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The readiness of rural government secondary schools in Uganda to teach information and communication technology (ICT) as a dedicated subject on the curriculum: A case study of two schools in Yumbe district

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THE READINESS OF RURAL GOVERNMENT SECONDARY SCHOOLS IN UGANDA TO TEACH INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) AS A DEDICATED SUBJECT ON THE CURRICULUM: A CASE STUDY OF TWO SCHOOLS IN YUMBE DISTRICT

BY

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A research project submitted to the Institute for Educational Development, Eastern Africa in partial fulfillment of the requirements for the degree of Master in Education (Teacher Education)

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APPROVAL PAGE

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Full Name of Student

I hereby give my permission for the research project of the above named student, for whom I have been acting as supervisor, to proceed to examination.

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(Research Project Supervisor)

The members of the Research Project Evaluation Committee appointed to examine the research project of the above named student find it satisfactory and recommend that it be accepted.

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Date: _____

DEDICATION

This work is dedicated to my two children, Adoke Benjamin and Akudi Catherine

ABSTRACT

This study sought to establish the readiness of two rural government secondary schools in Uganda to teach Information and Communication Technology (ICT) as a dedicated subject on the curriculum as part of the effort to equip the students with the necessary skills necessary for them to be able to access the benefits of ICTs both for enhancing their education and also for enabling them to fit and work successfully in an increasingly ICT-driven world. This qualitative study involved two schools in the rural district of Yumbe, in West Nile, Northern Uganda. The findings of this study suggest that schools still lack the traditional requirements such as classrooms and cannot afford to invest adequately in ICT infrastructure. The study found that ICT facilities were inadequate and of low quality and access to these was generally limited. The ICT teachers were not adequately qualified and they were few. Moreover, ICTs were still seen as things that interfered with, rather than promoted learning among students, and other teachers were not involved in the ICT integration process. This study, therefore, recommends the recruitment of qualified teachers and a provision for ICT support personnel in all schools implementing ICT programmes, and involvement of all teachers to support the integration of ICTs into the curriculum. The government needs to provide basic infrastructural support to the schools as well as adequate ICT equipment, and increased funding to cater for ongoing costs associated with ICT. Additionally, there is need for a clear ICT policy and sensitization on ICT-related issues. Finally, in areas for further investigation, there is need for a quantitative survey to obtain generalizable findings on a larger scale for the readiness of both government and private secondary schools to teach ICT, and another to establish the incorporation of ICT in teacher education.

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DECLARATION OF ORIGINALITY

I, BAIGA SOLOMON, hereby declare that this research project is my own work. It represents my own effort and has not been taken in whole or in part, without reference to whom or from where the information was attained.

TABLE OF CONTENTS

Contents   Page

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

A level	Advanced Level
ICT	Information and communication technology
MoWHC	Ministry of Works, Housing and Communication
NCDC	National Curriculum Development Centre
O level	Ordinary Level
U A C E	Uganda Advanced Certificate of Education
U C E	Uganda Certificate of Education
UNESCO	United Nations Educational Scientific and Cultural Organization
USD	United States Dollars
Ush	Uganda shillings

CHAPTER ONE

INTRODUCTION

1.0 Introduction

This chapter presents the background to the study, the problem statement, and rationale for the study. It further presents the research questions, the scope of the study and its significance.

1.1 Background to the Study

Information and communication technology (ICT) is one of the greatest influences on human life today. Since ICT permeates all aspects of life today – business, administration, education, legal, social and personal, it has become an essential component of knowledge or skills needed to live and function in the present world. Recognizing this, the UNESCO ICT Competence Framework for Teachers takes as its first approach "Increasing the extent to which new technology is used by students, citizens and the workforce by incorporating technology skills into the school curriculum…" (UNESCO, 2011, p. 7). According to the Qingdao Declaration 2015, "Technology offers unprecedented opportunities to reduce the long-existing learning divide." (UNESCO, 2015, p. 36) Accordingly, the delegates "acknowledge the need to integrate basic ICT skills and information literacy into primary and secondary education curricula" (UNESCO, 2015, p. 37) In Uganda, in 2006, a fully-fledged ministry for ICT was created whose vision is "A knowledge society where Information and Communications Technology (ICT) is central in all spheres of life" (Republic of Uganda, 2012, p. 6).

It fell upon the Ministry of Education to ensure that the citizens acquire the necessary skills for the realization of that vision. In light of this, the Ministry of Education and Sports introduced ICT as a compulsory subsidiary subject at Advanced

level ('A' level) for the class that were admitted in 2012. However, in 2013 when this set of candidates was to sit for their national examination, they could not do the subsidiary ICT examination as expected. The ministry cancelled it citing inadequate preparation. This raises the question of the capacity of schools to implement ICT as a subject on their curricula, especially in light of the fact that the postponed examination was meant for only a section of the A level candidates, with the others expected to do Subsidiary Mathematics instead, depending on their subject combinations. In light of the proposed curriculum reform in lower secondary school in which ICT will be one of the learning areas (National Curriculum Development Centre - NCDC, 2013), the question of whether the schools are ready becomes important.

1.2 Statement of the Problem

It is important to constantly evaluate educational efforts in order to provide sustainable education. Quoting Martin (2006), Aesaert et al. (2015) observes that ICT literacy has undergone three stages, namely, mastery (1980s), application (1990s) and reflection (current). This is with reference to the developed countries where ICT has been part of the system since the 1980s. In the words of Cakir and Yildirim (2013), the focus has shifted from learning about ICT, which should include the first two stages identified by Martin (2006), to learning through ICT, which could be seen as the third and last stage. It seems, therefore, that Uganda, like many other countries that have only recently adopted ICT, has to try to balance all the three stages at the same time. She cannot afford to follow the stages through in sequence lest she is left behind in the rapidly growing digital world. On the other hand, she cannot expect to compete at the same level with those countries which had the advantage of growing through the three stages and thus transiting naturally with a firm foundation, unless somehow she makes up for the lost time, grounding her labour-force with basic knowledge of how ICTs work. This is important because even England which has gone through the mastery, application and reflection stages still emphasizes mastery and application, and combines both learning about ICT and learning through ICT (Cakir & Yildirim, 2013). The problem, then, is that the readiness of rural schools in Uganda to effectively teach ICT has not been adequately

researched. Without proper preparation, the learners may not receive quality instruction in the subject to make them 'fluent' users of ICT, yet these learners are also the future teachers.

1.3 Purpose of the Study

The purpose of this study was to establish the "psychological readiness; sociological readiness; environmental readiness; human resource readiness; financial readiness (and) technological skill readiness" (Redempta & Elizabeth, 2012, p. 144, citing Chapnick, 2000) of the selected schools to provide effective ICT instruction, with reference to basic computer skills which were prescribed by the national curriculum guide. Particularly, this study looked at the current status of ICT instruction in light of the growing need to "promote the growth and implementation of e-learning" (Republic of Uganda, 2012, p. 30). After the introduction of the subject as a mandatory one for a section of students few years ago, this study may help to form a kind of evaluation to determine whether the schools are ready to implement the subject as part of the core curriculum of the larger, lower secondary school level.

1.4 Rationale

The position of schools in the question of ICT skills can be seen at three levels. First of all, the schools are responsible for "training and human resource development in the country" (Republic of Uganda, 2012, p. 39), and have the duty to teach ICT skills to all students, preparing them with the basic skills necessary for them to fit in whatever careers they pursue. Secondly, the schools increasingly need the aid of ICT affordances that help the teachers to facilitate delivery and for learners to access, build on, create and share knowledge. The nature and level of skills developed among students who end up becoming teachers will determine the 'fluency' with which these will work with ICTs, teaching the ICT skills, teaching with the ICT skills and preparing the next generation of

teachers. What all this means is that if schools do not provide quality ICT instruction to students, a cycle of poor quality that may result.

1.5 Research Questions

The main research question that guided this study was: How ready are Government schools in Yumbe District (something missing here) effectively to teach ICT as a dedicated subject on the school curriculum? This is a question that is based on the general guidelines for measuring ICT in schools (UNESCO Institute for Statistics, 2009) but with specific reference to the e-readiness guidelines outlined earlier and in the context of the curriculum goals for ICT in both lower (O level) and upper secondary (A level) in Uganda.

In order to answer the above question, the following sub-questions guided the study:

i. What is the state of ICT facilities in the sample schools?

ii. How have the schools implemented the incorporation of ICT as a subject in the curriculum?

iii. What challenges do the schools face in the teaching of ICT as a subject in the curriculum?

1.6 Significance of the Study

The significance of this study is that it will create awareness about the state of affairs in the Government schools in Yumbe District. This should guide policy makers at district level, and, by extension, national level as the schools prepare to implement the proposed new curriculum in which ICT is a core subject. It would also create awareness among the school leaders about the implications of the curriculum requirements, enabling them to develop strategies to anticipate possible challenges. Finally, there is a general want of research on ICT education in Uganda (Hennessy, Onguko, et al., 2010),

especially in the rural areas. This study should humbly contribute to the bridging of that gap.

1.7 Scope and context of the Study

This study focused on the teaching of ICT as a dedicated subject on the school curriculum. It was particularly interested in the aspect of equipping the students with skills to enable them to access and make use of the affordances offered by ICT rather than in the utilization of these resources for learning in other subjects. The study, however, recognized that ICT is learnt to access content, and the use of ICT in other subject areas does affect the acquisition of ICT skills in the form of providing motivation to learn the skill in order to access other content and providing opportunities for practice of skills as students use them to complete a task in another area. All the same, the details of how other teachers use ICT to teach specific subject content are outside the scope of this study, and this research contented itself with simply the knowledge of whether these teachers did use ICT. Secondly, the study was based on rural government schools in an upcountry district, and both schools implemented the government's Universal Secondary Education (USE). It is not within the scope of this study, therefore, to discuss details of schools of other descriptions such as private, non-USE implementing and urban schools.

1.8 Summary

In the above section I have provided the background to the problem and provided the rationale and purpose of the proposed study, the research questions, scope as well as the significance of the study. By now, it is clear that if there is no reliable information about the readiness of schools to teach ICT as a subject in the school curricula, it is a problem. For proper planning of the integration of ICT into education, this information gap needs to be addressed through research, and this study was a step in that direction.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

In this chapter I present the current status of the problem under study. This being largely a policy and intervention issue, the literature reviewed focuses on the policy provisions and expectations, along with experiences from various implementation attempts that have been made. It is important here to note that little literature is available regarding the topic in the specific context being studied, most literature focusing on using ICT in or for teaching rather than teaching it as a dedicated subject on the curriculum. The literature review is presented in line with the three research questions the analysis of the responses to which attempt to answer the main question on the readiness of the selected rural government secondary schools to teach ICT as a dedicated subject on the curriculum.

2.1 Policies and Trends

"Information and Communication Technologies (ICTs) consist of the hardware, software, networks, and media for collection, storage, processing, transmission and presentation of information (voice, data, text, images), as well as related services" (Sarkar, 2012, p. 32). As a subject, therefore, ICT has to do with equipping the learners to best make use of the opportunities offered by the technology in both their school and out of school endeavours.

The international community is keen on promoting ICT. The UNESCO ICT Competency Framework for Teachers (UNESCO, 2011) is one mark of the fact that ICT is expected to be embraced globally, and the school is key to this process. At the same time, the 2015 UNESCO World Conference on ICT held in Qingdao, China, lays emphasis on quality in using ICT in education, as well as calling for broader and more

strategic plans for implementation, with the observation that skills demands are changing rapidly (UNESCO, 2015). At this conference the ministers adopted the Qingdao Declaration which emphasizes access and inclusion in ICT. Article 9 of this declaration states, "We, therefore, acknowledge the need to integrate basic ICT skills and information literacy into primary and secondary education curricula" (p.37). This declaration focuses on basic skills, which means that they recognize the importance of mastery before use, or mastery that increases with use. Once again the question remains whether the schools are ready to provide these skills in a way that does not compromise quality.

The Ugandan government has for some time been taking steps to enable the integration of ICT, right from the first ICT policy developed in 2003 (MoWHC, 2003). Within the ensuing education sector policy was the design "to provide the requisite infrastructure to the poor rural schools during the first phase of the implementation" (Farrell, 2007, p. 5). However, by 2004, the same paper reports, 97.7% of rural households had no access to electricity. Indeed, only a year ago was when electricity was extended to Yumbe District (Daily Monitor, 2016). At this pace, before going on to the next phase of making ICT a core subject on the curriculum, an evaluative study is essential to determine whether the government schools in this district are now ready to teach ICT as a subject on the curriculum, which should be an important step towards gradual full integration.

