use of ICT in education to improve communication and administration in provinces, districts and schools, to facilitate the professional development of teachers, managers and administrators, to provide training in ICT and to integrate the use of ICT in the curriculum, by providing information and resources for teaching and learning and by providing on-line or software based learning opportunities. The white paper on eEducation of August 2004 has the overall policy goal that: ‘Every South African learner in the general and further education and training bands will be ICT capable (that is, use ICTs confidently and creatively to help develop the skills and knowledge they need to achieve personal goals and to be full participants in the global community) by 2013’. It is important to note that a firm understanding of ICT is essential in the modern world (Department of Education (DoE), 2003). However, it is impossible for teachers to develop such knowledge in learners if they themselves have no real grasp of ICT (Castells, 2001). The draft white Paper on eEducation also identifies policy imperatives that are set out under six strategic objectives (Department of Education (DoE), 2003): 1. ICT professional development: every teacher, manager and administrator in general and further education and training must have the skills, training and support they need to integrate ICT in teaching and learning. 2. Electronic content resources: The school curriculum in general and further education and training is supported through effective and engaging software, electronic content and online learning resources and teachers, content developers and administrators contribute effectively to these resources. 3. ICT Infrastructure: Every teacher and learner in general and further education and training must have access to an ICT basic set, including computers. 4. Connectivity: Every teacher and learner in general and further education and training must have access to an Educational Network and the Internet. 5. Community engagement: Schools must work in partnership with families and the wider community to ensure shared knowledge about ICTs and extended opportunities for learning and development through ICTs. 6. Research and development: The research and development community must continuously assess current practices and explore and experiment with new technologies, methodologies and techniques that are reliable and will support teachers and administrators in eLearning and eAdministration. The government’s eEducation Policy therefore provides the framework for the use of ICT in education to improve communication and administration in provinces, districts and schools, to facilitate the professional development of teachers, managers and administrators, to provide training in ICT and to integrate the use of ICT in the curriculum, by providing information and resources for teaching and learning and by providing on-line or software based learning opportunities. The overall goal and the six strategic objectives therefore provide the overall policy framework, priorities and targets for the introduction of eEducation in the North West Province.

There is a lot of evidence existing that indicates that technology can make a huge difference in education. Many teachers in South Africa use technology to improve their own teaching and to help learners to learn better. Some teachers use interactive classroom devices to keep learners interested and involved in learning material (Department of Education (DoE), 2003). Others
have flipped their classrooms: learners’ access content at home on mobile devices and teachers then use class time for stimulating discussions and making practical application of the material. Older computer labs are still used with great help by teachers for reinforcement, drill-and-practice and research (Hanrahan, 2002). Teachers report significant improvements in learning outcomes (DPSA, 2001). The use of ICT in schools has been seen to have the following benefits:

![Benefits of ICT in our schools](image_url)

**FIGURE 1** Benefits of ICT to schools

The benefits of the use or introduction of ICT in schools are immense; it is thus important that all stakeholders concerned with the South African education fraternity, such as government, the private sector, teachers, learners, school principals and society in general, join together and make effective efforts to ensure that ICT is introduced or used in South African schools in order to achieve educational development and enhance the productivity of teaching and learning (Bialobrzeska & Cohen, 2005)

**South African context and basis of the study**

The South African education system has for a number of years faced immense challenges, which range from educator union strikes to low pass rates at matric level, high dropout rates, high levels of absenteeism by teachers in schools and, mainly, the poor efficiency and productivity of both teaching and learning in schools. One way in which the country could overcome the challenge of low efficiency and productivity of both teaching and learning would be through the use or introduction of ICT in South African schools. Since 1994 the South African education landscape has undergone major transformation in governance, management, curricular reform, and teacher professional development. Central to this transformation has been a complete policy overhaul in the form of a new national qualifications framework (NQF)
and a new curriculum framework for schools based on the concept of outcomes-based education (OBE) (Department of Education, 1995). The NQF is a key mechanism for creating an egalitarian education and training system in South Africa with redress, access, mobility, and progression as key objectives. OBE, on the other hand, is a learner centred approach which considers learning as an interactive process between educators and learners, where the educator serves as both teacher and facilitator. This new system, introduced in 1996 as Curriculum 2005, was considered one of the most ambitious and far-reaching reform programmes in southern Africa because it signalled a fundamental shift from South Africa’s apartheid past by promoting the principles of equity, democracy, human rights, and economic prosperity (Department of Education, 2004). While very noble in its intentions, the implementation of OBE remains fraught with challenges, which the national Department of Education is committed to address. South African schools have used traditional teaching methods that have stayed the same for the last few decades or so. Educational institutions in South Africa, in particular previously disadvantaged schools, face numerous challenges, such as the dwindling ability to collect school fees from parents of learners, and declining financial support from the government. The disappointment or challenge faced by schools in South Africa that do not use ICT as a means of enhancing teaching and learning has led to South Africa’s failing to close the ‘digital divide’. The digital divide is defined as the gap between those individuals who benefit from digital technology and those who do not (Best, & McLay, 2002). The use of ICT in schools to enhance learning could help overcome some of the challenges of improving the efficiency and productivity of both learning and teaching in South African schools, thereby narrowing the digital divide. Narrowing the digital divide means ICT resources must be provided to those who do not have them, and that their competencies to access and process the knowledge that these resources make possible must be developed (Chitamu, van Olst and Vannucci, 2003). It is generally recognised that programmes to develop ICT capability in a country should give priority to ICT in education. Learners need to develop ICT skills so that they can function effectively in the broader society and can contribute to the sustained use of ICTs within it. Providing South African schools with ICT resources is a challenging task. The White Paper on e-Education (Department of Education 2004) acknowledges the magnitude of the task of delivering ICT and the infrastructure required for ICT in schools. It proposes that the integration of ICT into schools should take place over three phases. When the final phase is complete, in 2013: all education departments in the country will use ICT for planning management, communication and monitoring and evaluation; all schools will have access to a networked computer facility for teaching and learning, and to high quality educational resources; all schools, teachers and learners will be confident and competent users of ICT, and ICTs will be integrated into teaching and learning at all schools; and communities are involved in ICT developments at all schools. This has not been achieved but the department of basic education is still on course trying to meet this expectation. In addition to the challenge of obtaining ICT and the infrastructure to support it, schools face the equally important challenge of how to make the best use of these resources in their particular contexts.
semi-literate and illiterate individuals. New ICT technologies need to exploit the various skills of these community members to generate revenue for themselves by offering remote ICT services beyond their neighbourhoods. ICT solutions that support multimedia communications enhance the ability to exploit various skills of community members including those that do not have written skills. Security sensitive areas require video surveillance solutions to monitor and detect any suspicious behaviour. People who do not necessarily have written skills can monitor surveillance cameras remotely through appropriate ICT solutions (Tryhorn, 2009). Individuals with better literacy skills can be trained to offer services such as ICT problem solving etc. The use of computers was introduced into schools in South Africa during the 1980s, primarily in private schools and a few well-resourced government schools. Initially computers were used mainly for administrative purposes, such as keeping student records, recording examination marks, producing school reports and creating timetables, but with the continuous advances in ICT, this later changed. Despite the desperate need for ICT implementation in schools to be spread across the length and breadth of South Africa, there are a number of challenges that make it impossible to achieve this goal. On needs to highlight the importance of the usage of ICT in schools. The e-learning Africa Report 2012 is a survey completed by 447 respondents reviewing the eLearning experience in Africa over the last five years and is the first of its kind, bringing together the views of eLearning professionals and a range of other stakeholders from across 41 African countries. The researchers found the following with regard to the benefits or impact of the use of ICT in teaching and learning: ICT motivated learners to learn, it made distance learning easier, it made learning more fun, it encouraged learners to learn more independently, provided that learners were guided appropriately by teachers. It encouraged learners to produce knowledge themselves (Siluma-Mmekoa, & Welch, 2004). Learners pointed out that more content was available to them via the internet. Through ICT learners were connected to experts and had access to global resources. Learners had access to quality learning material. The research also shows that learners showed a better understanding of topics under study (Mdlongwa, 2012).

METHOD

Participants
The targeted population comprised of teachers, principals and parents from one region of the North West province. The region has 128 schools including primary, middle and high schools. This means that there were 128 principals, about 1 500 teachers and a lot of learners. The sample was made up of 65 participants, comprising 13 principals as well as 13 teachers and 39 parents. Parents in this study means parents of the learners including the SGB parent component. These were seen to be important since they represent parents in the community and they have a direct contact with the school. Participation by all individuals was voluntary because the purpose of the study was clearly explained to all possible participants. All questions and queries were addressed to their satisfaction. Examples of questions asked included (a) “... will you put my name in your report?” (b) “... will you report what I say to the department of education?” and so on. Following this process, it was indicated to the participants that if they so wished they could decline to participate.
Instrument and procedure
In this study both qualitative and quantitative methods of collecting data were utilized. In essence this was a mixed methods study. It is averred that the goal “…of mixed methods research is not to replace either of these approaches but rather to draw from the strengths and minimize the weaknesses of both in single research studies …” (Johnson, &Onwuegbuzie, 2004, pp. 14 - 15). In a similar vein, it has been pointed out that when the two methods are used in combination, the weakness of one could be balanced by the strength of the other (Breakwell& Millard, 1995). The aim of utilising both qualitative and quantitative methods here was to use these as some form of triangulating findings. This means that one method was used in some aspects of the study to verify and corroborate participants’ assertions and views in the other method. A questionnaire comprising two sections was used to collect data. The first section requested the participants to provide biographical data in terms of age, gender, highest academic qualification and work experience. The second section was about the usage and/or non-usage of computer laboratories in some schools in the one circuit in the North West province.