2.2 Conceptual Framework

The study was based on the conceptual framework shown in Figure 1.
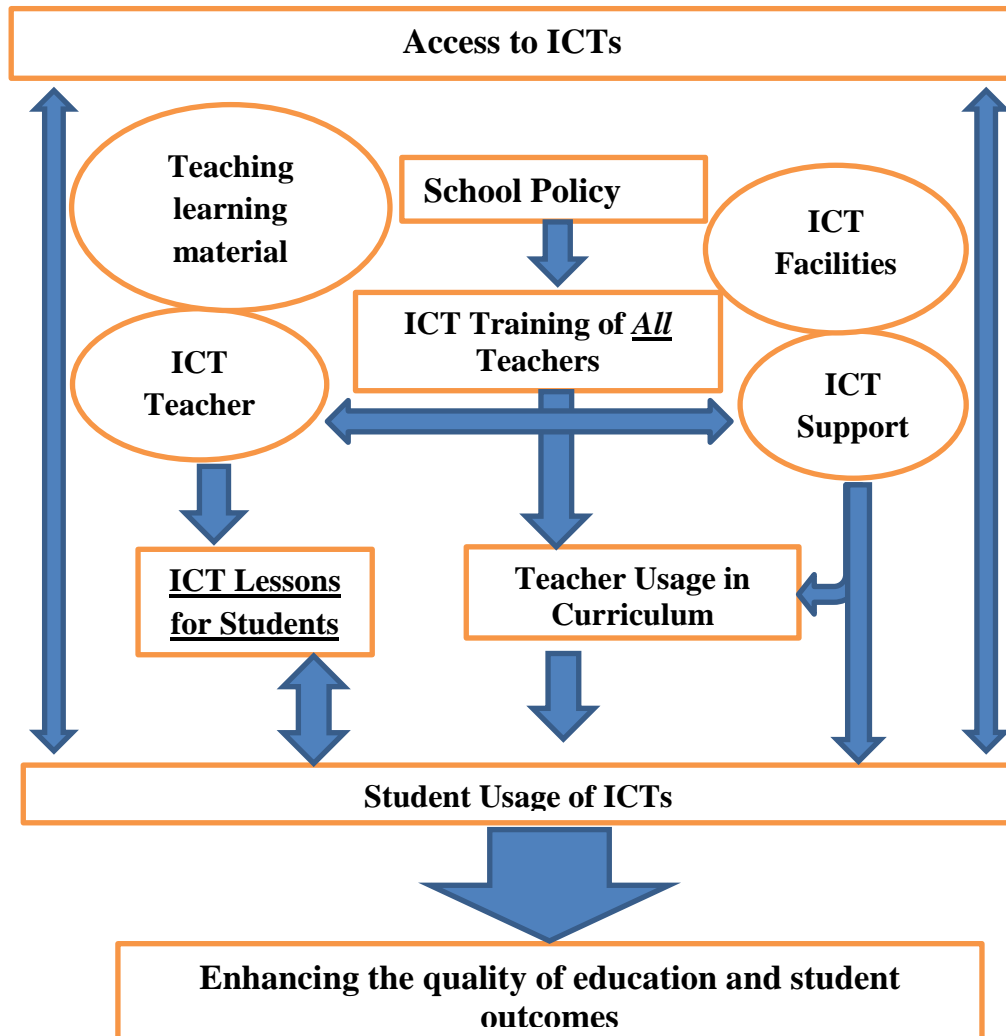
Figure 1: Conceptual framework. (Modified from UNESCO, 2006, p. 8)

The conceptual framework shown in Figure 1 is an adaptation of the UNESCO framework for ICTs in the school system (UNESCO, 2006). This framework was preferred because it spells out how ICTs can be made use of to enhance learning. Moreover, the present study really is about part of the integration of ICT in education

(Cakir & Yildirim, 2013). However, this study focuses on teaching ICT as a dedicated subject on the curriculum, which fits within the integration, but did not show explicitly in the original framework. By adapting the said framework and inserting within it the component of ICT as a subject in school, this study makes this framework relevant to the places in the world where it cannot be taken for granted that students join secondary school with a background of some ICT skills which they can build on. For them it might be the first time to interact with a computer, and there is need for a provision to teach them the basic ICT skills in a dedicated subject in order to equip them to use the ICTs with the ultimate goal of "enhancing the quality of education and student outcomes" (UNESCO, 2006, p. 8). Unless this is done, those who choose to become teachers will be ill-prepared to develop technological pedagogical content knowledge, for achieving greater learner engagement (Buzzetto-More, 2015; Hughes, 2012; Mason, Shuman, & Cook, 2013; Shabiralyani, Hasan, Hamad, & Iqbal, 2015; Staker & Horn, 2012). If this unfortunate cycle repeats itself, the ultimate result will be that the ultimate goal of ICT integration, enhancing the quality of education and student outcomes, will hardly ever be achieved for the said countries.

The component of ICT lessons, as seen from the framework, entails a specialist ICT teacher with a well-designed ICT curriculum and teaching and learning materials, as well as adequate ICT facilities for the ICT lessons and for student use along with ICT support staff to keep the ICT facilities functional and available, and assist in ICT-related issues other than teaching (Russell, 2012). It also involves teachers of the other subjects knowing and applying ICT in their lessons to enhance and be enhanced by the students' ICT skills gained in the ICT lessons.

2.3 ICT Facilities in Schools

By definition, ICT refers to facilities (Sarkar, 2012). It follows that for the subject to be taught, these facilities should be in place. Russell (2012) describes what might be the ideal situation of ICT facilities for successful teaching of ICT. The school he describes in the United Kingdom

…has 132 networked computers….There are five dedicated computer rooms. All rooms have one ink-jet and one laser printer… a range of laptops available for the staff to borrow …. Along with these laptops comes a liquid crystal tablet for projection using a powerful overhead projector (Russell, 2012, p. 43).

For their study in Niger State Nigeria, Gambari and Okoli (2007) developed a list of twenty-five items that they considered to form part of an ICT-enabled higher institution. This list might not be used as a yard-stick for assessing the facilities of a rural secondary school in Uganda, just as the school described by Russell (2012) above, was in the United Kingdom. However, the above list portrays the basic components required for effective teaching of ICT, namely:

- a sizeable dedicated room for a computer lab
- suitable furniture – at least tables and chairs or stools made with the purpose in mind,
- an appropriate number of computers that allows a ratio of at least one computer to two students in a single class as the A level Subsidiary ICT Syllabus specifies, "The learners work in pairs or individually to develop skills or put into practice the acquired knowledge (NCDC, 2013., p. 7).
- a laptop for the teacher's use to show students examples and to work collaboratively through ICT functions and problems,
- a projector for the interaction between teacher and students
- a printer
- access to the internet and
- a reliable power supply.

A number of writers (Adomi & Kpangban, 2010; Gambari & Okoli, 2007; Rezaei, Nazarpour, Emami, & Branch, 2011; Russell, 2012; Sarkar, 2012) would probably agree with the above benchmarks as, in one way or another, they reflect the minimum conditions for the successful implementation of an ICT programme on the curriculum. At the same time, the above list largely agrees with the indicators listed by Hepp, Hinostroza, Laval and Rehbein (2004) and adapted by Wagner et al (2005). The availability of the ICT facilities is a key indicator of readiness, according to Redempta

and Elizabeth (2012), and a study by Ünlü, Dökme and Sarikaya (2014) mentions the items of equipment that had to be provided for a fully-fledged ICT programme in Turkey. This particular study reveals the costly nature of ICT investments required to successfully implement an ICT programme, referring to multibillion-dollar investments by Turkey in ICT infrastructure, as well as a provision for other requirements including teacher training.

Moreover, for schools in Uganda which have always grappled with meeting even their traditional needs, availability and benefit of ICT facilities can be greatly affected by the said traditional needs as pointed out by (Hosman, 2010):

> There may be no classrooms. There may be no teachers. The prevailing social, economic, political, or even infrastructural conditions may not allow parents to send their children to school. None of these issues will be addressed or solved by handing out computers. (p. 50)

2.4 Incorporation of ICT subject on the curriculum

"The integration of computers into the curriculum usually occurs in one of two ways: either a separate course is dedicated to computer usage, or the computer is used as a 'helping tool' on projects" (Cakir & Yildirim, 2013, p. 223, citing Eurydice, 2001). This particular study looked at the teaching of ICT as a dedicated subject. It is, however, important to make the point right from the start that in Uganda the ICT skills are taught as Computer Science in O level and as Subsidiary ICT in A level. This very fact deserves close attention because both the work Brinda, Puhlmann, and Schulte (2009) and that of Russell (2012) point to a conflict between these two subjects in terms of implementation. According to the said authors, the difference between Computer Science and ICT is not always clear. This is because ICT is the subset of Computer Science which is considered a basic skill while Computer Science would go beyond what, according to Brinda, Puhlmann and Schulte (2009, p. 288) "is all about word processors, spreadsheets, or web browsers". Whether it is ICT only or ICT as part of Computer Science, however, the basic requirements for successful incorporation of the subjects on the curriculum remain

largely similar, and although that difference may need further consideration, it is sufficient to acknowledge that it exists for now.

In order to successfully teach ICT as a subject on the curriculum, a number of things have to be in place. Beyond the ICT facilities earlier referred to, there needs to be a favourable policy environment (Hennessy, Harrison, & Wamakote, 2010; Khan, Hossain, Hasan, & Clement, 2012; Sharma, 2008). Globally, there is a deliberate effort being made to promote access to ICT skills. The UNESCO ICT Competence Framework for Teachers (UNESCO, 2011) and the Qingdao Declaration (UNESCO, 2015) are manifestations of such efforts.

The Ugandan government showed interest in the promotion of ICT skills and came up with a national ICT policy as early as 2003. According to this policy, one of the capacity building strategies was to "Integrate ICT in mainstream educational curricula as well as other literacy programmes and provide for equitable access by pupils and/or students at all levels" (MoWHC, 2003, p. 33). This effort was followed by the establishment of a full ministry of ICT in 2006. In order to pursue the vision of "A knowledge society where Information and Communications Technology (ICT) is central in all spheres of life" (Republic of Uganda, 2012, p. 6), the Ministry of ICT is finalizing a new ICT policy.

Although there is no national ICT policy yet for the Ministry of Education and Sports, the Ministry initiated curriculum reforms in response to the urgent need to equip the labour force with ICT skills. One such reform was the introduction of Subsidiary ICT as a mandatory subject for A level students doing certain subject combinations. The ministry also aims to integrate ICT and ICT skills into the whole secondary school structure, according to the proposed curriculum reforms for lower secondary school (NCDC, 2013). The question of policy and implementation remains a key factor in the incorporation of ICT as a subject on the curriculum, with the implementation largely depending on the attitude of school leaders and their ability to adapt the policy to their local situation for successful implementation (Adomi & Kpangban, 2010; Hennessy, Harrison, et al., 2010; Khan et al., 2012; Rezaei et al., 2011; Sharma, 2008)

As with any other educational endeavor, the teaching of ICT requires sufficient numbers of qualified teachers. It would seem obvious that if a subject was to be

introduced, then first of all, the teachers to teach this subject would be prepared. However, this has not always been the case. This is partly because for some time, computers and schools existed side by side but independently of each other (Sharp, 2009). It is quite understandable, therefore, that in many places Computer Studies or ICT is still considered an additional vocational skill that is entirely different from the 'normal' secondary school subjects, and it follows that it is not taught by 'normal' teachers. They are often 'ICT coordinators', 'technology coordinators', and 'media specialists' (Cakir & Yildirim, 2013, p. 223, citing Law & Plomp, 2003) who are in many cases not trained as teachers. This question of "teaching assistants" being in charge of teaching ICT is not new (see Greenwood, 2003) , and inevitably the question was asked: "Does this mean ICT is any less important than the other subjects?" (Greenwood, 2003, p. 27). While the expected response to such a question would be in the negative, it must be admitted that somehow, that is the impression conveyed.

"Another major problem that constrains the successful implementation of ICT in secondary schools…is the shortage of appropriately qualified teachers" (Sharma, 2008, p. 5). Moreover, "Teacher education does not end when teacher candidates complete their \Bachelor of Education degrees" (Barret, Solomon, Singer, Portelli, & Mujuwamariya, 2009, p. 678). In other words, even for those trained to teach ICT, continuous professional development is essential.

There is another serious point here with reference to planning, which can be derived from the following:

> The best scenario is where there is an ICT coordinator, a subject specialist responsible for the ICT subject and technical support to solve the many problems that can and do occur with networked and non-networked computers. (Russell, 2012, p. 54)

The above means that in planning for an ICT programme, the personnel to be planned for should not be only the teachers. As Madzima, Dube and Mashwama (2013) agree, the subject has its special requirements that make it necessary to have more than one category of personnel to effectively implement it. This indeed deserves serious attention especially considering the fact that ICT has never really been absorbed as a

subject in the schools and requires "ICT coordinators qualified to wrestle ICT into the curriculum, as must happen in order for it to have the transformative effect…" (Greenwood, 2003, p. 28). This author rightly observed that ICT has to be "wrestled" into the curriculum whether as a dedicated subject or as a learning tool, and it would be unfair to leave this to an unqualified and unsupported persons.

The issue of funding is important. "ICTs have clearly made new demands on an already stretched sector while simultaneously offering opportunities in support of current difficulties" (Kipsoi, Chang'ach, & Sang, 2012, p. 25). Implicit within the above statement is the fact that if there are no funds to establish and sustain the ICTs, the opportunities will be lost.

Curriculum materials such as textbooks, reference books and ICT accessories and software are equally important (Brinda et al., 2009). Just like with all other subjects, curriculum materials support the teacher during preparation and students during personal research and study.

2.5 Challenges Facing the Teaching of ICT in Schools

The challenges facing the teaching of ICT are many. According to (Matthew, Joro, & Manasseh, 2015), the challenges facing ICT education are:

1. Lack of qualified teachers to teach ICT in schools
2. Lack of computers
3. Lack of electricity
4. Computers are still expensive in Nigeria
5. Broken down computers
6. Burglary
7. Lack of internet of slow connectivity
8. Increased moral degradation

(Adapted from Matthew et al., 2015, p. 67)

Hosman (2008, 2010) agrees with the above challenges, and is keen on the question of sustainability, competing needs and unrealistic expectations. According to

her, society takes time to assimilate new things including technology, and it is simply unrealistic, say, to "expect that Africans will only use the Internet for information-seeking in order to improve their livelihoods, skills, and incomes, when the majority of people around the world use the Internet largely for entertainment and communication" (Hosman, 2008, p. 8). Neither is it fair, she says, to expect African teachers to integrate ICT in their teaching when even some teachers in California still stick to traditional teaching methods. Agreeing with Hosman (2008), (Dzidonu, 2010) points out that ICT projects have often been in the form of pilots to "demonstrate the potential of ICTs" rather than to establish it, and once the donors leave, the programme collapses.

"Free computer time itself is a valuable educational resource" (Olson et al., 2011, p. 7). However, Newby, Hite, Hite, and Mugimu (2013) found that some schools, though they had some computers, had these computers locked away in the computer laboratories, and they were only accessible during computer lessons. In such circumstances, the learners do not get time to do personal practice, and one may add that it beats the idea of incorporating ICT into normal practice, giving the impression that computers are some peculiar machines that only the extraordinary people can handle, especially since the management of the computer room is left to that equally peculiar individual with the 'magic' of handling computers, the rest of the staff, like the students, hardly 'daring' to go there, and referring even the simplest ICT-related issue from students to the ICT teacher.

The other major challenge is that of lack of qualified teachers. This has been discussed already in the preceding section, and it has been a concern almost everywhere where the effort has been made to integrate ICT into the curriculum (Brinda et al., 2009; Hennessy, Onguko, et al., 2010b; Kipsoi et al., 2012; Koppi et al., 2008; Mugambi, 2015; Olson et al., 2011; Sharma, 2008; Stephen, James, Johnie, & Yawe, 2013). The issue of the number of teachers and that of their qualification need to be dealt with separately so that adequate attention can be given to each.

Lack of funds is a major hindrance to the successful and sustainable implementation of ICT programmes (Kipsoi et al., 2012; Madzima et al., 2013; Mugambi, 2015; Rezaei et al., 2011). This was hinted at in the preceding section with

reference to sustainability. There are also other issues such as perceived misuse of ICTs (Hosman, 2008, 2010; Matthew et al., 2015), lack of properly developed curriculum (Gambari & Okoli, 2007), shortage of materials such as textbooks and other teaching and learning materials (Olson et al., 2011), insufficient building space (Hennessy, Onguko, et al., 2010b; Kipsoi et al., 2012), general poverty (Lating, 2009) and attitude (Oye, Iahad, & Rabin, 2011). Finally, the question of ineffective or unfavourable policies is a big challenge (Adomi & Kpangban, 2010; Khan et al., 2012; Mugambi, 2015; Rezaei et al., 2011; Wagner et al., 2005). Whether at national level or at school level, ineffective or unfavourable policies will impede the teaching of ICT and ultimately hamper ICT integration in the schools.

2.6 Summary

In conclusion, the above literature review shows most of the issues facing schools in their effort to teach integrate ICT into their curricula world over. However, countries are at different stages of development with reference to ICTs, and even within countries, different regions are at different levels, especially with reference to rural and urban areas. This implies that these areas experience different challenges, or different levels of similar challenges. This study, therefore, sought to understand the particular circumstances of the rural government aided secondary schools in Yumbe District, West Nile Region, Uganda, in East Africa in their effort to teach ICT as a dedicated subject on the curriculum.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

In this section, I present the methodology adopted for this study. This includes the overall research approach, the specific research design and the data collection methods employed to obtain the data from the various sources involved. The methodology was adopted in line with the purpose of the study and with the research questions that this study sought answers to. In addition, in this chapter I explain the significance of this study, its scope and limitations as well as the ethical precautions and practices involved in the study.

3.1 Research Approach

In this research, a qualitative approach was used. "Qualitative research methods are used to understand some social phenomena from the perspectives of those involved, to contextualize issues in their particular socio-cultural-political milieu, and sometimes to transform or change social conditions." (Glesne, 2006, p. 4) This is a succinct summary of the purpose of this research: to explore, to let the members within Yumbe District in particular express their views and experiences in regard to the teaching of ICT as a subject on the curricula in the rural government secondary schools.

3.2 Study Design

Under the qualitative approach, the case study design was employed. "Compared to other methods, the strength of the case study method is its ability to examine, in-depth, a case within its real life context" (Green, Camilli, Elmore, & American Educational

Research Association, 2006, p. 111). Since this study was interested in the teaching of ICT as a subject in the particular geographical, socio-cultural, economic and even political environment in which the schools were situated, and more so in the perceptions, attitudes and practices of the people in the selected schools, the case study design was justified as the best approach.

3.3 Selection of Sample

The study was a multiple case study, involving the study of two schools. According to (Green et al., 2006),

> …multiple case designs have important advantages for you to consider. First, you will be able to show your audience that you can practice a complete cycle of case study research…with more than a single case…. Second, you will be able to respond to a common criticism of single case studies. Third, you will have a modest amount of comparative data… (p.115)

At the beginning of the 2015 academic year, the district had six government secondary schools of which four had Advanced level (A level) according to preliminary information. In this case, the two schools actually represented a half of the government A level schools, and so the findings can be quite representative of the situation in the entire district or at least provide a picture of the variations in the readiness levels. Prior to the curriculum change that made ICT compulsory in A level, many of the schools in Yumbe District were not offering the subject on their curriculum. This study focused on two schools, one of which had introduced the subject before the above change was made, which I shall call School 1 and another that introduced the subject after, to be called School 2 in this report. With reference to the district head-quarters (and hence the 'town'), School 1 was a little farther (eight kilometres) away than School 2, which was within the Town Council Local Government area. The first case was expected to provide an insight into the deeper motivations and vision of the school as it introduced the subject before there was government compulsion to do so, and the more long-drawn experiences

of offering the subject. The second case would yield data that might compare and contrast with the data from the first case. More importantly, the data in this case would give some insights into the implications of this policy for schools that did not have prior arrangements for this shift.

3.4 Selection of Participants

Selection of participants was partly purposeful and partly random. A total of twenty respondents participated in this study. Participants included the head-teacher and one ICT teacher as the key informants in each of the two schools. These were selected purposefully because they were directly in charge of the teaching and learning of ICT in the school. Specifically, the head-teacher would provide the managerial perspective as well as the policy-based data; the ICT teacher will provide technical and class-based data with regard to the teaching of ICT. On ground, each school was found to have only one ICT/Computer Science teacher, and there was therefore not much of a choice of respondents. However, both teachers were willing to participate in the study.

Finally, in each school, four ICT students in A level (two from Senior Five and two from Senior Six) and four in O level (Senior Four) were also involved. The selection of the categories was partly purposeful and partly random as only ICT students in upper classes were selected, but respondents were randomly selected from the ICT classes. This was based on the length of time they had spent in secondary school for the purpose of learning about their experiences with the subject over time. It is worth mentioning that the plan had been to have two respondents from Senior Three and two from Senior Four for the O level focus group in each case. However, for practical reasons, this was not possible. In School 1, there was no student in Senior Three doing Computer Science, and the total number of students doing the subject at Senior Four was five, and of these one was not in the school. This left me with the four candidates, three boys and one girl. Again, these were willing to participate in the study. In School 2, the O level focus group was equally limited to Senior Four, where there were again three boys and one girl selected with the help of the teacher, mainly basing on availability. There were ICT

students in Senior Three in School 2, but the school programmes could not allow representatives from both classes to participate at the same time. Here, preference was given to Senior Four because as they were just about to do their final examinations, their experiences would better reveal the sum of experiences with the subject for an O level student of ICT in this school. In the case of A level, in both schools group were made up of four respondents of whom one was a girl and three were boys, two being from Senior Five and two from Senior Six. Selection was with the help of the teacher, and again availability was considered especially for boys, while the girl in each case was the only one doing the subject. Table 1 shows the details of the respondents.

Table 1: Details of respondents

Category	Head-teachers		Teachers		A level		O level		Total	
Gender	M	F	M	F	M	F	M	F	M	F
School 1	1	0	1	0	3	1	3	1	8	2
School 2	1	0	1	0	3	1	3	1	8	2
Total	2	0	2	0	6	2	6	2	16	4

Key: M = male; F = female

3.5 Research Methods

The study employed the qualitative data collection methods, namely, observations, interviews and document analyses (Creswell, 2012; Creswell & Creswell, 2013; Green et al., 2006). Throughout the process, the researcher was personally involved, for in qualitative research, the researcher is the main research tool (Creswell & Creswell, 2013; Glesne, 2006). As emphasized by Walliman (2006), "Qualitative techniques rely more on language and the interpretation of its meaning, so data collection methods tend to involve close human involvement." (p. 37)

3.5.1 Observation

Observation was used to collect data on the state of ICT facilities. More so, observation, which "is a method of recording conditions, events and activities through looking rather than asking" (Walliman, 2006, p. 95), included as many aspects of the school curriculum, physical and social infrastructure as might have a bearing on the provision of ICT education. Observation permeated interviews and focus group discussions to sift out any subtle impressions in the course of the two activities. Observations were recorded in the form of field notes on spot during the audit of lab facilities, with others remaining as mental notes to be transferred to the written form later. In some situations, I took photographs as evidence of the observations made.

3.5.2 Interviews

Semi-structured interviews were used to find out attitudes, experiences, opinions or perceptions that the selected key informants had about the problem. The idea was to be flexible enough to accommodate all the informants' input, including aspects I might not have considered important but that did impact on the problem under study from the informants' point of view, while at the same time ensuring that I did not miss key information the study set out to obtain (Dawson, 2007). The key informants here were the head-teachers and the ICT teachers.

3.5.3 Focus group discussions

Meanwhile, for the students, focus group discussions (Lin, 2016) were used first of all to be able to get a larger variety of respondents' views in a short time and also to allow for and observe first-hand the interactions between or among perspectives of individuals in relation to the incorporation of ICT in the school curriculum. The focus

groups included one of the O level students and that of the A level students for each school. Interviews were audio recorded, and I took notes as well.

3.5.4 Document Analysis

Document analysis was used to provide background data, as well as in some cases corroborate claims that were made during the interviews or even observations made by the researcher. This included a study of the ICT curriculum guide, enrollment details, budgets, minutes of meetings, rules and regulations, school time-table and national examination results as well as sample past papers. No copies of ICT policy documents were available in the schools. I recorded observations from documents, and photographed pages of particular interest among the documents for reference. The curriculum guide was to act as a yard-stick to measure the existing arrangements in terms of their ability to ensure that the curriculum goals are achieved; enrollment details helped in gauging the ratio of learners to facilities, while budgets reflected the financial readiness aspect, including revealing the priorities of the school. Minutes of Board of Governors meetings and those of Parents Teachers Association meetings gave a picture of the attention ICT received, and rules and regulations revealed something about the socio-cultural situation and the norms of the schools, which might have implications on the incorporation of ICT on the curriculum. Finally, examination results were analysed to measure the effectiveness of teaching in the two schools basing on the national assessment.