Results

Biographical data
Participants were 65 teachers, principals and parents. Table 1 shows the biographical data that the participants were requested to provide. It may be observed from the table that the majority of participants were men. Participants’ ages ranged between 21 years and 55 years ($M = 35.4; SD = 9.6$). The table further reveals that the majority (56.9%) of the participants had completed either a diploma or a degree and higher. It is worth noticing that most of the teachers (53.8%) had teaching experience of 9 years or less. Where the teaching experience ranged between 5 years and 21 years ($M = 11$ years; $SD = 4.9$).

Table 1Biographical information of the participants (N = 65)

<table>
<thead>
<tr>
<th>Category</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>31</td>
<td>47.7</td>
</tr>
<tr>
<td>Men</td>
<td>34</td>
<td>52.3</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 – 29</td>
<td>27</td>
<td>41.5</td>
</tr>
<tr>
<td>30 – 39</td>
<td>13</td>
<td>20.0</td>
</tr>
<tr>
<td>40 +</td>
<td>25</td>
<td>38.5</td>
</tr>
<tr>
<td><strong>Highest academic qualification</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade 12</td>
<td>28</td>
<td>43.1</td>
</tr>
<tr>
<td>Diploma (e.g. Diploma in primary education)</td>
<td>22</td>
<td>33.8</td>
</tr>
<tr>
<td>Degree or higher(e.g. B.A. or B.A. Honours)</td>
<td>15</td>
<td>23.1</td>
</tr>
<tr>
<td><strong>Position held in school</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Deliberations on the use of computers in school computer laboratories

Participants were requested to indicate whether their schools have computer laboratories and whether those computers are used to educate their children. Table 2 shows the responses of respondents on what is the situation in schools about the use of computers in their schools. Respondents were asked to respond to the “Yes” and “No” questions on the use of computers in schools.

<table>
<thead>
<tr>
<th>Computers in schools</th>
<th>Yes/No</th>
<th>Educator</th>
<th>Principal</th>
<th>Parents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Does your school has a computer laboratory</td>
<td>Yes</td>
<td>10 (77)</td>
<td>10 (77)</td>
<td>15 (38.4)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>3 (23)</td>
<td>3 (23)</td>
<td>24 (61.6)</td>
</tr>
<tr>
<td>2. Are all computers working?</td>
<td>Yes</td>
<td>6 (46.1)</td>
<td>6 (46.1)</td>
<td>6 (15.3)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>7 (53.9)</td>
<td>7 (53.9)</td>
<td>33 (84.7)</td>
</tr>
<tr>
<td>3. Does your school have qualified computer teachers?</td>
<td>Yes</td>
<td>2 (15.3)</td>
<td>2 (15.3)</td>
<td>6 (15.3)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>11 (84.7)</td>
<td>11 (84.7)</td>
<td>33 (84.7)</td>
</tr>
<tr>
<td>4. Are your schools connected to internet?</td>
<td>Yes</td>
<td>4 (30.7)</td>
<td>4 (30.7)</td>
<td>9 (23.1)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>9 (69.3)</td>
<td>9 (69.3)</td>
<td>30 (76.9)</td>
</tr>
<tr>
<td>5. Are all educators computer literate?</td>
<td>Yes</td>
<td>2 (15.3)</td>
<td>1 (7.6)</td>
<td>9 (23.1)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>11 (84.7)</td>
<td>12 (92.4)</td>
<td>30 (76.9)</td>
</tr>
<tr>
<td>6. Does your school have the latest computer software?</td>
<td>Yes</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>13 (100)</td>
<td>13 (100)</td>
<td>39 (100)</td>
</tr>
<tr>
<td>7. In the case that the school has no qualified computer teacher, are you prepared to train them all?</td>
<td>Yes</td>
<td>13 (100)</td>
<td>13 (100)</td>
<td>39 (100)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>8. Do you have constant supply of electricity?</td>
<td>Yes</td>
<td>5 (38.4)</td>
<td>4 (30.7)</td>
<td>3 (7.7)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>8 (61.6)</td>
<td>9 (69.3)</td>
<td>36 (92.3)</td>
</tr>
<tr>
<td>9. Are your computers in a well secured place?</td>
<td>Yes</td>
<td>13 (100)</td>
<td>13 (100)</td>
<td>38 (97.4)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>1 (2.6)</td>
</tr>
<tr>
<td>10. Is your school willing to help the community to acquire computer skills?</td>
<td>Yes</td>
<td>13 (100)</td>
<td>13 (100)</td>
<td>36 (92.3)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>3 (7.7)</td>
</tr>
</tbody>
</table>
Table 2 Frequency distribution and percentages in terms of deliberations on the use of computers in school computer laboratories. From the responses here, one can deduce that not all school have computer laboratories. One can also conclude that most of the computers are not working. Based on what respondents have stated, one can notice that in most schools there are no qualified computer educators. This in itself shows that the acquisition of basic computer skills is a challenge since the expectation is that teachers have to transfer their computer skills to learners. Most people agree that internet connectivity is very vital for using ICT for education (Benjamin, P. 2000). This is said since through the use of internet, people will be able to research on a variety of topics. From the respondents, there are very few schools that have access to internet which means that the school community will not be in a position to access important data from the internet.

Discussion
The results presented here have shown that the participants were relatively mature individuals most of whom (58.5%) were 30 years or older. They were fairly educated with 56.9% in possession of a diploma or higher qualification. It was reported here that computers are not used in schools for educating learners due to different reasons one of which was lack of skilled teachers in ICT. After responses from the questionnaires, interviews were also utilised to get all the reasons for the usage or non-usage of the computer centres in schools. Responding to the question “why are computers in your computer centre not used?” responses to this question were different. Respondent 15 indicated that “…we do not have people with skills to operate this computers…people with knowledge are from far and are not able to come here every time”. This was supported by Respondent 4 who indicated that “…this computers are always not functioning…we spent a lot of time waiting for technicians who after leaving the computers are not functioning again, hence the school and people in the community end up not being interested in these computers”. Another respondent came with a different reason for the non-utilisation of the school computers. Respondent 27 indicated that there is a serious crime wave in their community. He stated that “…the security in our school is not tight and as a result our computers did not spend two months and were stolen”. Different respondents came up with different reasons for the non-use of their computers. The one reason that came up in most instances was the lack of skills on the side of teachers. Most respondents maintained that there was a serious need for skills transfer in that teachers needs to be trained on the use of computers and their knowledge be transferred to learners and the community at large. Based on the different responses, one can deduce that most respondents are in favour of having access to ICT and their responses in the interviews clearly showed that they wanted to have skills on ICT and they knew its importance. Based on responses, it is recommended that the Department of basic Education should start off by building strong computer laboratories in schools since without strong security measures, computers will be stolen and this will defeat the purpose of having computers in schools. When researchers were doing skills audit it was found that most of the teachers in schools are not computer literate. Most of the educators don’t even have the basic typing skills. This skills gap is a very big challenge to the department. We therefore recommend that teachers in schools should be trained in computers. The department can
outsource universities to train teachers on ICT. Workshops of a week or two can be organised for teachers to learn computers since without them, skills can’t be transferred.

Limitations
While the sample of this study was randomly selected the results presented here are in no way meant to be generalised to all schools in the North West province for instance. It is worth pointing out that the putting into practice of ICT in rural schools has a lot of challenges on its own hence this paper may not be seen as comprehensive in any way. Because of this, the researchers’ aim to know if computers in school are utilised or not and the reasons for either response was achieved.

References


Instructional resource requirements for the implementation of the computer studies/ICT component of the basic education curriculum in Nigeria’s primary schools.

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Abstract
This paper presents a report of a textual analysis of the 2007 edition of Nigeria’s Basic Education Curriculum (BEC) undertaken with the aim of identifying the range of instructional resources that schools are required to have in order to effectively implement the provisions of Computer Studies/ICT component of the curriculum. Among the design strategies that informed the Basic Education Curriculum (BEC) was the identification of expected minimum competences and aligning these with classroom pedagogy, instructional resources, and evaluation activities across all the subjects in the curriculum. It is against this background that this paper addresses two major concerns: (i) identification of the range of instructional resources required for pupils to attain the expected competences in Computer Studies/ICT; and, (ii) a discussion of the implications of these requirements for the government agencies/departments responsible for implementing BEC in Nigeria’s primary schools. The paper further recommends that, the three tiers of government should initiate and encourage public/private partnerships in the provision of ICT infrastructure and resources for effective implementation of computer studies/ICT curriculum at basic education level, more especially in the rural areas where social amenities are in short supply or none existent. In the same vein, Teacher training programmes should be redesigned and tailored towards the use of educational technologies in the classroom. This implies that teachers should be trained using technologies to give them opportunities to, use technologies in their classroom teaching.

Keywords: Basic Education, Basic Education Curriculum (BEC) Computer Studies, Instructional resources, Information and Communication Technology (ICT).

Introduction
The world is now described as a knowledge-based society or information society due to the pervasion of information and communication technologies (ICT) into every segment of the human society. This has given rise to generally accepted view that, there is the need for education systems to bring about changes in the preparation of its citizens for lifelong learning in an information society. The rationale for this view is not unconnected to the fact that ICTs are considered as tools for growth, development and for empowering societies to change into knowledge economies. Therefore, citizens in this information societies need to be prepared in new technology literacy competencies inclusive of higher order thinking (HOT) and sound reasoning skills, i.e. the ability to learn how to learn and the ability to reflect, analyse, synthesis ,to find solutions and to adapt in order to cope with the level and speed to changes in knowledge production and world globalization.Also, to increase their own activity and ability to continue
to develop and contribute to the knowledge society in which they live, (Hooker, Mwiyeria, & Verma, 2011). Nigeria considers it most appropriate for its citizens to acquire ICT knowledge and competencies right from the basic level of the formal education system so as to provide opportunities for them to fit into the global society and fully participate in all affairs as global citizens.

To attain this noble goal, in Nigeria, the law requires compulsory education for children between ages six to fifteen in primary and junior secondary school (i.e. Basic education) and so, it is a right for every Nigerian child to access basic education free of charge. This implies that primary education begins at the age of six for the majority of Nigerian children and they normally spend six years in primary school before graduating to proceed to the next level of schooling, normally called the junior secondary school (JSS). Prior to the introduction of the basic education curriculum, Subjects taught at the primary schools include; English language, math, Islamic religious studies, Bible knowledge, science and any of the three major Nigerian languages namely; Hausa, Igbo or Yoruba. However with the development and introduction of a new education curriculum via the Universal Basic Education Programme (UBE), more subjects like computer studies/ICT, French, basic science and technology were introduced into the primary school curriculum popularly referred to as basic education curriculum (BEC).

The introduction of the 9-year basic education programme in Nigeria is a deliberate pragmatic step towards the attainment of the millennium development goals (MDGs) and other national development strategies using education as a formidable tool. Perhaps, one important reason for the introduction of computer studies/ICT in the new nine year basic education curriculum is basically to address the gaps that existed in the old curriculum especially as it relates to the vision of Nigeria becoming one of the top 20 economies of the world by the year 2020, popularly called VISION 2020-20. In this 21st century, information and communication technologies have taken the centre stage in all human affairs. One area of the human society that has experienced significant influence of ICT Influx is the education sector. Nigeria has taken several giant strides towards integrating ICTs in its education system; in fact, this is incontestable as evident in the number of Information Technology policies, facilities, capacity building and infrastructure that are put in place. The First and perhaps the most paramount of all the policies put in place, is the role computer education policy and curriculum plays in attaining the national goals of technological development. Hence, the introduction of computer education in all the levels of Nigeria’s educational system. This is because Nigeria cannot really overlook the significant role of computers in propelling the desired development in all sectors of the society. To further reiterate government’s commitment to information and communication technology’s inclusion into the education system, it stated clearly in the national policy on education document in section 4 sub-section 19(M) that, the government recognise the role of information and communication technology in advancing knowledge and skills necessary for effective functioning in the modern world hence the urgent need to integrate ICT into education. Therefore computer education is now an integral part of the formal education system in Nigeria. However, there are great challenges in realisation of this noble
desire, these challenges are evident in the quantity and quality of resources available for curriculum implementation for realisation of the policy objectives.

**Objectives of computer studies/ICT curriculum at the basic education level**

Firstly, it is important to know that, the philosophy behind Basic Education in Nigeria is to provide opportunity for every learner who has successfully completed the nine years of continues basic education schooling, should have acquired sufficient level of literacy, numeracy, manipulative, communicative and life-long skills as well as ethical, moral and civic values needed for laying a solid foundation for life-long learning as a basis for scientific and reflective thinking. The Basic Education curriculum is structured into three levels of operation namely; lower basic education curriculum (primary 1-3), middle basic education curriculum (primary 4-6) and upper Basic Education curriculum (JS1-3). The focus of our discussion in this paper centres on the primary school i.e. the lower and middle basic education level (primary 1 to 6). We consider it not out of place to highlight the general goals of primary education as outlined in the national policy on education in Nigeria, and also the national policy on information and communication technologies (ICT) in Education document, this is to guide our discussion even as we present an argument as to whether the resources used in our primary schools are actually meeting the expectations of the policy. In recognition of the role of primary education as a foundation for other levels of education, the Nigerian government articulately set to achieve the following broad goals at the primary school level of basic education. Thus, the goals of primary education in Nigeria are to:

- Inculcate permanent literacy and numeracy, and ability to communicate effectively,
- Lay a sound basis for scientific and reflective thinking
- Give citizen education as a basis for effective participation in and contribute to the life of the society
- Mould the character and develop sound attitude and morals in the child
- Develop in the child ability to adapt to the child’s changing environment
- Give the child opportunities for developing manipulative skills that will enable the child function effectively in the society within the limit of the child’s capacity
- Provide the child with basic tools for further educational advancement, including preparation for trade and crafts of the locality

Now looking at the national policy on information and communication technologies (ICT) in education document, we will be left in no doubt about government’s commitment to integrating ICT into the education system as a strategy for development. The Objectives of ICT in education in Nigeria are as follows:

- To facilitate teaching and learning process
- To promote problem-solving, critical thinking and innovative skills
- To promote lifelong learning
- To enhance the various teaching/learning strategies required to meet the needs of the population
- To foster research and development
- To support effective and efficient education administration
• To enhance universal access to education and the range of instructional options and opportunities for any-where, any-time, any-space and any-path learning.

These policy objectives can be considered laudable and in-fact all encompassing towards making Nigerians becoming global citizen. But how feasible is it to pursue these laudable objectives in isolation of the various resources that promote learning in the school?. We must be quick to realise that policies and objectives don’t just yield fruits in isolation of human and material resources. Therefore the prospects of the above stated objectives depends on effective mobilization and utilization of relevant resources for implementation. In the light of the above set goals for the Nigerian child, one can conclude that the policy is actually well articulated with the promise of providing for the Nigerian child effective education which will prepare it for inclusive participation in workplace, social environment, political sphere and in the economic activities. However, good and promising as the policy may look, one may still wonder, What is actually responsible for the poor performance, high rate of dropout of school and other vices associated with children in our primary school?. We may arrive at an answer after making a thorough analysis of the policy provisions as indicated above, in the recommended resources for curriculum implementation and actual resources available in our schools.

Recommended instructional resources required for computer studies/ICT curriculum implementation in primary school in Nigeria

Instructional resources are generally classified into two major categories namely; human resources and material resources. Both are significant to teaching and learning process and they complement one another in achieving instructional goals. Therefore, In order to project or evaluate the possibility of achieving the stated objectives of computer studies/ICT Basic Education curriculum, it is imperative to identify the range of instructional resources required for pupils to attain the expected competences in Computer Studies/ICT. This is a list of instructional resources that are recommended in the 2007 Edition of Nigeria’s Basic Education Curriculum (BEC) for implementation; Computer system (C.P.U, monitor, keyboard, mouse, printers, speakers, software, Graphic materials (charts, pictures, photographs, flipcharts, flashcards, diagrams etc), GSM phone, Calculators, Typewriter, Television set, Diskette, Floppy disk, DVD, CD-ROM, flash, drive, Hard Disk, Radio, Multimedia computer, Video, Abacus, Internet facilities, Textbooks, Four square Tables, Slide rules, Computer laboratories. Computer laboratories and Teachers.

The state of Nigeria’s primary schools

The importance of provision of instructional materials for effective teaching and learning in any formal school system cannot be undermined, unfortunately, this is not the scenario in most primary schools in Nigeria where, many pupils attend school without books, especially in the rural areas. This can be attributed to a number of reasons, one of which is poverty, that is more
pronounced in the rural areas. The production and provision of textual and other instructional materials should be a priority for quality delivery of the curriculum (Danmole, 2011).

The current state of primary schools in Nigeria is not favourable for the attainment of the set objectives for the Basic Education. Although there are clear evidences of infrastructural improvement and increased access at all levels of education in Nigeria with the introduction of universal basic education programme (UBE) in September 1999, much is still desired. Instructional resources including teaching manpower are still grossly inadequate. Schools are characterised by untrained teaching personnel. Non-availability of computers, laboratories and other ICT facilities like electricity and internet connectivity are absent in most public primary schools in Nigeria. As a matter of fact, Several studies conducted (Hooker, Mwiyeria, & Verma, 2011, Olibie & Akudolu, 2008) revealed serious inadequacies in provision and availability of instructional materials, equipment and infrastructure including those required for teaching and learning of information and communication technology in schools.

Inadequacy and/or lack of accurate student population data has affected the provision of instructional materials such as textbooks, laboratory equipment, audiovisual materials, etc. in recent years. This has constituted a major challenge to successful implementation of the UBE programme. Many of the schools do not have these materials and where available, they are inadequate and outdated (Danmole, 2011). The overall problem regarding general inadequacy of infrastructure, teaching materials and amenities in the Nigerian educational system is well captured by the then minister of education, Ezekwesili when she submitted that; the physical infrastructure is below standard and grossly insufficient, the basic amenities such as water and light are seriously lacking in schools. In the same vein, the national policy on ICT in education in Nigeria document noted that, the present state of ICT in education in Nigeria is far from what is expected. The report of review of research on basic education provision in Nigeria compiled by Akyeampong, Sabates, Hunt & Anthony in 2009, obviously indicated that most primary schools are characterised by dilapidated buildings, poor sanitary conditions, insufficient furnishing, meagre supply of textbooks and other necessary teaching supplies. Ikoya & Onoyase (2008) earlier disclosed that most primary schools lack Information Technology facilities, libraries and computer laboratories. The authors further reported the following findings from a comprehensive survey conducted on Assessment of infrastructure in Nigerian schools in 2008;

- About half of schools (53 percent) lacked fundamental structures
- Only a fifth of schools had facilities that were sufficient in both quality and quantity to fulfil UBE objectives (92 percent of those were not regular public schools where vast majority of the people attend).
- 65 percent of the schools lacked electricity
- 54 percent lacked safe piped water
- 78 percent of the schools had no school bus/transportation

Sadly, all the above conditions are still prevalent in primary schools across the country, in fact the conditions are even worst in some cases, despite the launch of the universal basic education
programme in 1999(some fifteen years ago). The present trend, no doubt hampers the attainment of the policy provisions for the education system in Nigeria. Therefore, there is the need to rethink about pedagogy and accompanying resources in primary schools in order to fully and properly integrate ICT into Basic education in the country.