3.6 Data Analysis

Data analysis was iterative and simultaneous to the collection process (Leavy, 2014).After the saturation point (Leavy, 2014),analysis was based on the model spelt out by Creswell (2009). I began by transcribing interviews, typing up field notes and sorting and arranging different types of data according to sources. Here, the data from interviews with key informants, namely, the head-teacher and the ICT teacher, were be put together;

data from focus group discussions held were also one category, and data from observations formed another category. Pictures taken were also sorted out. After reading through all the data to get a general impression, I then coded the data. The coding was done on hard copies of the transcripts produced. In line with the research questions and the e-readiness indicators, coding was based on: the state of facilities, the implementation of the curriculum and challenges. Sub-themes included number of gadgets, maintenance and accessibility for facilities, while for the second theme sub-themes included school policies, teacher effectiveness, and funding.

3.7 Trustworthiness

To measure the ability of the tools to elicit the right kind of data, and to identify areas of possible confusion or misunderstanding, the research tools were tested in a neighbouring secondary school before they were used in the actual study. The fact that the study employed the multiple case study design but still obtained consistent data is evidence that the tools were reliable. The use of a variety of research methods and participants ensured that responses could be compared and any discrepancies cleared or at least understood in the context of the study.

3.8 Ethical Issues

The question of ethics in qualitative research like the one being planned is not a straight-forward one (Punch, 2006; Stake, 2010). However, following the guidelines offered by literature (Creswell, 2003, 2012; Gray, 2009; Punch, 2006; Stake, 2010; Walliman, 2006), a number of steps were taken.

First, I obtained clearance by the Ethics Review Committee of the university. I then sought permission from the office of the president through Uganda National Council for Science and Technology, and then proceeded to seek permission from District Education Office, Yumbe, to conduct my research. I proceeded to the selected school to

seek the permission of the head-teachers of the two schools to carry out this study in those schools, including the consent of the head-teachers to participate in the study.

I sought the informed consent of the respondents by first explaining to them the purpose of the study, their rights, and the risks involved as far as I could predict. Then they signed consent forms that I provided, and reiterated the information verbally at the start of and through the interviews. The research respected confidentiality by the use of number codes during the reporting of findings. During discussions, I assigned numbers to participants for identification during the sessions in order to avoid using their real names, and advised them not to mention their names or the names of their institutions in the responses.

Again, I made every effort not to interfere with school programmes, such as when I took the decision to hold a focus group discussion with members of only one class as a way of avoiding conflict with school programmes.

3.9 Limitations and Challenges of the Study Design

Being a case study design, it is subject to bias both of the researcher and of the participants. The reality recorded here, especially from the interviews and discussions, is one kind of reality (Salkind, 2006), as seen by the respondents. While through triangulation the effect of this was mitigated, there is no guarantee that it was eliminated completely.

Secondly, there were sampling-related challenges. For example, the teachers were relied on to select the respondents for the focus groups. It is not possible to be absolutely sure that this selection was random. Also, as indicated earlier, the O level focus groups consisted of only Senior Four students. While it is reasonable to think that these had the wider range of experiences, it is also reasonable to think that in response to certain experiences it remains true that Senior Three students were not obtained might have their own unique experiences, which were not captured in the findings..

Again, although as a multiple case study, it was still a case study, and at best can only provide a sense of the nature of issues worth investigating in a quantitative study. Only after such a study can the findings be generalizable.

Lastly, a multiple case study was so much work within the short period available for the project, especially because in this particular case, a change in the school calendar meant that for about half of the period for data collection, data could not be collected because schools had closed for holidays.

3.10 Summary

According to Kumar (2011) the essence of research is its systematic nature. The above were the procedures involved in the collection and analysis of data that formed the basis for this research report in line with ensuring a careful and systematic study. The findings of this study are presented in the next chapter.

CHAPTER 4

FINDINGS, DISCUSSIONS AND ANALYSIS

4.0 Introduction

This chapter presents the findings of the study on the readiness of two rural government secondary schools in Yumbe District to teach ICT as a dedicated subject in the curriculum. The findings presented here are the product of an analysis of data from a variety of sources, including four focus group discussions, involving students, two semi-structured individual interviews with the ICT teachers, and two similar interviews with the head-teachers of the selected schools. To this was added data from observations made during an audit of the facilities, as well as that from a study of a number of documents in each school. Analysis was done and the findings are here presented according to the three research questions.

4.1 The State of Facilities

To answer this question, data was gathered through an audit of the facilities in the school, interviews with the head-teachers and with the ICT teachers, and four focus group discussions, two in each school. The analysis and judgements on the number or size of facilities was based on the enrollment details obtained from the schools, which are shown in Table 1 and Table 2 below.

Table 2: School 1 enrollment details

Class	S 1	S 2	S 3	S 4	S 5	S 6	Overall
Male	76	61	36	59	09	09	250
Female	26	49	59	52	04	01	191
Total	102	110	95	110	13	10	441

Average number per class = 73 students

In comparison to the enrollment of School 1, the enrollment for school 2 was bigger as shown in Table 2. Accordingly, some of the classes were divided into two streams each.

Table 3: School 2 enrollment details

Class	S.1 A	S.1 B	S.2 A	S.2 B	S.3 A	S.3 B	S.4	S.5	S.6	Total
Male	82	73	75	92	95	97	66	74	33	687
Female	44	47	50	53	27	36	41	07	04	309
Total	126	120	125	145	122	133	107	81	37	996

Average number per class = 110

The above tables show that in terms of enrollments, School 2 had more than twice the number of students in School 1. In relation to the present study, it meant that in terms of facilities and personnel, School 2 needed at least twice as many as School 1 had, but it also meant a wider resource base.

4.1.1 Findings from facility audit

General situation of classrooms and space

School 1 had one fairly new complete two-room block; all other classrooms were never really completed. A two-classroom block was under construction. School 2 had two sets of old buildings, one set in quite good condition. Additionally, there were 10 new classrooms, 2 VIP latrines and a science laboratory recently built by the government. This was the first set of buildings built by the government in School 2, according to the explanation from the Head-Teacher (Head-Teacher interview, School 2) while in School

1, the government was yet to construct any building, and all buildings were as a result of the effort of parents.

The state of ICT laboratories (labs) in the selected schools

With particular reference to the dedicated ICT rooms, the findings are summarized in 4.

Table 4: The state of ICT laboratories (labs) in the selected schools

Aspect	School 1	School 2	Remarks
Size of ICT lab	About 3.5m X 7m (half of a typical classroom)	About 7m X 8m (the size of an ordinary classroom)	
Lab features	Part of administration block (intended for office or store)	Formerly a classroom, some renovation done e.g. ceiling, painting	Both rather dusty, poor lighting, no security installations
Description of furniture	• 5 Three-seat desks • 2 Tables	• 12 tables of different sizes • 28 stools of different heights • 2 three-seat desks	In School 1, the desks were often removed due to demand in classrooms

Condition of computers and internet access in the selected schools

School 1 had seven functional computers, four broken down computers and five additional computers which could not be used because of lack of power. School 2 had ten functional computers, two broken down and nine additional ones lacking power. In relation to enrollments, the number of functional computers translated into one computer to every sixty-three students (1:63) for School 1 and one to a hundred (1:100) in School 2. In both schools, access was usually only in the presence of the ICT teacher.

Internet access, peripheral devices and power

In both schools, there was no internet access in the ICT laboratories. School 1 had one modem and School 2 had two, but in both cases the modems were rarely used for lessons. There were no projectors, and no printers in the ICT laboratories. School 1 had one printer and School 2 had three, but these were in the offices and could only be accessed through the ICT teacher. The available computers used solar power, which was installed in a fixed manner to power only the eleven small computers installed by the government. There was no provision for any other gadget. School 2 had a functional generator with only the challenge of fuel, while the generator of School 2 had broken down. Some of the conditions in the ICT laboratories in the two schools can be seen from figures 2 to 6.

Figure 2: Computers in ICT laboratory, on three-seat writing desks (School 1)

Figure 3: CRT computers, with various objects in the foreground (School 1)

Figure 4: Some of the computers, and some of the furniture in the ICT lab (School 2)

Figure 5: Some of the big computers (School 2)

(The big computers could not be used regularly due to inadequate power.)

Figure 6: One of the computers supplied by the government

(Notice the small system unit attached to the back of the monitor, and the fixed connection to power)

In general, the audit findings were that there were some facilities in terms of equipment and rooms where these were installed, but these were inadequate and access was greatly limited, especially the printers which were not installed in the ICT laboratory. There was no internet access though receivers had been installed, and ICT labs were accessed solely through the ICT teacher. Some of the elements were also damaged, and would possibly not function efficiently.

4.1.2 Findings from Focus Group Discussions

Focus group discussions also made reference to the state of ICT facilities in the schools. From the focus group discussions it was found that students were generally not satisfied with the state of facilities in their respective schools. Issues revolved around the number of computers available, their access to the ICT lab and the lack of access to printers, as well as failure to maintain the computers which affected their efficiency. Following are sample responses obtained that made reference to the ICT facilities.

One respondent said, "There are some few problems because when the teacher is not there, we ask for the key of the lab from the watchmen and sometimes they even refuse to give us" (O level focus group discussion, School 1).

However, in School 2, this is what one respondent had to say about accessibility: "Our access to ICT - we have abundant time, only the way you programme yourself…the ICT room is always open" (A level focus group School 2).

Another respondent from School 2 however, insisted, "Sometimes you find the lab is closed. The administration requires that if students want to access the computer lab, the Computer Teacher is supposed to be around to avoid cases of theft and other issues" (A level focus group, School 2).

From the above, it can be deduced that there was a challenge with access. However, it was also apparent that the respondents in School 2 viewed their situation more positively than those from School 1, since the respondent showed understanding for the threat posed by unsupervised access.

As indicated earlier, one of the major concerns was the small number of computers, brought about by the lack of maintenance and the failure to provide power to run the other computers. According to one respondent,

> The number of computers is too limited because from Senior Three up to Senior Six there are very many students who are offering Computer Studies as a subject, so you find that you may want to come and do your things, but you find that everybody is doing theirs. So I find that it is very difficult (A level focus group School 2).

Another respondent expressed frustration: "There is freezing; most of these computers are freezing. You may want to try something, but as you go on, you find that the computer has already switched off" (A level focus group, School 2).

Respondents in School 1 saw the number of facilities in light of the shortage of power: One said, "There is a problem of power. The power here is not enough; if we

want to print something, we have to use the power from the deputy's office" (O level focus group, School 1).

Another respondent in School 2, in agreement, expressed the problem this way:

One of (the challenges) is the number of computers here – as you can see they are not enough…those are computers which use little power, as such they are operated using the solar. But these ones use much power and they are supposed to be operated with a generator…the issue of fueling the generator to operate these few computers here is a problem (A level focus group, School 2)

The lack of internet access was a big concern. According to one respondent, they had raised this issue several times as the extract below shows:

This issue of internet; we presented it for many occasions. They would say that they will install it the coming term, then the term goes, (and) then they promise it for the next term…up to now even we are not even thinking they will install it in our regime. (O level focus group School 1)

From the above responses it could be seen that the students were not satisfied with the facilities provided by the school towards the learning of ICT. They seemed to be frustrated by the fact that they could see a number of computers lying idle while they struggled to share the few that had power. The attitude was a little more positive in School 2 which unsurprisingly had more students doing the subject (18 in Senior Four and about 20 in Senior Three) compared to School 1 (5 in Senior Four and none in Senior Three).

At the same time, having the computers was one thing, but the way they functioned was a different concern altogether. The students in one school particularly worried about the freezing of the computers. With limited access to the computers because of the competition for access and demands put on the students' time by other subjects, the last thing a student would like to experience is a waste of time waiting for a computer that has stopped working. In worse situations, the student could lose their unsaved work with the abrupt shut down of computers either due to a faulty operating system or simply the disconnection from power since the cables were said to be so loose.

4.1.3 Findings from ICT Teacher Interviews

On the state of facilities, the teachers largely confirmed the challenges identified above. One teacher had this to say: "Well, the facilities are not up-to-date; we don't have a modern lab facility, and of course the lab would have a lab attendant, which is not the case…we are just merely with these desktop computers." He added, "…there would be a projector, so that the lessons could be conducted and projected…other than moving from one computer to another explaining the same point, which can consume a lot of time" (Teacher interview, School 2).