Implications for Basic Education Curriculum Implementation in Nigeria

The popular slogan that Education for all is the responsible of all suffices on general education in the society, but in the context of this discussion we are concerned with formal education which takes place in formal school settings. The responsibility of educating the young generation of Nigerians at the Basic Education level particularly at the primary school level is vested on agencies and agents of government, specifically, the state and local governments which are closer to the grassroots populace, This implies that, the implementation of the Basic Education curriculum in the primary school rest upon the shoulders of the above mentioned stakeholders. By implication, they determine the success or failure of any education policy or programme. Now, to be fair to the education system is to realise the fact that, in the quest for sustainable national development in which education is a critical determinant, and ICT a critical tool, there is a need to go beyond mere policy formulations in attaining the desired vision for Nigeria. These laudable policies formulated must be translated into products through appropriate actions and processes. The implications of the present state of Basic Education and in particular computer education/information and communication Technology Education in Nigeria do not promise any level of development for the future of the country.

It is pertinent to note here that, even the national policy on information and communication technologies (ICT) in education (2010), have identified some challenges plaguing the implementation of ICT in education in Nigeria. The document enumerated the following challenges as impediments to effective implementation of the policy provisions and the curriculum;

Regulation: there is high proliferation of ICT training outfits without control due to lack of standards, supervision and regulation.

Funding: the funding of the ICT sector generally and particularly ICT in Education is grossly inadequate compared to its desired impact on the society, however, there is a gradual improvement in the funding of ICT in education.

Curriculum: generally, there is no regular review of information technology curriculum to meet current societal needs in the sector

Capacity: although, capacity –building of teachers on ICT is going on, a high percentage of teachers are largely not ICT literate and have no adequate motivation to want to be.
Research: there is little or no research on ICT generally and on ICT education in particular.

Equity issues: there is a great divide between the urban and rural schools in terms of ICT access, personnel, resources and infrastructure.

Unfortunately, these challenges are still prevalent in our schools, several years after being identified. In view of the above, it implies that all the stakeholders in the primary schools need to be more proactive focussed and as well determined to actualise the goals of ICT education. Now, it is important at this juncture to highlight the specific implications of the state of affairs in our primary schools on stakeholders. The paper wish to focus its discussion on major actors involved in the implementation of the basic education curriculum in primary schools.

**The Government:** According to the national policy on ICT in education, it is the responsibility of state and local government tiers of government to implement the ICT in education policies and standards made by the federal government through the federal ministry of education (FME). Considering the state of infrastructure decay and quantity/quality of personnel in our primary and secondary schools in Nigeria, we can conclude that, it may be absolutely be difficult to achieve the policy objective as envisaged in the policy document. This is so, because the state and local governments have failed in their statutory responsibilities of providing resources for implementing the ICT curriculum as it should be. Computer laboratories are practically non-existent in most primary and secondary schools in Nigeria due to failure of the relevant tiers of government to provide funding. The implication is that, even the government is standing as an impediment to the curriculum implementation.

**Education Agencies:** State universal basic education boards (SUBEB) and local government education Authority (LGEAs) are the official agencies responsible for administration, supervision, recruitment of teachers, provision of infrastructure, materials, facilities at the basic education level in Nigeria. Sadly, the mandate given to these agencies is either poorly carried out or not carried out at all due to bottle necks, negative political influences in allocation of funds, recruitment, appointments or deployment of teachers. In fact, the provisions of teaching resources by these agencies remain very poor over a long time. Even with the establishment of basic education boards, the situation has not appreciated to a commendable level of satisfaction. There are therefore great challenges in the implementation of computer studies basic education curriculum in our primary schools.

**Teachers:** Teachers are no doubt critical stakeholders in curriculum implementation in any formal education system anywhere in the world; same is the situation in Nigeria. However, it is sad to note that primary school teachers in Nigeria are ill-prepared right from the pre-service training stage to teach computer studies in primary. Olibie & Akodulo, (2008) opined that teacher training on ICT education still does not go beyond computer appreciation lectures in colleges and universities as centres of teacher professional development. In response to the above reality, the government through the national commission for colleges of education (NCCE) decided to revise the Nigeria certificate in education (NCE) curriculum to align it with
the needs of the present realities in Nigeria. However, Hooker, Mwiyeria, and Verma (2011) reported that, even the newly revised Nigeria Certificate in Education (NCE) curriculum by the National Commission for Colleges of Education (NCCE) does not provide NCE graduates with in-depth knowledge and skills for integrating ICT into school curricula and teaching practices. This means there is still a gap between policy and practice and so to achieve the stated objectives of the curriculum still remain an illusion to the basic education operators.

Community: every school is a product of the society; therefore every curriculum is designed based on the needs, norms and aspirations of the society. Primary schools in Nigeria are rightly situated in various communities where the schools are needed. Most communities, especially in rural areas do not have the required ICT facilities and infrastructure that can support computer studies in primary schools. This implies that the community resources required to support the implementation of the basic education curriculum are lacking or in bad condition. There is the problem of digital divide between the urban and the rural school, whereas schools sited in urban areas have the opportunity to access ICT facilities within their communities, and those in the rural areas do not have such opportunity, thereby placing them at disadvantaged positions.

Recommendations
The three tiers of government (federal, state and local governments) should initiate and encourage public/private partnerships in the provision of ICT infrastructure and resources in every community for effective implementation of computer studies/ICT curriculum at basic education level, more especially in the rural areas where social amenities are in short supply or none existent.

Teacher training programmes should be redesigned and tailored towards the use of educational technologies in the classroom.

A special training programme for the production of computer /ICT teachers should be initiated and sponsored by the government to improve quantity and quality of computer teacher supply for basic education.

Teachers should be trained using Educational technology tools and in turn be mandated to use technology tools to do their teaching at basic education level..

Conclusion
In conclusion, I must state that, sadly but evidently, Nigeria has the history of formulating good policies and programmes for development and good governance, but unfortunately, most of the past policies are never translated into actions that could lead to higher standards of living for the citizens. I am afraid that, despite the current effort of the government to fast-track development through ICT integration in education, it will suffer from the same attitude of neglect by the same government that formulated the policies. My fear is informed by the current general state of our primary schools compared to the various provisions in the ICT in education
policy document and computer studies/ICT basic education curriculum. If the policy thrust of the national policy on information and communication technologies in education as contained in the document is anything to go by, then we can conclude that, the policy is far from the reality in our school, particularly at the Basic Education level in Nigeria.

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Moving secondary education towards e-learning in Osun State, Nigeria – an appraisal

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Abstract
The study appraised the introduction of e-learning program known locally as “Opon Imo” (tablet of knowledge) into secondary education in Osun State, Nigeria. The study examined the nature and composition of the ICT device. It reviewed the planning, trial-testing and the proposed full implementation of the program in the state. 400 respondents selected randomly comprising 250 secondary school students, 50 secondary school teachers, 20 school administrators and 80 educated members of the public were used for the study. A questionnaire that asked questions on the main theme of the study was used to gather data from the respondents. The analysis of data was done through the use of simple percentages. The discussion of the results showed that most of the respondents saw the introduction of “Opon-Imo” (tablet of knowledge) as a good innovative approach that could revolutionize secondary education in the area of study. The respondents however expressed fear in the areas of how the “tablet computer” would go round, how to integrate the technology into the classroom, the problem of unstable power supply, etc. It was recommended that a central place be established in the state and possibly in each local government for the supervision and evaluation of the project.

Introduction
Technology is now seen as a major force affecting every aspect of our life. Almost everything that man does has been affected and influenced by technology. The field of education has not been an exemption. Akinsanya and Akanmu (2010) observed that learners now have more sources of information than before and that with technology; automation has been introduced into education. In other words, technology and its product now have great influence on what goes on in the classroom. In the opinion of Siddiqui (2008) “technology is changing teaching and learning” and that technology is critical to preparing students to live, learn and work successfully in a digital age.

It has been observed that technology and some of its products, if properly applied to the process of education could help in solving the problems of knowledge explosion, population explosion, over-crowded classrooms, inadequately trained personnel, inadequate educational resources, etc., that were known to have bedeviled the traditional system. Adeyanju (2000) believes that through effective application of technology to education, some abstract concepts that were hitherto difficult to teach could now be taught with good illustration.

Of all the technological devices influencing education in recent times, Siddiqui (2008) believes that technology in the form of computer and the internet has become a major focus of education policy and reform. Computer is a machine specially designed for the manipulation of coded
information. It is an automatic electronic machine that could perform simple and complex operations by accepting, inputting and manipulating data and producing output inform of information (Akinsanya and Akanmu, 2010).

Internet is seen as a worldwide collection of millions of computers that are interconnected to support communication. It is a computer network used for world-wide communications (Akudolu, 2004). Commenting on this, Onuigbo (2003) argues that “what makes the internet a global network unique is its worldwide collection of digital telecommunication links that share a common set of computer network technologies, protocols and application”. A protocol refers to the means by which different computers communicate with each other. In the 1970s, the Internet Protocol (IP) was being used for addressing and routing of data packets. The Advanced Research Project Agency (ARPA) was in use before the IP. In 1983, the Transmission Control Protocol (TCP) came into operation. Since then the IP and TCP have been governing how electronic message is broken up and reassembled (Akudolu, 2004).

Generally, there are many uses of computers and internet. However, when it comes to their application to instruction or learning the term e-learning is commonly used. This simply means that electronic learning is essentially the computer and network enabled transfer of skills and knowledge. It refers to using electronic application and processes to learn. These may include web-based learning, computer-based learning, virtual classrooms and digital collaboration (Akinsanya and Akanmu, 2010).

The internet is a veritable source for school learning as both the teachers and students get current information on different school subjects from it. Akudolu (2004) believes that the e-learning made possible by the internet is a great boost to distance education and electronic books (e-books). The internet has also made possible the development of the idea of virtual or digital library. This is a type of electronic library (e-library) or hybrid library, as it is sometimes called. It is a type of library in which collections are stored in digital forms (as opposed to print, microform or other media) and accessible by computers.

With what computers and the internet tend to offer the school, it seems that our school system has not been able to make use of the potentialities of these powerful tools of Information and Communication Technology (ICT). In the words of Siddiqui (2008) “most schools have limited access to the information revolution brought about by the rapid growth in the use of computers and the internet”. So, it is considered commendable effort when the use of computer and or internet is introduced to the school system in any form. The belief of the proponents of this opinion is that “increasing the educational uses of computers and the internet may provide an opportunity to transform teaching, predicting a move toward more student-centered instruction based on content-rich real-world applications—what some have called the transformation of the classroom teacher from “the sage on the stage” to “the guide on the side” (Siddiqui, 2008).

The present study is an appraisal of the newly introduced “tablet of knowledge”- an ICT device called locally as “Opon-Imo” into senior secondary education in Osun State, South-West,
Nigeria. The project was conceived based on the belief that technology could help to attain some of our most ambitious conception of what school is and how it should operate. This view was supported by the committee in charge of the program in the State in one of its reports, when it states thus:

*Technology can help to transform the interest and natural curiosities of students into significant, learning opportunities.....with appropriate learning tools, an unguided young student who uses technology to play computer games, can translate that interest and intensity into an academically relevant application like a flight simulator program designed for adults, flying planes, capturing the same kind of excitement but with a challenging, real-world payoff.*

The assumption of the committee was that, perhaps the students were already familiar with some of the tools of technology that could be used to enhance school learning. After series of meetings of the committee and relevant Sub-Committees, the project was code-named “Opon-Imo Technology Enhanced Learning System (OITELS)”. By design, the OITELS is supposed to be a stand-alone system installed on tablets (Personal Computers) and specifically meant for Senior Secondary Education. The tool is expected to create and deliver compelling self-paced off-line courses conducted in a highly interactive computer-based learning environment synchronized into a library of relevant e-books and a computer-based testing environment (OITELS’ Committees Report, 2012).

It must be stated here that the device was designed only for senior secondary education in the area of study. The National Policy on Education (2004) revised makes provision for 2-tier of Secondary Education in Nigeria. The first-tier is a three year program tagged Junior Secondary School (JSS). It is the level of education after Primary Education and the level preceding Senior Secondary School (SSS) which is the second-tier. Only successful students from the Senior Secondary School (SSS) could proceed to tertiary institutions. Students in the Senior Secondary School (SSS) are usually prepared for external examinations and entrance examinations into tertiary institution. For instance, three recognized examination bodies exist in the country that organize the final examinations of Senior Secondary Schools (SSS) in the country. These are the West African Examination Council (WAEC), the National Examinations Council (NECO) and the National Business and Technical Education Board (NABTEB). Each of these bodies organizes relevant examination for Senior Secondary Education across the country. The Joint Admissions Matriculation Board (JAMB) organizes entrance examination into Nigerian Universities, Polytechnics and Colleges of Education. All these examinations are considered external to the Secondary Schools and frantic efforts are usually directed towards ensuring that students pass them very well. Perhaps this was what prompted the introduction of the “Opon-Imo” tool technology into the senior secondary school system in the area of study.

**Purpose of the Study**
The purpose of the study was to:
1. Appraise the introduction of “Opon-Imo” (tablet of knowledge) an ICT device into secondary education in Osun State, South-West, Nigeria.
2. Examine the expected roles of students, teachers, parents and other stakeholders in the new program.
3. Analyze those problems that might inhibit the successful implementation of the program.

**Research Questions**

The following questions were generated to guide the study.

1. What are the objectives of introducing the “Opon-Imo” (tablet of knowledge) tool technology into senior secondary education in the area of study?
2. What are the expected roles of the students, subject teachers and the parents in the new arrangement?
3. What are the likely problems that may inhibit the successful implementation of the program?

**Methodology**

**Research Design**

The research design employed in this study was a descriptive survey type. In it a structured questionnaire prepared by the researcher was used to elicit information from the selected respondents in the area of study.

**Population and Sample**

All the Senior Secondary School students, subject teachers, parents and educated members of the public in the state formed the population for the study. However, for the purpose of this study, only 400 respondents selected randomly from the various relevant sections of the society, were used as sample for the study. This comprised 250 randomly selected senior secondary school students from 25 randomly selected secondary schools across the State, 50 randomly selected secondary school teachers from 20 randomly selected secondary schools, 20 randomly selected school administrators and 80 randomly selected educated members of the general.

**Instrument**

The instrument used for gathering data in this study was a structured questionnaire. The questionnaire comprised two sections ‘A’ and ‘B’. Section ‘A’ asked questions on the background of the respondents while section ‘B’ comprised six sub-sections that asked questions on the main theme of the research study.

**Validation of the Instrument**

To give the instrument the needed face and content validity, the draft of the questionnaire was given to colleagues in Educational Technology and Information and Communication Technology (ICT) for their comments and observations. All corrections, comments and observations made were effected in the final copy of the questionnaire used for the study.
Procedure of Data Collection
Copies of the questionnaire were distributed personally by the researcher to the selected respondents across the state over a period of six weeks. The copies were collected back physically by the researcher after they had been completed by the respondents.

Data Analysis
The data collected from the study were analyzed using frequency tables and simple percentages.

Table I: Analysis of Responses on Reasons for the Introduction of “Opon-Imo” e-learning Technology into Secondary Schools (N=400)

<table>
<thead>
<tr>
<th>S/N</th>
<th>ITEM</th>
<th>NO</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>To improve the quality of instruction in secondary schools.</td>
<td>358</td>
<td>89.5</td>
</tr>
<tr>
<td>2</td>
<td>To prepare grounds for better performances of the learners in external examination such as WAEC, NECO and Jamb.</td>
<td>296</td>
<td>74</td>
</tr>
<tr>
<td>3</td>
<td>To bring to the doorstep of the learners and teachers, ICT related technology in support of teaching and learning at the level of education.</td>
<td>300</td>
<td>75</td>
</tr>
<tr>
<td>4</td>
<td>To help secondary school students overcome problems of reading materials which are either not available or too costly to be purchased</td>
<td>391</td>
<td>97.75</td>
</tr>
<tr>
<td>5</td>
<td>Others (pls. specify)</td>
<td>50</td>
<td>12.5</td>
</tr>
</tbody>
</table>

From the Table 1 above, we can see that 391(97.75%) of the respondents believed that the new “opon-imo” (tablet of knowledge), technology was introduced to help students to overcome problems of inadequate reading materials in the area of study. 358(89.58%) of them held the opinion that the new program was introduced in order to improve the quality of instruction in secondary schools. The interest to bring ICT related technology to the doorstep of learners and teachers was seen as the reason for the introduction of the program in the study area by 300(75%) of the respondents. 296 (74%) of them, however thought that the reason for the introduction of the program was to enhance learners’ performances in external examination. 50(12.5%) of the respondents gave other reasons which they felt were responsible for the introduction of the program in the area of study. Such reasons included that the new tool technology could make opportunities more equal as it would enable students to have access to the same materials from the same authority or sources on the various subjects listed in the new program. It could also be inferred from the analysis above that many of the respondents held the opinion that the new technology could help to provide solutions to some if not all the problems bedeviling secondary education in the area of study. Such problems would include inadequate reading materials, poor quality of instruction, poor preparation for external examinations and unequal access to good and similar reading materials. It could therefore be logically argued that people believed that the new program was introduced into secondary education in the area of study with the sole purpose of revolutionizing the system.
Table II: Analysis of Responses on the likely Benefits that the Program could offer Secondary Education in the State (N=400).

<table>
<thead>
<tr>
<th>S/N</th>
<th>ITEM</th>
<th>NO</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Improve access to good sources of information on secondary education curriculum</td>
<td>362</td>
<td>90.5</td>
</tr>
<tr>
<td>2</td>
<td>Ability to self-pace and personalize learning, thereby bringing the curriculum towards students’ interest.</td>
<td>400</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>Allow teachers to facilitate active students’ participation in the instructional process.</td>
<td>298</td>
<td>74.5</td>
</tr>
<tr>
<td>4</td>
<td>Ability to move the instructional process towards a paperless age.</td>
<td>315</td>
<td>78.75</td>
</tr>
<tr>
<td>5</td>
<td>Could be seen as revolutionary initiative that could move secondary education towards overcoming the challenges created by technology in the world</td>
<td>220</td>
<td>55</td>
</tr>
<tr>
<td>6</td>
<td>Others (pls. specify)</td>
<td>80</td>
<td>20</td>
</tr>
</tbody>
</table>

Table II above presents analysis of the responses on the likely benefit that the new tool technology could offer secondary education. All the 400 (100%) respondents agreed that it could help to self pace and personalize learning. 362(90.5%) felt that the new program could improve access to sources of information on secondary education curriculum. About 315(79.73%) of them thought that the new tool technology would move the instructional process towards a paperless age. The new “Opon-Imo” (tablet of knowledge) carried details of all subjects at the level of education. 298 (74.5%) of the respondents believed that the new program could facilitate active learners’ participation in the instructional process. It could thus, be seen as learners-centered strategy. Only 220(55%) of them were of the opinion that the program could revolutionize secondary education in the state and help to overcome some of the challenges created by technology in the world. Other benefits that could be derived from the program were given by 80 (20%) of respondents. A good example was the view by some of them that the program could get rid of problems of quality of teacher and or teaching and that of curriculum content coverage. Respondents generally believed that the new tool technology could in several ways benefit secondary education in the area of study. Some of these were that it could self-pace and personalize learning and could improve access to secondary education. Thus, it could be concluded here that people believed that the new tool technology would offer several benefits to secondary education in the area of study.