The other teacher involved summarized his comments about the facilities in two speeches. First he said:

> The facilities are far below average because there are quite a number of things lacking especially in the lab. The number of computers is not enough; power source is still a problem; then other requirements because we are supposed to have internet in the computer lab, we are supposed to have printers just installed permanently in the lab to aid printing on regular basis, but that kind of thing is not there because resources cannot enable the administration to fulfill the requirements which are expected for the subject.

He later added:

> As the ICT teacher, there is also supposed to be a laptop for aiding this subject but there is no laptop at the moment; and there are other devices which are supposed to be in the lab such as projectors which are supposed to aid also teaching…because this room being so small for a lab a projector would be so necessary (Teacher interview, School 1)

4.1.4 Findings from Head-Teacher Interviews

Interviews with the head-teachers revealed largely similar concerns, with an emphasis on the financial constraints which made it difficult for the schools to provide the ideal conditions in terms of ICT facilities. One, for instance, said:

> The other challenge is resources especially funds that can be used for constant internet connectivity…what the government gives is not adequate because the government is giving Ush 41,000 per child and this amount of money cannot do much in terms of fully-fledged computer activities (Head-teacher, School 1).

The second head-teacher expressed a similar concern and added, "So I see unless we get some donor support we may not move very fast; it is going to take time for the school to move in terms of acquiring these facilities" (Head-teacher, School 2).

It should be very challenging to teach ICT if the teacher has no laptop for preparations. It means that if the teacher is preparing he has to sit in the ICT lab, the only place he can access a computer from. Moreover, the absence of a projector means both wasting time and increasing fatigue for the teacher.

4.2 The Incorporation of ICT

Data here was mainly from the interviews, focus group discussions and analysis of internal documents and curriculum guides. As a guide, the research considered four major conditions necessary in order to successfully implement an ICT programme on the curriculum. These conditions, in addition to the facilities, as derived from (Hennessy, Harrison, et al., 2010) include the following.

1.   School and Ministry policies must support and advance the place of ICT learning in the curriculum

2.   There must be sufficient qualified ICT teachers to be able to respond to the numbers of students who are in the ICT courses

3.	There must be enough teaching and learning materials

4.	There must be sufficient funding to cover initial and ongoing costs

4.2.1 Policy Environment

In terms of policy, the Ministry of Education did not yet have an ICT policy. The Ministry of ICT, which should lead in developing an overall ICT policy was, according to one head-teacher, still in the process of developing a new policy. The schools did not have ICT policies either.

The Ministry of Education and Sports had in 2013 introduced two subsidiary subjects for A level, namely Subsidiary Mathematics and Subsidiary ICT. Candidates were required to do either of these depending on their Principal Subjects. As far as O level was concerned, the equivalent to ICT was Computer Science, which was being done as one of the elective subjects at Senior Four. This means that ICT did not actually exist as a subject at O level, while Computer Science did not exist as a principal subject at A level.

Internally, there was the question of the rules and regulations with regard to possession of ICT gadgets. The copy of rules and regulations seen had this: "15: Any student possessing unwanted items such as radios, cassettes, cameras, stoves, cooking gadgets, phones and accessories shall be suspended" (Document analysis, School 2)

According the ICT teacher in school 1 where a similar rule applied, this was in the interest of the students' academic progress and well-being. He said:

> …it is one of the school's policies – students are not supposed to use phones here at the school. It will make them lose direction especially in academics…they will be using them for making relationships and other nasty deals which are not allowed at the school premises" (Teacher interview, School 1).

4.2.2 Number and Qualifications of Teachers

The number and qualification of teachers are basic questions to ask during implementation of the curriculum. Teachers with sufficient training will have the professional preparation to create comprehensive and innovative ICT syllabi, and are able to employ appropriate pedagogical techniques for the teaching of ICT, and to use ICT effectively to model processes, correct errors in students' work, and give guiding feedback so that students to advance in their learning.

Findings about the number of teachers were that in each school, there was only one teacher. In fact, when asked to specify the challenges he was facing as a teacher, one respondent ignored all other challenges he had implied in response to other questions and only elaborated on the workload as follows:

> One is workload; because having only a single teacher for ICT for the entire school, from Senior One to Senior Six, and some of these classes are double-streamed and – this doubles the workload…so at times it makes me restless – planning lessons, going to classes and delivering, and also the computer lab – you also need to pay attention to see how they are using the machines… (Teacher interview School 2).

None of the respondents had any concerns about the qualifications of these teachers. All the same, this study was interested in the qualifications of the teachers. One teacher said this about himself:

> I did a diploma in Computer Science and Networking as a profession but when I sought for the jobs I wanted all in vain…I just decided to keep myself busy by teaching in my home district so that I could be busy (and) to get something little to start life from. (Teacher interview, School 1)

This respondent later added, however,

As a teacher I have not gone for that training I'm much longing to go for it, although I have taken too long to do that; but I'm longing to go for the training to become a professional teacher (Teacher interview, School 1).

The other teacher involved in the study also said he had not trained as a teacher. He described himself in these words:

I'm a graduate of computer studies majoring in information systems... I didn't train to be a teacher...I was invited to be here to guide the learners in the field of computing just simply because the demand was there but the personnel was not around...(Teacher interview, School 2).

Looking at the two teachers, certain things became clear. The teacher who explicitly expressed his desire to train as a teacher, being a diploma-holder, had a long way to go, requiring a degree in Computer Science before proceeding for a post-graduate programme in education. The other teacher, a graduate, would have a shorter struggle, but he was not on the government payroll and, as the head-teacher put it, did not have the necessary job-security. What this suggests is that the chances of having trained ICT teachers in these schools are negligible, at least in the short-run.

4.2.3 Curriculum Materials

According to one teacher (School 1), there were hardly any textbooks for preparation of lessons and lesson notes. This problem was aggravated by the lack of access to the internet from where both teachers and students could get information and materials that would enhance their efforts, he said.

4.2.4 Funding

ICT, in the words of one head-teacher School 1, is expensive in terms of maintaining it. From what was found, the government supplied eleven computers to each

of the schools, installing them in the best room the school could avail out of the existing buildings. The computers were installed with a solar system clearly estimated to provide just enough power for those particular computers. In School 2, that was all, and in School 1, they had the addition of a teacher paid by the government. In terms of funding, the head-teacher of School 2, referring to the USE funds remitted to the school in relation to funding for ICT said:

> It was not adjusted. It is still the same money that we have been receiving, only that now we are prioritizing ICT out of it, out of the budget that we receive because the capitation grant has remained stagnant – it has not changed since then (2007) (Head-teacher interview, School 2).

In this situation, the school had to find a printer and a projector as well as the power to run them and in the case of the printer, funds for replenishing the printing ink and printing paper. In the case of School 2 they had to pay the ICT teacher, and both schools needed at least one more ICT teacher whom they would have to pay, as well as a lab attendant whom they would equally need to pay. This excluded internet connection and maintenance costs and costs for storage devices and such other accessories. With no additional funding, these expenses would stretch the schools' resources too far.

On the other hand, the schools had their traditional needs pressing to be met. In this case, School 2 had the advantage, as shown earlier. However, document analysis revealed that the school had priorities other than the ICT programme as reflected in the following extract.

(With reference to Five-Year Strategic Plan) "The chairman strategic plan (committee) said priority areas (were): library, farmland, staff-houses, dormitory, tipper lorry and mosque" (Document analysis, School 2)

School 1 did not have the advantage of government-funded buildings, and hence was even more pressed for space as well as other traditional school requirements as reflected in the following extracts:

- "2.7. That staff and students who slept in grass thatched houses have their lives already threatened." [BOG chairman]

- "That he [head-teacher] would revisit the commissioner for more advice on the prices of acquiring the land title."

- The school should solicit a loan of reasonable amount to roof the two classes [classrooms] and staff houses in the quarters. (Action points)

- Beds for boys be procured in phases to decongest them in the hostels

(Document analysis, School 1)

4.3 Challenges Faced in the Teaching of ICT

The study found a number of challenges facing the schools in their attempt to teach ICT as a subject on their curricula, as evidenced in the responses got from various participants. These challenges are presented below.

Shortage of power was a major challenge which affected the number of gadgets available for use in the computer lab for teaching and learning purposes. As indicated earlier, in each school there were computers lying idle because there was no power to run them, and there was no printer installed in the computer lab partly for the same reason.

The schools also had inadequate equipment. In both schools the computers were not enough; the schools did not have projectors and printers were too few. For instance, one head-teacher said, "We have a printer which the school uses for both the ICT (lessons) and also for other school activities like printing exams, letters and the like" (Head-teacher interview School 1)

The counterpart in School 2 also said, "These are still inadequate…given our population of 996 where we have only 21 (computers), I think it is still a very low ratio" (Head-teacher interview, School 2)

Part of the reason for the inadequacy had to do with the failure to maintain all computers in a good working condition and the lack of power to run the additional computers.

Even for the functional equipment, access was a challenge partly because of competition and partly because of fear of misuse, damage or vandalism. Both schools also did not have internet access in the computer labs.

The number of teachers was a big concern for all the respondents. One teacher said, "…in school one teacher cannot really handle six classes successfully without getting a problem on the way" (Teacher interview, School 1).

There was a problem of funding. Apart from supplying the few computers and, in the case of one of the schools, posting one ICT teacher, the government apparently did nothing to enhance the teaching of ICT. According to the head-teachers, the government continued to pay Ush 41,000 (about 12 US Dollars) per child per term, the same amount of money that it paid when the USE programme began in 2007. In other words, no additional funds were provided for implementing the ICT programmes. In terms of allocation, the budget for "ICT maintenance" was Ush 1,000,000 (about USD 280) for 2016. It had been 600,000 (USD 170) for 2014 and 2015, with the money not spent at all in 2014 while in 2015, about 500,000 (USD 145) was spent. In School 2, the budget for 2016 for "Computer laboratory equipment and maintenance" was Ush. 5.8 million (USD 1650) of which 2m was for internet and 1.5m was for a projector 1.1m for cables and 1m for repair of the photocopier and printers among others in their budget for 2016. However, the previous budgets reflected similar allocations but were apparently not spent. The ICT teacher confirmed that the projector was in the budget for the third year, but even that year was about to end without it. As pointed out earlier, there was also no internet in spite of the allocation in the budget. This suggested that the funding for ICTs was subject to the fulfillment of more urgent school needs as viewed by management.

Both schools also lacked standard computer laboratories. The rooms housing the computers were not fit for accommodating the facilities and for accommodating learners during lessons. The rooms were small, dusty, poorly lit and lacking safety and security fittings such as lightning arrestors and fire extinguishers, and the furniture in the rooms was simply not designed for the purpose. There was the challenge of attitude, which also seemed to point to poor curriculum policy. According to one teacher, there was a problem teaching the subject in A level, where it was a mandatory subsidiary for certain categories of students. He said: "For the HSC (A level), the syllabus has quite a number of items for one point…so it has appeared to the learners as if they are bothered for something very minor" (Teacher interview, School 1).

An A level student in admitted: "… of course computer being a subsidiary subject, I do not consider it much, because I work on the principals" (A level focus group, School 2).

Interestingly, on the other hand, there was one in O level who was actually doing the subject against the will of the parents, because he loved the subject. He informed: "If I tell them I am offering computer I will be in conflict with them – yes – because they wanted me to offer Commerce" (O level focus group, School 2).

Moreover, the students who studied Computer Science through O level could not go on to study the subject as a principal at A level. Curriculum planning apparently did not consider the question of continuity.

4.4 Summary

The above findings provided a general picture of the conditions under which the selected schools were implementing the ICT programme on their curricula. It is evident that in terms of the main question, the inevitable answer is that the schools in this study were far from ready to implement successfully the incorporation of ICT on their curricula. The ICT facilities were inadequate, with basics for teaching such as projectors and laptops for teachers lacking, as well as lack of internet and inadequate power. There was limited access to the few facilities and each school had only one ICT teacher for all six classes. Without any ICT support staff or ICT coordinators from among the other teachers, the ICT department was left exclusively to the ICT teachers, who were not adequately qualified. ICT was apparently regarded as an additional skill at best, being considered more as a hindrance to the students' academic progress. These findings are discussed in the next chapter.