Table III: Analysis of Responses on the Expected Roles of the Subject Teachers in the New Arrangement (N=400).

<table>
<thead>
<tr>
<th>S/N</th>
<th>ITEM</th>
<th>NO</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Provide the needed platform to integrate the new program into classroom instructional process.</td>
<td>400</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>Serve as monitors and coordinators of the new program at school level.</td>
<td>398</td>
<td>99.5</td>
</tr>
<tr>
<td>3</td>
<td>Have a good knowledge of details of their subjects as obtained in the new program so as to enable them perform their assignment as monitors and coordinators.</td>
<td>290</td>
<td>72.5</td>
</tr>
</tbody>
</table>
Analysis of responses on the expected roles of the subject teachers in the new arrangement is presented in table III above. All the 400 (100%) respondents would expect the teachers to provide the needed platform to integrate the program into the classroom. 398 (99.5%) of them expected teachers would serve as monitors and coordinators of the new program. Teachers were also expected by 394 (98.5%) of the respondents to be organizing tutorial and group work on the new program. 375 (93.5%) of them would like teachers to help learners identify the various stages of activities (assignments, tests, feedbacks, etc) in the new program. Teachers would do their assignments as monitors and coordinators very well only if they had good knowledge of their subjects as presented in the new tool technology. This view was supported by 290 (72.5%) of the respondents. Only 220 (55%) of them were in support of the view that teachers should maintain relationship with parents through the Parent-Teachers’ Association (PTA) in order to ensure the success of the program. 156 (39%) respondents gave other roles they would like the teachers to perform in the new arrangement. For instance, some of them would like the teachers to be involved in the monitoring and evaluation of the program. Others would like the teachers or at least the school to be involved in the distribution of the tablet and training of the students. Secondary school teachers were not expected to be passive in the new program. They should instead see the tool as a design to complement their efforts and not to replace them on job. Teachers should be willing to work with other such stakeholders as the students and their parents in order to ensure success of the new program.

**TABLE IV: Analysis of Responses on the Expected Roles of the Parents in the New Arrangement (N=400)**

<table>
<thead>
<tr>
<th>S/N</th>
<th>ITEM</th>
<th>NO</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ensure that the students work on their systems (tablet of knowledge) as prescribed in the new program.</td>
<td>400</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>Provide needed materials for practical, experiments, assignments, feedback, etc</td>
<td>360</td>
<td>90</td>
</tr>
<tr>
<td>3</td>
<td>Ensure the safety of the tool (Opn-Imo) when in their custody at home.</td>
<td>400</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>Be willing to participate in all program organized through the PTA on how to ensure the success of the program.</td>
<td>275</td>
<td>68.75</td>
</tr>
<tr>
<td>5</td>
<td>Others (pls. specify)</td>
<td>156</td>
<td>39</td>
</tr>
</tbody>
</table>

Responses to the questions on the expected roles of the parents in the new arrangement were as analyzed in table IV above. All the 400(100%) respondents agreed that the parents should
ensure that the students work on their tablets of knowledge as prescribed and that they should ensure the safety of the tool at their homes. 360(90%) of the respondents felt that parents should provide the needed materials for practicals, experiments, feedback, etc; while 275(68.75%) of them would like the parents to be willing to participate in all programs organized on how to ensure its success. Only 68 (17%) of the respondents gave other roles they expected the parents to play in the new arrangement. They would like the parents to provide more support for their wards in terms of the provision of balanced diet, good school uniform, monitoring of their school works, etc. The parents should therefore not see the new tool technology as purely a “school-affair” but rather as what they should support and appreciate for it to achieve its set-out goals and objectives. Parents should also be willing to work with the teachers and the schools to have more information on what they should contribute toward the success of the program.

Table V: Analysis of Responses on the Expected Roles of the Students in the New Arrangement.

<table>
<thead>
<tr>
<th>S/N</th>
<th>ITEM</th>
<th>NO</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Keep to all instructions given on the procedure to be followed when utilizing the tool (Opon-Imo) in the new program.</td>
<td>400</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>Be willing to interact with the tool as designed and scheduled on daily and weekly basis.</td>
<td>286</td>
<td>71.5</td>
</tr>
<tr>
<td>3</td>
<td>Carry out studies, assignments, practicals, experiments, feedback, etc as may be prescribed in the new program.</td>
<td>391</td>
<td>97.75</td>
</tr>
<tr>
<td>4</td>
<td>Concentrate only on the subjects of their interest especially when preparing for external examinations such as “WAEC, NECO and JAMB”.</td>
<td>309</td>
<td>77.25</td>
</tr>
<tr>
<td>5</td>
<td>Be willing to take more instructions from their subject teachers on the content already arranged in the tool.</td>
<td>275</td>
<td>68.75</td>
</tr>
<tr>
<td>6</td>
<td>Need to consult other sources of relevant information apart from the one contained in the tool.</td>
<td>288</td>
<td>72</td>
</tr>
<tr>
<td>7</td>
<td>Need to work with other school mates in group works and tutorials.</td>
<td>273</td>
<td>68.25</td>
</tr>
<tr>
<td>8</td>
<td>Need to acquire more knowledge on ICT and related concepts to be able to use the skills acquired under the new program for proper e-learning via the internet.</td>
<td>318</td>
<td>79.5</td>
</tr>
<tr>
<td>9</td>
<td>Others (pls. specify)</td>
<td>125</td>
<td>31.25</td>
</tr>
</tbody>
</table>

Table V above shows the analysis of the responses on the expected roles of the students in the new program. All the 400 (100%) respondents expected the learners to keep to instructions on how to utilize the tool. That the learners should carry out all assignments, practicals, feedback, etc as designed in the program was supported by 391(97.75%) respondents. 318(79.5%) of them would like the students to acquire more knowledge of ICT. Students should also concentrate on their own subjects as arranged in the new tool. This view was supported by 309(77.25%) of the respondents. The need for the learners to be consulting other sources of relevant information apart from the one contained in the tool was emphasized by 288(72%) of
the respondents. 286 (71.5%) of the respondents wanted the learners to be interacting with the tool as scheduled on daily and weekly basis. The learners should be taking more instructions from their teachers on their subjects. 275(68.75%) supported this view, while 273(68.25%) were of the opinion that the learners should work together in tutorial groups. Students should not see the new tool technology as a mere play gadget, but rather they should see it as a design meant to assist them in their school works. They should also not see the design as self-sufficient. They would still need to search for more information from other sources like the textbooks, attend classes under the management of their subject teachers, engage in tutorial with their mates, etc., in order to enable them achieve the best from the new tool technology. In short, learners were expected to be more actively involved in the new arrangement and should not see the new tool technology as a substitute for their normal school works. Rather, the new program is expected to compliment and reinforce such other school activities as regularity in the classroom, taking instructions from the subject teachers, doing tutorial and group works, etc.

Table VI: Analysis of Responses on the likely Problems that may inhibit the success of the Program (N=400)

<table>
<thead>
<tr>
<th>S/N</th>
<th>ITEM</th>
<th>NO</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The program is capital intensive and may be difficult to sustain considering the large population of students.</td>
<td>280</td>
<td>70</td>
</tr>
<tr>
<td>2</td>
<td>The social cultural background of the students may be a problem as many of them are not familiar with ICT and related tools.</td>
<td>180</td>
<td>45</td>
</tr>
<tr>
<td>3</td>
<td>Subject teachers may want the program to fail, because of the fear that it may replace them in the class and throw them out of job.</td>
<td>175</td>
<td>45.75</td>
</tr>
<tr>
<td>4</td>
<td>The poor quality of electricity supply in the state may be a problem as the device depends on electricity for operation.</td>
<td>390</td>
<td>97.5</td>
</tr>
<tr>
<td>5</td>
<td>The students may see the device as a mere tool for play/fashion and not for serious instructional purpose.</td>
<td>280</td>
<td>70</td>
</tr>
<tr>
<td>6</td>
<td>The repair or replacement of the tool when damaged may be a problem, as there is no designated place for such at present.</td>
<td>276</td>
<td>69</td>
</tr>
<tr>
<td>7</td>
<td>The review of items in the tools may be difficult as there is no interconnectivity between the tools.</td>
<td>289</td>
<td>72.25</td>
</tr>
<tr>
<td>8</td>
<td>Monitoring and evaluation of the program if not properly done, may lead to failure.</td>
<td>215</td>
<td>53.75</td>
</tr>
<tr>
<td>9</td>
<td>Training of personnel involved in the program if not properly arranged may affect its success.</td>
<td>246</td>
<td>61.5</td>
</tr>
<tr>
<td>9</td>
<td>Others (pls. specify)</td>
<td>180</td>
<td>45</td>
</tr>
</tbody>
</table>

Many problems could inhibit the successful implementation of the program in the area of study as indicated by the analysis of the responses on this in table VI above. Prominent among such likely problems were poor quality of electricity supply as indicated by 390(97.5%) respondents; problem of review of item in the tool as observed by 289(72.25%) respondents; problems of finance to sustain the program and the likelihood that students might see the tool as mere
play/fashion as identified by 280(70%) respondents in each of the cases. The problem of how to replace or repair the tool when lost or damaged was listed by 276(69%) respondents. The problem of training personnel attracted 246(61.5%) responses. Problem of monitoring and evaluation attracted only 215(53.75%), while others listed likely problems such as poor social cultural background and apathy from subject teachers that attracted less than 200(40%) responses could not be said to be serious problems that could threaten the success of the program. It could be rightly observed that many people in the area of study believed that there where many problems that could threaten or inhibit the successful implementation of the program. Necessary precautionary measures should therefore be taken at every stage of planning, trial-testing and full-implementation of the program to prevent it from untimely collapse. Expectedly, many of the subjects used for the study were troubled about likely problems that could inhibit the success of the program. They were pessimistic on the possibility of the success of the program in view of the likely problem of poor electricity supply, poor funding, poor maintenance culture, problem of effective monitoring and evaluation, etc.

**Conclusion and Recommendations**

The introduction of the “Opon-Imo” (tablet of knowledge) tool into senior secondary education in Osun state, South-west, Nigeria could be described as an attempt to revolutionize the school system. Government said it was an attempt to introduce e-learning into the school system. Many people saw it as a good attempt at making use of technology within the school system. We are in a world of knowledge and information explosion where education is being moved towards a paperless age.

Respondents in the area of study believed that there were benefits that could be derived by the secondary school education and so the effort could be commended. They also believed that teachers, parents and students had their roles to play in the new arrangement for it to succeed. People envisaged that there were some problems that could inhibit the successful implementation of the program.

Based on the findings of this study, it is being recommended here that the government and all stakeholders should take necessary measures to prevent the failure of the program. This should start at the planning stage and should be extended to the trial-testing stage and full implementation stage. Monitoring and evaluation units should be well established at the various levels and stages of implementation. Parents, teachers and school administrators should not be left out in this arrangement. There should be frantic efforts made to inter-connect the tools, so that the e-learning through the internet could be witnessed soon in the state.

**References**


Improving Principal-Teachers’ Relationship in Secondary Schools’ Management through Effective Information and Communication Technology (ICT)

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Abstract
The emergence of the information age and the sudden ubiquity of information technology are among the biggest stories of our time. The information technology is revolutionizing the way in which we live and work. It is changing all aspects of our life and lifestyle, hence this study is aimed at improving principal teachers’ relationship in Nigeria secondary schools’ management through effective information and communication technology. The study adopts a descriptive survey research design. The instruments used for data collection are “principals and teachers’ self concept scale” (PSCS) (TSCS). Multi stage sampling was used to select the respondents. Two hypotheses were analyzed using multiple regression analysis. The result indicates among others that there is significant combined contribution of Information and Communication Technology to the prediction of principal-teachers’ relationship in school management. It was recommended among others that government should encourage the principals and teachers on the effective use of ICT through motivation and provision of necessary equipment and encouragement to facilitate principal-teachers’ relationship in school management. Principals and teachers should be given adequate training on the use of ICT to enhance principal-teachers’ relationship in school management.

Keywords: Improving, principal-teachers’ relationship, school management, effective communication, information and communication technology

Background to the Study
Interactions occur in organization and how well people bargain for various benefits in respect of their job are often dependent on the effectiveness of information and communication technology available. My observation both as a teacher and as student show that information and communication technology are routinely employed by educators. For a leader to succeed in administering the subordinates and for effective management of organization, information and communication technology must be adequately and effectively applied. Several forms of information and communication technology board today, ranging from networking of people, television, computer, communication sets, etc. In the school system, the principal has to link with people or ideas that are in line with goals and objectives. Principals as heads of secondary schools are the link between the teachers and students, parents and community.

The emergence of the information age and the sudden ubiquity of information technology are among the biggest stories of our time. The information technology is revolutionizing the way in which we live and work. It is changing all aspects of our life and lifestyle. The digital revolution has given mankind the ability to treat information with mathematical precision to
transmit it at very high accuracy and to manipulate it at will. The changes mentioned above in computation and communication add up to what is called the information revolution or IT revolution.

Information Communication Technology (ICT) covers in a wide range of aspect in our world today. There are few aspects of life today which is unaffected by Information Communication Technology. ICT has the capacity to provide higher interactive potential for users to develop their individual, intellectual and creative ability, it helps in the development of human mental resources, which allow people to successfully apply the existing knowledge and produce new knowledge.

Ogunsola (2005) cited in Jelili (2014) says ICT is an electronic based system of information transmission, reception, processing and retrieval, which has drastically changed the way we think, the way we live and the environment in which we live. It is used to access global knowledge and communication with other people.

The role of ICT in improving principal-teachers’ relationship in secondary school management and teaching and learning generally has rapidly become one of the most important and widely discussed issues in contemporary education policy. Principal who are ICT compliance gain deeper understanding of their staff and understanding and easily find solution to complex situation and are more likely to recall information and use it to solve problem in the school.

The term “Information Communication Technology” describes the integration of two previously existing discipline, computing and telecommunication. ICT therefore refers to the convergence of audio—visual and telephone networks with computer network and the technology encompass a wide range of activities, ranging from office data processing to remote control and monitoring of manufacturing robots. It also covers the cabling infrastructure e.g. Fiber optic cables, which carry voice data and video communication (Schiler, 2003). A major offshoot of convergence of information and communication technology is the emergence of the internet, which is a content distribution network comprising of a global system of interconnected computer networks through which data public academic, business and government networks of both local and global scope which facilitates the dissemination and exchange of information and make diverse other forms of non-physical interaction the new reality.

The primary objective of the school system is to ensure effective teaching –learning process. For this objective to materialize, the principal must be able to plan, organize, direct, co-ordinate and control the activities of the staff and students in an atmosphere devoid of persistent and unresolved conflicts. To this end, there is need for clear-cut policy concerning staff relations, duties and functions and most importantly, motivation in terms of remunerations and other staff welfare oriented policies.
The supervisory role is one of the functions of a school operation that has been and continues to be very challenging aspect of administration in secondary schools registered by the Ministry of Education. This challenge involves a continuous process of assisting teachers to improve their instructional performance in accordance with the professional code established by the Ministry of Education. Supervision is very important in school to ensure that standards set by the ministry are adhered to and not only institutional goals but also the national goals are met. If supervision is enhanced, then the teachers’ job performance shall be monitored and timely effective corrective implemented to ensure improvement of teachers’ competencies and general professional growth. Instructional problems can be easily detected through observations, appraisal, or by what Robbins and Coulter (1996) cited in Musibau (2014) termed Management By Working Around (MBWA) rather than sitting in their offices to read reports of their subordinates and papers.

According to Nkata (2006), effective leadership depends on the interactions of three factors; the traits and behaviours of the followers, the characteristics of the followers and situation in which leadership occurs or the leader operates.

Leaders may not only use varying behaviour with different subordinates but might use different behaviour with same subordinate situation (Osuala 2004). Path-goal theory suggest that depending upon subordinates and situations, different leadership behaviours will increase acceptance of leader by subordinates; level of satisfactions; and motivation to high performance. Based on situational factors, Path-Goal proposes a fourfold satisfaction of leaders behaviour as directive leader who tell subordinates exactly what they are suppose to do, supportive leaders who concern for subordinates well being and personal needs, participative leader who consults with subordinates about decision and achievement –oriented leader who set clear and challenging goals for subordinates.

Several characteristics determine how much satisfaction (present future) subordinates will obtain from a leader’s behaviour. Part of which are subordinates needs for affiliation, preference for structure, desires for control, and self perceived level of task ability (Northhouse, 2010). Characteristics of the follower also have a major effect on the relationship between the leader and the follower. These characteristics include the subordinates’ task design the organization’s formal authority system, and subordinates primary work group (Northhouse, 2010). This chapter of the school and its environment influence the kind of styles adopted by the principal. In the new millennium, there are potentially many types of stakeholders involved in the education management and leadership process, externally and internally, locally and globally in the new millennium (Cheng, 2002). He postulates further:

*Particularly we are making efforts to globalize our classrooms and institutions through different types of worldwide networking and information technology in order to allow our student to achieve world class – learning and teaching in the new millennium.*
The effective principal of today will have to keep abreast of what takes place locally, regionally and internationally. It is inadequate to discuss the effect of principalship on school performance without examining some indication of school performance. These indicators help us to gain a better understanding of relationship that exist in performance which is the accomplishment and execution of tasks. The accomplishment of tasks, in the context of the academic function of schools, refers to academic excellence or efficiency, which is measured in terms of student performance in class work, and national examinations. Teachers and students or even leaders of schools with the intention of transforming the academic culture of the schools positively, should aim at executing their effective school performance in the ability to produce desired education outcomes in relation to the school’s goals. In the context of teaching, performance refers to the teacher’s ability to teach consistency with diligence, honesty, and regularity (Nsubuga, 2008) cited in Jelili (2014).

Statement of Problem
Despite the fact that information and communication technology (ICT) resources have been looked upon as tools for upliftment of the standard of education and effective means of communication in every, the level of compliance in implementing the resources in instructional development process leaves much to be desired in Nigeria.

Purpose of the study
This study is at improving principal teachers’ relationship in Nigeria Secondary School management through effective information and communication technology. It will focus specially on the following:

1. How effective information and communication technology improve principals teachers’ relationship in school management.
2. How to improve effective information and communication technology in our secondary school to achieve educational aims and objectives.
3. How effective information and communication technology can improve and make simple; secondary schools’ leadership role, teaching learning and the quality of principals job performance.