CHAPTER FIVE

FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This study sought to establish the readiness of rural government secondary schools in Uganda to teach ICT as a dedicated subject, with a focus on two schools in Yumbe District in West Nile, Northern Uganda. The study focused on the state of ICT facilities in the selected schools, the way the schools have implemented the incorporation of ICT as a subject on the curriculum, and the challenges the schools were facing in the implementation of ICT as a dedicated subject on the curriculum. The findings presented in the preceding chapter are here discussed in line with the three guiding questions of the study. These findings compare positively with a number of other studies, with the difference being the level of emphasis on ICT support staff and the involvement of other teachers apart from the ICT teachers in the management of the ICT programme among others.

5.1 The state of ICT facilities

5.1.1 ICT laboratories

The findings of this study revealed that the two schools were making efforts to provide the conditions necessary for the effective teaching of ICT as a subject. Realizing that this meant a provision for at the installation of the computers, each of the schools dedicated a room according to the space available. However, it was also found that these schools had not constructed any buildings for the particular purpose of using them as ICT laboratories. In School 1, for example, the room assigned was too small, and its location

on the administration block did not give the impression that it was to be available for everyone's use. School had a larger room, formerly a classroom turned into a computer laboratory. The ICT laboratory in each case was usually locked every time the ICT teacher was not around, although in School 2, possibly because of having more classes to teach, the teacher here spent more time in the school. These findings are similar to those of (Newby et al., 2013) in their study in Mukono, a district in Central Uganda.

5.1.2 Computers

In both schools, two types of computers were found: the small apparently low-power computers running on solar power, and bigger ones lying redundant because there was no power for them. The government supplied an equal number of solar-powered computers to each of the schools despite the contrast in enrollment figures of the schools. In terms of the bigger computers, however, School 2 had a proportional ten to the five in School 1. What this means is that the problem of number of computers goes hand in hand with the problem of power. Many studies, especially those that have been carried out in rural areas identify the limited number of computers available and lack or shortage of power as a major hindrance to the implementation of ICT projects (Adomi & Kpangban, 2010; Matthew et al., 2015; Mugambi, 2015). In the present study, for example, if it were not because of lack of power to run the other computers which were otherwise functional, the ratio of functional computers to students would improve from one computer for every eleven students in a class to one to every five in School 2. According to the instructions in the syllabus, "The learners work in pairs or individually to develop skills or put into practice the acquired knowledge" (NCDC, 2013, p. 7). Going by this standard, and owing to the absence of power, the ratio of computers to students is five times higher than the recommended.

5.1.3 Peripherals

Computers and peripheral devices are complementary. While numerous categories of peripheral devices would be desirable, the present study focused on two basic ones, namely, the printers and the projectors. The reason particular attention was paid to these was that with reference to the projector, it is the only tool the teacher can use to guide the students effectively in parts of the curriculum which need the teacher's demonstration. In an ICT class, this means always. Because of the many programmes and icons on the computer, the teacher usually has to show the students which icon represents the desired command. The absence of a projector means, as one teacher said, that he had to move from table to table demonstrating whenever there was need to demonstrate (Teacher interview, School 2). For the ten functional computers in this teacher's class therefore, the teacher would use at least ten times as much time demonstrating from computer to computer as he would have used if he had a projector and demonstrated once for all to see.

What the above means is that in such lessons students really learnt one tenth of what they might have learnt in a similar lesson aided by a projector. Moreover, the teacher's movement from table to table could result in classroom management issues as every time the teacher was at one computer, students sitting at the remaining nine might get bored and therefore become disengaged. As for printing, it is a basic operation since even for their examinations, the students are required to produce hard copies of their work to accompany the soft copies. The schools did have at least a printer each. However, once again, the problem of power rendered the printers impossible to use regularly since they could not be powered by the solar power installed in the ICT laboratories. While most studies, being about using ICT to enhance learning in other subjects rather than teaching ICT as a subject (Akpan-Obong, Thomas, Samake, Niwe, & Mbarika, 2009; Newby et al., 2013), tend to make only a passing comment about these particular devices, this study found these worthy of special consideration.

5.1.4 Internet

There was no internet access for students in either school. According to the responses by the head-teachers, the government was meant to provide internet access along with the installations done. However, this had not happened for over three years since the installations took place. This situation was similar to that where among the schools originally selected for study by Newby et al. (2013), none had internet access. There were those which had had it, but had had to be disconnected because they could no longer afford the subscription fees. The absence of internet meant that students did not any hands-on experience with the use of the internet. Moreover, it was difficult for the teachers to access information online including new ideas and notes for improving their teaching. Although there were modems, these seemed to serve mainly administrative purposes due to the costs involved in obtaining internet data. Moreover, the modems did not have sharing capabilities, and therefore could only serve one computer at a time. It may be argued here that if there was no internet access for just teaching the students about the internet, the overall aim of ICT integration was still quite beyond the reach of the selected schools.

From the above, it can be seen that the two schools did have some of the facilities necessary for implementing an ICT programme. There were dedicated rooms for computer laboratories although these were a far cry from the standard ones built with sufficient resources and with the specific purpose in mind. There were computers that were functional and although the printers were not installed in the ICT laboratories, there was, in each school, some arrangement for powering them when it was necessary. School 2 had a larger number of computers and printers as well as a larger room for a computer laboratory, but it also had over two times the enrollment of School 1. The issue, however, seemed to be with access, and maintenance, as well as access to the internet.

5.2 The Incorporation of ICT in the Curriculum

In order to implement ICT as a dedicated subject in the curriculum the following factors must be considered, in addition to ICT facilities:

1. School and district policies must support and advance the place of ICT learning in the curriculum
2. There must be sufficient qualified ICT teachers to be able to respond to the numbers of students who are in the ICT courses
3. There must be sufficient and relevant teaching and learning materials
4. There must be sufficient and sustainable funding

5.2.1 ICT Policies

As we know, the policy environment within which the teaching of the subject goes on is very important (Adomi & Kpangban, 2010; Rezaei et al., 2011; Sharma, 2008). In this study, it was found that, there was no overall guiding policy from the Ministry of Education and Sports who, according to one head-teacher, was also waiting for the national ICT policy to be complete, which itself was still only in draft form. Indeed there was an ICT policy in place, but apparently this policy, adopted in 2003 (MoWHC, 2003), was apparently obsolete, and was hardly referred to in relation to teaching ICT.

The schools did not have their own policies, and although the head-teachers sounded very enthusiastic about the ICT program, there was apparent fear of the possible misuse of ICT resources by students, with particular emphasis on moral degeneration, a situation that was observed by Matthew et al. (2015). This is a crucial point because implementing an ICT programme without a policy to guide the use of ICTs at both national and school levels can be extremely counter-productive.

Meanwhile, another interesting claim was that ICT did not exist as a principal subject in A level. This begs the question: why did the students have to do Computer

Science at O level and not have the opportunity to advance in the same area through A level to the tertiary institutions? It stands to reason that for this very reason, the curriculum might be overloaded because all knowledge intended for secondary school was packed in O level, something that was hinted at by one respondent (Teacher 2) who observed that there were parts of the curriculum he did not consider relevant for the lower secondary school. As far as the study could gather, subsidiary ICT was mandatory for those doing mathematics as one of their principal subjects at A level, for the alternative subsidiary was Subsidiary Mathematics, which was mandatory for those doing economics as a principal subject without mathematics in the combination. As it is, however, not many students, especially those doing arts subjects in A level, were fans of mathematics, and they invariably had to add subsidiary ICT as their second subsidiary to fulfill the requirements for grading. This is yet another aspect that demands serious thought because the need for continuity, which according to (Russell, 2012) is an important consideration, is not catered for.

5.2.2 Qualification of Teachers

"The Computer Studies teaching syllabus is for use by a qualified Computer Studies secondary school teacher," (NCDC 2008, p. x). Despite this statement, the government recruited computer scientists rather than secondary school teachers. This was not entirely surprising, and seems to have been a challenge that has faced all countries at similar stages of introducing ICT programmes. Writing about the UK, Greenwood (2003) questioned the use of Teaching Assistants to teach ICT and yet for all other subjects only professional teachers were involved. The cause of the problem, likely would be what Davis (1992) as quoted in (Holland, Boylan, & Lowe, 2005), pointed out: Teacher education institutions were rarely included. Training for practicing teachers was recognized as important from the start, but was mainly in the form of inadequate short courses" (Holland et al., 2005, p. 2). It remains doubtable indeed if the ministry was right to make the subject compulsory at A level when, going by their recruitment of untrained persons to teach the subject, it was clear that there were hardly any teachers qualified to

teach the subject, yet this should have been a prerequisite for introducing the subject in schools, let alone making it compulsory, although making the subject compulsory is considered one way of promoting it (Adomi & Kpangban, 2010; Hennessy, Harrison, et al., 2010).

Although these individuals have attended workshops on the teaching of ICT, the government has, at least so far, not revealed any plans to arrange for full professional training for them. Moreover, there were two categories of ICT teachers: those trained as computer scientists but not as teachers and those trained as teachers but with only basic knowledge about ICTs. Clearly, these two categories had different needs, but the content of the workshops was the same for all. Again, other studies have observed this problem: "Another major problem that constrains the successful implementation of ICT in secondary schools in PICs is the shortage of appropriately qualified teachers" (Sharma, 2008, p. 5)

The fact that each school had one teacher meant that there was no colleague specialist at hand to consult with on any subject-specific issues. Moreover, it simply does not make sense to make someone still learning to teach in charge of the learning of a subject in the whole school, and leaving this to that one person. Even for teachers with initial teacher training, part of professional development involves reduced workload for some time (Ingersoll & Strong, 2011), which then gives the teacher time to reflect on his experiences in a lesson before going for another. Unfortunately, in both schools in the study, the teachers clearly did not have that luxury.

5.2.3 Number of teachers

Looking at the present status of the ICT teachers in this study, the most important issue is the teacher-student ratio. In both schools that participated in the study, there was one teacher for all the six classes, and, accordingly, for all the 440 and 990 students in School 1 and School 2 respectively. This is most likely related to the shortage of qualified teachers that has been a major challenge even in other places (Koppi et al., 2008; Sharma,

2008).. However, this unsuitable ratio relates not only to the number of teachers or, for that matter, computer scientists, but also to the financial ability of the schools. In other words, "in this study, 'rural' means 'poor'" (Lating, 2009, p. 62) This is particularly true of rural schools, rural settings not being that attractive to professionals in general, but ICT specialists in particular, as also with other scientists (Hudson & Hudson, 2008).

A confounding factor in the teacher-student ratio was that they did not have a lab assistant and therefore, had to look after the ICT labs themselves. These additional responsibilities obviously affected their efficiency to prepare for classes and to work with students outside of class. Beyond their teaching workload, these same teachers were also generally observed to be on call for any ICT related tasks that the administration wanted done, as well as assisting colleagues working on their laptops whenever they had challenges. This tallied with one student respondent identified, namely, that there was very limited students' access to the teacher, and apparently was regarded by the teachers, themselves as "other duties". This is a far cry from the ideal pointed out by (Russell, 2012): "The best scenario is where there is an ICT coordinator, a subject specialist responsible for the ICT subject and technical support to solve the many problems that can and do occur with networked and non-networked computers." (Russell, 2012, p. 54)

From the above it is possible to argue that an ICT laboratory without a laboratory assistant is not complete. Madzima, Dube and Mashwama (2013) agree that technical support is essential, "and if there is lack of technical assistance, then the regular repairs of the computer will not be carried out resulting in teachers not using computers in teaching"(Ali, Haolader, & Muhammad, 2013, p. 4065). However, the description in the above paragraph includes something else that is seldom seen in Ugandan schools, and certainly not in the schools in this study, and that is the ICT coordinator who, according to Russell (2012), need not be a specialist teacher of ICT. This is quite in tune with the UNESCO ICT Competency Framework for teachers (UNESCO, 2011) and the framework for the place of ICTs in the school system (UNESCO, 2006; Zlotnikova & van der Weide, 2011), where all teachers, not just the ICT teachers, use ICTs in the curriculum. This would mean that they also use the ICT laboratory for teaching non-computer classes, something that only occurred in very few schools according to some

studies (see Newby et al., 2013). The point here is that if more teachers used ICTs and in particular, the ICT laboratory for some lessons, the ICT laboratory would cease to 'belong' exclusively to the ICT teacher, and there would probably be collective responsibility among the teachers for the monitoring and promoting of students ICT skills growth. Apart from relieving the ICT teachers of part of the burden, such a situation would impress on the students the notion that ICT was not to be learnt to pass the ICT examination, but rather to enhance their learning experiences in other subjects.