Significance of the Study
The planning, coordination, directing and assessing of the educational progress of the child are achieved through the joint effort of the coordinating skill of the teachers and principal. Through effective information communication technology, there is the tendency for the management, administration and work of the principals and staff to be more proactively done. The result of this study will be of benefit to education stakeholders in the following ways:
It will offer principals and teachers the opportunity to appreciate the need for effective information and communication technology in improving the job performance in schools. This study will serves as guide which various school inspectors, supervisors, counselors, students and parents can utilize to ameliorate the current problem of coordination which teachers and
principals face in the course of performing their duties. It will enable stakeholders in education fashion out strategies to improve ICT in secondary schools. The result will also enable school administrator, principal and educationists in planning relevant training and workshop geared towards improved and efficient ICT.

**Research Hypotheses**
The following hypotheses are formulated to assist in accomplishing the aim of this study.

H01: There is no significant combined contribution of Transformation and Communication Technology to the prediction of principal-teachers’ relationship in school management.

H02: There is no significant relative contribution of Information and Communication Technology to the prediction of principal-teachers’ relationship in school management.

**Theory underpinning the study**

**Path-Goal Leadership Behaviours**
The Path-goal theory suggests that leaders may not only use varying behaviours with different subordinates but might use different behaviours with same subordinates in different situations (Reynolds et al., 2001). Path-Goal theory suggests that depending upon different situations, different leadership behaviours will increase acceptance of leader by subordinates; level of satisfaction; and motivation to high performance. Based on situational factors, Path-Goal proposes a fourfold classification of leader behaviours, as described underneath.

**Directive leader** tells subordinates exactly what they are supposed to do. This includes a leader who tells subordinates about their task, including what is expected of them, the way it is to be done, and time lag for the completion of particular task. Such leader also sets standard of performance and defines clear rules and regulations for subordinates (Northouse, 2010).

**Supportive Leader** shows concern for subordinates’ wellbeing and personal needs. This leadership consists of being friendly and approachable as a leader and take cognizance of the wellbeing and human needs of subordinates (Muijjs et al., 2010). Supportive leadership is appropriate when task is simple, formal authority is weak and the work group does not provide job satisfaction (Lussier and Achua, 2010).

**Participative leader** consults with subordinates about decisions. A participative leader consults subordinates, obtains their ideas and opinions and integrates their suggestions into decision making (Northouse, 2010) Participative leadership is appropriate when subordinates don’t want autocratic leadership, have internal locus of control, and followers’ ability is high; when task is complex, authority is either weak or strong, and satisfaction from co-workers is either high or low (Lussier and Achua, 2010).

**Achievement-oriented leader** sets clear and challenging goals for subordinates. The leader establishes a high standard of excellence for subordinates and seeks continuous improvement. Further leader shows a high degree of confidence in subordinates (Muijjs et al, 2010). Achievement oriented leadership is appropriate when followers are open to autocratic
leadership, have external locus of control, and followers’ ability is high; when task is simple, authority is strong, and job satisfaction from co-workers is either high or low (Lussier and Achua, 2013).

**Subordinate Characteristics**
Several characteristics determine how much satisfaction (present or future) subordinates will obtain from a leader’s behavior. Four of such are summarized here: ‘subordinates’ needs for affiliation, preferences for structure, desires for control, and self-perceived level of task ability” (Oyetunyi, 2006). Subordinates with a high need for affiliation should prefer supportive leadership because friendly, concerned leadership will give these subordinates greater satisfaction. On the other hand, subordinates who work in uncertain situations and have a tendency to be dogmatic and authoritarian should prefer directive leadership because this type of leadership gives ‘psychological structure and task clarity’ (Northouse, 2010). Whether subordinates have an internal or external locus of control determines which leader behaviors give more satisfaction.

Finally, self-perceived level of task ability is important in determining how leader behaviors affect subordinates’ satisfaction and motivation. Principals’ leadership behaviors depend on how best they apply this theory and in what situation. The principal must study the situation to know which of the fourfold Path-goal classification to use while the teachers as followers need to be familiar with subordinates characteristics.

**Design**
The study adopts a descriptive survey research design. Descriptive survey research design is a non-experimental design because the variables have existed much earlier in the population and so they will only be measured and not manipulated.

**Population**
The population comprised all public secondary school principals and teachers in Nigeria. The choice of secondary school principals and teachers was informed based on the high level of pedagogical and leadership experience they have.

**Sample and sampling procedure**
The sample for this study is two hundred (200) principals and four hundred (400) teachers for forty (40) secondary schools in Nigeria. Multi stage sampling was used to select the respondents. In the first stage, the researcher purposively select 40 schools in Nigeria, at the second stage, the researcher stratified the sampling based on the desired characteristics of gender, experience and leadership roles. Thereafter, simple random sampling technique was used to draw the required sample from each situation.

**Instrumentation**
The instruments used for data collection are “principals and teachers’ self concept scale” (PSCS) (TSCS). Each of the instruments has two sub-section A and B. sub-section A consist
elicits information about the personal data of the respondents while sub-section B consists of twenty (20) items to elicit information about principal and teachers’ disposition to ICT. The instruments were administered making use of research assistance to the respondents.

**Validity and Reliability of the Instruments.**
The instrument were subjected to both face and construct validity by giving them out to exports on the field for necessary corrections while the reliabilities were ensured through test-re-test administration of the instrument. Pearson product moment correlation formula was used with coefficients of 8.2 and 7.8 respectively assuring the reliabilities of the instruments.

**Methodology**
The two hypotheses were analyzed using multiple regression analysis.

**Results and Discussion**

H₀₁: There is no significant combined contribution of Transformation and Communication Technology to the prediction of principal-teachers’ relationship in school management.

Model summary of the regression analysis for the combined contributions of Information and Communication Technology to the prediction of principal-teachers relationship in school management.

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R² Adj</th>
<th>SE</th>
<th>Change</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R²</td>
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<td>Sig. F</td>
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</tr>
</tbody>
</table>

The results in table one above indicated that with all the predictor variables, (information and communication technology) in the regression model jointly predicted principal-teachers’ relationship in school management (R = .499; R² = .202; Adj. R² = .198; F(3.585) = 15.487; P < .05). This showed that all the predictor variables accounted for 19.8% of the variance in principal-teachers’ relationship in school management. The null hypothesis which stated that there is no significant combined contribution of Information and Communication Technology to the prediction of principal-teachers’ relationship in school management was rejected by this findings. Therefore, there is significant combined contribution of Information and Communication Technology to the prediction of principal-teachers’ relationship in school management.

The implication of this result is that, for principal-teachers’ relationship in school management to be improved, ICT cannot be overruled, and have influence on the school management by the principals. This findings support that of Adeyanju (2010) that, most of the problems of educational management and the managers in Nigeria may be traced back to the problems of poor management of information on education. The presence of a good ICT in schools and ministry would reduce the problems and make management a smooth and happy activity.
stressed further that in addition, reliable, concise and routinely available information in an organization has several other indirect benefits such as; it discourages guessing, rumour or gossip and thereby promotes trust, confidence and supportiveness; it saves time, money and other resources and is therefore a part of the cost-benefit of education delivery system; it enhances the personal confidence of the manager and encourage him to exhibit good leadership in the more vital activities of the organization.

**Ho2:** There is no significant relative contribution of Transformation and Communication Technology to the prediction of principal-teachers’ relationship in school management.

**Table 2:** Beta coefficients and t ratio for relative contributions of Information and Communication Technology to the prediction of principal-teachers relationship in school management.

<table>
<thead>
<tr>
<th>UnstandardisedCoefficients</th>
<th>StandardisedCoefficients</th>
<th>t-ratio</th>
<th>Sign. Coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Std. Error</td>
<td>Beta (β)</td>
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</tr>
<tr>
<td>Constant</td>
<td></td>
<td>.317</td>
<td>.355</td>
</tr>
<tr>
<td>Information</td>
<td></td>
<td>.317</td>
<td>4.532* .003</td>
</tr>
<tr>
<td>Communication</td>
<td></td>
<td>.355</td>
<td>6.914* .000</td>
</tr>
</tbody>
</table>

*a. Dependent Variable: principal-teachers relationship in school management*

The result in table two revealed the strength of causation of the predictor variables on the criterion variable. The most potent predictor of principal-teachers’ relationship in school management among the predictor variables of the study is communication (β = .355; t = 6.914; p < .05), information is the next potent factor (β = .317; t = 4.532; p < .05), in the prediction of principals-teachers’ relationship in school management. The hypothesis of no relative contribution of information and communication to the prediction of principal-teachers’ relationship in school management was rejected by this finding. This shows that there is a significant relative contributions of Information and Communication Technology to the prediction of principal-teachers relationship in school management.

This corroborates the view of Albirini (2007) cited in Akibu (1998) who posited that the influence of emerging technology in the present information driven society cannot be overemphasized. The evolution of it has not only cause a fundamental change in the way we perceive and posit solutions to our problems, but its pervasiveness has significantly influenced all realm of human activities education inclusive.

**Conclusion**

Conclusively, principal’s ability to carry along his subordinates making use of adequate Information and Telecommunication Technology and subordinates positive feedback to their leader make for good and conducive school administration and management.
Recommendations
Government should provide adequate materials that will enhance the use of Information and Telecommunication Technology in schools so strengthening the relationship between principals and teachers. Principals and teachers should be given adequate training on the use of ICT to enhance principal-teachers’ relationship in school management. By extension, the knowledge gained by teachers and the principals in the use of Information and Telecommunication Technology should be used positively in managing schools to enhance greater productivity.

References