The examination-oriented teaching was pointed out by one student respondent. The students were taught only theoretical concepts in the first two years of their interaction with ICT as a subject in secondary school. What this means is that for those who did not get selected to do the subject beyond the second year, there was no chance of acquiring any practical skills, because the lab would always be left to the use of those doing the subject beyond Senior Two As some students put it, they would surely pass the examinations, but beyond that they would not be able to apply any ICT knowledge in practical situations outside school. This sounded a very condemning description of the students' learning taking place in relation to the subject. Asked whether they had done very well in then recent District Mock preparatory examinations, they answered in the negative, saying part of the problem was the fact that unlike in the past where they would be required to input data, this time the data was ready on the CDs and theirs was to process or manipulate it. Since that change was, in fact, meant for their advantage since inputting data (especially typing) would have cost them more time, it clearly showed how any slight change in the examination setting could dislodge them.

Besides the limitations of the teachers, the curriculum materials, especially text-books were found to be lacking as pointed out by the teacher and as implied by some students' assertion that they were more confident about practical parts of the paper because they did not have enough notes for the theory part. In introducing a subject on the curriculum, the question of reading materials should be among the priorities, which this study found otherwise.

Again, the curriculum guide itself seemed to promote theory rather than practice. For instance, in Senior One, under the sub-topic "Keyboard and navigation" nine periods

(three weeks) are allocated and, while the specific objective was for students "to be able to use the keyboard and navigation tools", the time allocation column tagged these lessons "theory" (NCDC, 2008, p. 2). Clearly, the objectives and the instruction on duration did not match. Such a guide, in the hands of teachers who were not specialists in education, and by extension syllabus interpretation, would be unlikely to yield good instruction.

In conclusion, with regard to the implementation of the incorporation of ICT as a dedicated subject on the curriculum, some steps were taken, but it is clear that the curricular arrangements still need a lot of improvements if ICT is to be taught successfully as a subject on the curricula of the schools in question.

5.3 Challenges Faced in the Teaching of ICT

The findings of this study suggest that there are a number of challenges facing the schools selected in their efforts to implement the incorporation of ICT as a dedicated subject on the curriculum.

5.3.1 Facilities

The first challenge that was found was that of the ICT labs. Neither of the two schools in this study had a building built specifically to serve as an ICT lab. In School 1 in particular, there were simply not enough buildings, forcing the school to convert a rather small room on the administration block into the ICT room, apparently because they just had to allocate a room when the delivery was made – they could not reject the computers. As pointed out in the previous chapter, even then, the computers were sharing this room with building materials, student property and such non-ICT-related junk. Curiously, the government supplied and installed the computers in such buildings. It is doubtable that systematic arrangements were made in relation to provision of computers to the schools, because if this were the case, the question of space should have been

answered before the supply of the computers. However, although the state of ICT laboratories was far from the standards, it might not be the worst. Most of the schools surveyed by Newby et al. (2013) in their study had similar conditions, but there were cases where there were simply no rooms to install the computers, and the computers remained completely inaccessible. In comparison to such conditions, the schools in this study might be said to be better prepared.

Moreover, the strain of accommodating the computers is worse for schools which are still struggling to acquire basic infrastructure, as was the case in School 1 and as pointed out by (Hosman, 2010). Citing Farrell (2007), Hennessy et al. (2010) observed that due to the small size of laboratories, students could only go in alternatingly, In the present study even this was hardly possible for some classes. With 120 students in one class and 10 functional computers in the ICT laboratory, it was only practical not to attempt to teach a practical lesson, especially when the same teacher had at least five other classes to teach in a school where ICT was just one of at least ten subjects, and students, especially in lower classes, had to do all, meaning that even if the teacher were available, the students would be busy with other lessons.

The second major problem identified was with the ICT hardware. The number of computers in the schools was too small, and let alone that, there was a problem with maintenance of the computers, leading to an even more reduced number of computers available for the students. Indeed, School 1 had 07 computers available for 440 students and School 2 had 10 computers available for 990 students. Computer accessories like printers, projectors and speakers were either inadequate and inaccessible, or missing altogether. The problem of shortage of computers and peripheral devices has featured in a number of studies (Adomi & Kpangban, 2010; Gambari & Okoli, 2007; Matthew et al., 2015; Mugambi, 2015)

Internet access was also a problem which affected teaching and learning both by limiting the students' practical knowledge of internet-related topics and also limiting access to notes and learning materials available online. It was not surprising, therefore, to hear students say they had never done anything on the internet. The question of internet access was mainly a financial one, with the schools apparently lacking the capacity to

sustain subscriptions. "Few schools in Uganda can afford the high costs of Internet connectivity and bandwidth" (Lating, 2009, p. 57). This assertion, if true of schools in general, is bound to be even truer for rural schools such as the ones in this study.

Inadequate power was a big problem, as has been found to be the case in many other studies (Matthew et al., 2015) . in a study of factors for the low application of ICTs in higher institutions, "Frequent electricity interruption" (ranked) third with 101 respondents (57 percent) (Adomi & Kpangban, 2010, p. 4) Similarly, in both schools in this study for example, the printers could not be used regularly in the ICT labs partly because there was no power in the labs to run them. Both schools also had computers lying idle because there was no power to run them. If there was power, the number of computers available to the students would have increased by five and ten respectively in School 1 and School 2. The options for power in these schools were quite limited. It appeared the most reliable would be the installation of bigger capacity solar systems to power all the ICT gadgets.

5.3.2 ICT Laboratory Assistant

One issue that cut across maintenance and curriculum implementation was that of the ICT lab assistant. The absence of a lab assistant means a number of things. First, the teacher is overworked, having to both teach their lessons and look after the lab. Secondly, it affects student access to the ICT lab because the teacher, busy with the lessons and other duties, cannot always be in the lab to both supervise the use and offer assistance to students. Although not many studies have paid attention to this point, Ali, Haolader, & Muhammad, (2013) Madzima, Dube, & Mashwama (2013) and Russell (2012) all make a case for the need for ICT support personnel, of whom the laboratory assistant is the minimum requirement.

5.3.3 Number and Qualification of Teachers

Once we are talking about the learning process, we are inevitably talking about the teacher. That the schools had only a teacher each, and more so, that these had not received formal teacher training should be a cause for worry. Interestingly, students, the teachers themselves and the administrators all saw the number as a problem, but none seemed to worry about the training these teachers had. The findings about the number and qualifications of the ICT teachers have been the concern of many researchers (Gambari & Okoli, 2007; Greenwood, 2003; Holland et al., 2005; Koppi et al., 2008; Sharma, 2008).

5.3.4 Funding

In general, there was a problem of funds. Internet subscriptions, buying fuel for the generator, buying and repairing computers, buying projectors, building ICT labs, procuring the right furniture, hiring lab assistants, and so many other things could not be done because of financial constraints. As Rezaei, Nazarpour, Emami and Branch (2011, p. 597) put it, "One of the biggest challenges in application of ICT in education (is) balancing educational objectives with economic realities."

5.4 Summary

Conclusively, this study sought to establish the level of readiness of two rural government schools in Uganda to teach ICT as a dedicated subject on the curriculum. From the above discussion, it is clear that the schools that participated in this study still had a lot to put in place in order to effectively teach ICT as a subject. The facilities were inadequate, the teachers were insufficient and not properly qualified and there was no supportive policy environment. There were indeed efforts being made, but a lot still

needs to be done to effectively teach ICT as a subject, as part of the effort to integrate ICT fully in the curriculum.

5.4.1 Recommendations

Basing on the findings of this study, a number of things need to change if ICT is to be taught effectively in the rural schools. Although this study was based on only two schools, the recommendations made here may be applicable beyond the particular schools involved in this study, since the findings were in many ways similar to those of other studies carried out in other places. The various stakeholders need to combine efforts to ensure that ICT is properly taught in the rural secondary schools.

Recommendations to the Ministry of Education and Sports

There is need to increase funding for the schools to finance the ICT component. It is only when schools obtain additional funding that they can be reasonably expected to maintain the ICT equipment, hire support staff and acquire basic accessories. Until this is done, requiring the schools to teach and promote ICT will only remain as rhetoric.

The challenge of basic infrastructure such as classrooms should be addressed by the government, as well as that of ICT equipment, including power and internet.

There is need to take deliberate steps to equip all practicing teachers with some basic ICT knowledge. ICT-assisted learning aspect should then be encouraged in all subjects. Using the computers for such purposes will undoubtedly clear the sense of mystery around them and increase the students' enthusiasm for the subject as they see it helping them to solve problems, which is the purpose of ICTs in the first place. Responses like, "… of course computer being a subsidiary subject, I do not consider it much, because I work on the principals" (A level Focus group, School 2) might be avoided.

Recommendations to the teacher training institutions

There is need to introduce ICT as a teaching subject at the teacher training institutions. Those currently teaching the subject without teacher-training can then get a chance to obtain it.

Recommendations to the National Curriculum Development Centre

Since the goal is to have basic ICT skills for all secondary school graduates, it may be necessary to have ICT taught in O level while Computer Science is moved to A level. In this way all students, including those who might not go to A level, will have some skills to start with. Meanwhile, the Computer Science, which is supposed to be more than just basic computing, can be moved to A level as a Principal Subject, building on the basic ICT skills acquired in O level. These students can then opt to become teachers with ICT as their teaching subject.

Recommendations to Head-teachers

There should be another teacher, not necessarily the ICT teacher, to be the ICT coordinator. There could even be more than one other teacher to join the ICT 'committee'. This may help to build trust and comradeship, and a sense of collective responsibility for the proper use, and, indeed, integration of the ICTs in the curriculum, apart from guaranteeing better student access to ICT facilities.

Still in relation to staff, it is important that in planning for a computer laboratory, the question of an ICT technician or at least a laboratory attendant should be considered.

In such a situation, the best practice maybe to include a plan for on-the-job training in basic maintenance and troubleshooting (Hosman, 2010).

Another possibility is to encourage those students who can have access to laptops to carry these to school. This is because there are occasional cases of those whose parents might actually afford laptops for their children, which would serve to reduce the pressure on the few in the laboratory.

The above implies the need for a change of attitude. The issue of possible misuse should not be a hindrance to access, but rather an opportunity to guide the students. In any case, these students will go out and have to interact with ICTs, and the duty of the schools is to prepare them to use ICTs well.

5.4.2 Area for further research

This study focused on the readiness of government secondary schools in Uganda to teach ICT as a dedicated subject on the curriculum, with respect to the West Nile District of Yumbe. The findings can only apply to the two selected schools, but may provide a basis for further research in relation to ICT integration. Some suggested areas of research highlighted by this study are presented here.

There is need for a quantitative survey to establish the readiness of rural government schools in Uganda in general to teach ICT as a dedicated subject on the curriculum.

Another study that could be beneficial in understanding the issue of ICT integration would be a study of how ICT is integrated in the curriculum for teacher training, with specific reference to the universities and other teacher preparation institutions for secondary school teachers.

While this study was concerned with the implementation of ICT as a subject on the curriculum in government secondary schools, a large number of students go to private

schools, and it should be worth investigating the same situation as experienced in rural private schools.

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APPENDICES

Appendix A: Observation Guide

<u>OBSERVATION GUIDE</u>

FACILITIES

ITEM/ASPECT	NUMBER/DESIGN	ACCESS	CONDITION	REMARKS
Lab (building)				
Furniture				
Power source				
Computers				
Printers/scanners				
Internet				
*software/antivirus presence and update				

Appendix B: Interview Guide for Head-Teachers

<u>INTERVIEW GUIDE FOR HEAD TEACHER</u>

Hello. Thank you very much for accepting to participate in this study. I am interested in the issue of teaching ICT as a subject on the curriculum, and I am sure as the head teacher the information you provide will be invaluable to this study.

1. If I may begin from a personal point, would you please share a little about yourself in terms of the time you have worked in this school and your personal experience with ICT?

2. {How did you acquire the facilities required (computer lab, computers and associated equipment?)

3. How do you cover the cost of routine maintenance, repairs and replacement? How much is the budget for ICT? What is the source of funds? What are the main ICT-related recurrent expenditures?}

4. What steps have you as a school taken to ensure the sustainable and successful teaching of ICT as a subject on your school curriculum?

5. How would you rate your readiness to implement the teaching of ICT as a core subject?

6. What challenges do you face or foresee in the provision of ICT education in your school?

7. Any other comment you would like to make?

Thank you.

Appendix C: Interview Guide for ICT Teachers

<u>INTERVIEW FOR ICT TEACHER</u>

Thank you very much for accepting to participate in this study. I am interested in the teaching of ICT as a subject on the school curriculum. As the specialist teacher of ICT, you are possibly the most technical person, and have the real experience of trying to develop these skills among the learners. Do feel free to share what you know or think.

1. To begin with, please tell me a little about yourself; when and how you started teaching ICT in this school.

2. Let's talk about the facilities: how would you compare the condition of the ICT lab to what you know/think as the ideal? Please refer to both the building and the equipment.

3. How do you rate the supportiveness of the school towards your efforts to teach ICT in the school both in terms of facilitating you and providing an enabling environment?

4. (Tell me about student access to the computers, internet and smart phones/mobile phones that have access to internet.)

5. In general, what are the challenges you face or see in relation to your teaching and the students' learning ICT in the school?

6. What is your view about the ICT curriculum at the two levels? Does it equip students with enough skills by the time they complete?

7. Any additional insights?

Thank you very much.

Appendix D: Focus Group Discussion Guide for Students

FOCUS GROUP GUIDE (STUDENTS)

Thank you for accepting to take part in this study. Please feel free to share with me, because the information I am gathering is strictly for academic research purposes and will not be used to judge anybody or cause any harm, as you see in the consent forms you signed. I will give you numbers for referring to you during the interview because I do not want to have your names in the recording.

1. To begin with, how much experience did you have in using ICT before joining your current level (O level or A level? How did you get it?

2. How much access do you have to ICT facilities and assistance in the school? Outside school? In school but outside ICT lesson time? (What computer resources e.g. storage devices, printing, internet… do you have access to?)

3. How do you rate the ICT knowledge you have got so far? (How much do you know? Are you satisfied with your level of ICT skills?)

4. How does the school support you in your learning of ICT? (Any special arrangements the school has made in terms of staffing, programme design etc. to enhance your ICT skills development?

5. What challenges do you face as students doing ICT?

Thank you very much.

Appendix E: Document Analysis Guide

<u>DOCUMENT ANALYSIS GUIDE</u>

Document	Key expectations	Comments
School ICT policy	- Presence of document - Content of document (position of ICT in the school): vision, goal, funding, staffing, infrastructural priorities, ICT skill requirements for staff and students, integration of ICT into school curriculum (specific activities in the school)	
ICT Curriculum guide	- Presence of document - Content of document (skills being targeted)	
Enrollment records	Number of students vs. facilities available	
Budget	Provision for procurement, maintenance and replacement of ICT equipment, ICT reference materials…	
Minutes of managerial and/or staff meetings	Resolutions in relation to ICT	
Rules and regulations	Position of ICT, regulations on use of IT room and possession of ICT gadgets.	
School time table	Number of periods for ICT lessons or ICT-assisted lessons	
Examination results	Performance of students in the subject	
Sample ICT examination past papers	Nature of the skills examined	

Appendix F: Ethical Review Committee Clearance Certificate

THE AGA KHAN UNIVERSITY

Institute for Educational Development
East Africa

Ref.: AKU-IED, EA/2016/407/gt   **Date:** *August 18, 2016*

Baiga Solomon
Aga Khan University
Institute for Educational Development East Africa (IED EA)
P.O Box 125,
Dar es Salaam, Tanzania

RE: CLEARANCE CERTIFICATE FOR CONDUCTING EDUCATIONAL RESEARCH
     IN YUMBE DISTRICT, UGANDA.

Dear Baiga Solomon,

This is to certify that your research project *entitled* **"The readiness Of Rural Government Secondary Schools To Teach ICT As A Dedicated Subject On The Curriculum In Uganda: The Case Of Two Schools In Yumbe District"** undertaken as part of the dissertation project in the master of education program at IED EA has been approved for Ethics Clearance.

As a principal Investigator of the study you must ensure that the following conditions are fulfilled:

1. You will comply with the key principles of the AKU ethics policy i.e. confidentiality of information, anonymity of participants, informed consent, no harm to the participants and reciprocity.
2. Failure to comply with the AKU Ethics Policy could lead to a disciplinary procedure.

3. Approval for field work is for 3months from September 1- November 11, 2016

Yours Sincerely,

Joe Lugalla,
Professor, Director, IED EA
Chair Ethics Review Committee AKU

Cc: Dissertation Supervisor: Dr. Geoff Tennant

Appendix G: Approval Certificate from UNCST

Uganda National Council for Science and Technology

(Established by Act of Parliament of the Republic of Uganda)

UNCST

Our Ref: SS 4121

15th September 2016

Baiga Solomonn
Odravu Secondary School
Yumbe

Re: Research Approval: The Readiness of Government Secondary Schools to Teach ICT as a Dedicated Subject on the Curriculum in Uganda: The Case of Two Schools in Yumbe District

I am pleased to inform you that on **29/08/2016**, the Uganda National Council for Science and Technology (UNCST) approved the above referenced research project. The Approval of the research project is for the period **29/08/2016** to **29/08/2017**.

Your research registration number with the UNCST is **SS 4121**. Please, cite this number in all your future correspondences with UNCST in respect of the above research project. As Principal Investigator of the research project, you are responsible for fulfilling the following requirements of approval:

1. All co-investigators must be kept informed of the status of the research.
2. Changes, amendments, and addenda to the research protocol or the consent form (where applicable) must be submitted to the designated Research Ethics Committee (REC) or Lead Agency for re-review and approval **prior** to the activation of the changes. UNCST must be notified of the approved changes within five working days.
3. For clinical trials, all serious adverse events must be reported promptly to the designated local REC for review with copies to the National Drug Authority.
4. Unexpected events involving risks to research subjects/participants must be reported promptly to the UNCST. New information that becomes available which alters the risk/benefit ratio must be submitted promptly for UNCST review.
5. Only approved study procedures are to be implemented. The UNCST may conduct impromptu audits of all study records.
6. A progress report must be submitted electronically to UNCST within four weeks after every 12 months. Failure to do so may result in termination of the research project.

Below is a list of documents approved with this application:

	Document Title	Language	Version	Version Date
1.	Research Proposal	English	N/A	N/A
2.	Interview Guide for the Head Teacher	English	N/A	N/A
3.	Interview Schedule for the ICT Teacher	English	N/A	N/A
4.	Focus Group Guide (Students)	English	N/A	N/A
5.	Observation Guide	English	N/A	N/A
6.	Document Analysis Guide	English	N/A	N/A
7.	Informed Consent Form	English	N/A	N/A

Yours sincerely,

Hellen N. Opolot
for: Executive Secretary
UGANDA NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

Copied to: Chair, The Aga Khan University, Research Ethics Committee

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LOCATION/CORRESPONDENCE

Plot 6 Kimera Road, Ntinda
P. O. Box 6884
KAMPALA, UGANDA

COMMUNICATION

TEL: (256) 414 705500
FAX: (256) 414-234579
EMAIL: info@uncst.go.ug
WEBSITE: http://www.uncst.go.ug

Appendix H: Permission from District Education Office, Yumbe.

AGA KHAN UNIVERSITY

Institute for Educational Development, Eastern Africa

18 August 2016

The District Education Officer

Yumbe District Local Government

P. O. Box 1

Yumbe

Dear Sir,

Re: Permission to Conduct Research Study for Master of Education

I am Baiga Solomon, a Master of Education student of The Aga Khan University, Institute for Educational Development, East Africa.

As part of the requirements for my study programme, I am carrying out a research study titled *The Readiness of Rural Government Secondary Schools to Teach ICT as a Dedicated Subject on the Curriculum: The Case of Two Schools in Yumbe District.* The data collection is expected to take place for about one month starting from 12th September 2016.

I now write to request your permission to conduct the above study in two Government secondary schools in the district and, on successful completion of the study, to disseminate the findings.
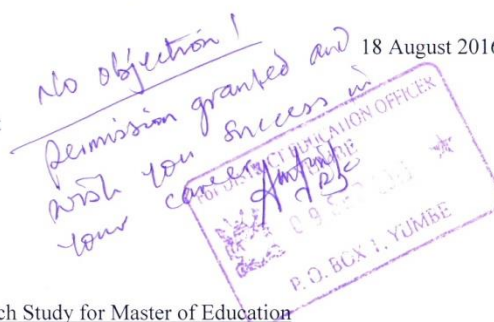
As far as possible, confidentiality of data and anonymity of participants' identity will be maintained, and it will be ensured that no harm comes to the participants.

I should be very grateful for your positive consideration and support.

Yours faithfully,

Baiga Solomon

0756577624

Appendix I: Letter to the Head-Teacher, Case 1

The Aga Khan University

Institute for Educational Development, East Africa

P. O. Box 125, Dar es Salaam

18 August 2016

The Head Teacher,

……… ……Secondary School,

P. O. Box …

Yumbe.

Dear Sir/Madam,

Re: Permission to Conduct Research in Your School for Master of Education Academic Programme

My name is Baiga Solomon and I am a Masters student at the Aga Khan University, Institute for Educational Development East Africa, Dar es Salaam. I am carrying out a research study as part of the requirements for my study programme. The title of my research is *The Readiness of Rural Government Secondary Schools to Teach ICT as a Dedicated Subject on the Curriculum in Uganda: The Case of Two Schools in Yumbe District.*

I am writing to seek your permission to carry out this study in your school as one of two cases.

Data collection will involve interview with the head-teacher, interview with ICT teacher, focus group discussion with four 'O' level students of at least 18 years of age and another with four A level students. It will also involve observation, including taking photographs, and studying documents, which may include scanning sections of these.

The data collection will be over a period of about one month. I will make every effort to minimize disruption of school programmes, and ensure that no harm is done to the participants.

If you agree to participate in this research, kindly sign the consent form attached.

Yours faithfully,

Baiga Solomon (0756577624)

Appendix J: Letter to the Head-Teacher, School 2

The Aga Khan University

Institute for Educational Development, East Africa

P. O. Box 125, Dar es Salaam

18 August 2016

The Head Teacher,

..........Secondary School,

P. O. Box ...... YUMBE

Yumbe.

Received on 01/09/2016

Dear Sir/Madam,

Re: <u>Permission to Conduct Research in Your School for Master of Education Academic Programme</u>

My name is Baiga Solomon and I am a Masters student at the Aga Khan University, Institute for Educational Development East Africa, Dar es Salaam. I am carrying out a research study as part of the requirements for my study programme. The title of my research is *The Readiness of Rural Government Secondary Schools to Teach ICT as a Dedicated Subject on the Curriculum in Uganda: The Case of Two Schools in Yumbe District.*

I am writing to seek your permission to carry out this study in your school as one of two cases.

Data collection will involve interview with the head-teacher, interview with ICT teacher, focus group discussion with four 'O' level students of at least 18 years of age and another with four A level students. It will also involve observation, including taking photographs, and studying documents, which may include scanning sections of these.

The data collection will be over a period of about one month. I will make every effort to minimize disruption of school programmes, and ensure that no harm is done to the participants.

If you agree to participate in this research, kindly sign the consent form attached.

Yours faithfully,

Baiga Solomon (0756577624)

Appendix K: Consent Form for Participants

Page **1** of **2**

Informed Consent Form for Dissertation Research Project

I, **Baiga Solomon**, am undertaking a research project entitled: *The Readiness of Rural Government Secondary Schools to Teach ICT as a Dedicated Subject on the Curriculum in Uganda: The Case of Two Schools in Yumbe District* as part of my dissertation project in the master of education programme at the Aga Khan University Institute for Educational Development East Africa. A description of the research project is attached. Data collection would be over the period **12/09/2016** to **07/10/2016** and would include the following:

☑ Field notes of observations;

☑ Audio-tape recording of interviews

☑ Photographs

☑ Scans of documents

I write to seek your permission to allow me to collect data as noted above, and to use the data for teaching, publication and conference presentations as appropriate. I agree to adhere to the following conditions:

- As far as possible confidentiality of data and anonymity of participants' identity would be maintained.
- It would be ensured that no harm comes to the participants

Should you agree, please sign the consent form below.

Name: **Baiga Solomon**   Signature-------   Date: 18th August 2016

M.Ed. Course Participant

CONSENT FORM

Page **2** of **2**

I agree to let the data be used for teaching, publications, dissemination including conference presentations as appropriate. I am aware that withdrawal of consent at any stage will not result in any adverse consequences for me.

Name of the Research Participant: ----------------------------------Signature:----------------

Institution:--------------------- SEC. SCHOOL ----------------Date: 01/09/2016

In the unlikely event of a breach of ethics or any other emerging issues, inform the Chair Ethics Review Committee of the Aga Khan University Tanzania

Prof. Anjum Halai

Salaama House

PO Box 125 Dar es Salaam

anjum.halai@aku.edu   Phone: +255 22 2150051